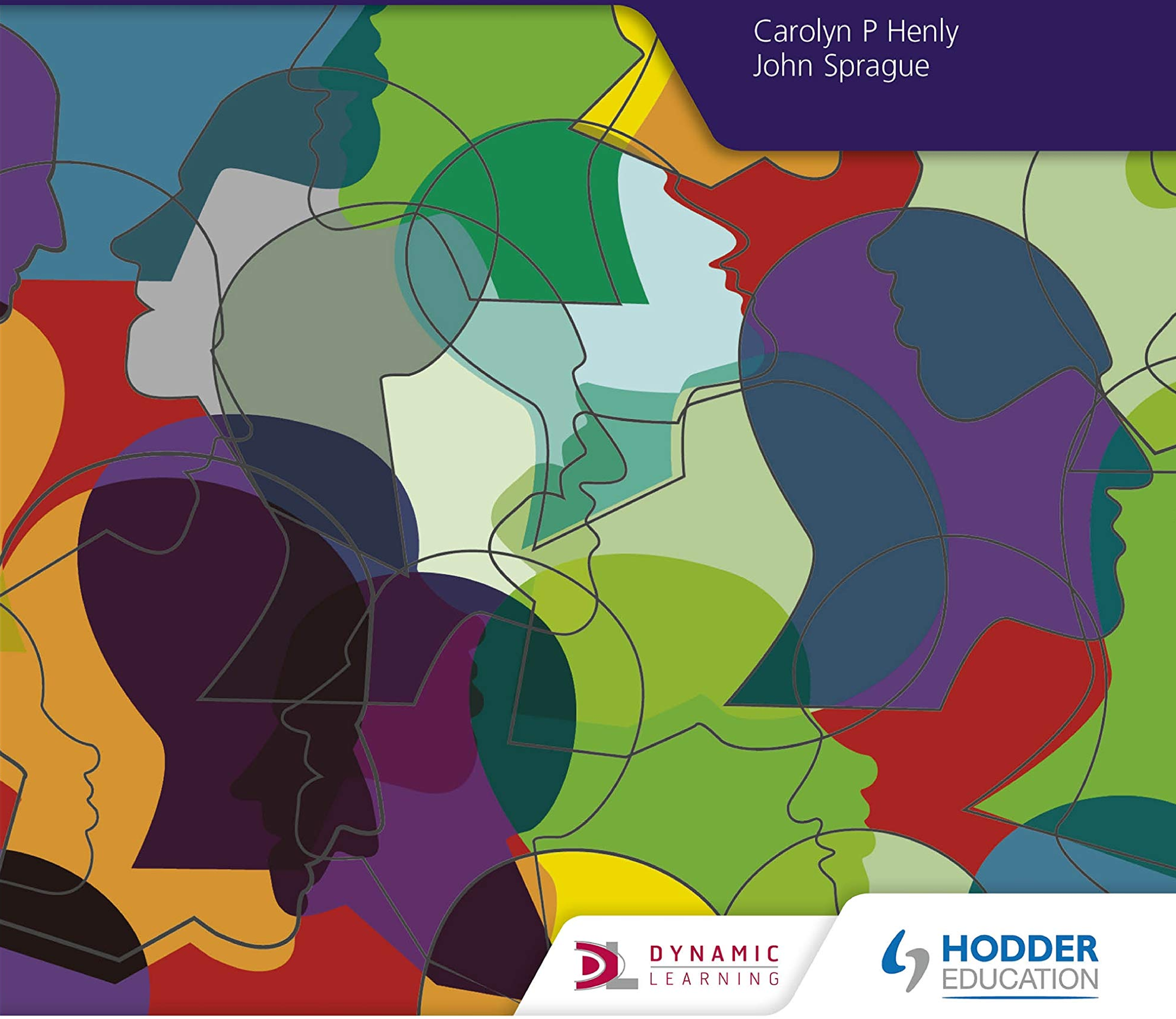
FOR THE IB DIPLOMA PROGRAMME

IN COOPERATION WITH

FOURTH EDITION

Theory of Knowledge

Carolyn P Henly
John Sprague



DYNAMIC LEARNING

HODDER EDUCATION

FOR THE
IB DIPLOMA
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Authors' acknowledgements

Carolyn P Henly

Bhumika Davé Tharoor for information about the Hindu wedding ceremony. Rahul Mahajan for information about the Hindu marriage ceremony. Audrey Le Mahajan for information about the Vietnamese marriage ceremony. Farrukh Hussain for information about the Muslim marriage ceremony. Timothy Henly for assistance with mathematical problem-solving procedures and questions about chemistry. Nancy Nelson and Kristina Green for verification of my claims about the order of operations. Salman Parvaiz for insights into the holographic universe hypothesis. Keith Hollowell for providing helpful articles on several topics. Vishaka Santosh, Jonathan Rice and Rawda Fawaz for assistance in understanding attitudes toward evolution in non-Christian religious and atheist communities. Miriam Gilbert for putting me onto the study of symptoms of PTSD in Shakespeare's work. And last, but not least, to my ever-patient husband, whose support allows me to take on a project of this magnitude. All errors are, of course, my own.

John Sprague

I'd like to thank the TOK students with whom I've had the pleasure to work over my years of TOK teaching: your conversations, arguments and questions have illuminated and deepened my own understanding of TOK. While each student only wrestles with the TOK course for two years, collectively, you've guided me through my own 20-year journey and helped me *start* to get my own head around it … finally.

Orders: please contact Bookpoint Ltd, 130 Park Drive, Milton Park, Abingdon, Oxon OX14 4SE. Telephone: +44 (0)1235 827827. Fax: +44 (0)1235 400401. Lines are open from 9 a.m. to 5 p.m., Monday to Saturday, with a 24-hour message answering service. Email: education@bookpoint.co.uk You can also order through our website: www.hoddereducation.com

First edition published in 2003
Second edition published in 2006
Third edition published © Nicholas Alchin and Carolyn P. Henly published in 2014

This edition published in 2020 by
Hodder Education,
An Hachette UK Company
Carmelite House
50 Victoria Embankment
London EC4Y 0DZ

www.hoddereducation.com

Impression number 10 9 8 7 6 5 4 3 2 1

Year 2024 2023 2022 2021 2020

Cover © kubko - stock.adobe.com

Typeset in ITC Berkley Oldstyle by Aptara, Inc.

Printed in Slovenia

A catalogue record for this title is available from the British Library.

ISBN: 9781510474314

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Introduction

Thinking about the world around us

Thirty years ago, a college professor at Washington University in St. Louis, Missouri, in the United States, told a story about a young Indian man who, deeply impressed by his mentor's assurance that the control of our destiny is all in our minds, walked, unafraid, into the cage of a man-eating tiger, confident that he could control the tiger. You will perhaps not be surprised to learn that the tiger killed the young man. The man made the mistake of taking a metaphor to be literal truth. While it might fairly be said that our destiny can, indeed, be a reflection of our mental states – confidence, courage, perseverance and open-mindedness, for example, are much more likely to bring us success than are fear, a tendency to give up and closed-mindedness – we cannot literally control the world around us with our minds. A literal man-eating tiger is a dangerous beast with a mind of his own who cannot be manipulated by the power of thought.

The young man made the critical – indeed fatal – error of rejecting the fact that the world consists of all kinds of things over which we have no control. He rejected reality. In a 1978 speech entitled 'How to Build a Universe that Doesn't Fall Apart Two Days Later', science fiction writer Philip K. Dick told a story about how, in 1972, he had defined reality this way: 'Reality is that which, when you stop believing in it, doesn't go away' (Dick 1–12). The definition has become famous, probably because it is both insightful and precise. When we talk about 'reality', we mean the reality that exists independently of our imagination. (Our capacity to imagine is another reality, but it, too, exists whether we wish it to or not.) Reality does, under certain circumstances, 'go away' all the time, but not simply because humans don't want to believe in it. Many aspects of physical reality change moment to moment: it might have been raining outside half an hour ago but not be raining now. If a major earthquake occurs or a volcano erupts, all the physical features of the landscape around those events change. The Earth moves in an orbit around the Sun, and it is in a different position in space every moment.

Reality is that which, when you stop believing in it, doesn't go away.

Philip K. Dick

■ What aspects of reality can we control? How much control do we have?

Equally true is the fact that humans have control over many realities and can change them at will: we build buildings that didn't exist and tear buildings down so that they no longer exist. We name our children, and our children can go down to the local courthouse and legally change their names, once they come of age. We can define 'planet' in such a way that it includes Pluto, and then, when many hundreds more objects like Pluto are discovered, we can redefine 'planet' in such a way that it does not include Pluto. But we can't just decide that the volcano did not erupt, or that the destroyed building is still there, or that we won't catch a disease just because we don't want to. Those things which we cannot change just by disbelieving in them constitute reality.

The denial of reality

The story of the young Indian and the man-eating tiger thus illustrates an important concept upon which the Theory of Knowledge (TOK) course is **predicated**: there is an external reality which exists independent of human existence and control. The course rests upon the absolutely essential assumption that that reality exists and is, to a significant degree, knowable. Throughout your TOK experience you will be examining all the mechanisms by which we figure out what is real to the best of our ability, when and how reality changes, and how we know. We call what we are able to figure out about reality knowledge. Failure to accept reality will eventually and **inevitably** result in some negative consequence. Most of us have more sense than to walk into a tiger's den thinking that we can control the tiger's behaviour with our beliefs, but, unfortunately, many people do in fact behave in ways which defy reality and then regret it later. A person of our acquaintance, for example, kept driving too fast until she got so many speeding tickets that her driving permit was taken away. When she decided to keep driving after that, she was arrested and made to serve 30 days in jail. All the while she just couldn't understand why she couldn't do what she wanted. In her mind, she needed to drive very fast because she was late to appointments or to work. Once she lost her permit, she believed that she needed to keep driving because she had to get to work. The fact that she could have avoided all these problems by leaving earlier and driving more slowly was irrelevant to her way of thinking; in her mind, the real world was to conform itself to her wishes. The reality of speed limit laws and laws about driving without a licence did not go away, however, just because she stopped believing in them.

◆ **Predicated**: Based or founded on something else. In this context, we are saying that the whole TOK course is founded upon the very important belief in a knowable reality outside of ourselves.

◆ **Inevitably**: Something that will happen; it is unavoidable. In this case, an unavoidable result of refusing to accept reality will be that the person who denies reality will eventually suffer some negative consequence.

◆ **Eradicated**: Wiped out.

Another serious and dangerous example is the anti-vaccination movement that began in the late twentieth century, when a former British doctor, Andrew Wakefield, published a study that suggested that there was a correlation between vaccines and autism. The movement gained momentum when a Hollywood celebrity began to campaign against vaccination, claiming that her son became autistic after he was vaccinated. Supported by some other very famous celebrities, she led a huge upsurge in 'anti-vaxxers', people who choose not to vaccinate their children against common childhood diseases. This is despite the reality that those diseases can be very dangerous, even fatal, and the health risk from getting the vaccine is vanishingly small. Those facts have not stopped the anti-vaxxer movement and, according to the US National Library of Medicine and National Institutes of Health, that refusal to believe in the reality of the safety of vaccines and the dangers of the diseases that those vaccines prevent has led to a return of diseases which had previously been, for all intents and purposes, **eradicated**.

The MMR (measles, mumps and rubella) vaccine has been the primary target of the anti-vaxxer movement, and since the current anti-vaccination movement began, measles has been on the rise. In the UK in 1998, 56 people contracted measles; in 2006, this number increased to 449 in the first five months of the year, with the first death since 1992. In 2008, measles was declared endemic in the UK for the first time in 14 years. In Ireland, an outbreak occurred in 2000 and 1 500 cases and three deaths were reported. The outbreak was reported to have occurred as a direct result of a drop in vaccination rates following the MMR controversy (Hussain, *et al*).

In 2018, the United States experienced its second worst outbreak of measles 'since measles was eliminated in the US in 2000. (The greatest was 667 cases reported in 2014)' (Fox). Almost none of those people who contracted measles had been vaccinated. By the end of April 2019, there had been more than 700 reported cases of measles in the United States – surpassing the 2014 number in only one-third of the year (Branswell). The widespread use of the vaccine against measles has resulted in a massive drop in the number of deaths worldwide from measles. Prior to 2000, the year in which measles was declared as having been eradicated in the US, 2 million people died annually from measles and complications arising from measles. By 2017, that number had dropped to about 110 000 (Scutti). The deaths that do still occur are almost all in countries where poverty and lack of effective health care systems result in too few people being vaccinated.

■ What factors do you think have contributed to the rise of the anti-vaccination movement?

Wakefield's 1985 work has long since been discredited, and he has been struck off the British medical register, which means he cannot practise medicine in the UK. He has been the subject of ethical inquiries, as he was working for a group of people suing vaccine manufacturers when he did his research (Hussain, *et al*), which suggests that he approached the work with a biased viewpoint that skewed the results. The reality is that there never was a connection between vaccines and autism. The reality is that children are much more likely to get ill or die from disease than they are from vaccines. Some of the people who chose to believe celebrities instead of scientists have had to suffer the consequences that their children died from a vaccine-preventable disease. It would have been vastly better for them – and for everyone – if these people had been able to **discern** which claims were true, and which were not. They would have been better off had they been able to judge which people telling a particular version of the vaccine story were the experts and which were the people with strong opinions but no actual knowledge.

◆ **Discern**: To be able to tell apart.

◆ **Conscientious**: To proceed in as careful and ethical way as possible in order to avoid mistakes and misunderstandings. Conscientious means something different from 'conscious'; to say that we undergo a 'conscious' process means that we are aware of what we are doing.

One of the main aims of TOK is to help you learn how to make those kinds of powerful judgments effectively. If you are able to know what is real, who to listen to under what circumstances and why, then you will have power over your own life in ways that people who cannot make those judgments do not.

The nature of knowledge

In TOK, we take the idea of knowledge seriously: we do not think that every idea we have is knowledge. In fact, we have a whole vocabulary for thoughts and observations that are tentative and have not earned the title of 'knowledge': 'opinion', 'hypothesis', 'guess', 'intuition', 'belief', 'assumption' and 'conjecture' are some examples of terms that identify findings or ideas which are preliminary. We do not think that opinions are knowledge. We differentiate between beliefs and knowledge. We do not stop pursuing our knowledge-making processes at the level of conjecture. Before we are willing to call something 'knowledge', we insist that it be checked carefully so that our guesses, hypotheses, ideas and intuitions have been verified in a conscious and **conscientious** process of validation.

Sometimes, of course, even after we go through a careful process of checking and validating, and even after we have agreed that something is, indeed, 'knowledge', we find out that we were wrong – in part or in full. Perhaps the most common reason for this is that new technologies allow us to gather evidence that we did not have access to before. In those cases, we have to be willing to revise our understanding. The reason that we must approach our knowledge-generating efforts so carefully is that there are only a few circumstances under which we can claim to be **absolutely certain** that we know the truth. To say that something is 'absolutely certain' is to say that there is no chance – not even a tiny one – of its ever being found to be wrong. You can see that to declare that something is absolutely certain is to make a bold claim. One must be very careful indeed, before making such a claim. There are, nevertheless, situations in which we can make that claim. Those cases are, however, **relatively** rare, and so the vast majority of our knowledge is accepted under less rigorous – but still, if we are honest and ethical, quite rigorous – terms. An important idea for us to recognize here is that a claim does not have to be absolutely certain to be called knowledge. Neither, however, can it be too tentative or sloppily formed.

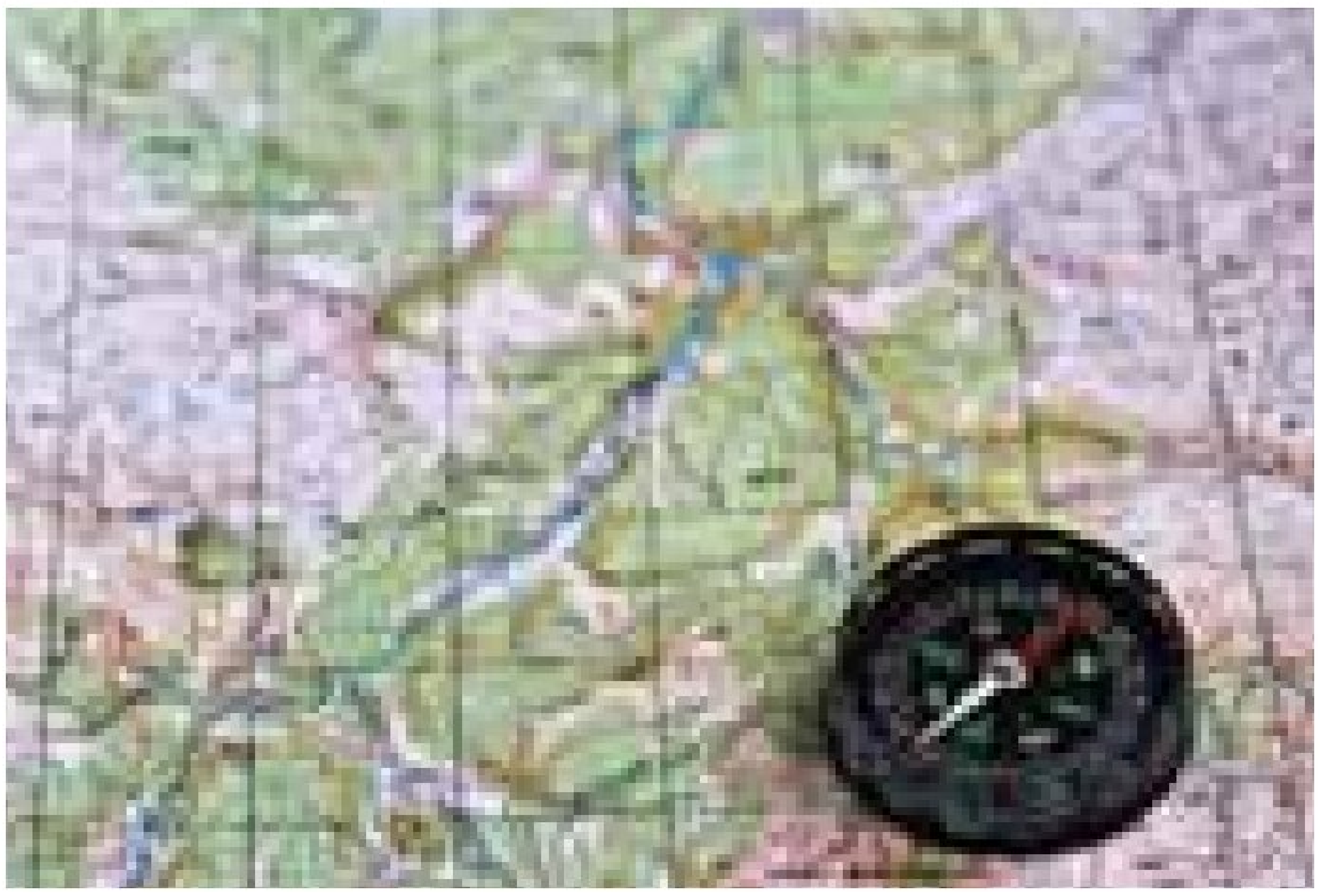
So far, we have been considering knowledge about the world. Another kind of knowledge is the knowledge of how to do things – how to play the piano, how to translate something from Russian to English, how to get a curling stone to hit only the stone we want it to hit, how to make chocolate chip cookies, or how to get from home to school and back again. Much of this kind of procedural knowledge is knowledge held by individuals, but sometimes we can think of procedural knowledge on a cultural or social level as well: how to celebrate national holidays or how to drive cars on busy roads are examples of knowledge that are shared communally. This kind of knowledge is also subject to updating and revision as needed when new information, new interpretations or new laws or regulations come along.

The TOK guide provides the metaphor of the map as a way of understanding the nature of knowledge. You may not be familiar with paper maps, but you are probably familiar with maps from apps on your smartphone. Street maps are diagrams which are intended to help anyone using the map to find their way from one place on the map to another. Street maps include features which are useful for the purpose of finding one's way: one-way streets are indicated. High-speed roads are differentiated from streets through neighbourhoods. Distances between spots are shown. Interactive maps, such as Google Maps or Waze, can also show potential obstacles such as car crashes or construction and slow or stopped traffic. All of these features are useful to the driver who wants to get somewhere by the most efficient route possible.

Street maps do not include features that are not relevant to getting from one place to the next, such as rainfall per year, population density, elevation or the sites of former gold mines.

◆ **Absolutely certain**: To believe that something is the truth and there is no possibility at all of its ever being found to be wrong. This phrase has a very particular meaning. You will read about the difference between 'certain' and 'absolutely certain' in detail in Chapter 1 of this book.

◆ **Relatively**: Assessed or considered by comparison with something else. In this case, when we use the phrase 'relatively rare', we mean that there may be a large number of whatever it is, but that compared to all the other cases – which we do not call 'rare' – there are very few.



■ In what ways are maps a good metaphor for knowledge?

Other maps, designed for different purposes, do show these characteristics. All types of maps are carefully constructed based on real features at the time of the making of the map. All types of maps can be updated periodically in order to reflect changes to the territory. Street maps must be updated in order to add new roads that were built since the old map was made. Topological maps, maps which show elevation, must be updated to reflect changes that occur due to such **phenomena** as earthquakes, erosion or rising water levels due to global warming. Population density maps, which are useful, for instance, to people who must plan how to deliver water and electricity to people in their cities, must be updated when a new **census** provides updated data about where people live.

The comparison of knowledge to a map, therefore, is a good one. A map is a picture of some specific aspect of the world. It is based on solid knowledge about reality, but it is flexible enough to be updated when new facts come along. A map does not try to contain everything there is to know about a particular part of the world; it is focused for a specific purpose. A map is reliable enough so that we can make plans based on the information it contains. Maps make a particular aspect of the world predictable. If we think about knowledge as being something that has all those characteristics, we have a pretty good understanding of what knowledge is and what we can do with it. You will find a more detailed discussion of the map as a metaphor for knowledge in Chapter 2.

◆ **Phenomena**: Things which actually happen. The word suggests that they happen naturally, that is, not because people controlled them deliberately.

◆ **Census**: A formal counting of people who live in a particular area. In the United States, there is a legal mandate for a complete census of the entire country to take place every 10 years. The results of the census have important implications for such things as determining how many members of congress each state is entitled to.

Elements of the TOK course

Areas of knowledge

In TOK, some of the contexts for knowledge-making that you will study will be:

- Mathematics
- The Natural Sciences
- The Human Sciences
- History
- The Arts.

These are called the 'areas of knowledge', and they represent the work of professional practitioners who work to break new ground in a particular area of knowledge. You will also study how individuals such as yourself make knowledge. Students do not, as a rule, make the same kind of knowledge that professionals do within those areas of knowledge. Students learning to do science, especially high school students, for example, very seldom, if ever, try to answer questions which have not already been answered by professional scientists working at universities or in commercial laboratories. Instead, the students are learning the techniques used by professional scientists so that they understand the process and learn the foundational knowledge which they would need if they were to pursue science as a career. The same is true of student mathematicians, psychologists and historians. In mathematics especially, students do work which is dramatically different from what professional mathematicians do. Mathematicians at a university do not sit in their offices and solve problems that they can check in the back of a book. They work to figure out new mathematics that isn't in any textbook yet, because it doesn't exist, and they work to find ways to apply known mathematics to solving problems in the real world.

Student artists may come the closest, in the areas of knowledge that we study in TOK, to doing what professionals do. Student artists do often make their own original art, and students who interpret works of art (visual, literary or any other kind) do the same type of work that professional critics do. Like student scientists, however, student critics are following in the footsteps of the professionals. Students are not writing criticism of brand-new works, and, given their level of expertise as interpreters of art, they are unlikely to discover anything in a given work of art which has not been found before by other critics.

In TOK, you will learn how what you do to make *your* personal knowledge (both of academic content in the various areas of knowledge and in your everyday dealings with the world) differs from and is similar to the ways that other people make knowledge. This includes professionals working at the cutting edge of knowledge to try to solve society's problems and achieve society's goals.

Core theme

As well as thinking about the way knowledge is created in specific areas of knowledge, TOK students are required to reflect on their own status as knowers, and to think about how the knowledge held by different individuals and communities of knowers is shaped. This is the purpose of the core theme of the TOK course, 'Knowledge and the Knower'. This part of the course encourages you to evaluate the reliability of your different sources of knowledge and to think about how your personal circumstances and the groups to which you belong inform what you know and believe, and influence the way you navigate the world around you.

Optional themes

In addition to the areas of knowledge and the core theme, your study will include some aspects of knowledge development in everyday life and in elements of society which are not included in the formal areas of knowledge. You will engage in a study of how individuals, such as yourself, make knowledge, and you will engage in a study of at least two of the following themes:

- Knowledge and Technology
- Knowledge and Language
- Knowledge and Politics
- Knowledge and Religion
- Knowledge and Indigenous Societies.

As with the areas of knowledge mentioned above, in each of these other investigations you will consider what kind of knowledge is generated and by whom. You will also consider the ways in which knowledge is developed and the methods used in each situation.

The knowledge framework

As you study the core theme, the optional theme and the areas of knowledge, you will consider four required elements of it: Scope, Perspectives, Methods and tools, and Ethics.

Scope

When you examine the scope of a particular area, you will be exploring questions about what the content is of that particular area. What makes something natural science rather than religion? What do we mean when we talk about technology and knowledge? What is technology? When we are exploring scope, we are also exploring the effects of that knowledge in the world – what role it plays in human experience and why it is valuable to us.

Perspectives

Perspectives is one of the 12 core course concepts, which you will read about in Chapter 1. You will find a detailed discussion of what we mean by perspectives beginning on page 25. In general, however, your perspective is the way in which you view something. It is shaped by all of your experience. Different people have different perspectives, and throughout the course you will be exploring the ways in which different perspectives shape how knowledge is made and how it is understood and valued.

Methods and tools

When we talk about the methods of making knowledge in each of the areas, we are talking about the means by which we make, develop, discover or otherwise acquire and update knowledge. What tools, cognitive, physical and procedural, do we use in each area?

Across all of these contexts, we seek knowledge – individually and in groups – for a wide variety of purposes. The methods that we use must be suited to the different purposes. Several factors determine how knowledge is sought and verified in each of those contexts. One factor is the material that is being studied. People who are trying to make mathematical knowledge are working with completely different materials – numbers, shapes and other elements of existing mathematics – than historians do. Among the methods and tools available to the historian are physical artefacts, such as documents and artwork, from past events. Human scientists, such as psychologists, are studying human beings. We can manipulate numbers in ways that we cannot manipulate shards of pottery or human beings.

Another important factor in determining the methods by which knowledge is sought in various different contexts is the aim of the area of knowledge. Historians are trying to find out what happened in the past and why events unfolded the way they did, whereas botanists are trying to make knowledge about how plants function. One can kill plants and cut them up into pieces in order to find out how they work; historians cannot reasonably smash up the artefacts that they find. Their efforts are aimed at preservation, so their tools for analysis are different from the tools used by scientists.

Each context requires a particular set of methods and steps to be taken in order to figure out what is true, to validate our knowledge and to update it when necessary. Each situation also requires a certain amount of justification before calling something 'knowledge' is acceptable to the group.

Ethics

Finally, for each topic that you study over the course of your programme, you will consider the role that ethics plays in the shaping and sharing of knowledge. To say that something is ethical is to say that it is the right thing to do, according to some principle. The methods of each area, for example, are shaped by what is considered to be ethical practice. Ethics is an important and extensive subject, so we have made available online a short 'Introduction to Ethical Theory' to introduce to you what we mean when we talk about ethics, different systems of ethical decision making and basic principles of ethics as they relate to knowledge. You can access this information using the QR code in the margin.

TOK and the 'post-truth' world

Recently, it has become common in the international news to claim that we live in a 'post-truth world'. The phrase 'post-something' means 'after something'. 'Post-mortem' means after death. 'Postpartum' means after birth. 'Post-secondary' means after secondary school. In fact, therefore, there is no such thing as a post-truth world. The world exists as it is, and our deciding that we aren't going to accept or acknowledge that will not change the facts. When people in the news talk about the 'post-truth world', they are talking about a world in which a good many people have decided that the truth does not matter. Such a decision is pretty perplexing, however, as there is no point in being so stubborn as to refuse to face facts. Sooner or later the facts will get in the way of the fantasies, and there will be unpleasant consequences to face for having denied reality.

The pathway to finding out what reality is does not consist of simply accepting everything you are told – even when you are told it by adults or people in roles of presumed authority. Some of what you are told is no doubt true. Some of what you are told, however, is false. You need to be able to tell the difference. In order to have a life in which you have the most control you can possibly have over your own destiny, you have to know the facts about what you can and cannot change. You have to be able to recognize consequences that will come to you if you fail to behave in ways which **accord** with reality. Before you can do that, of course, you have to know what reality is. Theory of Knowledge is a course that has the potential to give you power over knowledge. TOK will show you how to know what you can believe and, more importantly, why you can believe it. It will help you to know the difference between science and pseudo-science, between history and fake history. It will help you to know the conditions under which scientists, historians, mathematicians, doctors, celebrities or your friends and neighbours can be believed, because it will teach you to understand how the knowledge they make and pass on to you is developed and tested – or if it has not been tested, and is, in fact, nothing more than unsupported rumour. TOK will teach you to recognize the difference between knowledge which is absolutely certain, knowledge which is well-founded, beliefs and downright falsehoods.

◆ **Accord**: To match or fit with something. When people say that their views accord with another person's views, they are saying that their views fit together well.

How to use this book

We have chosen to organize this book around the required and optional elements of the Theory of Knowledge course. There are, however, many possible ways for a TOK course to be organized, and so the order in which the chapters of this book are presented may not match the order in which you study those topics in your class. You will need to follow your teacher's instructions about which chapters to read and when. One important skill, particularly in terms of preparing for your TOK essay, will be the ability to compare and contrast the way that knowledge is made, tested, justified and revised in each area of knowledge or theme with all the others. Your course may be organized in such a way as to explore the topics through those connections, rather than one after the other, as this book is organized. We have many times pointed out connections among the different topics, but we cannot, of course, in a book of this length, begin to explore them all. Even if we could, much of the pleasure from the course will be from discovering those connections for yourself, so be alert, throughout the course, to the ways in which the different topics are similar to, and different from, each other.

The first chapter delves into the important concepts around which the TOK course has been developed. You should read that chapter first just to familiarize yourself with the concepts, but do not worry about trying to learn everything in it all at once. The chapter will serve you as a reference: you will be able to return to it frequently as you encounter those concepts over and over during your TOK Programme. Each chapter has some examples of how the discussion in that chapter connects to some of the concepts.

We have provided definitions of key terms you might not be familiar with throughout the book in order to help you understand all of the content of the course (you will have seen several examples of this already on the preceding pages).

To help you successfully navigate the content in the remaining chapters, and to help you get the most out of your TOK studies, the following features are also used throughout the book.

ACTIVITY

Each chapter contains activities to help you check your understanding of the chapter content and to practise working with the ideas in that chapter. Remember that TOK thinking is a new kind of work for most students. You may not be accustomed to exploring ideas which do not always have one clear 'right' answer. Over time, you will develop the skills needed in order to be able to differentiate ideas in a complex and sophisticated way, as well as to notice and explain the nuances of a wide variety of knowledge-making situations.

Learner profile

Questions relating the content to attributes of the IB Learner profile are included in the margins throughout.

DEEPER THINKING

Sometimes TOK presents us with conceptual issues or dilemmas that need to be thought about in a bit more depth. Deeper thinking boxes are devoted to working through some of these points in the detail they require.

CONCEPT CONNECTION

Concept connection boxes highlight the relevance of one or more of the 12 key concepts to the topic being discussed. Similar boxes are used to highlight connections to the core theme.

CASE STUDY

Real-life examples are drawn on throughout the book to illustrate the issues raised by the TOK course. In-depth examples have been labelled Case studies.

TOK trap

The TOK course deals with a lot of potentially difficult ideas and many students make the same mistakes in their approaches to these. We have tried to identify some of these, so that you can avoid them.

Assessment advice

Guidance relating to the two assessment components – the essay and the exhibition – is labelled Assessment advice.

There are also a number of suggestions about how you could link your TOK studies to the other two core elements of the Diploma Programme – creativity, activity, service (CAS) and the Extended essay (EE) – interspersed throughout the book.

Using QR codes

Extra reading is recommended via the QR codes throughout the book. They are placed in the margin alongside the text for quick scanning, and look like the ones on the next page. Some of these will take you to Hodder Education's IB Extras, where you will need to navigate to the Theory of Knowledge section, before finding the relevant document.

To use the QR codes to access the weblinks you will need a QR code reader for your smartphone/tablet. There are many free readers available, depending on the device that you use. We have supplied some suggestions below, but this is not an exhaustive list and you should only download software compatible with your device and operating system. We do not endorse any of the third-party products listed below and downloading them is done at your own risk.

- For iPhone/iPad, Qrafter
- For Android, QR Droid
- For Blackberry, QR Code Scanner
- For Windows/Symbian, UpCode

Knowledge questions

The Theory of Knowledge course is founded in the exploration of knowledge questions. Knowledge questions are questions about knowledge, which might sound rather obvious, but it can sometimes be difficult to tell the difference between knowledge questions and regular questions about the world. Knowledge questions focus not on things that happen, but rather on how we develop knowledge, test knowledge claims, justify knowledge claims and, when necessary, revise knowledge claims. The following table gives you a few examples of real-world questions versus knowledge questions. The text in bold highlights the language which makes the question a knowledge question:

Real-world questions	Knowledge questions
Which is the best curling rink in the world?	**What evidence could we use to support a claim** about which is the best curling rink in the world? *A more general knowledge question*: **How do we know that we have sufficient evidence to support a knowledge claim?**
What is your favourite ice cream?	**Under what circumstances, if any, could there be any opposing claim** about what a person's favourite type of something is? *A more general knowledge question*: **Who has the right to determine what is true in any given situation?**
Are octopuses capable of using tools?	**What are the standards for determining** whether a particular biological creature has reasoning capacity? *A more general knowledge question*: **What are the methods by which scientists come to a determination about how natural processes work?** *An even more general knowledge question:* **What are the methods by which people can develop accurate knowledge claims in a given context?**

You may sometimes encounter different vocabulary for discussing knowledge questions: real-world questions will be called 'first-order questions', and knowledge questions will be called 'second-order questions'.

Throughout your course, you will be exploring answers to a wide variety of knowledge questions. Many knowledge questions apply in many different situations, and you will be considering how a particular knowledge question might be answered in different areas of knowledge or for different themes in the course. The questions in the chart above which are labeled '*more general knowledge questions*' are questions which expand the first knowledge question such that it would apply in a wide variety of situations, rather than in the specific real-world situation that the question in the first column identifies.

We have included some sample knowledge questions, like the one in the margin, at places where the discussion pertains to the question. Your teacher, however, will set questions for you or guide you to choose an appropriate question at an appropriate time. They may or may not select the questions that we included in the book, and you must, of course, follow the guidance of your teacher. It will be useful for you to remember that many different knowledge questions will apply to all the themes and areas of knowledge. We have also not provided any direct answers to the knowledge questions in this book. That's because there is no single answer to any knowledge question; the answer will depend entirely upon the particular knowledge being sought, the particular methods and tools being used and the particular circumstances under which the

KNOWLEDGE QUESTION

What shapes my perspective as a knower?

investigation is being undertaken. We have therefore chosen not to provide answers which might be taken as the 'right' answer to a knowledge question. Your teacher will also guide you through learning how to respond to knowledge questions in sophisticated ways.

When you come to write your TOK essay, you will find that the prescribed title you choose will be a knowledge question. Your essay will be an exploration of how that question can be answered in different knowledge-generating situations, so your ability to think about knowledge questions in a sophisticated way is a skill you need to develop throughout your course.

There is one set of knowledge questions for TOK which is intended for student use directly: these are the questions from which you will choose when the time comes to prepare your TOK exhibition – the internal assessment (IA) for the course. There is a list of 35 TOK IA prompts, and you will choose one of those as the basis for your exhibition. The TOK curriculum guide recommends that you complete your TOK exhibition with reference to the core theme or one of the optional themes. Therefore, we have included examples of those prompts, such as the one in the margin, at various places in the relevant chapters of the book where the discussion relates to those questions. We have not suggested any answers to those questions, for the same reason that we have not provided any responses to more general knowledge questions: you will need to learn how to develop complex responses which approach the question from different perspectives. The TOK skills book *Theory of Knowledge: Skills for Success* by John Sprague and published by Hodder Education, offers more detailed advice about how to respond to knowledge questions, how to prepare for the two assessments and how your study of the content in this book will help you complete those assessments effectively.

IA prompt

32 What makes a good explanation?

A very important point for you to understand and remember is that the concept connections and the IA prompts that you encounter in each chapter are examples only. You should understand that the concepts and prompts in any given chapter are not the only concepts or prompts which could be explored through the content in that chapter. Indeed, it is very possible that every one of the 12 concepts can be connected to every one of the themes and areas of knowledge in the course – that is why they are considered to be core concepts. The same might be true of the 35 IA prompts. Use the connections that you see in any given chapter to spur your thinking, but then challenge yourself to explore how the concepts and prompts which are not included in that particular chapter might be relevant and helpful in developing a sophisticated understanding of that part of the course.

The IB Theory of Knowledge course is unlike any other course you are likely to have taken. If you engage your full energy and attention, you will be rewarded with an ability that every human being should have: the ability to control your life, as much as is humanly possible. You will know which people and which sources of information you can trust and which you cannot. People will not be able to deliberately mislead you with false information, you will not be taken in by erroneous 'facts', and you will be able to make decisions about what to do for yourself and for your community which will have real power, because they will be based in reality. No one can ask for more from any schooling. Enjoy!

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1 Course Concepts

OBJECTIVES

After reading this chapter, students will:
- know what the 12 course concepts are
- understand the definitions of the 12 course concepts
- recognize additional concepts which are related to the 12 course concepts
- understand the relationships between and among the concepts
- understand how these concepts will shape the study of knowledge-production processes over the course of the Theory of Knowledge class.

Learner profile

Thinkers

How do the course concepts help us to identify and understand patterns of knowledge-making across TOK topics?

Introduction

There are a number of important vocabulary words – concepts – that we will return to again and again throughout this book. These words have precise meanings and they all mean something different from each other, but they are words which are, unfortunately, easily confused and often misused. We begin by giving thorough definitions here, so that when you encounter them in later chapters as we explore them in context, you will have a better understanding of how each one functions in each different area of knowledge or learning context.

Of particular importance are 12 vocabulary words which the IB has identified as being concepts that are central to the development of the course content. You will need to be very familiar with these terms, as they will very often form the basis of the knowledge questions that you will be investigating in each unit. One critical understanding that you must have as you learn these concepts is that, for TOK, you need to know the formal, technical meanings of these terms, as used by professionals. Very often there are **colloquial** versions of the terms, which people use in their everyday speech, but which are not correct in the technical sense that we are using the terms here. Precision is important if you are going to be successful at understanding TOK concepts. Throughout this book, we will highlight connections between the content that we are discussing and these 12 concepts. They are:

- Certainty (page 3)
- Culture (page 8)
- Evidence (page 9)
- Explanation (page 13)
- Interpretation (page 16)
- Justification (page 19)
- Objectivity (page 21)
- Perspective (page 25)
- Power (page 29)
- Responsibility (page 31)
- Truth (page 33)
- Values (page 35)

Let's consider these in depth. They appear here in alphabetical order, so you should not consider any one concept more important than any other. As we work our way through these 12 concepts, you will see that they **encompass** a number of other concepts. The more sophisticated your understanding of all of the concepts and their related sub-concepts, the better student of TOK you will be!

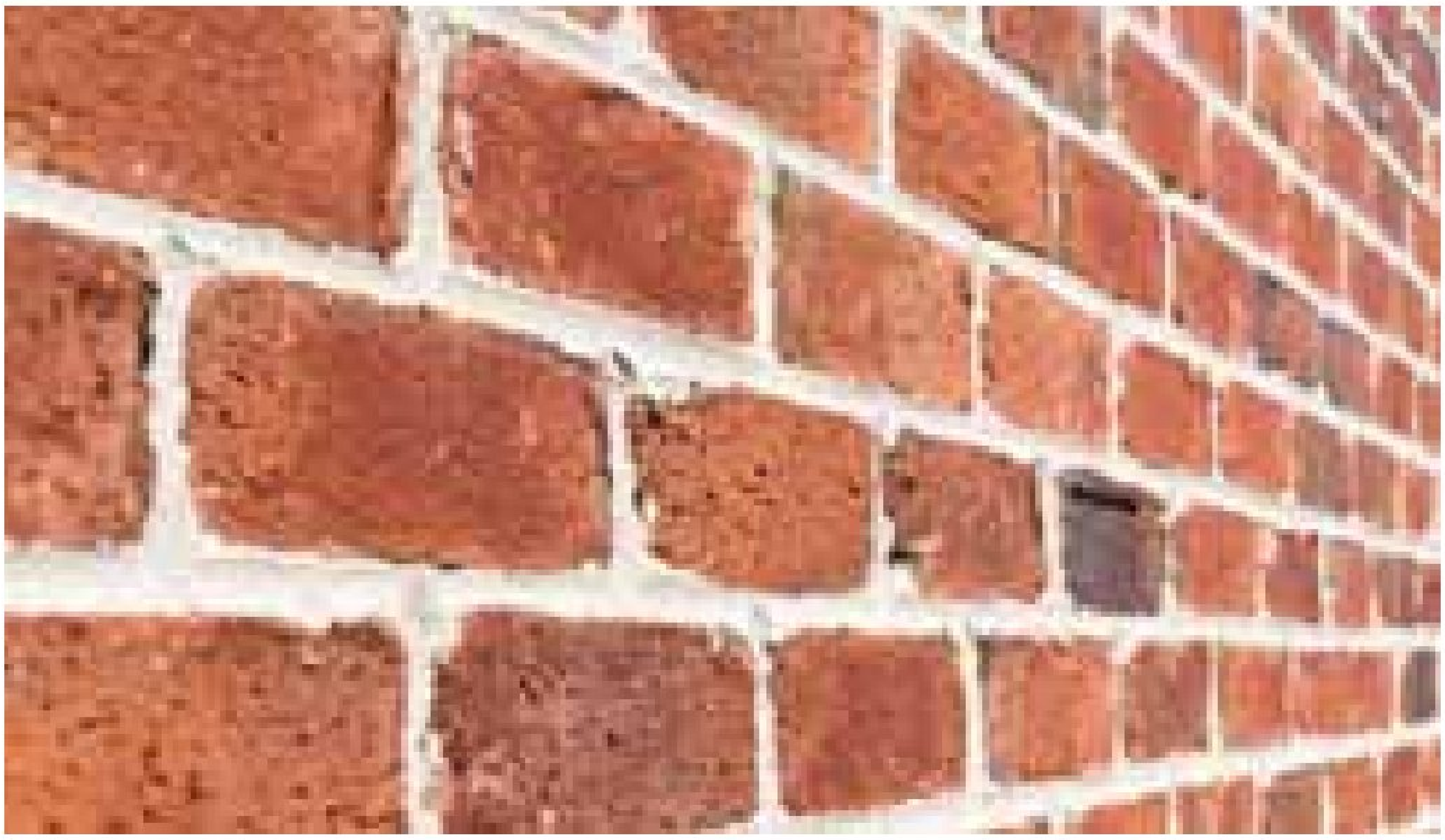
◆ **Colloquial**: Describes language used by everyday people outside of professional, academic or technical contexts. Colloquial language functions well for normal communication, but very often does not have the same meaning as technical uses have.

◆ **Encompass**: To include something or to contain something within; for example, Africa encompasses many countries, including Ghana, Morocco, Tanzania, Zimbabwe, South Africa and Côte d'Ivoire.

How to use this chapter

This chapter consists of detailed interpretations of the 12 core concepts for the Theory of Knowledge course. In that regard, it is quite different from the other chapters, all of which focus on one central subject. It also means that this chapter contains a lot of technical content that might be difficult to understand and absorb all at once. You may wish to read through the whole chapter once to familiarize yourself with the ideas, but don't worry about trying to learn all the ideas here all in one go. You will likely find it more useful to refer to the various sections of this chapter when you encounter these concepts in the context of the rest of your TOK studies. We suggest that you bookmark the beginning of this chapter, where the short table of contents is listed above, so that you can return to the chapter whenever you need to quickly find the particular concept that you wish to know more about.

Certainty



Certainty is a term that we use to describe knowledge that has been established beyond any reasonable doubt. Strictly speaking, when we say we 'know' something, we are saying that we are 'certain' that it is true. Calling something 'certain' is not the same thing as saying that it is 'absolutely certain'. To call something 'absolute' is to say that there are no qualifications whatsoever, no exceptions, and not even the tiniest amount of uncertainty. The standard for certainty is confidence beyond reasonable doubt, whereas the standard for absolute certainty is an assertion that we know right now that no evidence *can ever* arise which would cause us to have to revise the claim. One common error that people make is to think that if we don't know something with absolute certainty, then we don't know it at all. In fact, most of what we know is beyond any reasonable dispute but is not absolutely certain.

One example of something that we know, that is, one thing we are certain about, is that all living things eventually die. We cannot, however, claim that we know this with *absolute* certainty. The reason that we know that all living things die eventually is that we have observed this fact over and over. We have evidence from thousands, if not millions, of species spanning millions of years. We have scientific understanding of the nature of biological entities and of what happens to them over time. There has never been a single instance of an immortal being. The conclusion that all living things die is an *inductive* conclusion: that is, it is a conclusion based on observation of many individual instances. From those instances, we develop a pattern which becomes the knowledge claim. We are convinced beyond reasonable doubt by the massed evidence that all living things die. All living things have so far died, and we expect that to continue in the future. Scientists are particular, however, and they never make claims that are not precise. We do not say that it is absolutely certain that all living things will die because we cannot, with absolute certainty, predict the future based on the past. This is called the problem of induction.

We can assert that all living things have died, and we expect that all living things in the future will die. However, we cannot guarantee that that will happen to every living thing forever because we have not seen every living thing forever, and we never will be able to see every living thing that ever exists. If something living sometime in the future were to turn out to be immortal, we would have to adjust our thinking. Acknowledging that we are certain, but not absolutely certain, is our way of acknowledging the remote possibility that future evidence could cause a change in our knowledge. Notice, however, that if something immortal did show up one day, we would be unlikely to suddenly throw out our whole idea about the mortal nature of all living things. Instead, we would begin studying the question to try to determine what accounts for the apparently immortal being. Imagine that it were to transpire that a creature which was apparently human was 600 years old. We would want to know how that was possible. Avenues of study would include investigating the physical make-up of the 'person' to see if there were differences between them and other humans. Perhaps we could identify a mutation. Perhaps the 'person' would turn out to be some other species altogether, or a being from some other planet. We would also have the problem of establishing that it was, in fact, immortal. Just because something is very old does not mean that it will never die. Trees have lived longer than 9 500 years, for example (ScienceNews). One species of sponge, *Monorhaphis chuni,* has been known to have lived 11 000 years (Langley). Bowhead whales can live 200 years (Langley). Despite these impressive life spans, all of these living creatures eventually die, so any newcomer of great age would initially be presumed to be mortal, and we would try to explain the cause of the surprisingly long life.

In short, the likelihood that even new evidence would end up overthrowing our knowledge about the mortal nature of living things is **infinitesimally** small.

◆ **Infinitesimal**: Related to the idea of 'infinite', which means without boundaries. To call something infinitesimally small is a little ironic, then, because it suggests that the thing is small 'without boundaries'. The idea is that something which is infinitesimally small is the smallest thing you can imagine.

Absolute certainty is much rarer and is only attainable under very particular circumstances. We can claim to know something with absolute certainty if we (human beings) have power over the reality that the knowledge claim describes. Naming things, in fact, is one of the most common of the many realities over which humans have complete power. Famously, in 2006, Pluto lost its status as a planet (Library of Congress). We know, with absolute certainty, that Pluto is not a planet because 'planet' is a term which describes astronomical bodies with certain features. Human beings, specifically the members of the International Astronomical Union, determined that, based on recent discoveries, Pluto no longer meets all three of the criteria for planets. The three criteria for what constitutes a planet have been determined by the human beings in whose authority such matters lie. They could, if they wished, change the criteria. If they did so, Pluto's status might change again, because the reality which is expressed by calling Pluto a dwarf planet, as it is now known, would have changed. We can be absolutely certain because we create the reality.

■ Why can we be certain that Pluto is not a planet?

Notice that this example shows us that although some knowledge is absolutely certain because it is created by humans, it can change if humans decide to change it. Pluto used to be a planet, and we were absolutely certain about that, because we defined 'planet'. We are now absolutely certain that Pluto is a dwarf planet, because we define both 'planet' and 'dwarf planet'. The change in what is absolutely certain comes about because of a change in the reality of how we define and order things.

The other situation in which we can assert that our knowledge is absolutely certain is when the knowledge claim is the result of deductive reasoning. A proof is a formal argument which establishes premises, which are statements of fact which form the basis of the argument, and a conclusion, which is the logical extension of the premises. In other words, a formal argument shows that if certain premises are true, then the conclusion must also be true. A very simple type of formal argument is a syllogism, an argument with two premises and a conclusion. In order to result in absolute certainty, a syllogism, or any other more complicated proof, must meet two criteria: the premises must be true, and the logic must be valid. To say that an argument is valid is to say that the logic makes sense so that if the premises are true, then the argument is sound. Validity, in other words, refers to the logical relationship between the premises and the conclusion. Soundness refers to an argument in which the logic is valid and the premises are true, and so, therefore, the conclusion must also be true. This kind of reasoning – the drawing of an unavoidable conclusion from true premises – is called deductive reasoning. The conclusion drawn is called a deduction.

A fairly well-known syllogism can be used to demonstrate:

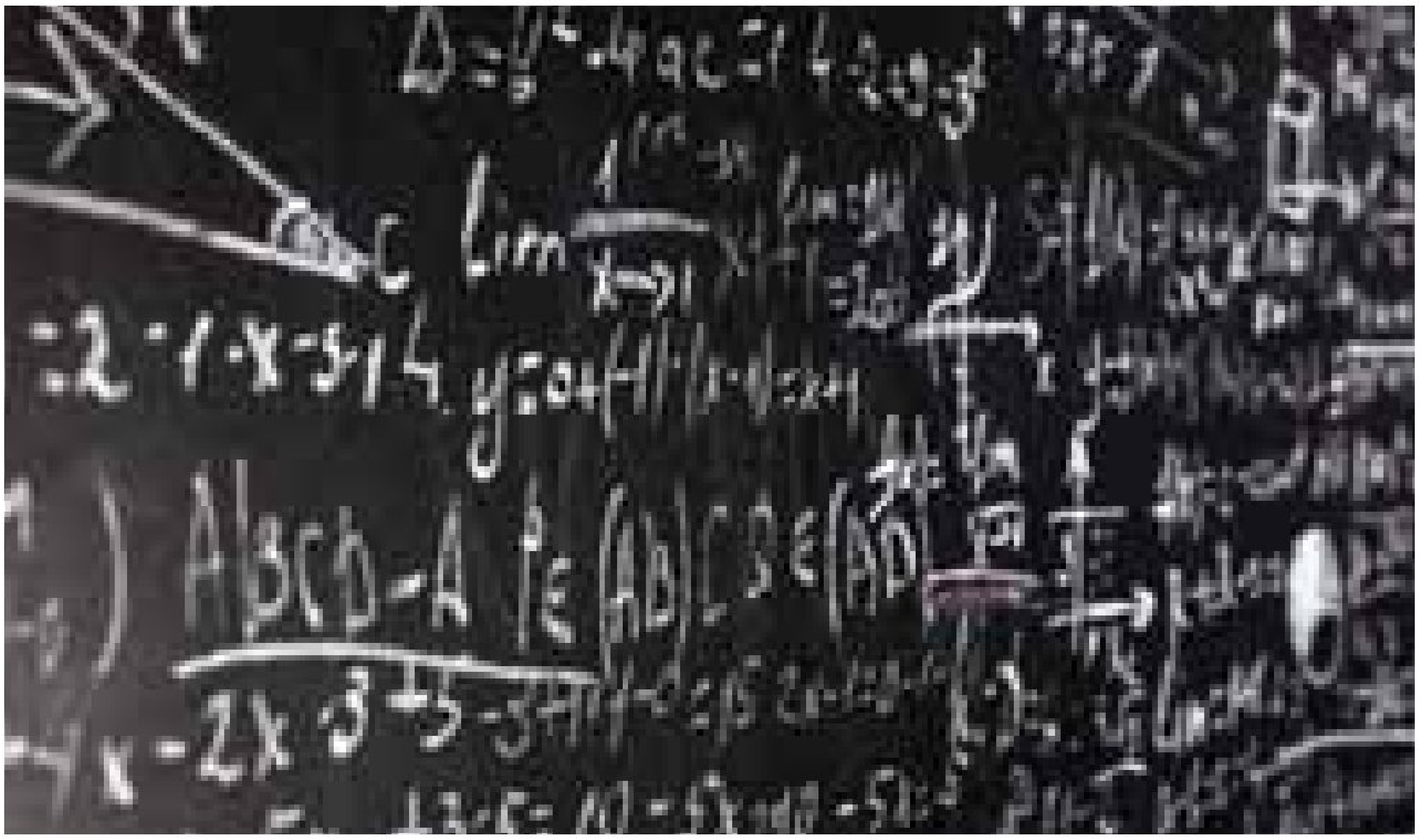
> All men are mortal.
>
> Socrates is a man.
>
> Therefore, Socrates is mortal.

The first two statements are the premises. Notice that they are both true. The first is certain, as discussed above, and the second is absolutely certain, as 'man' is a word that we invented to describe a male member of the species *homo sapiens*. Since both of the first statements are true, the third statement, the conclusion, must necessarily be true.

Another example of a syllogism which is both true and valid, and which therefore results in an absolutely certain conclusion, is this one:

> Adding 1 to any odd number will result in an even number.
>
> 3 is an odd number.
>
> Therefore: 3 + 1 results in an even number.

The mathematics in this syllogism is, of course, very simple. We offer it here because the rigorous proof, as you will see in Chapter 8, is one of the most essential methods for generating mathematical knowledge.



■ Mathematical proofs are an example of an absolute certainty

Here is an example of a syllogism which does not result in an absolutely certain conclusion. See if you can spot the problem or problems:

> If an object is grey, then it is an elephant.
>
> Sarah's handbag is grey.
>
> Therefore: Sarah's handbag is an elephant.

The logic, in this case, is valid. That is to say: *if* the premises were both true, that conclusion would inevitably follow; however, the first premise is not true. Without true premises *and* valid logic, the argument is not sound, and we cannot generate a proof. Once we have a proof, our knowledge is absolutely certain and, in the case of deductive knowledge, it can never change. It is very important to remember, however, that reason alone cannot lead to absolute certainty. Our deductions are only as good as the premises that go into them. If the premises are not true, then we cannot get knowledge out of a formal argument. If we find out at some future point that our premises were actually false, then our former certainty must be abandoned.

A final point to be made about 'certainty' and 'absolute certainty' is that the colloquial use of these terms is usually very different from the technical use. You may have heard people say things like 'I am absolutely certain that I left my keys in the kitchen', or 'I am absolutely certain that the longest-lived mammal is the Great Blue Whale', or 'I am certain my mother will let me go out to the movies on Friday night', only to have it transpire that the statement is not true. The 'certainty' expressed was not, in fact, certainty of the type that we have been investigating here. These uses of 'certain' and 'absolutely certain' obviously do not indicate knowledge beyond reasonable doubt, or knowledge which can never be upended; they mean something more like 'I seem to remember very clearly that this is true', or 'I have been told in the past', or even 'I hope that this is true'. People using language outside of any technical or academic context use these terms much more casually and, indeed, may not even be aware that these terms have precise technical meanings. Claiming to be certain that the longest-lived mammal is the Great Blue Whale may represent poor memory, confusion between types of whales, misinformation or deliberate deceit. Professional **purveyors** of knowledge are neither so casual nor so careless with language. If a professional scientist, for example, tells us that something is certain, they mean that scientists have amassed enough evidence for the claim to ensure that it will never be easily overturned, and that, in fact, it will likely never be overturned.

◆ **Purveyor:** A purveyor of something is a person who promotes or spreads ideas. In this case, a purveyor of knowledge is a person who helps to share knowledge among many people.

We have seen, now, that there are only two circumstances under which we can claim that something is absolutely certain: proofs and situations over which we have the power and authority to create the relevant reality. Most of our knowledge is not of this sort. Most of our knowledge has been developed over a long period of time and/or through a very careful process of checking. Some of our knowledge cannot be established to the level of certain beyond reasonable doubt, and so some knowledge claims remain contestable. You will see, over the course of this book, how knowledge is developed and justified in different circumstances and for different purposes. That investigation will help you to understand when and how we can be certain about a wide variety of knowledge claims.

We have spent a long time discussing the concept of certainty, because, as mentioned earlier, one of the most common errors that students make is to think that absolute certainty is the standard for knowledge. You should now understand why that idea is in fact **erroneous**. Absolute certainty does, indeed, ensure that we have knowledge; however, since we have seen that absolute certainty is only achievable in two very particular kinds of circumstances, we now know that only certain kinds of knowledge can possibly be absolutely certain. Other

◆ **Erroneous**: The adjective form of the noun 'error'; to say that something is erroneous is to say that it is wrong.

kinds of knowledge are certain and no longer contestable. Some kinds of claims do not rise to the level of certainty. They are contestable and open to change or reinterpretation. As we go through the course, we will see, for each area of knowledge and each of the themes, what kind of knowledge claims can be generated and whether they rise to the level of certainty or absolute certainty.

RELATED IDEAS

We have seen that the concept of certainty encompasses a number of additional concepts. These are:

- the difference between certainty and absolute certainty
- inductive reasoning vs deductive reasoning
- formal arguments, syllogisms and rigorous proofs, including the concepts of premises, conclusions, valid arguments, true premises and sound arguments
- the problem of induction
- technical vs colloquial uses of the terms 'certainty' and 'absolute certainty'.

IA prompt

8 To what extent is certainty attainable?

ACTIVITY

After you have completed parts A and B of this activity, you can check your answers using the QR code.

Part A

Read each of the following knowledge claims and determine whether it is certain (that is, beyond reasonable dispute) or absolutely certain (knowledge that cannot be overturned unless reality itself actually changes).

1. The names of the days of the week in English are: Sunday, Monday, Tuesday, Wednesday, Thursday, Friday and Saturday.
2. The Earth is essentially spherical.
3. If I am standing on Earth and I drop my pen, it will fall to the ground unless stopped by something in its way.
4. The capital city of Malaysia is Kuala Lumpur.
5. In June 2016, citizens of the United Kingdom voted in favour of 'Brexit' – a referendum which determined that the United Kingdom would withdraw from the European Union.

Part B

Read each of the following syllogisms and determine whether the conclusion (the statement in **bold**) is absolutely certain or false. If the conclusion is false, identify the reason.

1. Only cows eat grass. My cat, Max, eats grass; therefore, **my cat Max is a cow**.
2. Wednesday is the day after Tuesday. Today is Wednesday; therefore, **yesterday was Tuesday**.
3. Iceland is in the northern hemisphere. Reykjavik is a city in Iceland; therefore, **Reykjavik is in the northern hemisphere**.
4. Horses have four legs. My table has four legs; therefore, **my table is a horse**.
5. The agency responsible for the civilian space programme in the United States, NASA (National Aeronautics and Space Administration), would like to send a manned spaceship to Mars. NASA has a project to send a manned spaceship to Mars; therefore, **NASA will send a manned spaceship to Mars**.

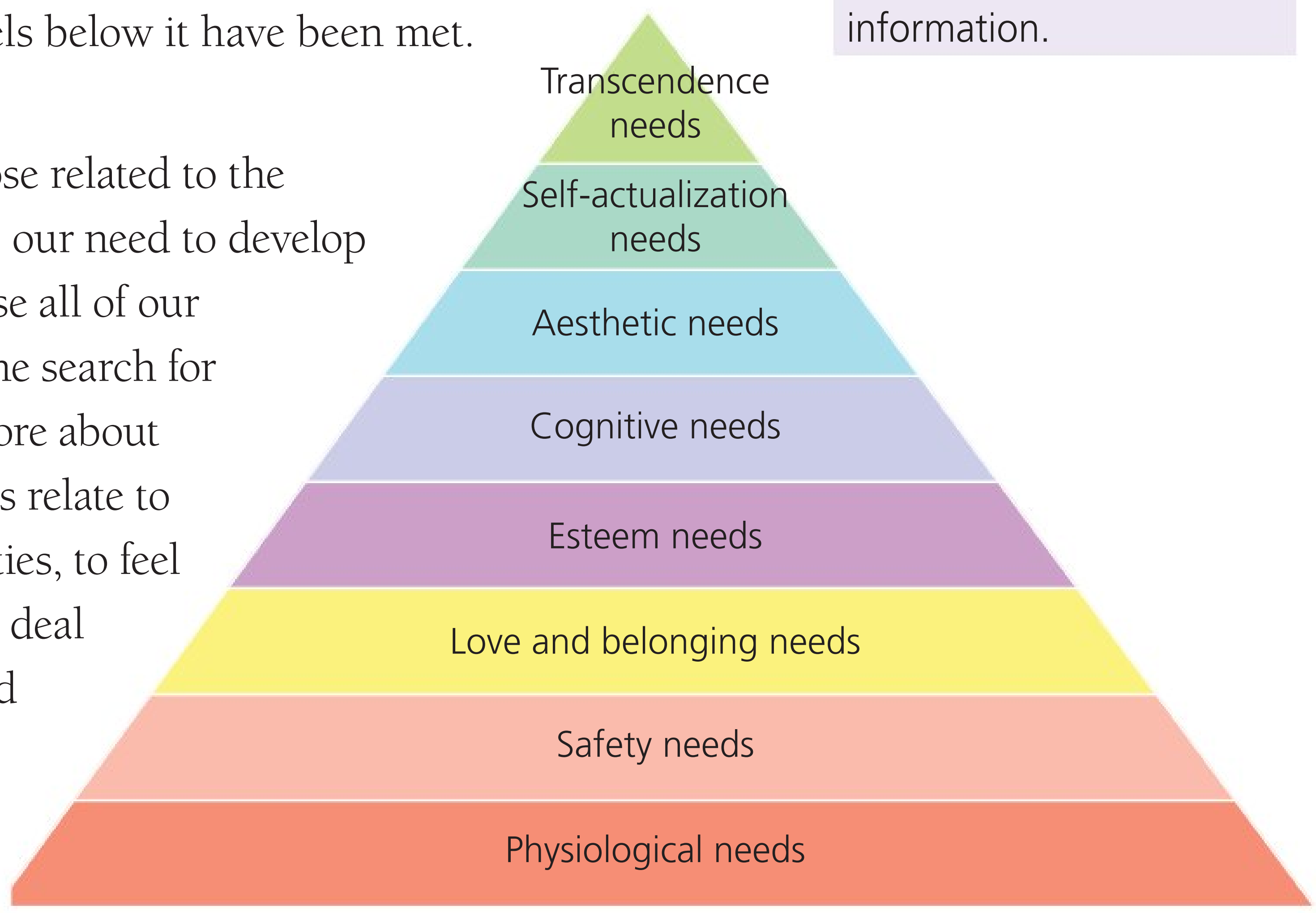
Culture

> *Taken in its wide ethnographic sense, [culture] is that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society.*
>
> *Sir Edward Burnett Tylor*

The concept of 'culture' is a familiar one to most of us but can be difficult to truly pin down in a sophisticated way. The culture of any given society incorporates a great many elements of that society, including the arts, religion, ceremonies, traditions and **mores** about a wide range of cultural practices, such as clothing, gender roles and food, as well as a traditional understanding of the history of that society. Culture includes the **ethical and moral** values of the people within it. Sir Edward Burnett Tylor, an English anthropologist of the early twentieth century, described culture this way: 'Taken in its wide ethnographic sense, [culture] is that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society' (Tylor). The key idea from Tylor's definition is that culture consists only of that which is man-made and of everything that is man-made. All the practices of all the areas of knowledge that you will study during your TOK course, in other words, are part of culture.

Psychologist Abraham Maslow created a diagram which represents how people, both individually and in groups, develop from basic, simple lives to more complex ones. At the bottom of the pyramid are the most basic needs – those which must be fulfilled in order for the person and species to survive. The idea that Maslow wanted to convey is that we cannot fulfil the needs on any one level until the needs on all the levels below it have been met. They must, in other words, be fulfilled in order.

The top four levels in Maslow's hierarchy of needs are those related to the development of complex culture. Cognitive needs refer to our need to develop knowledge as a society and as individuals, as well as to use all of our mental capabilities. Aesthetic needs are those related to the search for order and beauty and meaning in form (you will learn more about this in Chapter 12 about the arts). Self-actualization needs relate to individuals' desires to maximize all their personal capacities, to feel fulfilled (McLeod). Transcendence needs are those which deal with a person being 'motivated by values which transcend beyond the personal self (eg, mystical experiences and certain experiences with nature, aesthetic experiences, sexual experiences, service to others, the pursuit of science, religious faith, etc)' (McLeod).



■ Maslow's hierarchy of needs

Learner profile

Caring

How does knowledge of culture help us to become caring people?

◆ **Mores**: Rules which govern what is acceptable within a given society. The word is related to the word 'morals', so 'mores' imply a value of right and wrong, or good and evil. Social mores determine how members of a particular social group will view certain behaviours and whether they will judge those behaviours as being right or wrong.

◆ **Ethics and morals**: Related concepts about how we know the difference between good and evil. Morals are the underlying values about what is right, while ethics are the rules we put in place to try to ensure that people behave in accordance with the moral values of the community in which they live and function. See the online 'Introduction to Ethical Theory' for more information.

You can see that those associated with what we typically mean when we talk about culture – the arts, intellectual and creative development and religion – appear in the upper levels of the pyramid. Most aspects of culture, in other words, arise out of advanced needs achieved only as societies develop into more complex and sophisticated entities. Because of this pattern, 'cultured' has also come to describe people or behaviour that is considered to be a sign of advanced intellectual or **aesthetic** development. Cultured people are people we think of as having sophistication or 'class', which does not necessarily relate to how much money they have.

For our purposes, we want to know how culture relates to knowledge. There are two aspects to this question: how does our culture shape what we can, as individuals and as groups, know, and how does what we know shape our culture? You will explore these two aspects of culture as it relates to knowledge in the chapters that follow.

◆ **Aesthetic**: An adjective that describes our response to sensory input. A person with a sophisticated sense of the aesthetic is seen to have excellent taste in any number of aspects of society, especially the arts, as well as an understanding of how to behave in company in such a way as to draw admiration.

RELATED IDEAS

We have seen that the concept of culture encompasses a number of additional concepts. These are:

- beliefs about what is ethical and moral and the difference between ethics and morals
- the development of biological human nature vs the development of human-created social conventions
- the relationship between the stages of Maslow's hierarchy and the development of culture
- the relationship between culture and beliefs
- the reciprocal relationship between knowledge and culture.

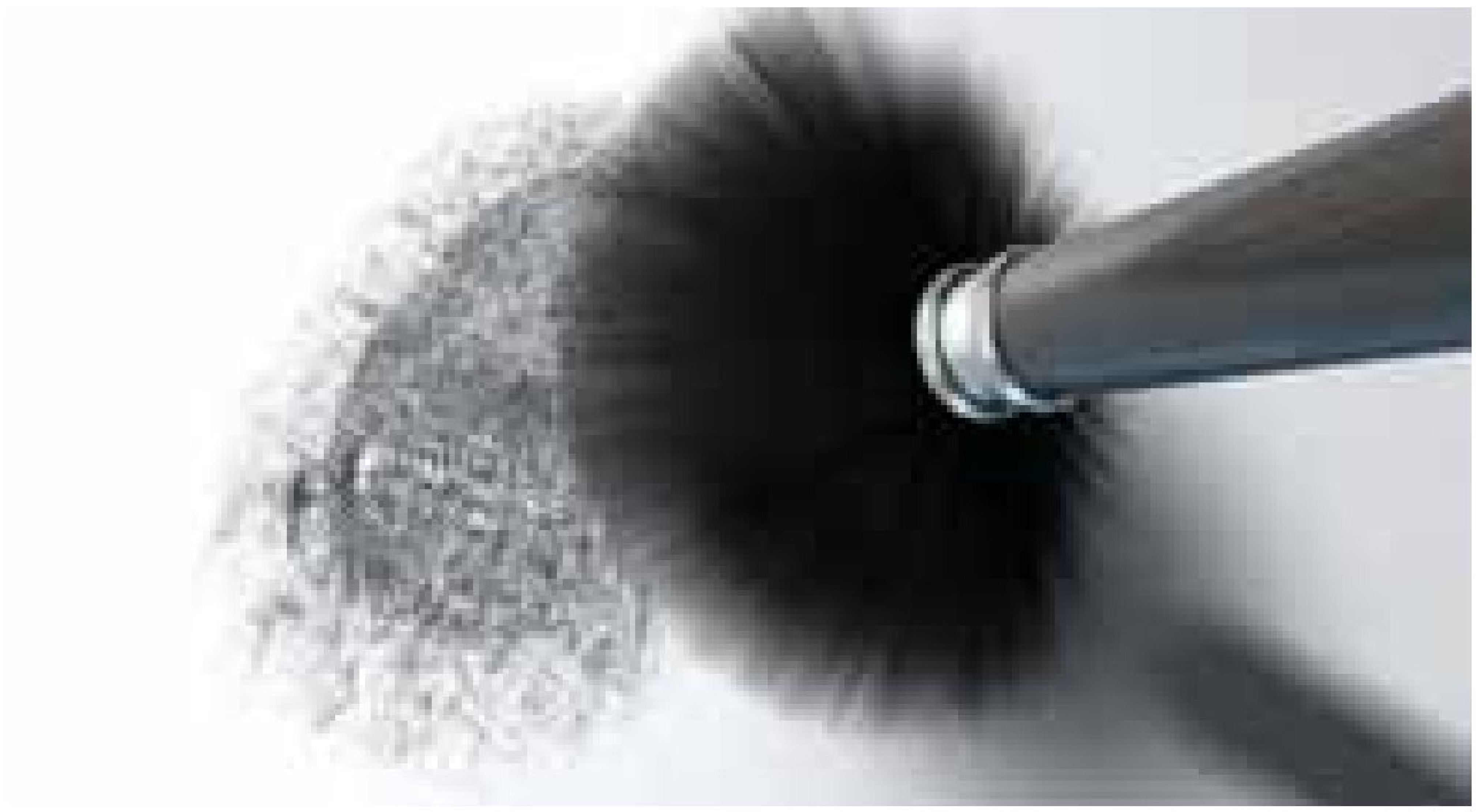
IA prompt

21 What is the relationship between knowledge and culture?

IA prompt

29 Who owns knowledge?

Evidence



Evidence is any fact or claim that someone offers in support of another claim. Sometimes people will offer facts in support of a claim and sometimes they will offer opinions, so we need to know the difference between those two things.

A fact is a feature of reality. Facts exist whether we know about them or not, but a large part of what we do when we try to make or discover or otherwise generate knowledge is to determine what the facts are. Over the course of this book, we will **delineate** the kinds of facts that make up

◆ **Delineate**: To explain the features of something. Although similar to the word 'describe', it implies a more detailed kind of description than we generally mean when we just say that we will describe something.

the reality of all the different areas of knowledge and knowledge-making that TOK explores. For now, here are a few examples: the natural sciences deal with facts about the physical nature of the universe, so we can say that it is a fact that the Earth travels a path around the Sun. This fact was famously established by the sixteenth-century scientist Nicolaus Copernicus. It was not accepted readily, especially by the leadership of the Catholic Church, but eventually it had to be accepted because it is in fact true. You may not know that that same claim was made 1 800 years before Copernicus by a Greek astronomer, Aristarchus of Stamos. His claim also offended religious leaders, who accused him of '**impiety**' (Evans). Even though many people were offended when first hearing about these facts, the facts about the relationship between the Sun and the Earth are true. They accurately describe reality.

◆ **Impiety**: Describes the actions of someone who violates God's word. It is the opposite of 'piety', which describes an appropriate degree of humble adherence to God's word.

◆ **Inalienable**: Something that cannot be taken away from us. It is related to the word 'alien', which means something different, or apart from us. If something cannot be made alien, then it is inevitably and permanently a part of ourselves. To call a right 'inalienable' is a powerful claim about what is owed by birth right to all human beings.

Another type of fact is one which arises from a reality that is under the control of humans. We have looked at some of these facts already: that your name is what it is is a fact, because your parents are the people who had the legal right to name you, and they did. If today is Tuesday, then it is a fact that today is Tuesday, because humans invented the calendar and the organization of days into weeks, and the originators of English gave Tuesday its name. If you are legally required to go to school until age 18, or to drive at or below a given speed limit, or if you are forbidden to get married until a certain age, these are facts that were established by humans living together in society and making agreements about what would constitute behaviour that allows the society to flourish.

Not every statement of 'fact' is actually a fact. People will sometimes claim as fact things which are either a matter of opinion or belief, or which are simply untrue.

You might have heard some people defend a claim that they have made by declaring: 'I am entitled to my own opinion!' or 'I have a right to my own opinion!' That claim is true, but only under very specific conditions. To say that you are 'entitled' to something, or that you 'have a right' to something is a very strong statement. To be entitled to something, or to have a right to something, means that it is owed to you, either by birth right, because you have earned it, or because it is yours by law. We do, indeed, have many rights. We have legal rights which are granted to us by our governments and by laws which govern our societies. Many people would agree that we are born with certain rights. The Declaration of Independence, the document which declared Britain's 13 colonies in North America to be free and independent of the rule of King George III, contains the claim that we have certain **inalienable** rights, including 'life, liberty, and the pursuit of happiness' ('Declaration of Independence: A Transcription'). The United Nations Universal Declaration of Human Rights details a number of rights to which they believe all human beings are entitled, but a right to an opinion does not appear there either (United Nations). When people claim, therefore, that 'I have a right to my opinion', or 'I am entitled to my opinion', they are trying to assert that no one can argue against them because by some inalienable right, they are permitted to have whatever opinion they want. Unfortunately, however, this claim is too often made in situations in which people do not have a right – divine, earned or otherwise – to an opinion, because opinion is *not* the relevant knowledge-making method.

You are entitled to your own opinion, *when opinion is the appropriate determining factor* for what is real (Whyte 1–10). Many times, opinion is a satisfactory means of deciding what reality is. If you are asked about your favourite flavour of ice cream, for example, your opinion that, say, butter pecan ice cream is the best is the determining factor. No one else can tell you that some other flavour is your favourite flavour, and no one else can make you change your mind. That opinion could change. Someone might offer you a flavour you have never tried before – say Ben & Jerry's® Chunky Monkey – and you might find that you love it so much that it replaces butter pecan in your heart. You were not previously wrong; when butter pecan was your favourite ice cream, then that was a fact. Having discovered a new favourite, however, now there is a new reality and your opinion has changed so that the fact is that Chunky Monkey is now your favourite ice cream. Opinion is the appropriate determining factor for questions such as what the best restaurant in town is, what your favourite action movie is and whether cold weather sports are more fun than warm weather sports. You can think of many more such instances. Opinion is not, however, the determining factor when the subject at hand is a reality which is beyond our control or choosing.

In those cases, *facts are the determining factor*, and no one is entitled to make up their own personal facts which apply only to them and not to everyone else. Opinions are attitudes toward facts; they are not facts in and of themselves. That Indian gentleman we read about in the introduction could not make the man-eating tiger into a tame house pet just because he had an opinion that he could. The anti-vaxxers cannot make the refusal to vaccinate into a safe and sensible course of action just because they have an opinion which is not based on actual scientific facts. They cannot change the reality of vaccines or potentially fatal diseases just because they feel like it. You can't have an opinion that falling off a 20-storey building won't injure you and you can't have an opinion that the Sun revolves around the Earth. If you make such claims, you are mistaken. Asserting that they are your opinion and that you are entitled to it does not make your opinion correct.

What evidence do we have for the date on which the United States Declaration of Independence was signed?

Notice, finally, that in those cases in which your opinion is, in fact, the appropriate determining factor of what reality is, then your opinion becomes a fact, and you are entitled to it. These are very limited kinds of facts, however, and they do not extend to the world beyond your personal control!

Both facts and opinions might be offered as evidence for knowledge claims. If you claim that your mother will let you go to the cinema with your friends on the weekend, you might support that claim with either facts (she already told you that you could go) or with your opinion (she has let you go before, and so you think that she will let you go this time, too).

A third kind of thing which might be offered as evidence for a claim is physical evidence. In the United States, the fourth of July is a national holiday, which most people think celebrates the signing of the Declaration of Independence. However, the Declaration of Independence was not signed on 4 July, but rather on 2 August (Sneff). The evidence for that fact consists of several historical documents – primary sources from July and August 1776 which are now housed in the US government archives. Harvard doctoral student Emily Sneff details the documents used to determine the actual date on which the official copy of the Declaration of Independence was signed, in a fascinating blog post for the Declaration Resources Project. You can use the QR code in the margin on the right to read it.

One of these supporting documents is Thomas Jefferson's 'Notes of Proceedings in the Continental Congress, 7 June – 1 August 1776'. Another is the parchment declaration itself, which was 'fairly engrossed', that is, copied out in a large clear handwriting, by a man named Timothy Matlack. That claim, in turn, has been established by handwriting experts comparing the handwriting on the Declaration to documents which are known to have been written by Matlack (Sneff). Another physical artefact which serves as relevant evidence in this investigation is a letter from delegate Benjamin Rush from Pennsylvania to John Adams describing the **solemnity** of the ceremony of the signing on 2 August (Sneff). Physical artefacts very commonly provide evidence of historical events.

◆ **Solemnity**: The noun form of the more familiar adjective 'solemn', it means seriousness and is used to describe the mood of a particular event or gathering. In the case of the signing of the Declaration of Independence, the signers were, of course, committing treason against the king and were well aware that should their efforts to achieve independence from Britain fail, all the signers would be hanged.

Any knowledge claim requires some sort of evidence. Evidence, however, is not the same thing as proof. Consider the examples above: in the case of your claim that your mother will let you go to the cinema, it will be correct so long as she has indeed told you that you may go. If you are offering your opinion, based only on past experiences, you might easily be shown to be wrong when the time comes. Perhaps your mother has other plans for you for Friday night that you don't know about. Perhaps your mother has taken a disliking to those friends or feels that the movie you want to see is inappropriate. Perhaps your mother needs you to babysit your younger siblings because she is going to be out that evening herself. Many facts of which you are unaware could easily contradict your belief that you will be able to go to the cinema this weekend. Finally, although you would never lie to your friends about your beliefs, some people do lie when they make claims about what is true.

The trip to the cinema example reveals one kind of problem: the problem of establishing the accuracy of claims which are made on an individual's word alone. The example of the signing of the Declaration of Independence offers another reason that evidence alone does not constitute proof, because the facts are incomplete, and they conflict with each other. Jefferson said that the document was signed on 4 July during the meeting of the Continental Congress (Jefferson); however, if that document existed, it has disappeared. We do know that after 4 July, the 'engrossed' copy was made and signed on 2 August, according to the *Journals of the Continental Congress* (Sneff). Despite many years' study and the examination of a great many more primary source documents which are not mentioned here, a few historians still do not accept the claim that the Declaration of Independence was signed on 2 August 1776. This digression from the norm reveals another aspect of the relationship between evidence and proof: the evidence has to be convincing to the person to whom it is offered, or no agreement can be reached. In the study of history, we seldom achieve universal agreement, for reasons that you will explore in much greater depth in the chapter on history as an area of knowledge.

In order, therefore, to prove a knowledge claim, to establish that it is true, one must certainly have evidence, but the simple offering of evidence alone is insufficient to demonstrate the validity of any claim. For evidence to become convincing, several other elements must be present. Evidence must first be examined, tested and verified. There must be *sufficient evidence* to be convincing. Similar to the way that premises are used in syllogisms or rigorous proofs, evidence offered in less formally structured arguments must be believable and the explanation, as we shall see in our exploration of the concepts of explanation and justification, must be logical enough to be convincing. Each kind of knowledge-generating undertaking has its own procedures for accomplishing all of these things, as you will see in the following chapters.

A final concept related to evidence is the concept of belief. To say that 'I believe' something means that you accept it as true (Corvino). You can have beliefs which apply to facts or to opinions. You can say that you believe your mother will let you go to the cinema either because she has told you that you can or because she has allowed you to go on past occasions and you have no reason to expect this week to be any different. Historians can say that they believe that the evidence supporting the claim that the Declaration of Independence was signed on 2 August is sufficient to demonstrate the truth of that claim, or they can say that they do not believe it. 'Belief', then, applies to individuals and their relationship to knowledge claims. Someone can believe something which is not true (such as the 'flat-earther' who believes that the Earth is flat) and someone else might refuse to believe something which is true (such as the anti-vaxxer who refuses to believe that it is in her child's best interest to be vaccinated).

Learner profile

Open-minded

How does being open-minded help us to refine and justify our beliefs?

The word 'belief' is nearly synonymous with the word 'opinion' in that both describe the relationship of an individual mind to reality. Just as beliefs can be either correct or incorrect, so can opinions. We did, however, note earlier in this section that there are times when opinion is the prevailing force for determining reality. In those cases ('chocolate swirl is the best ice cream' or 'Manchester United is my favourite soccer team' or 'there is nowhere better to live in India than

Delhi'), we would be more likely to use the word 'opinion' than the word 'belief,' but you can see how similar they are. We do, however, use the word 'belief' in some cases in which we would not use the word 'opinion'. Some examples are 'I believe you', or 'I believe in God', or 'I believe in the importance of giving back to your community'. The idea of belief in these cases tends to convey an extra depth of emotional commitment to an idea that 'opinion' does not imply.

TOK trap

One final important point to make about beliefs is that all beliefs are based in evidence and argument, although some beliefs ultimately turn out to be based in good evidence and valid arguments, while other beliefs deny facts or fail to accept logical connections between them.

A common mistake that students make when writing their TOK essays is to assert that people who believe in God, or a god, or some gods have no evidence for their beliefs. Such a claim is not true; no one has beliefs without evidence. The evidence for the existence of a deity or deities consists of holy texts and historical artefacts which are associated with the history of that religion. Believers also have evidence in the form of testimony from other believers – family members and religious leaders, for example. Many believers experience moments of personal revelation in which they feel themselves to be connected to a deity in an emotional sense. All of these experiences are evidence. You will explore in more detail the particular kind of belief that constitutes religious belief, as well as the role of faith as a way of knowing in developing that belief, in Chapter 6 later in this book.

IA prompt

25 How can we distinguish between knowledge, belief and opinion?

RELATED IDEAS

Concepts related to evidence are:

- sufficiency of evidence
- belief
- facts
- proof
- opinions

Explanation

An explanation in TOK terms is the same kind of explanation that you are used to in everyday life. An explanation is a description of a thing, system or phenomenon. However, an explanation goes beyond simply describing, because it accounts for *why* the thing is the way it is, or what it does, or what it is good for. 'Explanation' is included as an important concept in TOK because so much of our knowledge functions to explain something.

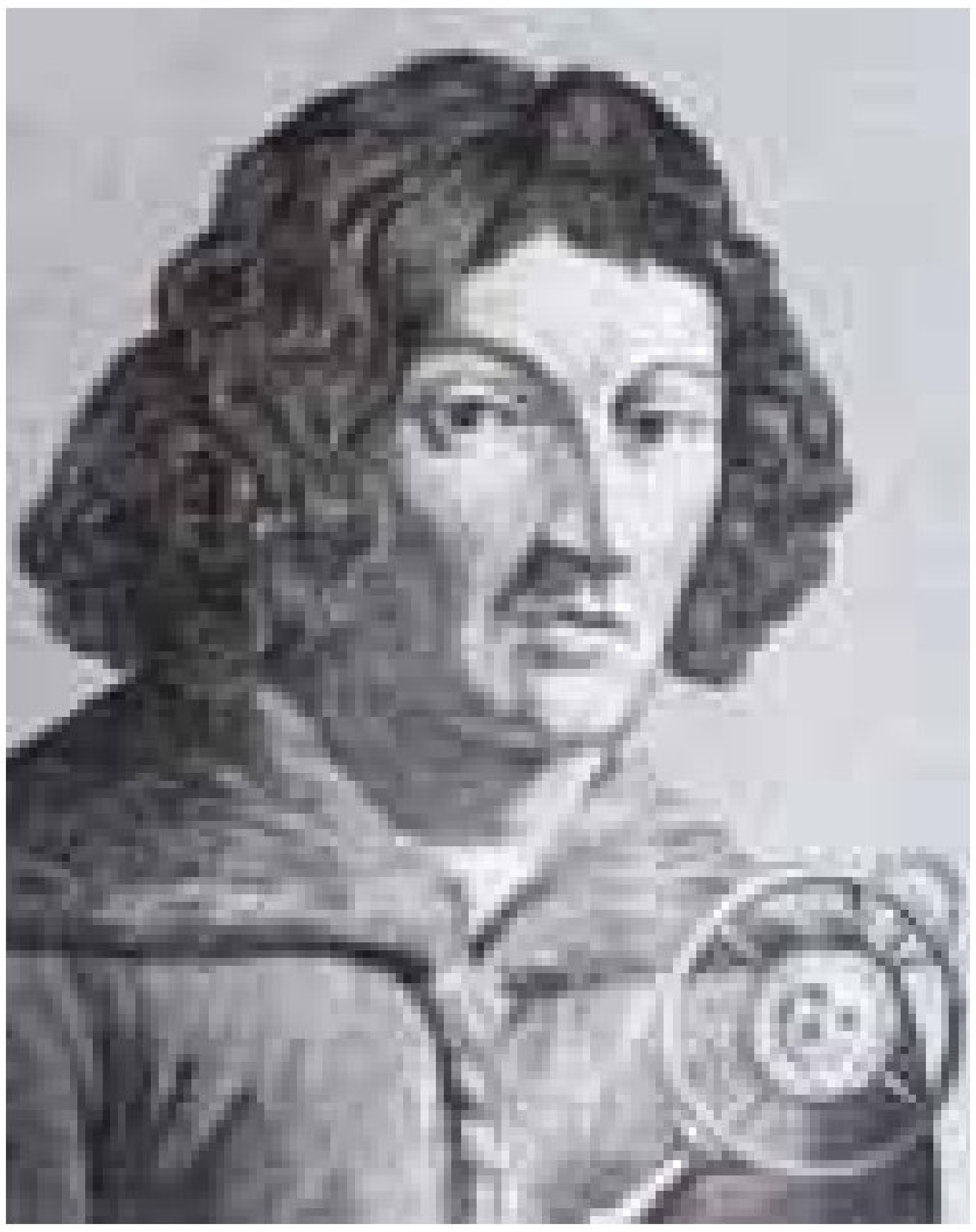
■ *Still Life with Cheeses, Artichoke, and Cherries* (c. 1625) by Clara Peeters

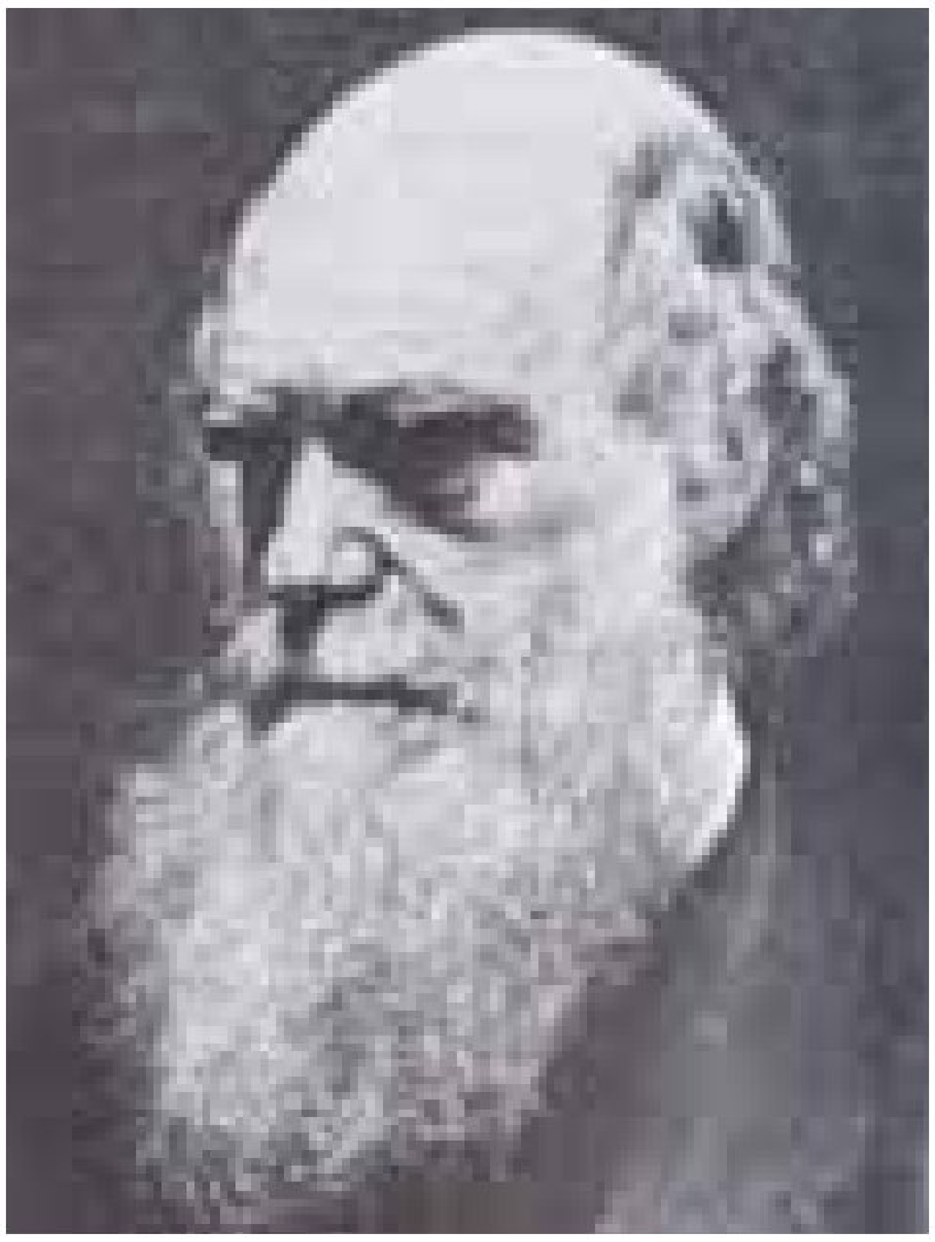
Explanations are used by people who have knowledge (or facts, opinions or beliefs) in order to make those ideas clear to someone else. Consider, for instance, an explanation from mathematics, the Pythagorean Theorem: $a^2 + b^2 = c^2$. The theorem is an explanation of the relationship between the lengths of the sides of a right triangle. An explanation from the arts can be found in the article 'In Dutch Still Lifes, Dark Secrets Hide Behind Exotic Delicacies', which provides an explanation of the meaning of Clara Peeters' painting *Still Life with Cheeses, Artichoke, and Cherries* (c. 1625). Consider how author Julia Fiore offers much more than a description of the painting:

> Indeed, the painting has a nationalistic flavor. The butter and huge cheese wheels that dominate the composition evince cultural pride in Dutch agriculture (milk, called the 'noble liquid', has become such an integral marker of Dutch heritage that Johannes Vermeer's *Milkmaid*, 1657–58, seems almost a cliché). At the same time, this still life's humility reflects prevailing Calvinist sentiments. The crust of the hard biscuit, symbolizing daily life, crumbles on the counter. The work is intensely realistic – every scrape of the serrated knife is reflected in the butter, for instance. The flowering artichoke and beautiful red cherries reflected on a silver plate punctuate the largely brown-hued composition. An eaten cherry at the edge of the table, only the stem and pit remaining, is a gentle reminder of the impermanence of life. But paintings, of course, were valued for their permanence. Here, the food never spoils. (Fiore)

Finally, an example from the human sciences and ethics can be found in 'The Lady Vanishes', an episode of Canadian journalist Malcolm Gladwell's podcast, *Revisionist History*. In the podcast, Gladwell explains the concept of 'moral licensing' from the field of social psychology. Moral licensing is the idea that '[p]ast good deeds can liberate individuals to engage in behaviors that are immoral, unethical, or otherwise problematic, behaviors that they would otherwise avoid for fear of feeling or appearing immoral' (Merritt, *et al* 344–35). Gladwell uses the idea of moral licensing to help explain why people who appear to be open-minded and supportive of change can turn around and act in ways that appear to be hypocritical by behaving in ways that are bigoted or close-minded and which block, rather than support, change. You can use the QR code on the right to listen to the podcast.

As with evidence and opinions and beliefs, explanations cannot in and of themselves make something true. There are good explanations and bad explanations. An explanation in and of itself cannot ensure that the listener will understand or accept the knowledge. Sometimes individuals refuse to accept even good explanations. Famously, Copernicus' explanation of the heliocentric universe (the idea that the Sun is assumed to lie at or near a central point of the solar system while the Earth and other bodies revolve around it) was not accepted by the Roman Catholic Church. However, you might not know that the church did initially accept the theory, rejecting it only in 1616, 73 years after Copernicus' book *De Revolutionibus Orbium Coelestium* was published, when a big push of Protestant claims that the theory was heresy drove the Catholic Church to fall in line (Singham). Ironically, the Protestant Church was then the first to accept the theory after new





Copernicus' theory of a heliocentric universe and Darwin's theory of natural selection were both famously met with resistance from the church

findings by such scientists as Galileo and Isaac Newton supported it. The Catholic Church did not lift the ban on Copernicus' book until 1835 (Solis). In this example, then, a good explanation was initially accepted by the Catholic Church, then rejected by both the Protestant and Catholic Churches, then accepted by the Protestant institutions, but not finally officially accepted by the Catholic leadership until nearly 300 years after the original explanation was offered!

An important concept that comes up in the example of the Copernican revolution is the concept of a *theory*. In the natural sciences, 'theory' has a particular meaning which is significantly different from the way the word is used in everyday speech. In colloquial speech, 'theory' is often used to mean something like 'idea' or 'wild guess'. You might have heard people say things such as, 'I have a theory about why my friend is so easily fooled by lies', or 'I have a theory about why the food in the school cafeteria is so bad'. In colloquial English, the idea of a 'theory' has the **connotation** of something which is not proven, and which is not even necessarily supported by very much evidence. 'Theories' in that context can be quite imaginative and are very likely to collapse when more information is gathered. A theory in the natural sciences, however, is something very different.

◆ **Connotation**: The meaning of a word which is implied, though not stated. Politics has a neutral meaning when it refers to the system by which people in groups make decisions about how they will live together, but when seen through the perspective of people who have been subject to the misuse of power, the word 'politics' takes on a negative connotation.

A theory in the natural sciences is an explanation which accounts for a very large set of data, usually gathered by many scientists over long periods – sometimes decades or even centuries. The theory of evolution, for example, encompasses observations of huge numbers of living things as well as of fossils. It extends back to Darwin, who first published the theory in 1859, but whose work in developing it began decades before that. An explanation which has risen to the level of a theory in the sciences is an explanation which is as close to absolute certainty as it is possible to get. It is called a theory because, as we have already seen, absolute certainty is not attainable in an inductive field of study, and scientists care about being precise in their naming of things. Mathematicians can talk about proofs; scientists talk, instead, about theories. A scientific theory, in contrast to the speculative theory of the everyday speaker of English, is so well-established that the odds of its ever being overthrown are infinitesimally small. Claiming that 'evolution is just a theory', therefore, is to miss the point entirely about what makes something a theory in the sciences. You will read more about this theory in Chapter 9. New evidence might be expected to spur some study, leading to minor adjustments in the details of the theory, but not to the essential nature of the explanation. As you study the sciences in your TOK course, you will need to remember that the word 'theory' does not suggest something tentative or unsupported by data; rather, it refers to something which is now certain, beyond reasonable contention.

Throughout the TOK course, you will be considering the kinds of explanations which can be developed in all the various knowledge-generating situations you study, and you will be working to understand what constitutes a good explanation in each of those situations.

RELATED IDEAS

Concepts related to explanation are:

- good explanations
- bad explanations
- theory
- belief
- opinions.

Interpretation

'Interpretation' means to examine the facts in a particular case and then to figure out what they mean. Usually, interpretation is called for when we have a set of facts and we want to figure out what conclusions we can draw from the whole set together. The simple existence of a rock is a fact that needs no interpretation. However, if we examine the rock microscopically and discover that it has in it some elements which are not normally found on Earth, we must then make an interpretation of what the presence of those elements suggests. In 1971, Apollo 14 brought a sample of Moon rocks back to Earth (see image on page 17). In early 2019, scientists at the Center for Lunar Science and Exploration, a department in NASA (the United States' space exploration agency) published a paper arguing that one of those rocks originated on Earth, was jettisoned off the Earth by something like the impact of a meteor and, in its turn, landed on the Moon as space debris 4 billion years ago (Anderson). This conclusion was based on the facts shown in Table 1.1.

Table 1.1 Interpretation of facts relating to samples of Moon rocks

Facts	Interpretation
• The rock contains quartz, feldspar and zircon • Quartz, feldspar and zircon are common on Earth • Quartz, feldspar and zircon are extremely rare on the Moon	These three facts together suggest that the rock was much more likely to have originated on Earth rather than on the Moon. It is not impossible that the rock originated on the Moon, but the likelihood is very small, while such rocks are common on Earth
• Crystallization on the Moon occurs at higher temperatures than on Earth • The rock crystallized under cooler atmospheric conditions, like those on Earth, rather than like those on the Moon	These two facts together also suggest that the rock was created on Earth. These two facts make the interpretation above even more likely
• Four billion years ago, the Moon was much closer to the Earth	The nearer proximity of the Moon to the Earth at the time the rock was formed makes the possibility of the Earth rock travelling to and hitting the Moon as the result of an impact on Earth much more likely

We might be able to find some interpretations convincing even if there are some ambiguities or unanswered questions because they account for what is known in a logical way. However, the more facts an interpretation can account for, the more thoroughly convincing it is likely to be. The connection between the facts and the interpretations also must be logical and they have to go together in a system that makes sense. The scientists' explanation about the Earth rock on the Moon does both of these things. You should recognize these requirements by now: we saw them in the context of syllogisms, where we noted that in order for a syllogism to produce an absolutely certain conclusion, the premises have to be true and the logic has to be valid. In the case of interpretations – as with any other formal argument – the facts (like premises) have to be true and the logic has to be valid. The reason that we cannot achieve absolute certainty in the case of the Earth rock on the Moon, is that, as with many other knowledge claims, we don't know that we have *all* the facts that are relevant. Maybe one day we'll find another source in the Universe of rocks which contain quartz, feldspar and zircon and which crystallizes rock at Earth-like temperatures. Maybe we will one day discover evidence of some dramatic astronomical event which resulted in rocks being spewed over long distances which could account for the presence of the rock on the Moon. Many other findings are possible in the future, but for now, the interpretation, based on all the known facts, of the rock known as Apollo sample 14321 (Bellucci, *et al* 173–85) is reasonable.


Apollo sample 14321

As you study the areas of knowledge and the knowledge-related themes throughout your TOK course, one of the things you will be learning is how interpretation is done in each of those realms. The processes differ because the conditions for knowledge-making and the availability and nature of facts differ. In the astronomy example we saw above, the facts have to do with physical properties of the rock itself, all of which are observable today, regardless of the fact that the rock itself is 4 billion years old and that it was brought back to Earth nearly 50 years ago. Historians, on the other hand, though they do have access to some physical objects, do not have access to nearly the quantity of physical evidence that natural scientists can study, nor are the physical objects themselves the only facts that historians would like to have. They would like to know, for example, what was said between Copernicus and church leaders at the time of the publication of his book about the heliocentric universe. They would like to know what was said at the meeting during which it was decided to build the Great Wall of China. As it is, historians must content themselves with whatever records are left, and we are always aware that what has survived is very likely to be only a small fraction of what originally existed.

In the arts, the facts which are used for interpretation consist primarily of the features of the individual artwork. In the earlier example of the Dutch still life, you can see the picture for yourself, so you can see that Julia Fiore's interpretation of the painting does take into account the facts of the painting: the cheeses, the biscuit, the marks of the knife in the butter and the remnant of the eaten cherry. But that interpretation also required knowledge of a great many other facts about the beliefs of what Fiore called 'prevailing Calvinist sentiments'. Her interpretation was based on the nature of the work of art, but also on a consideration of its having been created in a particular place at a particular time. Because the culture of that time and place influenced the making of the painting, the interpreter of the painting must know something about that culture in order to be able to interpret effectively.

Part of what you will be doing in TOK is to consider the ways in which interpretations are constructed, evaluating the accuracy and relevance of the proposed facts and judging the validity of the argument presented. But part of what you will be doing is developing and presenting interpretations of your own, which you will also have to do in your other IB courses.

Assessment advice

In creating your TOK exhibition, you will have to be able to interpret the significance of objects in terms of what they reveal about how knowledge functions in the real world. Imagine that you were creating an exhibition about the degree to which certainty is possible. You will have to choose objects which will illustrate an answer or several different answers to that question. In order to choose objects that reveal insight into this aspect of knowledge in the real world, you must interpret a variety of objects and choose the best ones. So perhaps you would consider how a calculator functions in mathematics and what it suggests about certainty. A calculator is used to perform calculations that humans cannot perform – or at least cannot perform very rapidly. Say, for example, you wished to know the answer to the following expression:

$$456 + (92 \times 87) \div 100 = ?$$

You can input the equation into the calculator and get the answer: 536.04. That answer is absolutely certain. The calculator knows the order of operations, so it first calculates the (92×87) which is in parentheses. It then divides that number, which is 8004, by 100 which gives a response of 80.04, to which it adds 456, for a total of 536.04.

In this instance, the calculator is an example of an object which stands for the ability to achieve absolute certainty. This statement is our interpretation of the significance of the calculator as an object which reveals something about the initial question of the degree to which certainty is possible. For your exhibition, you would then *justify* your choice of the calculator by explaining your interpretation of its significance.

For your TOK essay, your interpretive job is somewhat different. For that assessment, you will choose from a list of prescribed titles and then you will have to examine real-world situations to see what kind of answers they suggest to the question. Imagine, for example, that you were writing an essay in response to this potential prescribed title: ‘How does an individual knower gain from and contribute to the knowledge of a community? Discuss with reference to two areas of knowledge.’

The essential question here is: ‘In what way can shared knowledge shape personal knowledge?’ Suppose that you have just recently read about Stanford Bioengineer Manu Prakash who, in 2016, won a MacArthur Genius grant for the invention of a $1 microscope made out of paper which the user folds, like origami. Prakash’s microscope has been distributed to tens of thousands of children around the world, and they have been able to contribute their scientific findings to a website for uses of the Foldoscope. The express purpose of this invention was to engage people in scientific practice and to inspire wonder about the natural world. Prakesh cites one 6-year-old girl who was inspired by the movie *Frozen* to research crystals. ‘She researched over months and months all kinds of crystals she could find, all the way to medicine cabinets, to ice cream, to maple taffy. It’s incredible to just watch her go and you watch her progression of how she came to that experiment’ (Resnick).

Once you know the facts of the story, your job is to interpret its significance in terms of providing an answer to the question in the prescribed title. For this real-world example, you might argue that shared knowledge of how microscopes work, along with shared knowledge about origami, combined in Prakash and his graduate students to produce the foldable microscope. The foldable microscope in turn reaches outside of the professional scientific community to engage new participants in the knowledge-making endeavour. We see a kind of cycle of individual and community knowledge influencing each other. Knowledge of both microscopes and origami is widely known by many people, but perhaps there are not very many people who have extensive knowledge of both, and certainly no one else had ever thought of combining them before. So, Prakash took his personal knowledge from two very different fields to create something totally new which was, initially anyway, a matter of his individual knowledge. He then shared that new knowledge widely in order to inspire young people to develop their own individual knowledge of scientific observation. The young people in turn can then share their individual knowledge through the website, so that it can become community knowledge. So, our interpretation of this real-life situation is that it shows in two different ways that community knowledge forms the essential basis for the development of new individual knowledge, as well as two different ways in which individual knowledge can become community knowledge. In your essay, you would explain your interpretation and justify its effectiveness.

As you create your TOK assessments, you need to realize that the act of *creating an interpretation* is the act of examining the facts and developing an explanation for why it is that they all coexist. It is an act of finding the meaning in something. The act of *presenting an interpretation* to someone else is the act of justifying your interpretation. ‘Justification’ is, in fact, our next course concept.

RELATED IDEAS

Concepts related to interpretation are:

- argument
- facts
- logic
- justification.

Justification

A justification is a type of explanation; however, a justification includes an attempt to persuade the listener that the actions taken were correct or at least understandable. Explanations don't include any **overt** attempt to convince the listener to believe what is being said, while justifications do. As we saw with explanations, there are, of course, good justifications and bad justifications. A bad justification is one in which, rather than providing a rational and compelling explanation, the person offering it is simply making excuses for herself or for someone else. Another word for the kind of self-serving and inappropriate attempt at justification is rationalization. Rationalizations, despite the fact that they sound like they must be logical, because the word contains the idea of reason, are weak explanations which attempt to excuse behaviour that the person offering the rationalization knows was wrong. The professor who falsifies data in a study and then tries to justify it by saying that there was a lot of pressure from the pharmaceutical company paying for the research is offering a rationalization.

An effective justification, on the other hand, provides good reasons that explain a behaviour or decision without necessarily **exonerating** the person who made the decision or took the action. For example, Orlando Patterson, writing for the *New York Times* in 1999, discussed Hillary Clinton's explanation for her husband's having committed adultery and then lying about it. She attributed his behaviour, which she called a sin of weakness, to his dysfunctional family background. Patterson addresses the fact that Hillary Clinton drew a lot of criticism from people who thought that she was trying to 'justify' her husband's infidelity by saying it wasn't really his fault. Patterson disagreed, saying that he did not take what Mrs Clinton said to suggest in any way that she was absolving her husband from responsibility for his actions.

Patterson's suggestion is that Hillary Clinton was *explaining* her husband's bad behaviour, but she was not *justifying* it. In this sense of 'justification', the word implies making excuses for someone – in this case, President Clinton – so that that person is not responsible for his bad deeds. Hillary Clinton was not doing that; she was simply explaining the roots of her husband's inability to choose well. She said elsewhere, quite bluntly, that President Clinton was a grown man and therefore responsible for his own behaviour (Patterson).

Rationalization is a common understanding of the idea of justification in everyday speech, but we will use the term more narrowly in TOK.

◆ **Overt**: A word used to describe something which is made obvious on the surface of something. If there is an overt effort to persuade someone, then the persuasion is obvious and the language that the persuader is using directly refers to the act of persuasion so that there can be no confusion.

◆ **Exonerate**: To absolve a person of any guilt for having done an action; people who are found innocent of crimes have been exonerated of those crimes.

Assessment advice

In the context of Theory of Knowledge and, more generally, in the broader context of students in education, justifications are not self-serving. Throughout the IB Diploma Programme, you will be asked to justify the claims that you make, particularly on your IB assessments.

In TOK, you will complete an exhibition, for which you will choose several objects in the real world, and you will have to justify your choices by explaining why those particular objects *effectively* represent an idea about how knowledge works in the real world. For your TOK essay, you will have to choose some real-life situations and make claims about what those situations reveal about the way knowledge works with regard to a specific idea, which will be expressed in the prescribed title you choose to write about. Here you will have to justify your interpretation of what that real-life example reveals with regard to that title.

In both cases, what will make your work justifications rather than explanations is the fact that you must convince your examiner that your thinking and your ideas are effective. Your justifications will be persuasive if they are accurate, rational, balanced and objective. Those qualities are all reflected in this list of course concepts. Accuracy is an important component of the concept of truth (page 33). We saw that rationality, which pertains to the effective use of reason, is an important element of the concept of certainty (page 3). The idea of balance is an important component of perspective (page 25) and objectivity is itself one of the main course concepts (page 2).

The reason that you are so often called to produce justifications, rather than explanations, over the course of your educational career is that your work is so often being judged, either by teachers or by examiners. This kind of justification does, however, also apply in the world outside of **academia**. Sometimes we are called upon to justify our choices because they seem on the outside to have been misguided, but when explained, can be justified as having resulted in a proper course of action. This is particularly true with regard to ethical knowledge-making. If you must make a hard decision about whether the right thing to do is to turn your best friend in for cheating on one of their IB assessments, you have to choose between competing ethical values: loyalty and support and honesty and integrity. If you choose to turn in your friend, you will probably have to justify to them why you did it. Perhaps you have several reasons: for instance, that the rules have to apply equally to everyone rather than privileging some; that if your friend gets away with turning in work that wasn't theirs, they not only cheated, but lost the opportunity to learn and to show what they could actually do; that one instance of cheating tends to result in repeated instances, so that ultimately, your friend's education, as well as their ability to believe in their own talents, could be seriously compromised. These are good reasons for a decision to turn your friend in, and they would comprise a proper justification for your decision.

◆ **Academia**: Describes the whole community of any institution involved in education. It is usually applied to higher levels of learning which are involved in education for education's sake.

■ Would you report your friend for cheating? Would you be confident you could justify your decision?

On the other hand, if you decide not to turn your friend in because you wish to be loyal to them no matter what, you will have to justify that decision. Interestingly, you may find it harder to convince anyone but your friend. You might argue that loyalty is more important than honesty, but if we delve into that claim, we have to start asking ourselves whether covering up lies really constitutes loyalty, because doing so is not ultimately in the best interest of the person we're covering up for. In helping your friend cover up their misdeed, you become complicit in that misdeed, and it is always harder to successfully justify a bad action. This is often the case with ethical dilemmas: we are faced with a difficult decision, and sometimes the difficulty arises from the fact that both options result in equally good and bad outcomes. Pretty frequently the difficulty comes from the fact that doing the right thing will cost us something that we value. If, in those cases, we decide not to pay the price, we are likely to find that our justification is of the everyday sort in which we are really only rationalizing a decision we know was not the right one.

In Theory of Knowledge, when we examine the justifications people in the real world give for their courses of action, we will evaluate those justifications using the same standards that your teachers and examiners use to evaluate your justifications to them. This is because we want to be sure that the decisions that people make are sound, rational and **disinterested**, rather than biased or self-serving. We need to determine whether the knowledge upon which people's actions were based, or upon which conclusions were drawn, is sound, and that their explanations for why they acted as they did are, therefore, true justifications rather than rationalizations.

◆ **Disinterested**: To be able to view a situation objectively without considering whether any particular outcome would be better for oneself than other outcomes. The word 'disinterest' uses an old meaning of the word 'interest,' which refers to having a stake in something.

One final note about justification: in our discussion of the concept of evidence, we examined the role of opinion in knowledge development. In situations in which your opinion is the determining factor, such as the identification of your favourite book or film, no justification is required. The justification is that you like it. You might give your reasons for why you like rap music better than classical music or vice versa, but you do not need to persuade anyone that your choice is 'right'. Where opinion matters, opinion is the deciding factor.

RELATED IDEAS

Concepts related to justification are:

- explanation
- disinterestedness
- rationalization
- exoneration.

IA prompt

19 What counts as a good justification for a claim?

Objectivity

As we saw in the introduction to this book, this course takes as an ethical obligation the need to produce accurate knowledge. We saw that we must strive to create knowledge which is accurate because the costs of disseminating 'knowledge' or 'facts' which are not true are so very high. Regardless of whether the knowledge being produced is professional knowledge, such as that generated in the formal areas of knowledge, or whether it is personal knowledge or the kinds of knowledge that we will examine in the optional themes sections of the course, for knowledge to be functional it must be as accurate as we can possibly make it.

Objectivity, the ability to observe, to interpret, to analyse and to report such that we have not shaped our processes or our findings by our personal wishes, is an important requirement necessary to the generation of accurate knowledge. 'Disinterestedness,' which we discussed in the section on justification, is another word for objectivity. The opposite of objectivity is *subjectivity*. The word 'subjectivity' means to take an intellectual stance in which information is filtered through our expectations and so is coloured by those expectations.

One barrier to accuracy with which you may be familiar is cognitive bias. Cognitive bias is a generic term for a variety of mechanisms that take place unconsciously in a knower's brain and which keep that person from seeing the world in a clear-minded, objective way. If a knower wants badly for something to be true, they might fall victim to several kinds of problems. One very familiar type of cognitive bias is *confirmation bias*. 'Confirmation bias' is the technical term for a person ignoring evidence which works against a desired outcome. The learner or researcher, in other words, just looks for evidence which confirms their **preconceptions**. Psychologists and sociologists have identified many other types of cognitive bias. The poster on page 23 shows 24 of these kinds of bias. To see the full-size poster, use the QR code in the margin.

◆ **Preconception**: An idea or concept that is formed before appropriate research is done. A preconception might shape the way in which a person looks for an answer, so that they get the answer they thought they were going to get.

Notice that all of these kinds of bias are subconscious. The influence of these biases, then, on the production of knowledge is quite different from the kind of deliberate obfuscation of facts, manufacturing of evidence or outright lying that can result in 'knowledge claims' being made which are just not true. Researchers or learners who deliberately engage in activities which they know will result in false claims are not demonstrating cognitive bias, they are demonstrating unethical practice.

Other forces besides cognitive biases can keep us from being completely objective. We saw how culture, for example, can shape what we know. The culture in which we were raised and the culture in which we live shapes our thinking in significant ways. It affects what we believe is right and wrong and it affects what we believe is possible. These values shape the way we approach everything we encounter. The effect of culture on knowledge is perhaps most obviously seen in the area of ethical knowledge-making, but it is also a very powerful force in the making of knowledge about religion or politics.

Jonathan Haidt, Professor of Ethical Leadership at New York University's Stern School of Business, is well known for having identified foundational beliefs that are powerful predictors of people's political affiliations. We will explore these more in Chapter 7 (Knowledge and Politics), but as an example, he suggests that there is a fundamental difference in worldview between self-identified liberals and self-identified conservatives. The liberals care more about fairness and not causing harm than they do about loyalty to a group of like-minded people or compliance with authority, while conservatives think the opposite values are most important.

You can see how these attitudes might shape what the different groups of people understand and know: someone who cares about not causing harm will be more likely to believe that gun control laws need to be strict, while someone who cares about in-group loyalty might believe that it's much more important to be loyal to those people who own guns for recreational purposes or for protection of their homes and families than it is to worry about whether some people might be injured or killed by irresponsible gun use.

■ The 24 cognitive biases

The respective knowledge of the opposing groups is shaped by the culture and by the values of the culture in which the individuals formed their worldviews. Haidt notes that it's not that either liberals or conservatives don't share values – liberal people do care about loyalty and authority and conservative people do care about fairness and harm – it's that they hold those values in different relationship in terms of their relative importance. You can use the QR code on the right to watch Haidt's TED talk on the subject. You will read more about Haidt's work and what it reveals about political knowledge in Chapter 7.

You can see that in the cases of knowledge which is founded on our moral values and ethical principles, the question of whether we are capable of objectivity is much trickier than when the knowledge is founded in observations of facts in the world (though you will see in later chapters that sometimes identifying objective facts about the world is also tricky and potentially influenced by subjectivity). Who could say whether it is more 'objective' to value one principle, such as loyalty or adherence to authority, over others, such as fairness and the wish to do no harm? Pure objectivity, therefore, is extremely difficult to attain, so what we look for is the willingness to be **open-minded** to judge facts carefully and rationally and the ability to rethink conclusions when new evidence is discovered.

A final note about objectivity: some kinds of knowledge do not need to be objective. Knowledge which is conveyed through the arts is highly subjective, and that is surely much of the point. Art is a medium through which we gain insight into the artist's view of the world. The artist's subjectivity is not only *not* unethical, it is desirable. The point of a work of art, from the artist's perspective, is to reflect something about the artist's view of the world. In interpreting the artwork, however, we have to try to be much more objective than the artist had to be, as we are trying to discover something outside of ourselves.

Subjectivity in viewing artwork, however, does not carry the same kind of catastrophic consequences that subjectivity in choosing not to accept important scientific knowledge carries. If you don't know, for instance, that crumbling bread was a symbol of decay and that an eaten cherry was a sign of the impermanence of life in the Clara Peeters' still life on page 14, and you

IA prompt

3 What features of knowledge have an impact on its reliability?

◆ **Open-minded**: The willingness to listen to other people's perspectives, which may have the power to help us change our worldview. Open-mindedness is probably familiar to you as one of the IB Learner profile traits; it is similar, but not quite the same thing as objectivity, which is the capacity to take in information and to make judgments in as disinterested a way as possible.

interpreted it through your subjective belief that a meal of bread and cheese symbolizes poverty, you would have missed some ideas that you might have been able to get had you been more objective and searched for ideas outside of yourself. However, you would not cause anyone harm in the way that failure to be objective about vaccines can cause harm. And as we have seen several times now, some kinds of knowledge *are* predicated on your own personal subjectivity. Those are the kinds of knowledge in which your personal opinion is the deciding factor for what is true.

RELATED IDEAS

Concepts related to objectivity are:

- disinterestedness
- cognitive bias
- confirmation bias
- preconceptions
- open-mindedness.

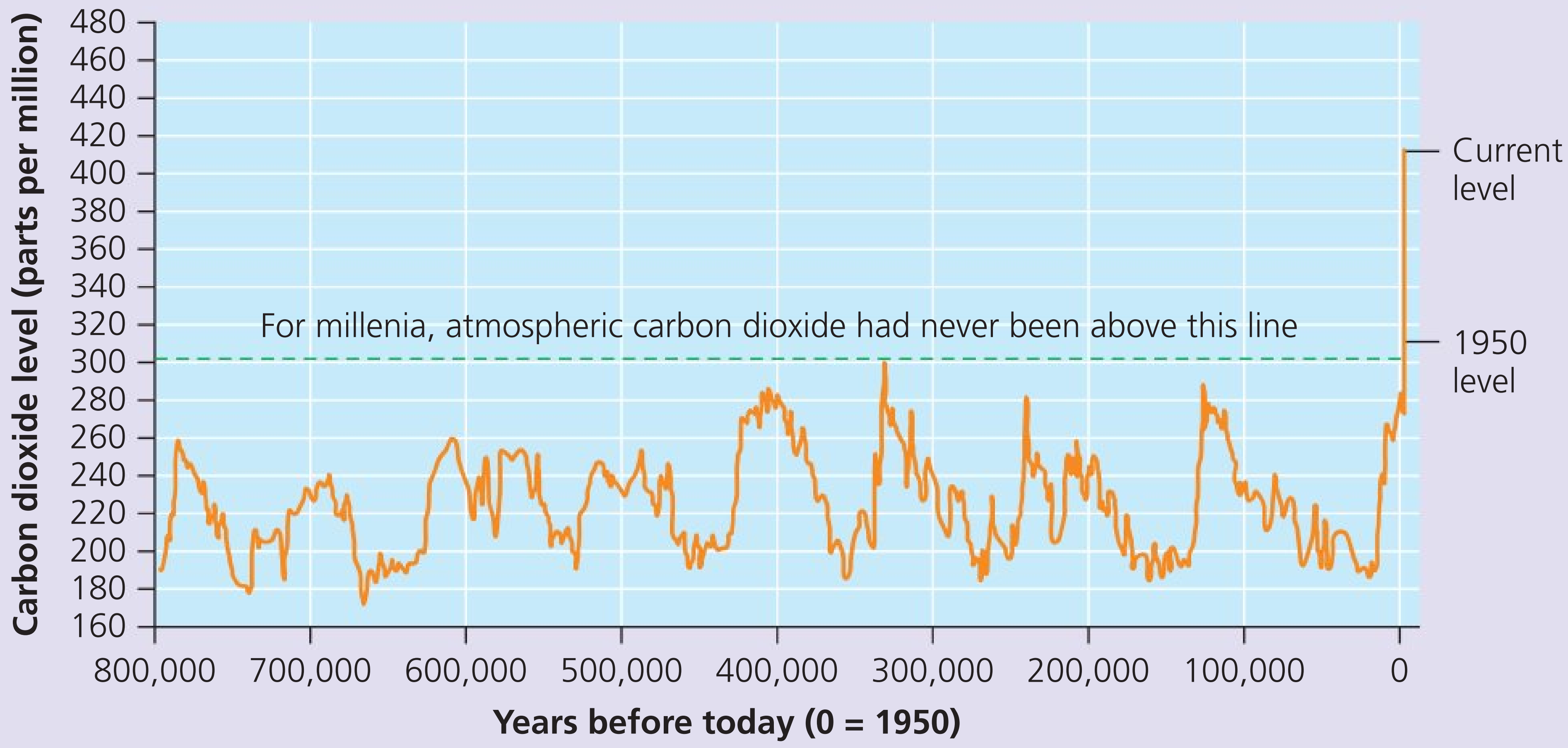
ACTIVITY

After you have completed this activity you can check your answers by using the first QR code.

As you should now be aware, there is a strong relationship between many of the concepts that we have examined so far. The concepts are all related to how we determine whether or not a particular claim is true, though each one describes a slightly different aspect of the process of demonstrating the truth of a particular knowledge claim.

Examine the graph below, which is based on data from NASA (United States' National Aeronautics and Space Administration). It is one of many different representations of data which have been studied to determine the cause of global climate change. If you wish to, use the second QR code on the right to read more about the graph on the NASA Global Climate Change website.

Answer the questions below the graph.



■ This graph, based on the comparison of atmospheric samples contained in ice cores and more recent direct measurements, provides evidence that atmospheric CO_2 has increased since the Industrial Revolution

(Source: climate.nasa.gov)

1. What phenomenon does the graph *explain*?
2. What *evidence* does the graph provide to support that explanation?
3. What *interpretation* is offered of the data on the graph?

4 What *justification* is there for that interpretation?
5 Does the data on the graph provide *absolute certainty* that global warming is caused by human activity? Why or why not?
6 Does the data on the graph provide justification beyond reasonable doubt that there is a powerful *correlation* between human activity and global warming? Why or why not?
7 Why can we say that this data is *objective* rather than subjective?

Perspective

'Perspective' is the word that we use to describe the particular viewpoint from which an individual takes in information and decides what is important or what something means. We saw, in our consideration of objectivity, that sometimes one's personal perspective can be problematic for the production of accurate knowledge. It can certainly be problematic in terms of our ability to come to an agreement with others who see the world from perspectives which are fundamentally different to our own. Because of this difficulty, the IB mission statement contains a direct acknowledgment in the belief of the value of being able to accept different perspectives. The mission statement expresses the idea that students who complete IB programmes become people who 'understand that other people, with their differences, can also be right'. An important part of what we are trying to do in TOK is to understand how we develop our own perspectives – the habits of mind which shape what we can and do know. Once we understand our own, we are much better positioned to recognize that other people have formed their perspectives in logical, reasonable ways as well, and to be able to move toward understanding others.

Perspective is a particularly thorny concept when it comes to the making of religious or ethical knowledge. Wars have been fought for centuries over the differences in perspectives about which religion has the 'right' understanding of mankind's place in the Universe. Religious knowledge tends to be presented as a matter of absolutes – there is one God or there is not; Jesus Christ came to Earth as the messiah or he did not; people who accept Jesus Christ as their saviour will go to heaven when they die and those who do not will go to hell; or there is no heaven or hell. These different positions are, for many people **dichotomous**. That is, they do not lend themselves to compromise. If I believe that there is no god and no such thing as heaven or hell, I am not going

◆ **Dichotomy**: A choice between two positions, of which only one can be true.

to find it easy to believe that other people, with their viewpoint that I am going to go to hell for my **atheism**, can also be right.

Many of the ethical dilemmas that we face individually or as communities or countries arise from situations, perhaps similar to the one above, in which we hold a perspective which is not only fundamentally **irreconcilable** with the perspective of someone else, but in which we also believe that our perspective is morally right. As a result of this, we are brought to the point of having to decide whether to interfere with someone else's way of doing things.

Clearly this kind of situation ought to be approached very cautiously. We have seen the negative consequences – sometimes truly horrific consequences – of the decisions of one people to interfere with the culture and lives of another people throughout history. Probably you know some of the many stories of invasion and conquest that resulted in the complete, or nearly complete, destruction of the way of life of the Indigenous people of the Americas, Africa or Alaska and the far north. You probably know about the millions of people who died in the Holocaust, the Russian pogroms and the genocides in Cambodia, Bosnia, Darfur and Rwanda. All of these, and many others, are extreme examples of people who had one perspective about how life ought to be lived, and particularly about which god ought to be worshipped, and who took it as their responsibility to impose that perspective on others. All of these examples suggest that the IB mission statement is correct, and those millions of people ought to have been left alone to live their lives as they saw fit.

The mission statement says, however, that 'others with their differences *can* also be right'; it does not say 'are also right'. The mission statement, does, therefore, allow for the kind of situation in which we have to make the moral judgments required of us to stand up for what is right and to step in when wrongs are being done. The difficulty, then, is knowing when that time has come. Most people would agree that when we see someone – individually or in a group – being bullied mercilessly by someone else, we should not respect the perspective of the bullies, but we should rather step in and help the person or people who are being victimized. Many countries have been founded on the principle of religious freedom which means (or ought to mean) that they have **codified** a value of respecting the religious practices of others, whether those practices are like ours or not. In practice, that value has proven time and again to be an extremely difficult one to live up to. Many people feel so strongly that they have the one and only correct religion that they feel compelled to try to force it onto others. Even in situations in which people desire to respect religious practices that are different from their own, some people may feel compelled to interfere because of a perception that some of the practices are inhumane or restrict the personal freedoms of others, often women. The difficulty, then, becomes how to know when such interference is a matter of moral justice and when it is a matter of unwarranted and inexcusable meddling. Just because these questions are difficult to resolve, however, does not mean that we should not try.

Perspective is not always a problem for the production of knowledge, however; sometimes it is a vitally important contributing factor. That charge from the International Baccalaureate Organization is easier and more relevant in some areas of knowledge and in some knowledge-making situations than in others. In the generation of historical knowledge, multiple perspectives are extremely important to our ability to create a full understanding of past events. We can understand this claim better by examining a case in which only one perspective of a historical period was provided.

You may have heard the claim that 'history is written by the victors', which is so commonly offered as an explanation for how historical knowledge gets made that it has become a cliché. It is true,

◆ **Atheism**: The belief that there is no god. It differs from agnosticism in that the latter describes the middle ground in between religious belief and atheism. Agnostics take the position that they do not know whether or not God or a god or some gods exist.

◆ **Irreconcilable**: A word used to describe a situation in which two different perspectives are so fundamentally different that there is no way to find a compromise between them.

◆ **Codified**: Something which has been 'codified' has been written into law or otherwise overtly stated as a requirement of social and governmental practice.

too, that our knowledge of past events has led to the mischaracterization of many historical events because only one perspective was offered. In the Soviet Union, Stalin went so far as to produce a textbook, the *Short Course on the History of the USSR,* for school children which Stalin himself edited by hand. Professor David Brandenberger of the University of Richmond in Virginia in the US has written a book about that textbook. Brandenberger identifies a number of ways in which Stalin altered the history of the Soviet Union so that those school children, from 1959 to 1986, grew up learning a certain version of Soviet history which later turned out not to be true. Among numerous other observations, Brandenberger says this about Stalin's input to the text:

> First, Stalin consistently strengthened **etatist** aspects of this historical narrative, enhancing aspects of Russian history connected to the consolidation of central political authority. This put the communist leader in the awkward position of defending the historical legacies of not only the tsars and their servitors, but the Russian Orthodox Church as well. (Brandenberger)

Since the whole point of the Russian Revolution in 1919 was to overthrow the tsars, who were believed to be running the country in ways that were detrimental to the working class, a textbook which presents the Soviet Union as somehow being derived from the legacy of those same tsars and which, therefore, defends the royal family, is surprisingly misleading. Stalin's remaking of the past of the Soviet movement is an extreme example of what can happen when only one perspective – that of the people in power – is recorded and disseminated. Many other examples of strongly biased history were reported through less deliberately **obfuscatory** means.

Whether it is done deliberately, or indirectly due to lack of care, the presentation of history through only one perspective leaves us with a very narrow kind of knowledge. In the present day, historical practices have changed a good deal, and now multiple perspectives on historical events are commonly sought out so that they can be included on the historical record. Once we can learn about a particular event from multiple perspectives, we can start to understand how different people experience the world differently.

Historian Jon Wiener, writing for *Slate Magazine*, described a potential high school study unit on 'Reconstruction following the American Civil War', and advocated having students consider the Reconstruction from three different perspectives: the northerners who wanted to bring the southern black population into the national economy, the white plantation owners of the south

◆ **Etatist**: A person who is in favour of authoritarian control of government, in which one person makes the decisions. This contrasts with democracy, for example, in which governmental decisions are guided by input from citizens.

◆ **Obfuscate**: To deliberately hide something from others. You may be familiar with the word 'obscure', which comes from the same root. When someone deliberately tries to make something less clear, that person is obfuscating. In this case, Stalin was obfuscating the true history of the Soviet regime's rise to power.

■ How does the consideration of different perspectives enrich our understanding of historical events?

who wanted to keep as much of their pre-war lifestyle as they could, despite having lost their slaves, and the former slaves, for whom freedom meant, among other things, the right to work for themselves. Wiener suggests that students who study the Reconstruction from different perspectives learn to see that the history we know was formed from the actions of different groups, rather than just one. That experience can then be **extrapolated** into an understanding of not only what happened during the years after the end of the civil war and the reconstruction of the nation, but also of how history itself is constructed – or reconstructed.

◆ **Extrapolate**: To extrapolate is to extend a known idea to surmise or work out something unknown. In this case, if we understand how different perspectives help us to better understand reconstruction, we can work out that different perspectives will help us understand many situations better.

One reason that it has been historically true that only winners write history is that winners of any conflict were the ones who took control of the systems for recording and disseminating information. Poor people and people who were not in positions of influence had no means of getting their version of events out to the world. Modern technology has added considerably to the ability of the less wealthy, less well-armed, less powerful people to get their side of a story out to the rest of the world. During the Arab Spring uprising in Egypt in 2011, for example, video and audio recordings as well as written information was sent out of Egypt to the western world via social media. We now have on record those primary sources rather than just having the story as told by the Egyptian government.

In Chapter 3 (Knowledge and Technology), we will explore the many problems for knowledge that arise with extremely widespread technology which allows anyone to post anything at all, whether true or false, on the internet to be read, potentially by millions of people.

'Perspectives' is one of the four headings which guide the study of all the course components in TOK. As you study the various systems in which knowledge is made, you will be considering whether we have access to multiple perspectives or not, and if not, whether we can say that we have managed to create maps which reflect sound understanding of what actually happened.

A final note about perspective: in some kinds of knowledge, differing perspectives are not helpful or relevant. There can be no different perspective on the fact that your favourite dinner is your mother's homemade lasagne. There can be no different perspectives on the laws of physics. The physical properties of the Universe are what they are; they are not subject to different interpretations by people from different cultures.

Different perspectives can be helpful in many circumstances in the development of scientific or mathematical knowledge – someone else might give you a new perspective on how to solve a problem or design an experiment. However, the knowledge that is ultimately constructed is not going to be subject to reinterpretation from people who see things differently. In fact, the idea that there can be different perspectives on reality is one of the problems for knowledge in the world today. We saw in the introduction that people cannot stop their children from getting measles and potentially dying because they have a personal perspective on vaccines. Similarly, we cannot stop the ocean from continuing to rise as fast or faster than it did in the last 25 years (more than 3 inches), causing significant changes to coastal land and affecting both land use and weather patterns (Nunez), just because we have a different perspective on the question. We can certainly benefit from different perspectives on how to solve the problem and how to deal with the consequences, but what happens as a result of the rising temperatures of the oceans is not a matter of perspective; it is a matter of the physical nature of the oceans. As you work through your TOK course, you will need to attend to those situations in which different perspectives can enrich our knowledge, as opposed to those in which perspective is simply not relevant.

RELATED IDEAS

Concepts related to perspective are:

- multiple perspectives vs single perspectives
- the role of technology
- falsified history vs enriched multi-perspective historical knowledge.

Power

You may have noticed the many times that the word 'power' has appeared in the discussion of the concepts so far. 'Knowledge is power' has become a well-known cliché, and, indeed, there are obvious ways in which it is true. Movies and television shows by the dozen are based on **unscrupulous** people **exploiting** their knowledge for wicked purposes. Blackmailers, thieves and other ne'er-do-wells use their knowledge as a tool in order to benefit themselves. Clearly this is not the sort of power we are interested in with regard to knowledge in TOK. Knowledge is, nevertheless, a source of power.

There are two ways in which we want to consider the concept of power in relation to knowledge:

- the way in which knowledge gives us power
- the way in which those who have power in a particular society or group control the knowledge that gets made and distributed.

Knowledge from the various areas of knowledge gives us a particular kind of power over our lives. Knowledge of the natural sciences, for example, gives us, individually and in communities, power over our environment and allows us to improve the quality of our lives. Knowledge put men on the Moon. Knowledge put your mobile phone in your hand and allows us to fly from one side of the world to another. Knowledge, as we have seen, has allowed us to **eradicate** diseases, and lack of knowledge has caused some people to bring those **vanquished** diseases down on the heads of their children. Knowledge of other people allows us to communicate, to form alliances and to solve problems. As we saw from Josef Stalin's attempt to completely rewrite the history of his country in order to convey a whole set of assumptions and values that fit his plan for controlling the nation, knowledge of history gives us the power that comes with understanding

◆ **Unscrupulous**: People who are willing to take advantage of others for their own betterment. 'Scruples' is another word for the brakes we have on our consciences; your scruples are the values you have internalized which keep you from behaving badly, particularly with regard to how you treat other people.

◆ **Exploit**: To use someone or something for your own good. The idea of exploitation has a negative connotation – if you exploit the resources in your area, for example, you use them up without regard to the consequences.

◆ **Eradicate**: To wipe out.

◆ **Vanquish**: To defeat. Vanquished is a word that is used to describe the losing side in a war.

the values our countries are founded upon and why. It provides us with guidance about how to behave if we are to live up to the ideals that have shaped our current social and governmental practices. Knowledge tells us when the time has come to rise up against injustice and help to steer a community or nation or the world toward a better course.

One other important way in which the concept of power is related to our understanding of how knowledge works in the world is the question of who has the power to make and distribute knowledge. We mentioned an example of this earlier in the discussion of the concept of perspective as it relates to making knowledge in history. The idea that history has long been written by winners is a way to express the fact that the winners have had the power over how the stories of many historical events have been told. The people with the power to disseminate their version have the power to shape the knowledge that others will have.

Power over the knowledge-making process is not limited to the field of history, of course. We also saw how scientific research into the connection between vaccines and autism was misrepresented due to the power of some companies who were funding the research. In that case, the power of a commercial interest led to findings which were inaccurate, and which have proven to be extremely difficult to correct – even after nearly 30 years – and which have had serious consequences for people around the world.

As you study the themes and areas of knowledge throughout this course, consider who has the power to make and disseminate knowledge and what **recourse** we have, as individuals and groups, to check whether the findings that are presented to us are balanced and whether they reflect multiple perspectives, or just the perspectives of those in a position to make claims.

◆ **Recourse**: The options that exist to fix a problem.

The Theory of Knowledge course is one in which you will develop knowledge about knowledge. When you have a rich understanding of how knowledge is developed, tested, justified and updated, you have the power of being able to determine what is real and what is not, who is lying to you and who is not. That knowledge gives you power over your own life. When you know how to judge for yourself whether what you are being told is true or not, you are free from the manipulation of others who would exploit you for their own purposes. You are free from the consequences of accepting erroneous claims made by those who, though not deliberately malicious, are themselves labouring under the burden of not knowing what is real and what is not.

'Power' is perhaps one of the easier concepts to understand, but it is one of the most important ones, because it lies at the heart of why we study Theory of Knowledge in the first place. One of the stated aims of the course is: 'to equip students to be able to effectively navigate and make sense of the world and help prepare them to encounter novel and complex situations' (TOK Guide). In other words: one of the aims of the course is to give you power over your own future. As you work your way through this course, then, attend to the ways in which the different kinds of knowledge give us power over our own lives. When you study the scope of each of the different kinds of knowledge, pursue an understanding of why that knowledge is valuable in the world – of what it allows us to do that we could not do before we had that knowledge.

RELATED IDEAS

A concept related to power is freedom.

Responsibility

With freedom comes responsibility.
Eleanor Roosevelt

Although the concepts in this chapter appear in alphabetical order, 'responsibility' is a very appropriate concept to follow immediately after power. Maybe you have heard another common saying: 'with freedom comes responsibility'. This cliché has become so common because it gets at an almost universal ethical belief: that when one has enough power to free oneself from the control of other people or of nature, one has an obligation to use it wisely.

Most people would say that when one has power, one has an obligation to use it for the good of all, not just for the good of oneself. It follows then, that most people would **concur** with the idea that, since our knowledge confers power upon us, our knowledge should be used wisely – for the good of everyone.

◆ **Concur:** To agree with. Concur relates to the word 'concurrence', which means something that happens alongside something else.

◆ **Censure**: Formally denouncing a particular behaviour; it often carries serious penalties.

All the professional areas of knowledge, in fact, have formal codes of ethics that guide the generation of knowledge within that area so that the responsibility for making accurate knowledge is formalized and the practices which will lead to that accurate knowledge are identified and mandated. Practitioners in all the areas of knowledge who are caught violating those codes of ethics are **censured** and, very often, stripped of the right to continue to work in that field, as Andrew Wakefield was for his unethical work in claiming a non-existent tie between vaccines and autism.

In fact, much of our knowledge is used to ensure good for everyone:

- Technologies are developed in order to make people's lives easier or better.
- Medical knowledge allows people to live longer, healthier lives.
- Knowledge of history and law has helped many people get the justice they deserve.
- Knowledge of psychology has helped people to overcome mental illness.

- Knowledge of biology and ecology has helped provide drinking water to people around the globe – even in areas of extreme desert.
- Knowledge of mathematics has helped to build skyscrapers and bridges.

Not all knowledge is used for good, however, and not all good has extended to all people:

- Many people are wrongly incarcerated despite our having knowledge about how to interpret evidence such as that obtained from DNA.
- Many people do not have the food, water or medical supplies that they need.
- Despite widespread availability of cellular technology and the internet, many people – even in developed countries such as the US – do not have access to those services.
- Knowledge led to the atomic bomb and the deaths of hundreds of thousands of Japanese citizens at the end of the Second World War.
- Many individuals do what is ethically wrong, even though they know what is ethically right.

Hiroshima, 1945. Who is responsible for the way knowledge is used? Those who create knowledge or those who employ it?

All of these circumstances lead to questions that you will pursue throughout your TOK studies:

- Who must be responsible for the knowledge we have?
- Are the people who make or discover the knowledge more responsible than the people who use that knowledge?
- Do we have a responsibility to ensure that the benefits of knowledge reach everyone, rather than just a privileged few?
- What do you, as an individual, have responsibility for with regard to the knowledge that you seek or the claims with which you are presented?

As you study the themes and areas of knowledge, consider what the concept of responsibility reveals about why the methods that are used have been developed.

A final note about power and responsibility: neither of these concepts seems to be very complicated, but they both reveal a very important idea about Theory of Knowledge – the course content is very serious. Sometimes in school we wonder why we have to study what we have to study or when we will ever use our knowledge of how to solve a problem in mathematics or our knowledge of the importance of structure in Shakespeare's *Hamlet* or our knowledge of the history of China under the rule of Mao Tse Tung. Theory of Knowledge offers you two important opportunities:

- By understanding the power that different kinds of knowledge confer on people in the world, you will be able to answer those questions about why you have been required to study the things you study in school.
- Theory of Knowledge itself, because it is, in part, about how you as an individual can gain power over your life – true independence – and about what responsibilities you will incur because of that power, is a course with direct application in your life and throughout your life.

RELATED IDEAS

Concepts related to responsibility are:

- power
- freedom
- independence.

IA prompt

27 Does all knowledge impose ethical obligations on those who know it?

Truth

The concept of truth sometimes seems to be a scary one for Theory of Knowledge, because the nature of truth is a massive question in the formal study of philosophy, and can be both complicated and distancing. The Stanford Encyclopedia of Philosophy, for example, describes one aspect of the philosophical question of truth this way:

> These theories all attempt to directly answer the **nature question**: what is the nature of truth? They take this question at face value: there are truths, and the question to be answered concerns their nature. In answering this question, each theory makes the notion of truth part of a more thoroughgoing metaphysics or epistemology. Explaining the nature of truth becomes an application of some metaphysical system, and truth inherits significant metaphysical presuppositions along the way. (Glanzberg)

You can see that trying to tangle with concepts such as 'thoroughgoing metaphysics' or 'epistemology' and 'metaphysical presuppositions' would be enough to make most people run for cover. Fortunately for us, however, these extremely abstract notions surrounding the nature of truth are not relevant to the role of truth in the specific context of knowledge in TOK. In TOK, we are concerned with a much more direct concept of truth, which we have already described in the introduction to this book. The Theory of Knowledge course is predicated on an essential **assumption** that reality exists outside of our minds. That is to say: TOK rejects the philosophy of **solipsism**, which is the idea that there is no external reality, and that since it's impossible to experience anything at all that doesn't pass through our minds, we cannot say with any degree of certainty that anything exists at all except our minds.

We acknowledge that our acceptance of the existence of an external reality is an assumption, but we also accept that that assumption accords with experience. If, for example, we assume that the wall ahead of us is really there, and is not just a figment of our imagination, we will

◆ **Assumption**: A belief that someone holds because there is no way to test it. Assumptions are formed based on experience, so they are not wild guesses. With regard to the belief that reality exists outside of our minds, we cannot get outside of our heads in order to test the proposition that what we experience inside our heads matches what is outside.

◆ **Solipsism**: A belief that the only thing that can be known to exist is the self.

not run headlong into it, smashing our forehead and giving ourselves a concussion. If, on the other hand, we assume that the wall is not real, and we therefore run into it, we will suffer the pain of our assumption. Would running headlong into the wall prove with absolute certainty that the wall is there and not simply an artefact in our minds? No, it will not. One could make a fairly complicated argument that the pain is also a creation of our solipsistic mind, and that it is, therefore, no more 'real' than the wall is, but such an argument seems pretty frivolous. If all the consequences of our behaviours are exactly the same in a solipsistic universe as they are in a universe which is real, then there is no difference between them, and we might as well behave as if the Universe is, in fact, real.

We have thousands of years' worth of experience as a species which tells us that when we have solid knowledge – when we are certain or absolutely certain – we have power over our environment, ourselves and our lives. We also have experience that tells us when we are wrong, when we only think we know or when we believe in things which are not real, we do not have that control, and we suffer consequences that are not at all desirable. Remember the man who thought that the man-eating tiger's behaviour was all a matter of his mental control? He did not survive his delusion long enough to realize the error of his ways.

For the purposes of Theory of Knowledge, then, we know the truth when we understand, and are able to explain, reality accurately.

All of the various areas of knowledge and themes of the course focus on different aspects of that reality: the physical Universe, the quantification of relationships among objects, of speed and motion, of politics and language, of human behaviour and past events, and so on. In each different area, we will be examining the effort to know the truth about those different elements of human life and experience, as well as about physical reality. People working in each of those areas will study different materials and use different procedures in order to do the studying. Our efforts to know in each area will be guided by ethical concerns, and many of those areas will look different, or be approached differently, by people with different perspectives. By considering the generation of knowledge in all these different domains, we will be looking at the ways in which truth is identified – and the degree to which it is possible to actually recognize and describe any meaningful truths.

Much of your TOK course will reveal to you the problems that we face in trying to know, but that does not mean that knowledge is not achievable. The fact that truth is a central course concept is a reminder to you that our journey through the problems we face as a species, in trying to make knowledge in many different contexts, do not ultimately stop us from knowing. Our understanding of the obstacles and the means by which we overcome them is a primary means of helping us understand *how* we know, *when* we know and *why* we know.

RELATED IDEAS

Concepts related to truth are:

- assumption
- reality
- solipsism
- accuracy
- certainty
- absolute certainty
- methods
- ethics
- perspectives.

Values

The twelfth and final central course concept is values. By now, we have already touched on a good many values that are relevant to our exploration of knowledge in this course. We have seen how the IB mission statement embodies the value of respecting other people's perspectives and how that value relates to our understanding of how to use our knowledge. We have also seen how values shape our knowledge through the culture in which we live and in which we seek and apply our knowledge.

We have also seen some of the values that underlie the Theory of Knowledge as a course: the value of independence and the ability to have power over one's life and environment, as well as the value of gaining and using our knowledge wisely and ethically. We have seen that while we value absolute certainty, we do not value it as the primary goal for determining whether we know something or not. Finally, with regard to values that have shaped the course, we have raised questions about the value of knowledge itself. You will continue to explore all of these aspects of the relationship between values and knowledge as you proceed.

There are also values inherent to each of the knowledge domains that we will examine in the course. We have seen that each professional area of knowledge has a code of ethics, which reveals that they all value accuracy and responsibility. As you study each area of knowledge and each of the required and optional themes, you will also consider what it reveals about what we value as humans. The scope of each area implies something about what we value about our lives and experiences. The methods imply something about what we value about accuracy and precision. Our investigation into perspectives will imply something about our valuing of different ways of seeing the world and different ways of doing things, and our exploration of the ethical ramifications within each domain will imply things about what we think of as fundamentally right and wrong. In short, all the aspects of each of the areas you will study in your Theory of Knowledge course reveal what we value in our communities, be they groups as small as a family or as large as the entire population of the world.

Perhaps the value with the biggest implications for knowledge is the value we place on truth, on having knowledge that is accurate enough to be functional. If you understand that, then you understand that serious practitioners in all areas take their responsibilities seriously. When that happens, we can trust the knowledge that is generated and shared.

RELATED IDEAS

Concepts related to values are:

- certainty
- culture
- evidence
- explanation
- interpretation
- justification
- objectivity
- perspective
- power
- responsibility
- truth.

Conclusion

We have spent a long time considering the nature of the 12 concepts which IB has designated as being central to your study of Theory of Knowledge. We hope that this initial journey through the concepts has helped give you a foundation for understanding these ideas which you will visit time and again throughout your TOK experience, and, in particular, the relationships among them. You may wish to return to this chapter often as you work through your course for a refresher of what these concepts are all about. We have provided page numbers on the initial list of concepts on page 2 at the beginning of the chapter, so if you bookmark that list, you can use the page numbers there to move quickly to the discussion of the particular concept you wish to review. As you become more familiar with these concepts and how they relate to the processes of producing, testing, validating and updating knowledge, you will also gain a richer understanding of the processes themselves.

Learner profile

Knowledgeable

How does studying TOK through concepts help us to become more knowledgeable about how knowledge is constructed in all the themes and areas of knowledge?

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Core theme

2 Core theme: Knowledge and the Knower

OBJECTIVES

After reading this chapter, students will:

- be able to define knowledge and truth, as opposed to beliefs and opinions
- understand the notion of communities of knowers
- be able to identify the individuals and institutions that have shaped their perspectives
- recognize different sources of knowledge and cognitive tools
- understand how different perspectives inform our responses to ethical dilemmas.

Learner profile

Reflective

What shapes my perspective as a knower?

Introduction

Take a look around you at this moment and consider all the things that you can see, hear and touch right now. All of them are the products of knowledge or knowing. The buildings require knowledge of engineering, and knowledge of how to create the materials that make up the building. The roads and vehicles needed to transport these materials to the site required further knowledge about materials and machines. Someone had the knowledge needed to organize the builders who put it all together; others had the knowledge of how to organize the money required to buy the land and materials and how to pay the builders. Someone else knew how to feed electricity into the building, others knew how to build whatever machines are in that building and then you have the knowledge of how to use those machines.

Nearly everything around us is the result of the intentions, desires and activities of other human beings who were applying what they knew in order to create the world we see. Even many of the natural elements we see, from the trees and parks around us, the animals we see and pets we love are all impacted at some level by human knowledge. Consider the cats and dogs we have as pets; they are the result of centuries of selective breeding, again the product of human thought. In an entirely natural environment, many of our pets would have no chance of survival because we have bred away their basic abilities to look after themselves.

Interestingly, we *as individuals* know very little in relation to all the knowledge surrounding us. Rather, we hold this knowledge *as a culture*. It would be wrong to say that we hold this knowledge as a species because knowing these things doesn't really have anything to do with our biological make-up. It is something that we have developed in the context of culture and have passed on through the generations. This knowledge held by a group or a culture is sometimes referred to in TOK circles as 'shared knowledge' because the methods by which it was discovered

ACTIVITY

Select one item that you can see from where you are sitting right now. Try to list all the different knowers responsible for the fact that the item currently sits in the room where you are.

Is any knowledge created independently of other knowledge?

and 'approved' included groups of people working together. For example, you might know what the chemical equation for photosynthesis is, but you had nothing to do with finding it. The community of biologists and chemists worked it out and you then learned it in school.

In this chapter, we will think about the individual in relation to all this knowledge held by the culture and by communities. As individuals, we all hold knowledge and, hopefully (especially as you are a student), you are gaining more and more knowledge each day. The culture which has this knowledge has developed systems and processes which pass some of it on to individual knowers. In many cases, the individuals will then take on this knowledge and add to it, change it, develop it or even overturn it. This type of knowledge held by an individual is often referred to as 'personal knowledge' because it relates to those things which you can say that you know. You know how to do things, for instance, that others might not. This might extend from knowing how to juggle to knowing how to solve quadratic equations. You might know facts as well, for instance the chemical equation for photosynthesis; this knowledge might have been developed or discovered by other individuals and accepted by communities, but you have it now. You might also know things that no one else can know. This could be knowledge of how you feel right now (tired, grumpy, worried, confident), or knowledge of your opinion about certain events or facts. We might agree on certain facts, say, about the amount of waste a city produces (an example of shared knowledge), but differ on our opinions on what, if anything, should be done about it (an example of personal knowledge).

KNOWLEDGE QUESTION

How do individual experts in an AOK manage to have their knowledge accepted by other experts in that AOK?

We will explore our understanding of ourselves as individual knowers. The TOK subject guide calls this section 'the core theme', meaning it should play a significant part in your thinking about knowledge during the course. The idea is that in *all* situations you act as both a member of some community of knowers, but also as an individual who accepts knowledge from that community, and also contributes to it. Throughout the course, when you are thinking about the role of technology, language and politics, when you are thinking of the knowledge held by Indigenous and religious communities (the optional themes) and when you are thinking about the knowledge held by the more formal communities of mathematicians, scientists (natural and human), historians and artists, you should be thinking about what the role of the individual in that community is. You should also think about what *your* role is in those contexts too. This course is not only about knowledge 'out there in the world'; you and your knowledge are at the 'core' of the whole experience.

In the Scope section we'll explore what knowledge is thought to be and why it is different from belief or opinion. There we will also explore the idea that knowledge is often developed in the context of a community and how our individual knowledge is often best seen as being in relation to such communities. The Perspectives section builds on this in thinking about how our individual perspective is constructed by a network of different factors and communities. The Methods and tools section explores the various ways that individuals gain their knowledge. Finally, in the Ethics section we'll look at the sort of knowledge we call 'ethical knowledge' and consider how that is developed and what its impact might be.

KNOWLEDGE QUESTION

Does the knowledge or experience of an individual have the same relevance in the construction of knowledge in different AOKs?

Scope

Just what are we referring to when we talk about knowledge, as opposed to beliefs or opinions? Each of these categories are up for discussion in TOK and different contexts or areas of knowledge might treat these terms slightly differently. For the purposes of TOK, we often use the term 'knowledge' to refer to any claims that are the product of various processes used by people when trying to understand or make sense of the world. In some cases, we recognize that some of these claims are quite different than others in terms of certainty, reliability, objectivity or changeability. We might use 'knowledge', 'belief' or 'opinion' differently in these circumstances. Let's take a moment and see if we can find some differences between these concepts so we can use them later in analyses of what we think we 'know'.

Knowledge, belief and opinion

How many people are surfing in Thailand at this very moment? There is a right answer, but could we ever know what it is?

Throughout this section we will be using a number of terms which are helpful in describing knowledge and how knowledge relates to the world.

- Facts are how the world is, or how things actually are, whether you know it or not. There is, for instance, a fact about the number of people in Thailand surfing at this moment in time, but there's no practical way of finding that fact out. But there is a fact of the matter and the truth of any guess I made would be true only if it corresponds to that fact.
- Claims or propositions are statements made by people stating what they think might be a fact. I might claim or propose that 'there are 1 357 people surfing in Thailand right now'. Claims and propositions can be true or false. If I claim that the Earth is flat, I'd be saying something that is false because there is no fact in the world that this claim corresponds to (no matter what YouTube tells you!). Much of what this course is about is under what conditions claims can be considered as knowledge.
- A truth is another name for a claim or proposition which has been shown to be or is accepted as true. 'The Moon orbits the Earth' is a truth, as is, 'The internal angles of all triangles are equivalent to two right angles'. We're differentiating 'a truth' from 'true' because we have seen throughout history that many times what we called 'a truth' turned out not to be true at all. 'The body is made up of four humours' was once considered a truth but it was never true: it was merely a claim that people *thought* was true but wasn't.

The vast majority of creatures on the planet demonstrate no interest in knowledge about the world; they just get on with the business of living in it. Bats, banana slugs and Bengal tigers simply carry on what they do without any thought about what knowledge is, or how it is constructed. Their approach to reality is simply to live in it, try to find food in it and try not to be someone else's food in it.

Most humans, however, do spend a fair bit of time wondering what is true about the world. They make claims about the world and then try to work out which ones are correct. That you spend a large proportion of your day in a building with a bunch of other people whose job it is to teach you things you should know is pretty unique in the animal kingdom. While this might seem odd, it is utterly unavoidable that we need to know things. Look around you and consider all the

KNOWLEDGE QUESTION

What criteria can we use to distinguish between knowledge, belief and opinion? Are these criteria the same in different AOKs or in different communities of knowers?

IA prompt

1 What counts as knowledge?

objects and practices that you can see from where you're sitting that would be impossible without 'knowledge' about the world, for example:

- knowing what electricity is and how it can be harnessed to power your computer
- knowing about air pressure and the shapes of wings is necessary to produce aircraft that fly
- knowing how to organize other human beings and how to coordinate their behaviour is necessary if you are going to have anything like a business or an economy
- knowing facts about the growth of bacteria is necessary if you are going to effectively store food for long periods of time, and so on.

Traditionally claims about the world have been broken into three categories: *opinions*, *beliefs* and *knowledge*. What are these and how are they different? Before continuing complete the activity below.

ACTIVITY

Draw three columns on a piece of paper and label them 'Opinion', 'Belief' and 'Knowledge'.

1. Think of five examples of claims that you would place under each category.
2. Compare them with a partner and discuss any ways in which your partner would have categorized your choices differently.
3. Can you create some principles which you can use to identify unique characteristics or which would differentiate the three from one another?

You might have found that there was some disagreement, but that there was a lot of agreement as well. All three are forms of 'belief'; that is, they are claims about something which we in some sense 'believe'. They might also all be seen on a sort of spectrum where knowledge is the stuff that is in some sense 'truest'.

You might have found that they are different in the degree to which they can be thought of as 'subjective' or whether or not different people might think differently about them. 'I like 90s indie pop', for instance, while an objective fact about an individual's musical tastes, doesn't really mean that others should feel the same way. '90s indie pop is good music', could be just another way of saying 'I like it' and is an *opinion*. Opinions are thought of as 'subjective' in that what makes the claim true or false depends on an individual's *taste* (although, inevitably, some opinions are closer to knowledge than others, hence the phrase 'expert opinion'). In a sense, then, opinions state truths about an individual. When we *investigate* an opinion, we don't really have to look much further than the person saying it as it is their holding that opinion that is important.

Examples of these sorts of claims might include:

Set 1:

- Peanut butter is good.
- Paris is beautiful in the spring.
- Hot chocolate is best served with buttered toast.
- Watching the sunrise over Ankor Wat is overrated.
- Euler's Identity is a thing of beauty.
- Chemistry is hard.

But there are other examples of claims which don't fit easily into this category.

Set 2:

- The events of 9/11 changed the world.
- Religious belief and practice bring out the best in people.

- Religious belief and practice bring out the worst in people.
- Liverpool FC deserves the praise it receives.
- The US Union Army's Siege of Petersburg was the beginning of the Confederate defeat.
- Japan's attack on Pearl Harbor was simply a diversion for their attack on the Malay Peninsula.
- Acupuncture works for back pain.
- Abortion should be legal.

These claims *might* simply refer to an individual's taste, but they also could be thought of as making a claim about the world, and, in this regard, they are quite distinct from opinion. They might be *true*, and this wouldn't necessarily depend on whether I happen to think the claims are true. 'Belief' and 'knowledge' are similar in this way, and different from 'opinion'. These claims can be supported or challenged by *evidence* and we might argue about them in the hopes that we might convince others that we are right and that they *should* believe it as well. Similarly, we might find that the weight of evidence against a claim such as those above might mean that we give it up, or don't accept it anymore. These claims might be thought of as 'objective' in that what makes them true or false might be found in the world, and not simply in my own subjective tastes.

So, what about the list below? Do they represent another *kind* of belief? Identify what you think might be *different* about Set 2 and Set 3.

Set 3:

- The force on an object is equal to its mass multiplied by its acceleration.
- Mitochondria provide cells with energy needed to function.
- India became independent from Britain in 1947.
- The quantity of a wanted good is inversely proportional to its price.
- The Dharma are the fundamental teachings of Buddha.
- Dick Fosbury represents a huge shift in the high jump community.
- Nico Rosberg won the Formula 1 World Championship in 2016.
- $\sin\alpha \pm \sin\beta = 2\ \sin\frac{1}{2}(\alpha \pm \beta)\ \cos\frac{1}{2}(\alpha \mp \beta)$
- Hobbits have hairy feet.

The beliefs in this set seem less open to debate in the way that those in Set 2 are, though they still might have been contentious. Many of the same things we said about the second set of claims can be said of this third set: that they are evidence based; that we might convince others that they are true, but there is a sense in which the debate about whether they are true or false has been completed – we accept these as true. Some are the outcome of a lot of experiment and discovery and some are definitions, but they all represent truths about the world that some group of people can be said to 'know' or might reasonably be called 'knowledge'. We might characterize the claims in Set 2 as 'beliefs' which have yet to be decided (indeed, if it is even possible to decide once and for all) and the claims in Set 3 are examples of what we might call 'knowledge'.

But what exactly is the difference between 'belief' and 'knowledge'? This is a question that has challenged scientists and philosophers for thousands of years, but it is pretty well accepted that it has something to do with two things: truth and justification.

The suggestion is that some beliefs can be promoted to 'knowledge' provided particular criteria are met – they need to be true and they need to be justified. What makes some claim or another true and justified, however, can be a very tricky issue. As individual knowers we find ourselves caught between what appear to be competing claims for knowledge. In some communities, claims might be considered true and justified, but another community might not accept that the claim is either true or justified. Different communities often set up different criteria for what makes a claim true, or what makes a claim justified. The same claim might be accepted as true by individuals in one group but not accepted by individuals in other groups.

Investigating and analysing these criteria are partly what the Theory of Knowledge course is about.

Knowledge claims are true

One way in which beliefs are contrasted with knowledge, is to suggest that knowledge is known to be 'true', that is to say that knowledge claims capture some fact about reality or the way the world *actually* is. What makes something 'true' and how this is established, however, are highly contentious and generally depend on the way that some community of knowers or an AOK has decided the criteria for what 'truth' amounts to.

Calling a claim a 'belief', or saying 'I believe that …' means something like, 'I think it's true and I might have some *reasons* for thinking this is true, but I'm not sure or certain', or it might mean 'I am absolutely certain this is true, but don't have a method by which I can make you as certain as I am' (see Chapter 1 for a more in-depth discussion of the concept of certainty).

Correspondence theory

In some cases, a claim can be said to be true if it *corresponds* with facts about the world. So were I to claim that the statement 'Mitochondria provide cells with the energy needed to function is true', what I mean is that there really *are* mitochondria in cells and they *really do* provide the energy needed to function. There is a fact about mitochondria and cells and my claim captures and describes that fact, and this is what it means for that claim to be true. The claims you find in biology, chemistry, physics or other sciences generally follow this sort of understanding of truth. An important part of this is that it doesn't matter what I think about the world, or what I think about the claim, some claims are just true or false depending on how the world actually is. People who claim that 'the Earth is flat', for instance, are simply mistaken, because there is a fact about the world's shape, regardless of what they think about it. The actual shape of the Earth simply does not correspond with the claim 'the Earth is flat'.

■ Mitochondria. Scientific claims are considered true if they are consistent with our observations and experiences

Coherence theory

Some of the other claims in Set 3 above are less clearly associated with a fact *in the world*. These claims cannot really *correspond* to the world in the same way as the others, as it is not entirely clear what in the world they'd apply to. The trigonometry identity or the claim about hobbits' feet don't obviously correspond to the actual world, but we'd still want to say that they are *true* and that we know them.

Another way to think about truth is to say that some claim is 'true' when it is *coherent* with all the other true claims in a system. When investigating whether hobbits have hairy feet, we might see what else is true in the world of Middle Earth. We would find that, indeed, 'Hobbits are little human-like

■ Hobbits have hairy feet. In what sense is this statement true?

creatures with oddly hairy feet' and that this fact is consistent with other truths in that world. So the claim that 'hobbits have hairy feet' is true. Were I also to say that 'Gandalf is the name of the King of the Elves', this claim contradicts all that we know about Middle Earth, so we'd say that this claim is false, even though there is no fact in *this* world which would ever show it to be true or false (unless you consider the book *The Lord of the Rings* as the object which shows it to be false).

Mathematics is generally accepted to be true in this sense; it's hard to see just what is being *described* by mathematical equations. We don't bump up against numbers and *sine* and *cosine* in the world, but we know that certain mathematical truths are still available. What makes the quadratic formula equivalent to quadratic equations isn't some fact about the world around us, but rather facts about the *system* of mathematics (see Chapter 8 for a more sophisticated examination of knowledge claims in mathematics).

Some claims seem to occupy a middle ground. Measuring the supply and demand of goods and relating them to price, for instance, isn't as straight forward as getting out a microscope and tape measure. 'Supply' and 'demand' are concepts that relate to *general behaviours* of groups of people. Although we might measure and tally particular instances of people wanting to buy particular items, this isn't quite the same as measuring the 'demand' in the market for that good. These concepts, while they build on individual instances of real-world actions, are also truths about concepts which exist as *ideas,* not objects.

KNOWLEDGE QUESTION

How do we distinguish claims that are contestable from claims that are not?

ACTIVITY

1. Compile a number of knowledge claims that you find in your various IB Diploma Programme subjects.
2. Try to identify exactly what corresponds with the world in terms of *observing* their truth.
3. What knowledge do you already need to have to make sense of the new knowledge you are learning or constructing in your classes?
4. Can you identify which theory of truth (correspondence or coherence) adequately captures your different subjects? What are the implications for the 'reliability' of the AOK if a clear type of truth can't be found?

In summary, knowledge isn't just whatever you want it to be. We all have a number of thoughts about the external world in our head and only some of them really deserve to be called 'knowledge'. I might really like peanut butter, but that doesn't mean that I 'know' that peanut butter is good. At best this means nothing more than 'I like peanut butter'. Some facts like these are best thought of as opinions. The distinction between what we can know or what we believe or have opinions about, however, isn't always clear.

Knowledge claims are justified

Aside from truth there is another important criterion which any statement of 'knowledge' should have. It should be *justified* in the sense that there must be evidence for the claim, and the evidence must be part of the reason why we believe it. Again, like truth, what constitutes 'justification', or 'having evidence', is not always obvious since a claim that is justified to some, might not be justified to others. The fact that this is sometimes a thorny issue doesn't mean that we shouldn't be considering it carefully.

IA prompt

19 What counts as a good justification for a claim?

Why is justification necessary? Why not just accept that when a belief is true then we should accept it as knowledge? Simply believing something that is true cannot be considered 'knowledge' for a number of reasons.

Justification helps distinguish knowledge from lucky guesses

Firstly, requiring that our knowledge be justified in some way helps us distinguish genuine knowledge from lucky guesses. As a paleontologist studying dinosaurs, or an archaeologist studying very early humans, you might find some bone and simply guess what the species of dinosaur it is, or simply guess at what this ancient human ancestor was like. Suppose that years later other evidence is found, and it turns out that you were right (so far as the evidence suggests). We would not want to say that you *knew* this, when you in fact simply stumbled on a lucky guess. Imagine a mathematics quiz where you simply jotted down a random number as a solution to an algebra question. You'd never claim to 'know' the answer, you simply guessed it. That you were simply guessing is easily worked out when it becomes clear to the teacher that you don't know *how* to formulate the correct response. Understanding or knowing a subject means more than simply naming a correct answer to a question – it also means *knowing how* to answer the question.

■ What is the difference between getting a question right and knowing the answer?

Justification helps us decide what we want to accept

Secondly, being able to find justification for a claim means that you can *decide* what you wish to accept as true. Without *reasons* for a claim you have nothing by which to judge which claims are better or worse, or which claims you should hold. Thinking critically means, among other things, reflecting on the reasons why you hold a belief and making *choices* about which beliefs you wish to hold. As we mentioned before, the interesting thing isn't which beliefs you *do* hold, but *why* you hold them and knowing about a subject means knowing which beliefs we *should* hold.

KNOWLEDGE QUESTION

Why are the criteria for what counts as knowledge not obvious?

What reasons do you have for believing the sorts of things you believe? Sometimes these reasons can be a challenge to articulate. Sometimes they can be a challenge to even identify. At the level of the individual we can explore the reasons why people accept beliefs through a number of cognitive tools. These cognitive tools are psychological processes which individuals might appeal to as reasons for knowing some claim or another. Here are some possible sources for an individual's knowledge (we'll explore these in more detail later):

- memory
- imagination
- sense perception
- emotion
- reason
- language
- faith
- intuition.

All of these sources (and perhaps many others) help us explain why we think we know what it is that we claim to know. In some cases, one of these might take precedence while others are less important. When deriving the quadratic formula from a quadratic equation, for instance, my emotions play a lesser role to the deductive processes of reason. Emotions, however, might play a more prominent role when exploring the arts. Empathy or some forms of imagination might play a larger role in constructing claims in the study of history, as it is important to consider the thoughts, motives and feelings of the historical figures we're studying.

At the individual level, however, these sources may lead us astray. Memory, for instance, is a notoriously unreliable source of knowledge: we might be utterly convinced that we remember some event correctly, but there are all sorts of reasons why our memories lead us astray.

We might use these cognitive tools together in order to help establish when one is leading us away from knowledge that we can properly justify.

Justification helps us convince others

Thirdly, justification helps knowers make arguments about what sorts of beliefs we *should* hold. Suppose that you are utterly convinced that you have come to a belief that is true and that you have critically reflected on *why* you accept this belief as true and have identified and articulated these reasons. The fact that *you* have accepted this belief, however, is no reason why *other* people should also accept it. One of the uses of justification is to create *arguments* designed to convince others that they should believe it too.

This contrasts with opinion, which is not the sort of thing generally thought of as transferable to others. If someone offers a belief and suggests that 'this is just my opinion' this is often taken to mean that there is nothing to be decided or defended or offered for others to believe. If my opinion that '*The Truman Show* is a good film' is *merely* an opinion, then it is equivalent to 'I like *The Truman Show*' and that's the end of it. People are free to have their own opinions.

However, while we can accept that others have different opinions, we also generally accept that some opinions are better than others. This is where justification comes in.

If, for example, I said that '*The Truman Show* is a good film *because* of Peter Weir's direction' then my claim now has a justification, one that I might use in explaining why you should also think that *The Truman Show* is a good film. This sort of discussion will be familiar with students taking the arts as their IB Group 6 subject and the sort of analysis you use when analysing novels and poems from your Group 1 language course. There, you are making arguments about the quality of works of literature and justifying those arguments with reference to features of the works themselves.

KNOWLEDGE QUESTION

Do different AOKs or communities of knowers have different ideas about what makes a good justification?

In other words, if I use justifications as reasons why I think some claim is true, I might use those same justifications to give you reasons why you should believe the claim as well. To do this effectively, however, you and I need to agree on just what sorts of things make good justifications. In other words, for me to use the fact that a film is well-directed in my argument that it is a 'good' film, you would also have to think that good direction is one of the criteria of a good film. You and I would have entered into a sort of 'community' where we both agree to some extent on which standards are good reasons for accepting certain claims about good films. These commonly held standards can be used to evaluate the justifications presented by individuals making claims.

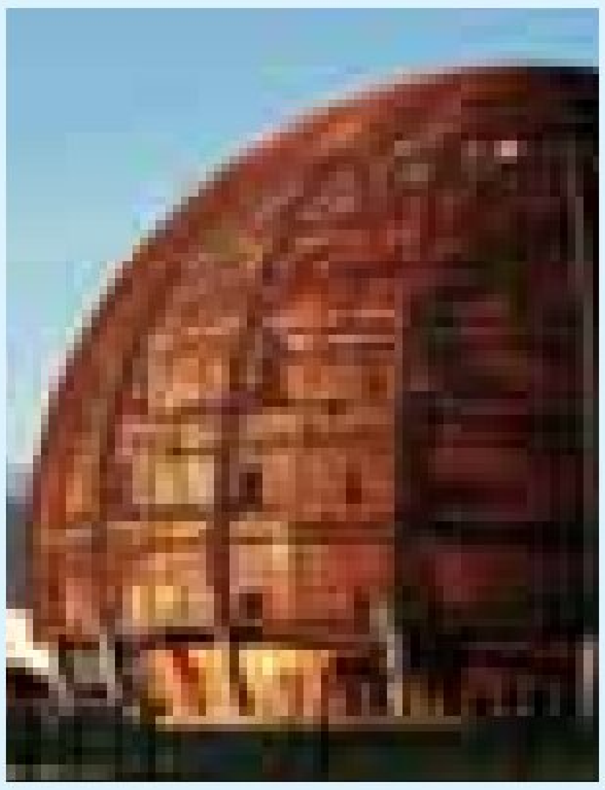
In the field of the arts these standards might be relatively broad. In the natural sciences, however, the standards by which the beliefs of an individual are transferred to the community through justification are more rigorous. In the sciences, the reasons individuals give to others for their beliefs are meticulously reviewed, and only the justifications that withstand critical scrutiny are accepted by the community.

CASE STUDY

The OPERA experiment at CERN

In a 2010 experiment called OPERA, the European Organization for Nuclear Research (CERN) laboratories were investigating the nature of neutrinos when they appeared to have found evidence that some of these neutrinos could travel faster than the speed of light. This contradicted the established 'rules' of physics, partly put in place by Albert Einstein in the early twentieth century. Einstein claimed that no object with mass can travel faster than the speed of light. The data from the CERN laboratory was therefore very contentious.

This finding, however, didn't mean that Einstein and all the accepted theories were suddenly called into question. The community of physicists have well-established methods and rules which govern whether the claims and findings of an individual scientist (or laboratory) are accepted by the community. Before any surprising result can be accepted, the surprising claims must undergo careful review by other scientists; this is the bedrock of what is called 'the scientific method', which is designed to mitigate the inaccuracies which can sometimes work their way into the experiments of individual scientists. The OPERA team, accepting these rules of *how to do science*, made their processes and data public in the expectation that other scientists would repeat the experiments and would compare the new data with the OPERA team's initial findings. If the



CERN in Geneva, Switzerland is most famous for the Large Hadron Collider work of other scientists was consistent with the results of the OPERA experiment, then this would be further justification that OPERA's claims corresponded to facts in the world and might give reasons why Einstein's rules about objects not travelling faster than the speed of light might be flawed.

What this process of reviewing showed, however, was that there were issues with the initial experiment. When another set of scientists tried to replicate their findings, their new data showed that the measurements of the speed of the neutrinos were, in fact, consistent with Einstein's initial principle. In the end, in the face of these new data and findings, the original OPERA scientists accepted that their data was flawed and backed down from their claims that the neutrinos might have broken the established laws of physics.

What this example shows is that even if an individual has justification and reasons for their knowledge, there are rules around whether a community should accept that knowledge. The OPERA team accepted these rules and conventions and followed them even though they are designed directly to challenge their findings.

For a more in-depth discussion of the scientific method, see Chapter 9 (The Natural Sciences).

Knowing 'how' versus knowing 'that'

Does the word 'know' mean different things in different contexts?

In addition to thinking about what constitutes knowledge, it is also useful to think about the different forms that knowledge takes.

Propositional knowledge

As students, you are spending a lot of time in school learning theories and facts. Each subject has a 'body of knowledge' that, as a student in that field, you are expected to know. Knowledge of facts, knowledge that is 'true' in that it corresponds to some fact in the world is often called 'propositional knowledge', because claiming to know something is to *propose* that something is true or real. In other words, people could agree with you about something. This form of knowledge can usually be translated as 'I know that …' followed by a claim.

Here are some examples of propositional knowledge:

- 'I know that California became a state in 1850.'
- 'I know that Braham is the fundamental creative principle in Hinduism.'
- 'I know that quadratic equations have two solutions.'
- 'I know that a water molecule has two hydrogen atoms.'
- 'I know that the population of China is around 1.4 billion.'
- 'I know that The Police released their album 'Zenyatta Mondatta' in 1980.'

KNOWLEDGE QUESTION

Do the different communities of knowers that you belong to have different types of propositional knowledge?

Much of what you are doing in your classes day by day is learning propositional knowledge, and much of what you will be assessed on in the next exam session is your ability to recall that information In addition, you might belong to different groups or communities of knowers that focus on particular facts which others might not know or care about.

Propositional knowledge is often the result of a process or a method of deriving such truths. The methodologies of the various AOKs are designed to create this knowledge. In each of these cases I have a belief that can then be tested using the various methodologies and can finally be justified through some sort of evidence. The form of justification might be unique to the particular AOK, but in each of the cases there can be a consensus reached through some sort of public analysis.

Ability knowledge

Claims to know something might take another form, however. Ability knowledge refers to abilities or skills that I have learned or that I have some instinctual ability to do. Here are some examples:

- 'I know how to swim.'
- 'I know how to read.'
- 'I know how to find my way through the Singapore MRT system.'
- 'I know how to book a flight online.'
- 'I know how to set up a reliable experiment in biology.'
- 'I know how to balance a chemical equation.'
- 'I know how to speak a foreign language.'
- 'I know how to tie a figure-of-eight knot.'
- 'I know how to perform a frontside 180 on a skateboard.'

In addition to the propositional knowledge that you are learning in your classes, you are also (perhaps more importantly) learning a range of skills. Take learning a language for instance: to be able to speak a language, you will need to know a lot of *facts* about the language. To be able to speak Portuguese, for instance, you will need to know that *Onde está Pedro?* translates to 'where is Pedro?' in English but knowing this isn't (yet) speaking Portuguese. Genuinely knowing how to speak a foreign language requires a lot of this sort of propositional knowledge, and you will need to have the ability to use this vocabulary nearly instinctively.

Knowing how to do something and being skilled at it are also quite different. I might know how to play Gaelic football, but I am certainly not skilled at it. I may be able to explain some of the rules ('I know that you must kick or hand pass the ball after four steps' – which is an example of propositional knowledge), and I might know enough of these rules to be able to enact a few basic drills or play casually with a group of friends. I would not, however, pretend to be skilled enough to play in a genuine match. I simply do not have the skills and I would undoubtedly end up hurt.

The fact that ability knowledge is required is clear when it comes to communities of sportsmen and women, but what about other more formal knowledge communities?

KNOWLEDGE QUESTION

What do the various communities of knowers that you belong to expect you to *know how* to do?

ACTIVITY

1 With a friend from another class, think of your most recent IB assessment. Make a list identifying *both* the propositional knowledge and the ability knowledge that was being assessed.
2 Which type of knowledge do you think is most important in terms of 'being skilled' in the subject?

In each of the AOKs and in each of the individual disciplines within those AOKs, there is of course a 'body of knowledge' that you will be expected to know in order to do well on your exams or to be part of that AOK-community. However, there are a lot of other skills and abilities that you'll need to know in order to genuinely excel. In philosophy, knowing that a philosopher developed a theory is good, but to be a good philosopher you'll have to know how to use that information in the service of your own argument. Knowing the net worth of a company might be important in a business management case study, but you will also have to be able to use that information in an analysis to show top-level skills in your assessment.

Is knowing *how* more or less important than knowing *that*?

So which form of knowledge is more important? First, you will have already guessed that each form of knowledge will depend to a large extent on the other. Being a member of a community of knowers requires some level of *both* propositional and ability knowledge. They are intimately related, though we can think about them separately. This is clear in sporting communities where you must know the rules (propositional knowledge) but then also have the ability to play. It is no less clear that in your academic subjects they are related as well. One of the big changes in your own education is that you are being taught to shift from emphasizing propositional knowledge in the lower grades, to developing more and more skills and abilities.

Are there certain types of activities which are more focused on ability knowledge? In some disciplines in the arts for instance, impromptu, free-styling activity is sometimes the norm. From hip-hop rap battles, to improvisational jazz, to some spoken word competitions, the level of ability knowledge required seems to exceed propositional knowledge. Simply being able to draw well seems, at first, to be a basic talent that you either have or don't have and you didn't have to know anything to get good at; repeated practice will help your natural talent to grow.

On closer consideration, however, the experts in these fields will admit to having a wealth of propositional knowledge as well as an amazing ability that allows them to create in a coherent and meaningful way. Improvisational poets and spoken word artists will use their knowledge of rhythm and rhyme to create a structure for their word choice. Musicians will know and exploit their knowledge of scale, harmony and key to constrain and develop their musical phrasing and melody. Visual artists and sculptors will need to have a wealth of knowledge about the nature of their medium and knowledge about form, composition, structure and effect. Their expertise is that they are able to take the facts about the field in which they are working (propositional knowledge) and build on them to create something unique, effective and meaningful (ability knowledge).

Communities of knowers

When we normally think of 'communities' we think of groups of people living next to one another, or in specific locations. Another way to think about communities, however, is to focus on a group of people who have characteristics in common, but which don't necessarily refer to physical location. We might, for example, refer to a community based on ethnicity or culture as the 'Hispanic community' or the 'Indian community', or define a community by other traits, such as sexual orientation or shared interest in issues to do with gender and sexuality, like the 'LGBTQ+ community'. These groupings are not set in stone; they are simply ways of quickly identifying a group of people who have some sort of shared experience and interest.

IA prompt

14 Does some knowledge belong only to particular communities of knowers?

What communities do you belong to? How have they shaped what you know and think?

A 'community of knowers' would be one way of describing such communities. Again, the terms are quite broad, but they refer to groups of people who share beliefs, theories, experiences and ideas. We might, for example, speak of a city's 'Spanish-speaking community' or its 'English-speaking community' in cities where those languages are not the primary language. (It would be odd to speak of Trondheim's 'Norwegian-speaking community' since that would include nearly everyone in the city.) In identifying these 'communities', we are grouping people together in relation to their linguistic knowledge.

The other communities mentioned above might also be characterized in terms of knowledge, beliefs, ideas or theories. The LBGTQ+ community of knowers would share much by way of experience and interest and while this might not be knowledge *per se*, that experience and interest would lead the community members to share much that is related to knowledge. This could include beliefs and values, political positions, culture and society and perhaps a knowledge and understanding of a shared history.

DEEPER THINKING

Generalization and stereotyping

Knowledge about the world, and people in the world, is often generalized; that is, the claims are about groups rather than individuals. When economists talk about 'the market' or when psychologists talk about behavioural trends across populations, they are not talking about individuals. Similarly, when talking about 'communities of knowers' we are talking about general features which can be used to group people together. What might be the dangers of this sort of generalization? How might our thinking about individuals be influenced knowing that they identify, or we identify them, as part of a group?

It is easy to pigeonhole people into particular groups

Whether justified or not, people might have certain beliefs about these communities, and it might be unfair to use these beliefs about the community to describe someone in that community. This is the root of the injustice of 'stereotyping', where we place an individual into a community and then unfairly pre-judge that individual based on what we think is true about that community.

Communities of knowers might also refer to groups that are linked through knowing how to do certain things. Netball and baseball players, skateboarders, gymnasts and bassists all know how to do specific things and have skills which bring them into a community. The notion of communities of knowers can also be used to make sense of more traditional or more formal academic disciplines such as those in the AOKs: historians, mathematicians, biologists and psychologists all form communities of sorts. In each of these cases, a group of people share propositional and ability knowledge and can meaningfully engage with one another in relation to that knowledge. There might not be a single set of knowledge they all share, and they might even disagree on certain claims within their community, but there are important overlapping beliefs and skills which bring them into a close relationship which they do not share with others. Not having that knowledge is a way of showing that you do not belong to a community or only stand on the edge of it. I know that I am not a central member of a community of knowers if I cannot participate meaningfully in that knowledge.

By way of a loose definition, therefore, we might say that a *community of knowers is a group of people who share similar relationships to a body of knowledge, beliefs, assumptions or opinions. They also share knowledge of methods about how to build knowledge in the field and are able to collaborate meaningfully in the practice of that knowledge.*

ACTIVITY

Consider the groups that you are part of. They might be social, religious, academic or related to sports or other skills or interests.

1. Compile a list of knowledge or beliefs that are common or which overlap in that community.
2. What disagreements are there in the community?
3. Are there ways of managing those disagreements?

Individuals and communities

Having established the notion of a 'community of knowers', how can it help us understand ourselves as individual knowers?

We, as knowers, are related to a community of knowers

Our individual knowledge and perspectives are often defined by being related to a community of knowers. Individuals generally (perhaps not always) are part of larger groups. In terms of TOK, the idea is that we, as knowers, stand within communities of knowers. Knowledge is deeply embedded and networked, meaning that the methods we use to construct knowledge, the claims that we arrive at and the perspectives we take as individuals are connected and take their meaning from the wider community.

Being an English speaker, for instance, means that you are able to effectively use a language which has been developed by other people. The meanings of the terms you use and the rules for the proper use of them have already been decided upon before you started using them. Even when thinking, you might find that 'the little voice' in your head uses proper grammar. It is certainly true that you might create a new word or phrase, but for it to genuinely be part of the language, others would have to use it with you. You can also use language in new and exciting ways which might never have been done before: literature and poetry are perfect examples of this. Even here, however, using words to convey personal or new thoughts, even when breaking established rules, still makes use of publicly accepted meanings and conventions.

KNOWLEDGE QUESTION

Are there types of knowledge that are specifically linked to particular communities of knowers?

Being an individual knower in a community of knowers associated with an area of knowledge requires you to make use of established conventions and knowledge. Think of your teachers. They are individuals who are part of their discipline's community of knowers. *Being* a mathematician or a psychologist or a philosopher means accepting the knowledge (or at least important aspects of it) of the community. It also means that you have accepted the general conventions of knowledge construction in that community. Being an astronomer, for example, means accepting that the data given through spectroscopy is reliable, more reliable, for instance than merely peering into the night sky. Even in the arts, where you might think the knowledge gained is personal and subjective, the knowledge of techniques, the history of the medium and the concepts used in the discussion of the quality of art are all shared among the community. As is the case with language, these conventions might be used to share deeply personal emotional responses and experiences, but they nevertheless are recognized by others in the community.

Membership criteria

Another way of thinking about individuals and communities is by thinking about what an individual must know or be able to do to consider themselves a member of a community.

Consider being a member of a religious community. Being Jewish or Hindu or Jain means, among other things, that you understand certain concepts and accept certain types of knowledge as true. Being part of these communities means that you know how to participate in certain rituals or that you are able to participate in certain traditions and activities. To be a full member of a community requires an individual to take part in learning how to do these sorts of things.

Likewise, you might know the basic rules of chess and play regularly with friends, in which case you might consider yourself broadly to be a part of a community of chess players. You might not be an expert, or a particularly good player, but you would have the knowledge to meaningfully engage to some degree with other members of this community. Considering your knowledge and skills as a whole, you can probably think of all sorts of different communities of knowers of which you are broadly a part. Think of all the things that you enjoy doing – in each case you might consider yourself a part of that community of knowers in that you know enough facts and have enough skill to participate.

ACTIVITY

1. What communities would you consider yourself a 'member' of?
2. What knowledge (propositional and ability) have you gained that makes you a member of this community?

You might be better at some (closer to 'expert') and worse at others (closer to 'novice') but you can be said to be part of that community at some level.

Experts and apprentices

Using this notion of 'community of knowers' also gives us the opportunity to explore a central concept in the world of TOK: experts. If TOK is about knowledge and knowing, then it is crucial to be able to discuss and evaluate just what it means to be an 'expert' or to have more expertise in something, or what makes an individual more or less reliable than others in relation to that community.

Members of communities don't necessarily all have a similar standing. In many cases, but not all, we easily recognize when someone is an expert in the group. We have an intuitive understanding that some individuals will be a more or less reliable voice in that community. Many of us, however, do have quite a bit of knowledge and experience in a field and would be reliable sources of knowledge when it comes to those fields. Your guitar teacher (presumably) has a good deal of both knowledge and skill which make them a reliable source of knowledge about guitar playing. They will know facts about scales and where certain notes are and how they make up chords. They will know certain skills and techniques, from how to hold the guitar to how and where to place which fingers to make chords. This is not to say that every guitar teacher is an expert, but simply to suggest that some individuals have more expertise than others. There is no best guitar player in the world, just like there is no best map of the world, though we might happily recognize that some players are better in certain respects.

Your subject teachers are another example of people with more expertise than others. In relation to their subject, your teachers have knowledge of the facts and skills needed to succeed in the context of the IB. This is not, of course, to say that they are 'experts', though of course they might be. Their job is about, among other things, helping you get through the IB, so their level of expertise needs to be tailored to that task.

ACTIVITY

What makes an expert more or less reliable? Interview someone who you would consider being in the same 'community of knowers' as you but whom you think is more of an expert than you.

1. Try to identify what makes them more of an expert.
2. Is there anything which they have that you don't have yet?
3. Is there anything which they have which you *cannot* have?

IA prompt

22 What role do experts play in influencing our consumption or acquisition of knowledge?

DEEPER THINKING

Privilege and perspective

When thinking about what makes one person more of an expert than others, you might have come across certain experiences or traits that make someone more reliable than others in terms of their sophisticated understanding of certain claims. When thinking about the debate about a woman's right to choose what happens to her own body and a fetus' 'right to life', one might reasonably think that *being a woman* gives an individual a certain experience that makes her point of view more reliable. When thinking about racism and the power structures that privilege a racial majority, one might reasonably think that *being part of a minority* might give one a certain insight into the issues that someone in the power majority might not be sensitive to.

In the discussion of race and racism there is the concept of 'privilege' which captures this intuition: being part of the majority in a society might make it harder to see how social structures and conventions make life easier for that majority. For example, there might be a whole series of issues around race, gender and economics that a white middle class male, for example, might not be naturally sensitive to. We need to be attentive to any non-conscious biases that might result from our potentially privileged status. Ignoring that others might have life experiences which give weight to their perspectives is to pretend that 'knowing' about the world has nothing to do with our place *in* that world.

How does this discussion of experts or expertise help? We've suggested that experts are reliable sources of knowledge, but we must take care when taking advice from those with more expertise, because we should only accept advice from those who have expertise in the areas we want to know about. If you needed help with your physics coursework, for instance, you would go to a physics teacher, but not your English literature teacher.

This is because being part of a community of knowers means that you understand the skills and knowledge needed in that community to *excel* in that community. Each community will have established rules or conventions which identify *good* or *excellent* knowledge in that community. Becoming part of that community means gaining the understanding and techniques to produce this quality knowledge. The training your English teacher has received has not been aimed at producing excellent knowledge in physics.

Similarly, when trying to educate ourselves on particularly contentious issues, like abortion or climate change, we need to make sure that our sources of knowledge are themselves experts in the field. For example, whatever training a politician receives when learning to be a good politician isn't designed for understanding science, so when trying to understand the science, politicians would do well to ask the experts.

Individual learners are apprentices in communities of knowers

A helpful way to think of your journey as a 'knower' is to consider yourself as a sort of apprentice into these community of knowers. In many professions and jobs, the way you become a member is through a system called 'apprenticeship'. It is a term referring to young people who begin working with an expert. They learn the trade by first acting as simply a helper, but then are given more and more knowledge and are allowed to begin actually practising the trade. Apprenticeship schemes are still common, and many students choose to join one as a way of learning a trade on the job, rather than perhaps reading about it in a book or learning about it at university. Work experience or internships can be thought of as a type of short-term apprenticeship. Studying a subject at university can also be thought of as *part* of a long-term apprenticeship, in that you are learning the basic knowledge and academic skills required for success in that field.

Apprenticeships provide knowledge of facts and skills that help individual knowers shift from being outside the community to being a novice in the community and then move continually towards being an expert in the community. Members of these communities build on the overall knowledge and techniques to help the knowledge base of that community grow and develop as they find new techniques and discover new facts in their fields.

The overall philosophy of the International Baccalaureate is similar to this process in terms of the 'academic' subjects you take (including TOK). While there is a lot of learning involved, the subject guides for each of your subjects encourage and assess the actual *doing* of the subject. Consider your Internal Assessments for instance: in each of them you are expected to complete a piece of genuine research in the field or your own personal interpretation. Instead of just writing a report on what others in the field have said, you are asking a question and then demonstrating the subject-based skills that you've developed by researching, interpreting, thinking and presenting your response in a way that is appropriate to that subject.

However, this is just the process you're undergoing in the IB. You will not go on to become an expert in all of your subjects; you may go on to become an expert in something else entirely. For now, though, you are an apprentice or an intern in the various disciplines you are taking in the IB. If you are a full DP candidate, you are becoming a mathematician and you are becoming a fluent language speaker through Language A or B or *ab initio*. Through your Language A, you are becoming a literary critic. If you take Group 6 Art, you're learning the processes and reflective processes needed to become an artist. Group 4 teaches you some of the facts, rules and methods that you will need to know if you become a scientist. For each subject you take, there is a group of professionals in that field, and the work you do during your IB years makes up the early stages of an apprenticeship for that field, should you decide to continue in that direction after the IB.

This process is very much like an apprentice's journey: first you watch and learn, then you begin to take up the tools on smaller projects or essays, then you shift into larger projects taking increasing responsibility, until finally you can complete the job in a way that is similar to the way experts in the field do it. This process is also how the *body* of knowledge and skills developed by that community of knowers is transferred to you as an individual. Though of course, it might take many years before you're considered an expert.

The use of this metaphor of 'apprentice' as a way of thinking of yourself as a knower is helpful when exploring the dynamic between not-knowing and knowing, or between being outside a community of knowers and being inside a community of knowers, or the dynamic between the individual knower and the group of which the individual is a part. Much of what TOK is about is thinking about that dynamic: what are the core facts and methods needed in a community of knowers? How does that community accept new members? In what ways do these communities shape how their members think or behave in the world? How do communities manage the inclusion of new knowledge from its individuals?

ACTIVITY

1. For each of your subjects, make a list of the knowledge and the skills required to be a successful 'practitioner' in that field. Think about what your teachers have asked you to do, what information they have given you and what skills and knowledge you have developed through your own research.
2. Show this list to your subject teachers and see what they think: are there elements that you have missed out? Have your teachers ever considered themselves 'masters' teaching a trade to apprentices before?

Perspectives

How do individuals develop the knowledge that we have? What is their relationship to the knowledge of others? In this section we explore ways in which we might unpack the various influences on our knowledge and explore how we might analyse the impact of these influences.

Every individual will have a unique experience in relation to the world and how they have gained their knowledge, so there's no way we can exactly describe your personal experience. But it remains true for everyone that *we have developed our knowledge or our own 'perspectives' in the context of other knowledge and other knowers*. In some cases, we consciously accept that knowledge (perhaps through learning), in some cases we challenge it, and in some cases we are unaware that we have taken on certain beliefs in a non-conscious or non-reflective way.

The goal here is not to describe for every individual just how their knowledge has been developed or what has influenced them, but rather to provide some conceptual tools which might be used to uncover what is the case in your own experience as a knower. This unit relates to a core theme of the Theory of Knowledge course, meaning that a critical reflection of your own knowledge in the world is the *point* of this course. These concepts might help you to reflect on your knowledge and identify and describe the ways that what you know about the world has been influenced, and give you tools to think about how to respond to this new awareness.

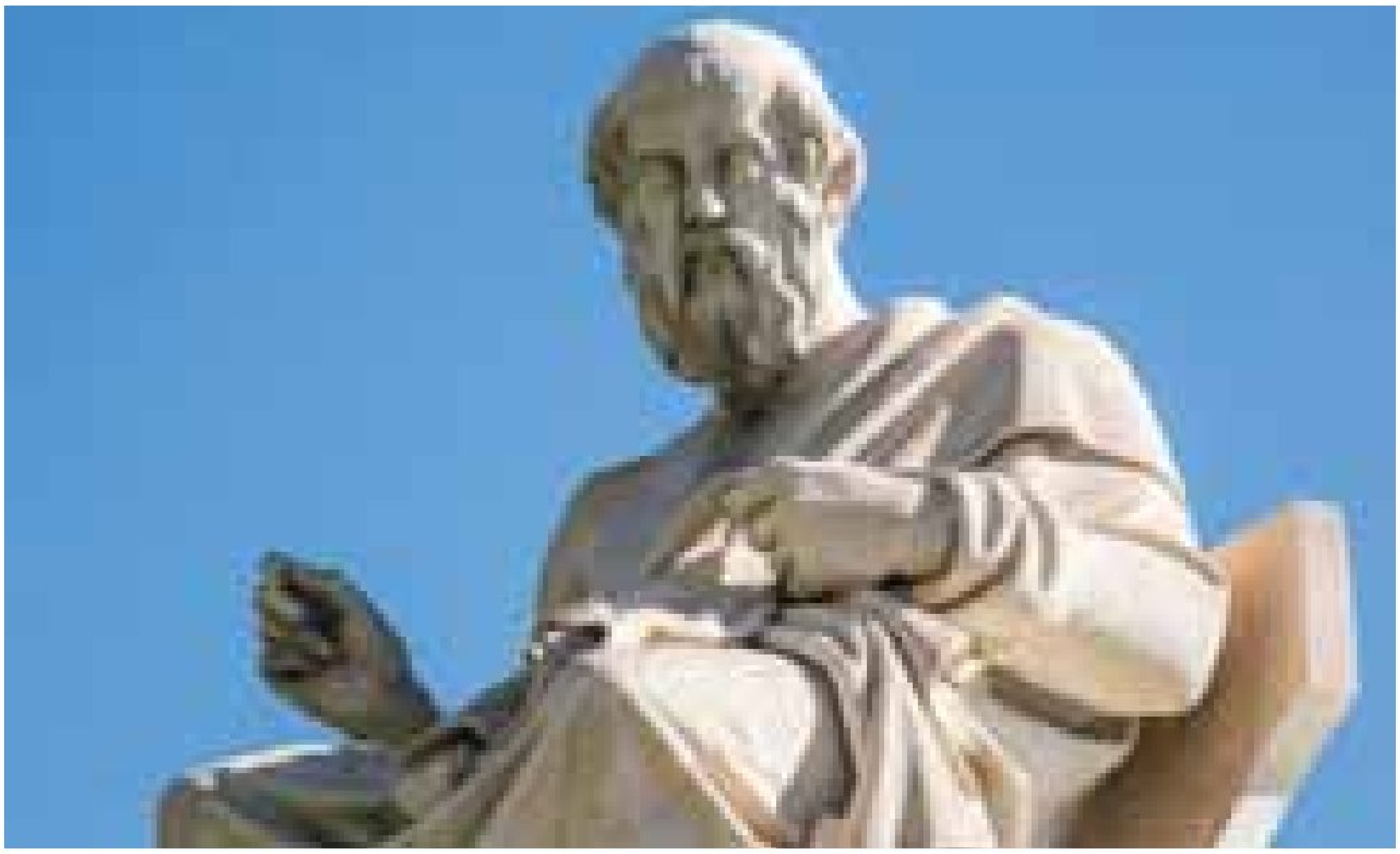
Puppet masters

First, a story.

Imagine yourself a prisoner in a dark cave where you've been trapped since birth. You're chained so you can only face the wall in front of you. To your right and left are other prisoners in the same position as you. In front of you are flickering and indistinct images bouncing about on the wall and you hear vague echoes coming from them. Other than you and your co-prisoners,

KNOWLEDGE QUESTION

What shapes my perspective as a knower?



Plato was an apprentice of Socrates and Aristotle was an apprentice of Plato

this is all there is in your world – the images and sounds have always been there, you've never really questioned them, and they have become your 'reality'; this is what you think the world is like. You and your fellow prisoners have even developed a sort of language, one that allows you to name the images in front of you, and you play games trying to recall the names of the images before anyone else can. It's a pretty shallow form of 'fun' but it is all that is available to you.

But there's more. Behind you there is a roaring fire and in front of the fire is a walkway where people with variously shaped objects pass between you and the fire and their objects cast shadows on the wall in front of you, as if they were shadow-puppets. You have never experienced the people, nor do you even have the *idea* that there are people other than your prisoner-friends, or the idea of a whole other existence beyond your own wall, images and chains. Your reality is what is real, there it is thrown on the wall in front of you; these images are not the *whole* story – but you're entirely unaware that there's more to what you see.

This story comes from an ancient Greek text written by a philosopher named Plato who died in Athens about the year 347 BCE. In his most famous work *The Republic,* Plato offers this story in what is called 'The Allegory of the Cave'. This allegory is used by Plato to make all sorts of points, but at the heart of all the various interpretations is this dilemma: the prisoners believe that the shifting and vague images dancing about on the wall in front of them is what is 'real' and they are deeply mistaken.

Plato's point is that we are, in all sorts of ways, very much like these prisoners. We happily accept what is presented to us as our reality. But, consider for a moment which beliefs, opinions or 'knowledge' we have that might be no more real than the flickering shadows of the cave? If you have ever had the experience of seeing a situation in a new light and realized that you had previously been mistaken, then you might have a sense of what it must be like for Plato's prisoners. For the rest of our beliefs, are we *sure* that we have it right?

Now the story continues:

Imagine that one day you are released from your chains and you turn to climb out of the cave. You see the fire behind you and the people milling about. With a shock you recognize that the fire and these objects are what created the shadows you previously mistook for reality. The shadows are not real objects at all! You then rise and continue out of the cave and find yourself in the harsh light of the day. You see the bright Sun above you illuminating the world around you, even brighter than the fire below. You realize that all this time you'd been living in an illusion; none of what you thought was real is actually real at all. This is a revelation indeed!

You remember your friends still chained in the darkness below, so you run back into the cave and call down to them. They hear you but your voice has now become one among the many indistinct voices they hear coming from the wall in front of them. Perhaps they see your shadow, but they only think that this image is just another of the images they've always seen; the reality of the situation is so far beyond what they even *could* know that they barely give you a second thought. Since they are not responding to your calls, you run back down to them and stand before them and attempt to convince them of what they cannot understand: there is no reality to the shadows in front of them; what they see is they are an illusion, a vague and pale reflection of the reality of the world outside the cave. Your presence is a surprise to them, your words of this other reality simply confuses them. They don't believe you. In fact, they *cannot* believe you because they have no ideas or concepts to help them understand this reality beyond anything they know. They actually think it is *you* who has lost touch with reality. In order to give you the chance to prove that you suddenly have not lost your mind, they challenge you to a game of 'name that image', the favoured game from before you left. However, because your eyes are no longer accustomed to the darkness of the cave, and because you no longer can see the point in this game, you struggle to make sense of the images as well as you used to and they consider you a miserable failure, thereby making you even *less* reliable. They are now convinced of your madness and dismiss you. You have no choice but to leave them to their illusions.

This story has occupied scholars for the last 2000 years and there are layers and layers of meaning waiting to be uncovered. In one sense, it is an allegory for the journey of the life-long learner. We are born into a world of existing facts and beliefs not of our making, utterly convinced by the vague and imprecise notions we learn in our childhood. As we learn about and see more of the world, we recognize that we have always had so much to learn. Our learning is genuine – we move on from our childish understandings of the world and replace them with more reliable facts and beliefs. In some cases, we experience so much and learn so much about the world that we simply cannot return to our relative ignorance. Imagine finding tales of Father Christmas (Santa Claus) or the Tooth Fairy as convincing today as you once did. This can be troubling and painful. In the original story, the prisoner's transition to the harsh light of day is uncomfortable. He staggers about in the bright light, shading his eyes, but he does become accustomed to the new environment. It is then that his past environment becomes what is odd and unknowable.

Let us now consider those individuals in the Allegory of the Cave that are wandering about in front of the fire with various objects whose shadows are cast on to the wall in front of the prisoners. Plato likens them to 'puppet masters' because the objects they carry, some of which take the shape of various animals and other people, are like puppets whose shadows being cast on the wall are being judged as real by the prisoners. In Plato's story they are nameless, but who are these puppet masters? If we are like the prisoners in the story, then perhaps there are people, groups, institutions and processes that cast their own shadows which we accept as 'real'. Much of what we think – many of our beliefs – are the result of other people casting their truths into our world, which we often accept without much reflection. They are, in a sense, responsible for our understanding of the world around us. Who are these puppet masters casting their shadows?

Plato's 'Allegory of the Cave'

ACTIVITY

Consider some of the beliefs that you once had, but which have changed since you've gotten older.

1. Can you identify *why* your views changed? Was it changed? Was it because of a new experience? New challenges? New learning?
2. Perhaps the ideas you chose are not ideas that conflict with what you knew before, but simply reflect a deeper understanding. Try to characterize your thinking in the following terms: 'I used to think …, but now I think …'

ACTIVITY

1 Consider for a moment your own 'puppet masters'. Who is responsible for your understanding of the world? These might be individuals or groups of people. Brainstorm a list of people, groups or institutions that have played a role in developing your views on the world. When thinking about certain people, try to be specific. Rather than the generic 'teachers', try 'Mr Moore'. Institutions might be more general but try to identify specific institutions.
2 Consider what makes them a source for your understanding of the world. Why are they in the position of casting their knowledge onto you?
3 Now see if you can rank them according to who you think is most reliable in that creation of your reality. Who should you be listening to? Can you make an argument about who is most reliable on your list? What is it about them that makes them most reliable?
4 For each of the puppet masters that you identified, try to identify a genuine belief that you hold and that you can directly link to this puppet master. The belief might be religious or political or ethical.

We find ourselves in the middle of a highly interconnected web of people from whom we learn and who are sources for our knowledge. Schools are a great example. They are designed to pass on knowledge and information which has already been discovered and which you simply don't have time to learn yourself. If you have any hope of learning what your school leaders have decided you need to learn before leaving school, then you have to accept much of what you are told and move on. Imagine if you were asked to develop, by yourself, all the knowledge you've learned even this week. Of course, during your IB Diploma Programme experience you will conduct a number of science experiments, you'll read a good few novels and write reflective essays on them and you might develop proofs for a handful of mathematical theorems. However, these exercises are largely so you know how those processes work, not so that you develop new knowledge. Most of the time you're being given information that others, sometimes long ago, have developed and which, hopefully, you can move beyond as your education becomes more specialized.

But who chose which knowledge to pass on to you? Your parents are part of the decision in that the choices they make have led you to the school you're in, your curriculum writers at the IB have made choices about what is essential for DP candidates to know in their subjects, teachers have made choices about what and how to present those concepts in the classroom and your textbook writers have made choices about what to discuss in the books you read. You might consider them as similar to the 'puppet masters' in Plato's Allegory of the Cave, who construct the reality that we happily accept.

Not all is mere illusion of course. Some of the information offered by your puppet masters is true and it would be right to accept what they pass on to you. For example, it is very useful to have good medical information: knowing how to treat or prevent dangerous diseases is good to know, especially if you have that disease. However, some of the other images of reality presented by your puppet masters might not be as helpful, or they might be limiting. Leafing through a fashion magazine and looking at the models depicted might give a false impression of what 'beauty' should look like. An examination of the racial and gender profiles of the boards of governors of many major companies might give a false impression of the types of people needed to successfully run a company. These shadows cast on your knowledge do need reflecting on, and in some cases, they need to be challenged or replaced with better ideas.

ACTIVITY

From your list of puppet masters, choose a source of knowledge that you think might offer an unreliable, unhelpful or misleading view of reality.

1 How effective has that image of reality been for your thinking?
2 What learning or experience has made it possible for you to identify that information as unreliable?

Assessment advice

Choose one of your puppet masters and think of a human-made object which is linked to them or it. You might want to use this object as one of your exhibits in your internal assessment. Perhaps it is something that this person uses or has created. Think about how that object illustrates something particular about how that puppet master constructs knowledge.

The idea is that we, as knowers, do not stand in isolation from others around us. Thinking about who or what has influenced us is very much at the heart of the TOK Programme. As children, we find ourselves living in a world where there are already many ideas about how the world works, about what is real, about how people should behave and about what is important or valuable. The point of living in families and societies is so that we can learn from these groups. It is therefore the responsibility of these groups to pass their understanding and approaches on to the young in their groups. As we become older, we begin to develop a certain distance from those groups and to think about which of the beliefs provided to us we *want* to believe and why. Many of those beliefs are not worth thinking about, but some are very much worth believing, for a variety of reasons, and we must decide which is which. The TOK course is one way in which we can understand the importance of this task and develop the skills and processes to make these decisions.

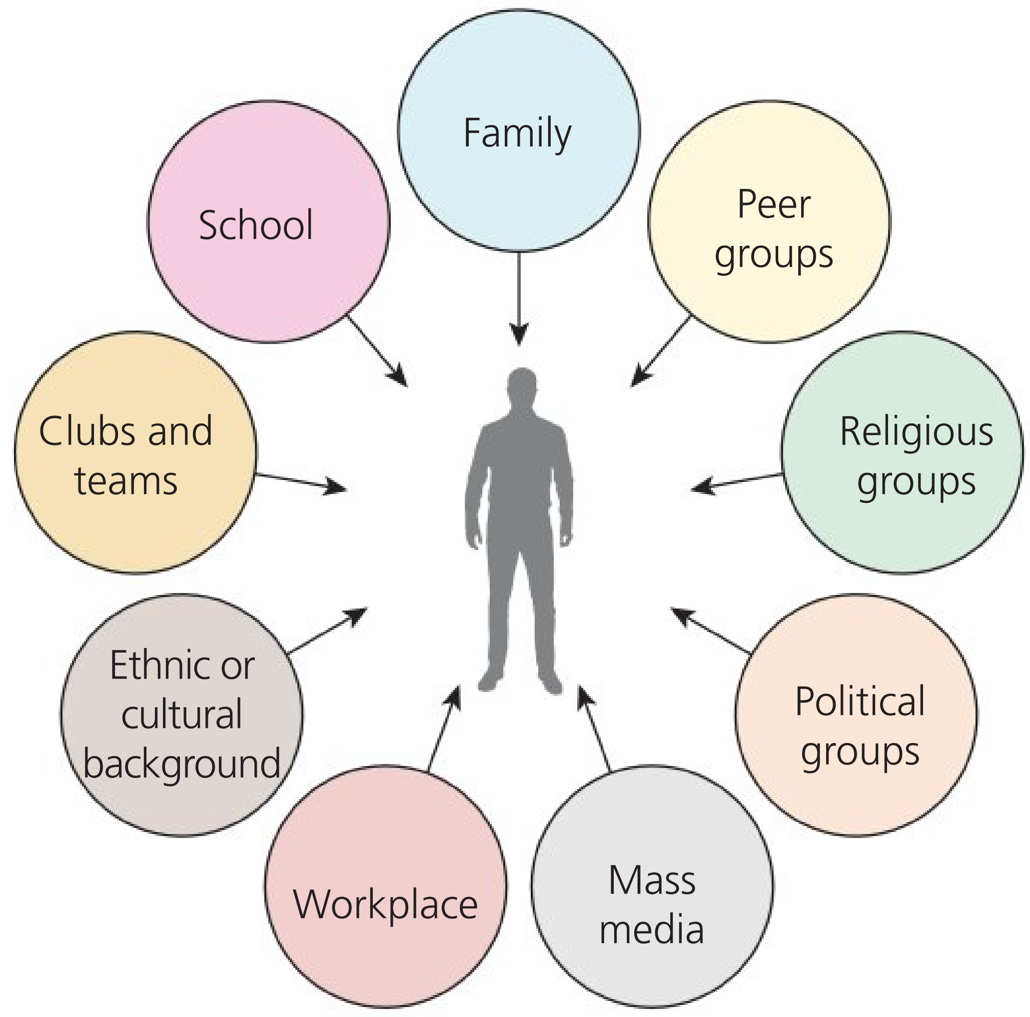
Having thought about your own puppet masters, you might have realized that each of us has many different sources of knowledge – different puppet masters casting their shadows in various ways. As individual 'knowers' we stand in relation to a number of these sources. In another way of thinking about it, we might find that we are parts of many different 'communities of knowers': groups of people of shared interest, skills and knowledge.

So how can we think about what these puppet masters provide? They give us different maps, different ways of navigating the world.

ACTIVITY

Interview one of your chosen puppet masters.

1. Explain to them the concept of puppet master and why you think this person is one of yours.
2. Explain in what way they have helped shape your reality.
3. Ask them whether they know about the impact they have had on your understanding of the world.
4. Did they reflect on how *best* to influence you?
5. Do they think they are a *reliable* influence on your understanding of the world around you?
6. Where do they think they may be less reliable, or may have misled you?



■ Our puppet masters can take many forms

Knowledge as a map

One of the central metaphors we use in TOK and one which you will find scattered through the subject guide is the notion of knowledge as a map. The idea behind this map metaphor is to think of the construction of knowledge as a way of 'navigating' the world around us. Earlier we made a distinction between 'facts' (the way the world is whether we 'know' it or not) and 'knowledge' (a set of beliefs we think accurately represent those facts). The 'map' of the world in this case is our knowledge about the world. What we say we know about the world and how the world really is are distinct: our attempts at constructing knowledge is like trying to develop a map which tells us what is out there and how to get around in that world.

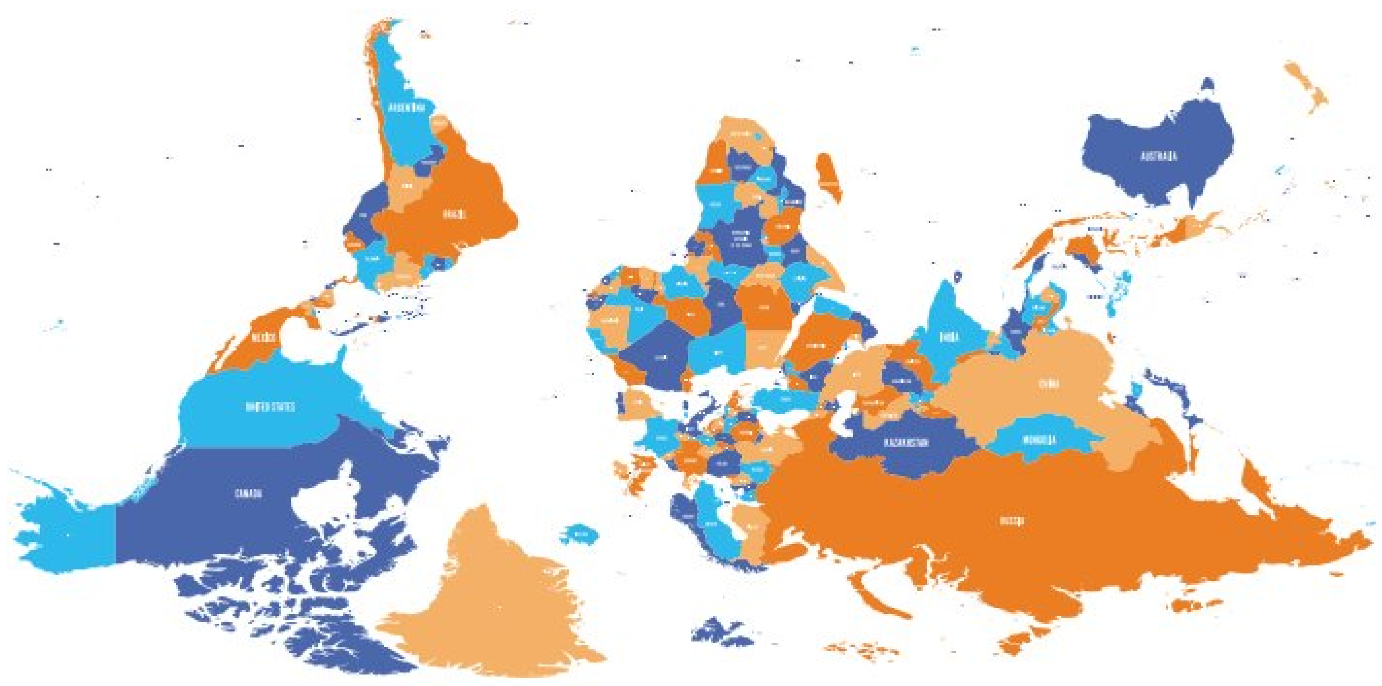
As individuals we find ourselves lost in a world of knowledge. Everyone seems to know something we don't know. Everywhere there is something more to know. Some things we *need* to know (such as how to keep ourselves healthy, how to find our way home, the facts that we need to pass an exam or to do our job). Some things we'd like to know (how to play the drums, what people are really thinking about us, or more about the subjects in school we're really interested in). But as the discussion of the puppet masters shows, there are also a whole range of people trying to pass their knowledge on to us or to get us to know certain things rather than others.

Navigating this world of knowledge is just as much of a challenge as navigating the real world around us. To help us get around the real world – the world of mountains, rivers, cities and roads – we use maps. These maps pick out certain features of the world and we use them as guides to help us get around. In navigating the world of knowledge, we might also think about the maps that we create. In this section we will explore this way of thinking about how we create and use maps to navigate the world of knowledge.

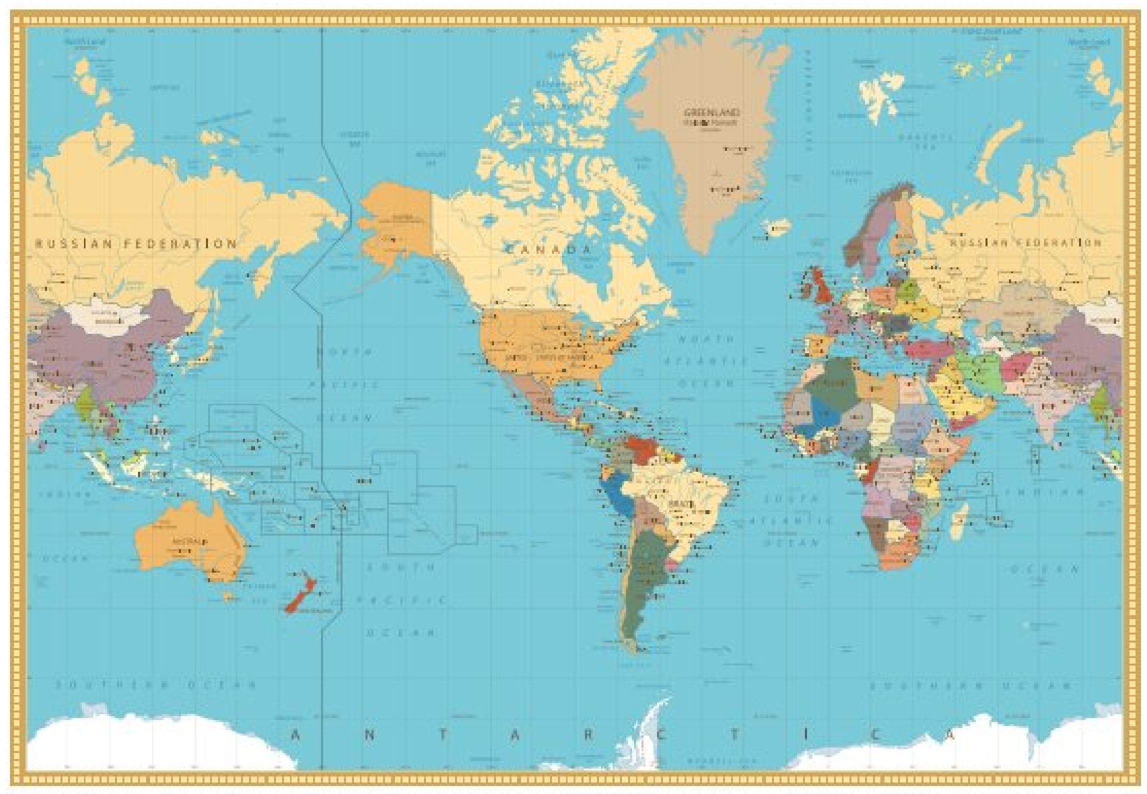
Before we get ahead of ourselves, however, let's just play with some maps. Which of the maps shown do you think is most accurate? Each map presents the globe in a slightly different way and it is important to identify the differences between the maps.

■ Map 1

■ Map 2



■ Map 3



■ Map 4

■ Map 5

■ Map 6

ACTIVITY

1. Consider the six maps. Look at Map 1. Identify what you think is accurate about it. Now consider Map 2. Is it more or less accurate than Map 1? Repeat for Maps 3, 4, 5 and 6 and rank all the maps in order from most to least accurate.
2. In small groups, discuss how each person ranked the various maps. Which maps were generally thought of as 'accurate' and why? Which maps were generally less accurate and why?
3. What general claims can you make about the question 'Which is more accurate?' based on this exercise?
4. Were the maps more or less accurate for the same reasons? You might have suggested Map 1 was accurate for one reason, but that Map 3 was equally as accurate, but for a different reason.

You might have found that there was some agreement and some disagreement. The accuracy of the maps depends mostly on what you mean by 'accurate' and this depends largely on what sort of information you *want* to know. If you are wondering where countries are in relation to one another, then Maps 3, 4 and 5 will do that job well. If, however, you are wondering what geographical features you might expect to find in certain places (mountains, deserts, oceans, jungles) then perhaps Maps 1, 2 and 6 would be more useful. All the maps could tell you what was directly north or south or east or west of some point, but some present their information in a way that makes this more easy than others: Map 6 uses these directions but it makes this information hard to read. Map 3 has exactly the same information as maps we're used to seeing, but it simply places south at the *top* as opposed to the normal convention of placing south at the bottom.

In order to read or follow any map, we must be aware of how the map works and what conventions and assumptions are written into the creation of the map. There are a number of these assumptions and conventions in the maps on page 61. The cartographer (map maker) would have made a decision about how to lay out the map and this required them to decide both *how* to represent the world and *what* to represent. Maps 1, 2 and 6 ignore the human and political features of the world (cities and countries) and instead opt only to tell the reader what the world *looks* like. Maps 3, 4 and 5 decide to show *only* the human and political features. Each map also makes a decision to orientate itself in a certain direction. This decision is most obvious in Map 3, given that it offers an orientation (the south is at the top) which we normally don't see. This decision, however, doesn't mean that the map is any less accurate in its depiction of the facts; it's simply that we don't *normally* see south at the top. The point is that we cannot read a map effectively – we cannot see how it tells us anything about reality – unless we understand and accept these conventions.

Much of this understanding and acceptance happens non-consciously – when we see maps with north at the top, we don't even think about it. When we see maps with south at the top, we can quickly change our understanding and get on with the task of reading it in the same way as other maps we're more used to. What we often don't think carefully about, however, is what these conventions and assumptions written into the maps lead us to think. Consider the differences between Maps 1 and 2: the physical shapes of the continents are very different, particularly as you look at the land masses furthest from the equator. Consider Map 1. This is called the Mercator Projection and is what happens when you take a spherical globe and try to translate it onto a flat page – this results in a stretching effect where the land masses get distorted to fill in the spaces furthest from the equator; the relative area of the far north and south land masses become disproportionally large compared to the land masses at the equator.

If you are not using the map to think about the relative land mass, then this poses no problem. But not being aware of this distortion might lead you into certain false conclusions. You might, for instance, uncritically accept that Greenland is about the same size as the continent of Africa. However, in terms of land mass, Africa is about 14 times the size of Greenland. While overemphasizing the size of Greenland, the flip side of this is that the size of Africa is underemphasized. Africa is an impressively large land mass. The entirety of the USA, China, most of Europe and India could fit within the area of Africa, yet much of the world treats Africa and its huge countries, people, traditions, cultures and practices as if it were a homogenous whole. It's not unreasonable to think this *might* be because many maps underestimate its size (*The Economist*). You can use the QR code to read the article in *The Economist*.

Map 2 is a response to this dilemma. This projection, called the Galls-Peters projection, is an attempt to capture the same information as Map 1 (where the land masses are in relation to one another, and what they look like) but with the added information of how big the land masses are. However, it's easy to see how the choice to capture this added fact of relative land size has created its own distortions; the details of the land masses at the north and south extremes become nearly impossible to read. So, the choice to prioritize one set of facts has distorted another set of facts.

Another consequence of the choices made in building these maps is to consider what we think of as important or valuable. The presentation of the world in Maps 1 and 2 is traditional in Europe, while students growing up in the United States might recognize Map 4 and students from the Pacific Island nations might recognize Map 5. In other words, the decision to place one part of the world at the centre of the map suggests that the map *values* certain areas over others. This might simply be because the map is intended for one audience and not another. Looking at Map 3 however, it might be jarring because it makes it something of a challenge to find your own country.

There's nothing bad at work here, but it does lead to some interesting conclusions about how these values get written into the values we hold today. 'The Middle East' and the 'Far East', for instance, are phrases that make sense if we consider ourselves to be *starting* from Europe. Calling the areas around the Arabian Peninsula the 'Middle East' suggests that they have an identity in relation to Europe, but why should that be the case? Similarly, with the Far East. We might ask 'far from what?' Why should the peoples and countries at the eastern edge of the Asian continent be *far* from anywhere? Again, this suggests that Europe is at the centre of it all, but why should this be the case? By looking at Maps 1 and 2 you might uncritically think that Europe really does sit at the top and centre of the world. The east Asian countries are pushed off to the edges. Australia ends up 'down under' the globe, but it's not under anything or down from anything unless you accept that the northern hemisphere *should* be at the top. Considering the choices of Maps 3, 4 and 5 is more interesting. The top or the centre of these maps lead their readers into thinking about what is *important*.

Many maps use latitude and longitude to divide the world up and help make navigating easier, and here again we might find hidden assumptions about what is important coded into how we describe the world. The starting point for longitude is the 'Prime Meridian' and this runs through a place called Greenwich in southeast London in the United Kingdom. That this starting point runs through the UK is not an accident. At the time this feature of maps was being developed, Britain was home to the best maritime knowledge. It was also the greatest military and colonial power. The strength and knowledge of Britain at the time gave it the ability to decide that the foundations of the system used to measure the world *begin* in Britain. This starting point then has been coded into every navigational map on the planet today. The Prime Meridian could have been

■ The Royal Observatory, Greenwich. Is it problematic that some of the tools we use to describe the world today are rooted in the history of colonialism?

IA prompt

33 How is current knowledge shaped by its historical development?

anywhere, except for the particular strengths of a little country on a little island off the coast of the European continent.

Map 6 is called an 'Azimuthal Equidistant Projection' which shows the relative distances from one point on the Earth. Map 6 has chosen the North Pole as this point, but it could have been any other point on the surface of the globe. Interestingly, this projection seems to be the favourite with the Flat Earth Society and serves as the model for the UN logo. The knowledge expressed in this map is different in significant ways from the knowledge expressed in the other maps. Understanding what is being represented in each of these maps is important so you don't mistake what you *think* is being represented with what is *actually* being represented.

■ What explains the fact that the logo of the United Nations resembles the Flat Earth Society's preferred model of the planet?

Another feature of how maps might distort our understanding of the world is illustrated by the old saying 'the shortest distance between two points is a straight line'. When looking at any of the maps, were we to try to calculate how to cover a great distance in the most direct way possible we might apply that basic truth of geometry and simply draw a straight line. Applying this principle to a sphere, however, will *not* result in the shortest distance.

Anyone who has taken a long-haul flight from east to west will recognize this immediately when thinking about the maps that most airline TV consoles provide. When travelling from Abu Dhabi in the UAE westward to Los Angeles on the west coast of the USA, rather than travelling west at all, the flight path takes you directly *north* over central Asia, through Russia, clipping the North Pole, then directly south down the west coast of North America to Los Angeles. This would be something you'd never consider from looking at any of the maps we presented here. In other words, trying to navigate the real world, simply by applying the map of the world, would have led you to use rational processes that are misleading. Sure, travelling directly west from Abu Dhabi would eventually get me to Los Angeles, but the journey would be something like 3 300 km longer in a 'direct' path to the west.

Clearly there is no *one* way to represent the world, it depends precisely on what you have chosen to represent. Any attempt to create a map must begin with making a whole range of choices. The world that maps represent is infinitely complex even though maps are necessarily simple: they translate the infinite complexities of the 'real' world into a simplified representation of it, highlighting certain aspects and ignoring or possibly distorting others.

In summary we might recognize the following points about maps:

- They require the individual to accept assumptions about how that map works.
- Maps distort reality to some degree and therefore can lead us to false conclusions about the world.
- In choosing what features to include, certain values are written into maps.
- Maps guide our thinking processes in ways that we may not be aware of.

ACTIVITY

1 Draw a timeline of your life. This is a 'map' of the time you have been alive. Since you cannot choose *every* event of your life to represent, what sorts of events will you choose? What type of story does your timeline tell a stranger?

2 Now draw a timeline of your life that represents your journey as a 'knower'. What do you 'know' now and where have you learnt it? What events in your life are relevant to you as a knower? Perhaps you will include when you started school and when you began the IB Programme. What other important knowledge have you gained and when did you learn it? Compare your timeline of your journey as a knower with a fellow student. Note the differences: even though you are both 'IB students' (and so might be similar in terms of what you know), you might have identified quite different moments to record on your map. Discuss why that might be. Is it possible for two students ever to create the same map?

3 If you have a social media account like Instagram, Twitter or Facebook, what events are on your feed and what is *not* on your feed? What effect would the choices you've made have on a stranger's impression of you? What kind of person would they think you are? What values and beliefs do you think are illustrated by the choices you've made?

ACTIVITY

1 Individually, create a map of your school, thinking carefully about which information you want to represent and how you will represent it.

2 Compare your finished map with a partner's map. What are the similarities and differences? How do those similarities and differences reflect your respective experiences of the school?

3 How can you decide which is a *better* map of the school?

Individual maps

We are now in a position to think about these maps in relation to ourselves as individual knowers. Go back to the timeline you created above and consider the story that map tells about you. What are the main features of that landscape? What have you included and what have you not included? What other maps can you create which will still tell us about you? At what point would your map become *fiction*? What maps do you use to make sense of your world and what use can we make of this metaphor?

These 'maps' will be influenced by the experiences you've had growing up, the people you are spending your life with and the beliefs and expectations of your family, friends, religion and school. None of us use only *one* map; the maps we use will change depending on the situations we find ourselves in. You might, for example, use a map provided by the scientific method (see Chapter 9) when working with your lab partner in science while trying to discover or explain some feature of the world. You will, however, switch to a different map when discussing the world and your place in it with your religious leader. You might be discussing the same *phenomenon*, but these different maps might be looking at completely different things. Perhaps you are thinking about global warming using an *economic* map, while your friend looks at it with a *biological* map, or you might be thinking about abortion using a *women's rights* map while your friend thinks about it using a *religious* map.

Our approaches to the decisions and actions we make every day are part of a wide variety of goals, desires and needs. At times you are acting as a sportsperson, other times you are a friend, a son or daughter, a leader or a follower. In each case you are using a set of principles which help you navigate that moment. Who influences what features you include on your maps and are those maps *reliable*?

Think back to the key concepts presented in Chapter 1. How can those concepts help you make decisions about which maps you *want* to use? Being a reflective and critical thinker means that you must take responsibility for the choice of maps that you use. If you want, for instance, to join the community of 'anti-vaxxers', then one consequence of that choice is that you are using a map which tries to make scientific claims about the causes of autism, but which actually turns its back on years of study by world experts on autism and vaccinations. You can, of course, interpret the world however you wish (it is your 'right' to have an opinion, or in this case 'use a particular map'), but this does not by itself make that opinion or map a *good* opinion or map. To use a map which denies well established and reliable scientific methods in order to make claims that are exactly opposite to what is real, is like looking at the Mercator Projection map on page 61 and deciding that Greenland and Africa are the same size. It is just not true. The map has led you away from reality, rather than helped you navigate reliably through it.

AOKs as maps

The metaphor of knowledge as map is a helpful one which the TOK subject guide uses and which this book will apply at various points. Knowing the world or creating knowledge about the world is a lot like creating maps of the world. Various maps will highlight certain information, ignore other information, guide our thinking and possibly distort our understanding of the world. The knowledge we construct about the world will do these things, too. As mathematicians construct mathematical knowledge, they will highlight concepts like number and logical deduction, but might ignore other concepts like culture. A historian, however, will consider culture and its influence on the individual as important, so will discuss as they construct their historical narratives, but will perhaps ignore the nature of basic mathematical axioms. Similarly, the artist or philosopher might emphasize the individual experiences of singular human beings, while the economist might accept they are part of an economic analysis but limit that effect in favour of developing generalizations about how *groups* of people tend to behave. Likewise, an artist might highlight the notion of inspiration and intuition in the artist, while the natural scientist might accept that individual scientists have moments of inspiration, but make sure that this inspiration has been tested against repeatable and publicly observable experiments. In other words, each area of knowledge will emphasize and prioritize some aspects of reality and try to describe *those* elements, while perhaps leaving other aspects to some other field of knowledge. The task of the TOK student is to become sensitive to and evaluate those different approaches and maps.

ACTIVITY

1. Consider your IB Diploma Programme subjects. For each, try to develop a set of questions that are unique to that subject. What types of questions does that subject ask that others might not?
2. What rules do the various approaches follow? Are they similar to or different from the approaches of the other subjects?
3. Are there better or worse approaches or does it only matter what you're trying to achieve? What are the appropriate ways of acting or constructing knowledge in this AOK, and what responsibilities does an individual have in that AOK?

Background beliefs

We've considered two metaphors (Plato's Allegory of the Cave and the map metaphor) to help frame our thinking about knowledge, arriving at two outcomes:

- Our knowledge is heavily impacted by those individuals and institutions around us.
- The models and maps we choose to use in interpreting the world around us will distort reality and guide our thinking in ways we might not be aware of.

These discussions are a way of exploring what might be called 'background beliefs' – beliefs which we hold and use to make sense of what we see around us. They are in the 'background' in the sense that we often are not consciously thinking of them when we investigate the world, though the beliefs themselves may or may not have been consciously arrived at.

None of us approach a situation as a blank canvas; we make sense of everything around us through the beliefs and ideas that we have already formed. People who tend to believe in conspiracy theories are an obvious and extreme example of this. From fake Moon landings, to the 9/11 attacks in New York City in 2001, many people refuse to take events at face value and instead see them as masking some deeper truth which most of us are unaware of. These people

Learner profile

Reflective

How do my own background beliefs influence the way I engage with the world?

are interpreting the world through the lens of their pre-existing beliefs about the way the world is. Often in conspiracy theories, these beliefs are about secret and powerful groups who want to harm us in some way or another (whether it be simply 'keeping us in the dark' or hiding their true evil intentions). The Flat Earth Society, for instance, suggests that:

> The purpose of NASA is to fake the concept of space travel to further America's militaristic dominance of space. That was the purpose of NASA's creation from the very start: To put ICBMs and other weapons into space (or at least appear to). The motto 'Scientific exploration of new frontiers for all mankind' was nothing more than a front. ('The Conspiracy')

The Flat Earth Society then suggests that NASA scientists *cannot know* that the Earth is round because 'They are not running a real space programme, so they wouldn't know what shape the Earth truly takes'. What appears to be happening here is that those responsible for these claims are working with a map or a set of background beliefs about the nature of the US Government that involve ideas that contradict all available evidence and which will require further buttressing and **intellectual gymnastics** when actually presented with facts. The map, in this case, is *not* representing the reality common to us all and so is more misleading than reliable.

◆ **Intellectual gymnastics**: Refers to the need to twist one's thinking in all sorts of ways in order to get a claim to appear 'reasonable'. This is another example of how 'reasonable' is *not* synonymous with 'true' or even 'reliable'. One can make a 'reasonable' argument for any conclusion, provided one cleverly chooses one's premises.

There are more mainstream examples of the impact of background beliefs. Studies in 'unconscious bias', which we touched on in Chapter 1, are an interesting (and controversial) example of this. The basic idea here is that our interactions with others are filtered through pre-existing biases which then impact our interactions with people. These biases usually have the biggest impact in 'quick thinking' situations, where people are making fast, non-reflective judgments in the immediacy of a situation. However, they also have an impact in situations where people are meant to be reflective.

In 2013, the Equality Challenge Unit (ECU), a group that helps universities in the UK and around the world develop programmes that promote and protect diversity, explored unconscious bias in relation to hiring practices at universities (Equality in Higher Education Statistical Report 2013). This was in response to worries identified by the ECU that the majority of full-time academic positions were held by a disproportionately high number of white staff, which was inconsistent with the proportions of ethnicities in the student bodies. One reason suggested by ECU for why the proportion of white academics is inconsistent with the proportion of black and minority ethnic students is that universities' hiring practices are influenced by unconscious bias. The suggestion is that hiring committees, even when they are being reflective and making attempts to be aware of any conscious bias, may nevertheless allow their unreflective background bias to impact their decisions in reviewing applications, short-listing candidates, interpreting interview responses and ultimately making job offers. The claim that unconscious biases exist is not the same as claiming that individuals are 'racist and don't know it'. Rather, in forming our understanding of the world and the people around us, we form non-conscious 'short-cuts' to thinking that are sometimes hard to identify and challenge, even when we think carefully about them.

DEEPER THINKING

Background beliefs and intuition

While these considerations show that in some instances people use their background beliefs to interpret the world around them, a full TOK analysis would take this a step further. Even if you are not a conspiracy theorist or involved in university hiring, it is important to consider what background beliefs you have which have impacted the way that you see the world around you.

What are your own background beliefs? Thinking about who your puppet masters are and what maps you use to navigate the world are ways to identify and describe these influences. If you are a student at one of the universities described in the ECU study, for instance, what impact does seeing one ethnic group over-represented around you have? Does it seem to be 'normal' and does this 'normal' lead you to think differently about what is outside this 'norm'? Another example might be to consider how different your social, religious, political or economic beliefs and expectations are from those of your parents and your friends.

Malcom Gladwell's *Blink* is an excellent introduction into an implication of how these background beliefs work in our claiming to know about the world. Gladwell describes a process he calls 'thin-slicing', which refers to making quick, seemingly non-conscious judgments about situations in which people find themselves. He describes a case in which the art community had accepted a statue, the 'Getty kouros' as being an authentic statue from the sixth century BC. However, many scholars just weren't sure – initially their intuitions were leading them to question the authenticity, but they couldn't quite justify why or articulate their misgivings. It turns out that having taken these doubts of a few experts seriously, the community has arrived at a position where the authenticity of the statue cannot be clearly established. After some critical reflection and further research it appears that the initial intuitions of the doubters and their subsequent investigations were warranted. Even today the J Paul Getty Museum suggests that the statue is from '… about 530 BC or modern forgery' and claims that '… the anomalies of the Getty kouros may be due more to our limited knowledge of Greek sculpture in this period rather than to mistakes on the part of a forger' (Getty Museum).

What this suggests is that intuition, even though it is non-reflective or non-rational, can actually be *better*. The intuitions of art history experts, for example, can be better than the intuitions of other people and the reason for this is background beliefs and knowledge. The expert's wealth of experience, knowledge and ability means that their non-reflective intuitions about things in their realm of expertise are more finely tuned. So even when they are not thinking explicitly about a problem, their intuitions should be relied upon and listened to as authorities in their field.

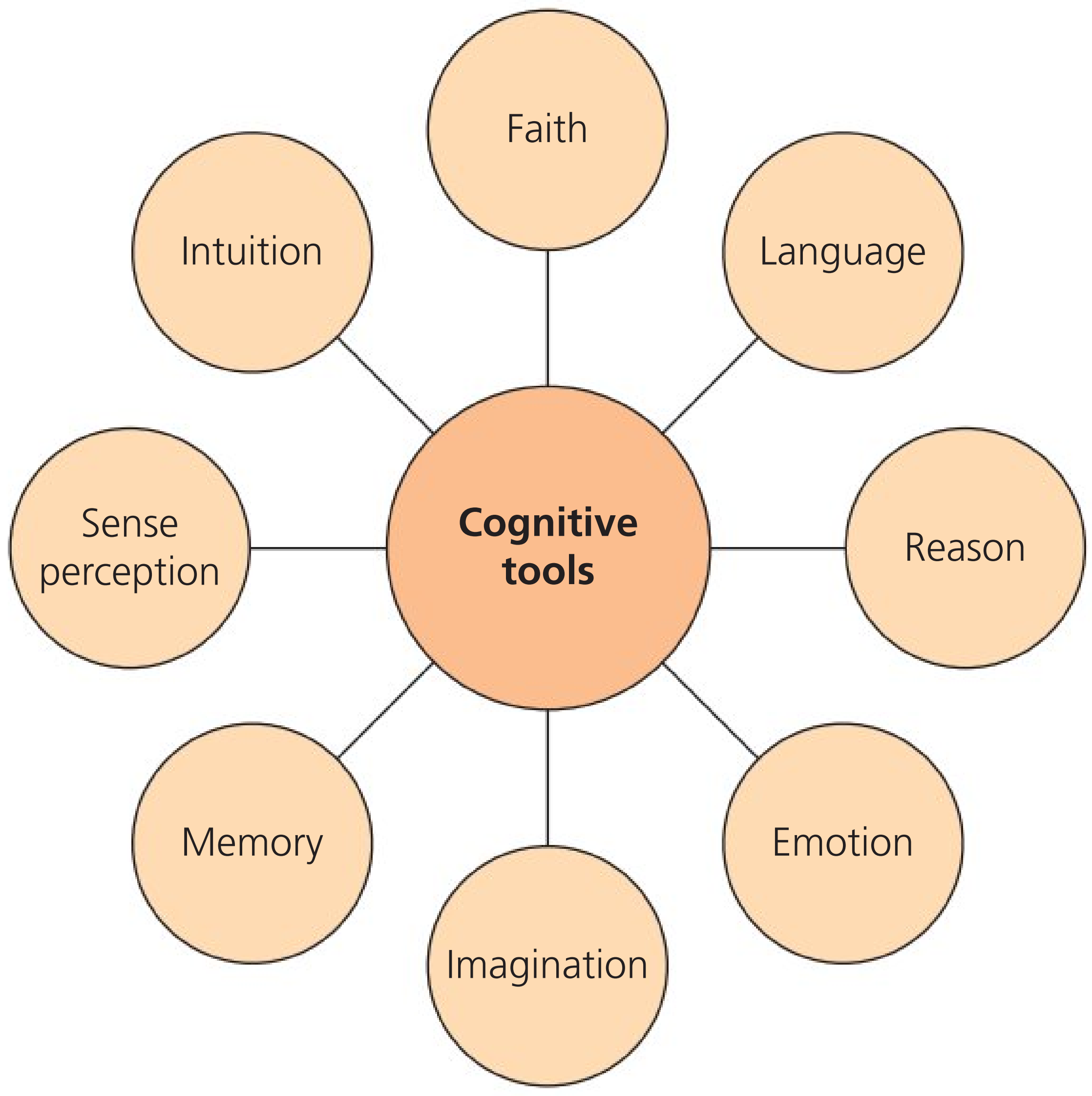

The Getty kouros

In this section we've explored the sources from which individuals develop their own perspectives on the world and the conditions under which they do so. We've also explored how we can selectively choose how we want to engage with the world of knowledge, depending on what models and maps we wish to apply to the confusing and ambiguous reality that we find ourselves confronted with. As we discussed in the introduction, however, these perspectives and maps do require some connection with the facts of the world around us. There are, in other words, better and more useful perspectives and maps. A perspective or theory that starts with the assumption that the Earth is flat, for instance, will not be able to explain all sorts of features of our experience of the world with any precision or succinctness.

Methods and tools

Cognitive tools

In considering the methods of individual knowers, we might consider the sources through which information is presented to the individual. External sources of knowledge, like books, websites and authority figures, might shape our knowledge to a great extent, but the *internal* cognitive processes and tools that we use to gather and interpret information into knowledge might also shape that knowledge in ways we are unaware of. These are inherently individual and so an analysis of these sources is best understood as an analysis of an individual's thought or thinking process. This is an important discussion because we often show an appropriate amount of healthy scepticism when other people tell us things, but we might not be considering how our own processes are also sometimes unreliable.



Cognitive tools

For example, our construction of knowledge about the world might follow this process:

- First, we might experience the world through our senses (sense perception).
- We might then categorize what we are experiencing using memory and language (memory and language).
- From this description we might consider whether it is consistent with what we've already experienced in the world (reason).
- We might even have an emotional reaction to this experience based on what has happened to us before or what we know about what is happening to us (emotion).
- If we have a question about the reasons for our experience, we might consider and test a number of explanations (imagination and reason).
- We might even have a 'hunch' about what the right explanation is, or a hunch that someone else's explanation might be mistaken (intuition).
- There might be some explanations that we inherently trust because they come from a trusted authority in the field (faith as trust), or because they come from a source to whom we've committed ourselves (religious faith).

KNOWLEDGE QUESTION

How do we acquire knowledge?

There are all sorts of ways to characterize the cognitive processes by which individuals make claims about the world. In each case, however, the following should be kept in mind:

- **The cognitive tools are intermingled.** None of the tools outlined in the diagram above or any others that you wish to consider, work in isolation. Trying to isolate, for instance, reason and emotion in the consideration of how we know the world would be like trying to isolate different types of plants in a forest or isolate one single part of your body when thinking about 'digestion'. No part works in isolation, all parts work together.
- **Cognitive tools are influenced by our experience and culture**. Even though some of these words refer to biological processes in humans (sense perception, for instance), this does not mean that they operate the same way for each of us. What we believe to be 'reasonable' might differ dramatically between cultures. When discussing earthquakes in the Himalayas, for instance, some local cultures will use an explanation which includes mythical beasts battling it out underground and consider this perfectly 'reasonable', because the language concepts they are using are entirely consistent with their basic understandings (or map) of the world.

Learner profile

Inquirers

What shapes our personal experience of the world?

IA prompt

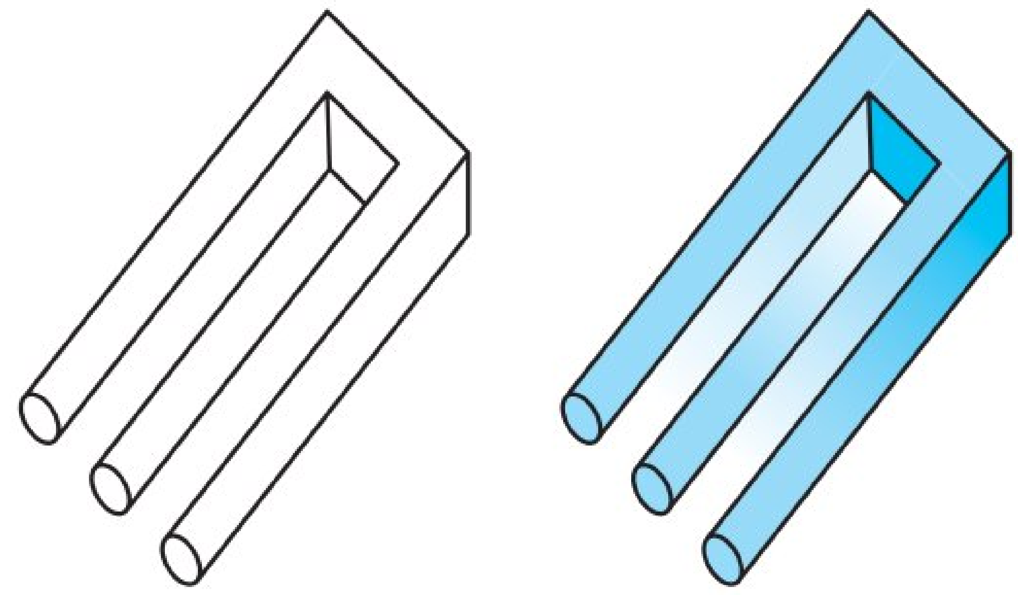
30 What role does imagination play in producing knowledge about the world?

Similarly, religious devotees may use certain premises to explain the world that will be unavailable to an atheist.

- **Sometimes our cognitive tools are trustworthy, but sometimes they are misleading**. Like any map, our cognitive processes, when not used reflectively, can lead us astray, even if most of the time they are reliable. Optical illusions are a clear example of this, as is the fact that the way we describe our sense impressions might be heavily influenced by the concepts that our language provides. One of my favourite illusions that demonstrates this point, isn't really an 'illusion' at all, except that our mind makes it so. What is intriguing about the impossible trident illusion, shown right, is that it is simply lines on a surface, but our mind tries to create out of that design a three-dimensional object which cannot exist in reality. It is not the image on the page that is the illusion, but your mind trying to *impose* an interpretation on it and that interpretation cannot exist. We don't experience any of this interpretation – we see the image, our minds try to interpret it as 3D, we do a double take and get confused.

  That sense perception and interpretation are so closely related is also brought out by another more obvious point: none of the oddly shaped lines (the text) on this page have presented themselves as odd; you have seen the lines and squiggles and immediately understood only the 'concept' behind them. The interpretation and the sense-experience are the same. Only when we visit a new country – the native language of which we do not speak – are we confronted with a disconnect between the squiggly lines and the meaning. When a native English speaker sees Hebrew, Japanese, Chinese or Vietnamese, they see only the lines because they do not have the right background knowledge. But when it comes to English, they will not even be aware of the lines; they only see the words and 'see' their meaning.

  The point here is that while we might be experiencing the world through these cognitive processes, they are experienced through the lens of our interpretations and background beliefs. If we are not careful, those interpretations might lead us into the dangerous territory of mistaken interpretation or outright prejudice.



Impossible trident illusion

Signs in many different languages

- **Our cognitive tools are managed by communities of knowers**. No matter how much thinking about or analysis of our cognitive processes we do, they really only become interesting in terms of TOK when we consider their role in the formation of knowledge. That we are sometimes deceived by sense perception, or that reason can lead us into falsehoods, or that intuition can give us nudges in the right direction, is less interesting in TOK than *how the sources are managed by the community of knowers*. This is the step that all considerations of cognitive tools should take. For instance, that our senses can sometimes lead us astray is interesting, but it's a real problem for a community of knowers like scientists because the whole 'method' that science uses is based on observations of the world as the primary data. The question, then, isn't whether the senses can sometimes lead us astray but, more importantly, how scientists manage this problem.

  Memory and language can be quite faulty for an individual in developing knowledge, but the real question is how does the community of historians overcome this or take this into consideration

Learner profile

Open-minded

How can I remain open to the fact that my own views might not be fully reliable?

when developing historical knowledge that often uses first person testimony of events as evidence? Each AOK brings with it a 'method' which will be discussed in the following chapters and the point of these methods is to take advantage of the strengths of these cognitive tools and manage the weaknesses of them in relation to the scope of that community.

- **Simply discussing the tools is not an adequate Theory of Knowledge analysis**. The sum of this discussion is a relatively straightforward but crucial point in relation to an effective and successful TOK experience. Simply outlining the weaknesses of the cognitive tools for individuals isn't yet a full analysis of knowledge. A successful TOK analysis will consider how those weaknesses relate to the construction of knowledge, whether it be at the individual level ('Should I trust my memory?' or 'How does my imagination help me understand the knowledge of others?'), or the shared level of the community ('What role does intuition play in the construction of mathematical knowledge?' or 'How does technology influence the reliability of our political knowledge?' or 'How does the scientific method protect against the unconscious bias of individual scientists?').

Ethics

How do we identify relevant facts when considering an ethical dilemma?

In ethical dilemmas, we can develop a solid TOK analysis of the principles by:

- exploring which facts or knowledge about the situation are relevant to the decision
- considering where this knowledge comes from
- asking why we have chosen some facts over others in making a decision.

Another way of saying this is to consider which features you would place on the map that helps you make sense of the ethical dilemma.

CASE STUDY

Mapping an ethical dilemma

In the year 2000, a couple from Malta (an island in the Mediterranean Sea) travelled to Manchester in the United Kingdom. The wife was pregnant with conjoined twins and, knowing that it would be a very difficult birth and that the babies would need intensive care, the UK had invited the couple to St Mary's Hospital in order to look after the mother and babies. The babies were born in August, but one of the twins, Mary, was very sick and her heart and lungs stopped working immediately after birth. Being conjoined, this meant that the other baby, Jodie, provided blood and oxygen for both of them. Unfortunately, this placed a huge burden on Jodie's heart and lungs and the doctors did not expect Jodie to survive for long as she was doing so much work for both twins.

The doctors wanted to separate the twins, believing that Jodie had a very good chance of survival, though they knew that because Mary's heart and lungs were not functioning, she would not survive any attempt at separation. The babies' parents understood the medical facts and the likely outcomes, but did not consent to the operation, arguing that they could not willingly consent to an operation that would kill one of their children.

The hospital, believing that it had a duty to protect life where it could, went to the courts to ask permission to separate the babies. The first court (Crown Court) allowed the separation against the parents' wishes, but the parents appealed to the High Court to stop the operation. The High Court also allowed the operation, but for different reasons. The operation was successfully conducted, Mary died, and the family returned to Malta with Jodie, who grew up healthily and happily (BBC News).

There are all sorts of ways to explore this example, which is full of ethical and legal dilemmas as well as deep human tragedy and triumph. One way is to analyse and evaluate the reasons the judges gave for their decisions to separate the twins and the different approaches they used. These different approaches can be thought of as different 'maps': the reality of the situation was about babies, biology and law, but the *ethical* dilemma was hard to describe. The first Crown Court judge, Lord Johnson, described the situation using the language of 'life support machines', arguing that Mary 'lives only because of her physical attachment to Jodie. The blood and the oxygen that maintain her life come from Jodie. In the words of one of the doctors, Jodie is her life support machine' (A (Children)). Think back to what we said about maps earlier. Lord Johnson takes the reality and translates it into a different set of circumstances which provide a method of thinking through the dilemma.

The map Lord Johnson used to think through the situation emphasized Mary and her well-being. He asked the traditional questions one asks when faced with someone who is on life support and who is not expected to survive. In those cases, the tools available (the elements of the 'life support map') are things like quality of life and questions such as, 'is it right to end a life of unending suffering with no hope of long-term survival?' Characterizing the situation in this way and using this sort of reasoning led to a relatively straight forward answer – it was in Mary's best interests to allow Mary to die and end her suffering.

The High Court decision, while advocating for the same result, used an entirely different map to navigate the complexities of the issue. In their decision, one of the judges, Justice Ward suggested that Mary 'sucks the lifeblood of Jodie and her parasitic living will soon be the cause of Jodie ceasing to live' (A (Children)).

While the first map emphasized Mary's health, this map decidedly prioritizes Jodie's health and uses a map normally applied to biology and medicine. This map characterizes the issue as a medical health issue, suggesting that Jodie's life is being threatened by something that will quickly kill her and it draws on the duty of the doctors to protect that life.

The maps therefore drew on quite different principles, and each distorted the reality of the situation, but in so doing, made it possible to navigate the very sad and challenging decisions that had to be made. In each case, the application of the maps gave the doctors a clear choice ('when to remove a patient from life support' and 'what needs to be done in order to protect a patient from a dangerous parasite') and a clear set of principles to make an ethical decision.

The parents felt that their faith in God and their beliefs about God meant that the situation was somehow part of God's plan. As parents, they felt that a course of action which resulted in the death of one of their children was never an option. These are certainly reasonable things to consider in making this decision, even if you wouldn't choose them yourself. However, the doctors involved used a different map to see their way through the dilemma, emphasizing instead the chance of a successful medical intervention in keeping one of the children alive. The judges also then identified relevant facts and used them to develop analogies, saying that the situation was sufficiently similar to when a patient is on a life support machine, or when a patient is suffering from the effects of a parasite. These models could then be used to guide their decisions on what would be the 'right' thing to do.

ACTIVITY

Consider the two positions offered by the Justices in the case study about the conjoined twins.

1. What are the various strengths of the two maps being applied to the situation?
2. Is one way of understanding the dilemma better than the other? How are you measuring this?
3. What *other* maps might have been applied to the case? Try to develop a different way of unpacking the various elements of the dilemma.
4. What is different about your map of the situation from others?
5. What are the different priorities in the various approaches?
6. Are there better and worse approaches to dilemmas like this? How can we decide which are better or worse?

ACTIVITY

Consider an ethical dilemma.

1. Choose a stance to take on the dilemma and decide which facts pertaining to the case you would choose in order to develop an argument for your position.
2. Now choose a different position on the case. Are there different facts you would choose to explore in relation to the dilemma?
3. How can you overcome the challenges of deciding which factors are most relevant?

■ Who are the puppet masters whose influence can be seen operating in this case? Are there others besides those suggested by the photos?

Different people may disagree fundamentally on what the right facts to consider are in an ethical dilemma, and this will undoubtedly be the result of a whole range of factors. An individual's religion will have an influence, as will their background knowledge and which community of knowers they are part of. The parents of the conjoined twins, being religious, imposed that element onto the situation; the doctors at St Mary's Hospital had a particular skill set, so naturally thought of the dilemma in terms of what their medical abilities could do in the situation to make things better. The judges chose different maps again: given that their task was to *decide*, they needed to look to models that were helpful for decision making and applied maps which have been helpful in the past. Whether to withdraw someone from life support or to protect someone from a threat are situations for which answers, and methods to find answers, have already been developed. Finding similarities with the case of the conjoined twins and applying these models provided clear methods to find answers in this case too.

KNOWLEDGE QUESTION

If moral claims conflict, does it follow that all views are equally acceptable?

The reasons why you've been encouraged to consider who your puppet masters are or which communities of knowers you belong to is another way of exploring what tools you can use to explore challenging ethical dilemmas such as those described above.

DEEPER THINKING

Ethics, objectivity and reason

Does this discussion about the challenges we face in identifying relevant facts to use in our exploration of ethical dilemmas mean that there can be no agreement on what those facts are? Does this mean, in other words, that ethical principles are purely relative or that there are not 'objective' relative principles?

The answer to this question depends on a number of factors. Just because there may be some disagreement over which map, or which ethical principles we should use, to help us make ethical decisions, does not mean that there are not *better* or *worse* maps and principles. Making this distinction, however, requires debate and argument and this is not simply a process of emotions. This debate requires logic, reason, justification and evidence. Agreement in this sort of inquiry is possible, but it might take time, critical reflection, debate and compromise to arrive at it. This, interestingly, is the same in any community of knowers or AOK.

Another important point is that our question about the relativity of ethical principles is a question we've arrived at through an analysis of how ethical dilemmas work. We have not assumed that ethical questions are inherently relative from the outset. Too often, TOK students, when thinking about ethical dilemmas, assume from the beginning that ethics is entirely relative in a way that other questions like science or mathematics is not. There might be some truth in this position, but it is a position that should never be blindly assumed and applied.

Individual knowers hold an incredible amount of power in relation to the community of which they are a part. The knowledge of a community is in a constant state of flux: our understanding of the world changes with new evidence and new experiences; new beliefs and theories replace older ones; individuals add to existing 'bodies of knowledge'. Individual knowers play a central role in this process in that individuals are the ones having the new experiences, finding the new evidence and developing the new theories and beliefs based on them. Our history books are full of stories of these individuals who happened to be in the right place at the right time to see what needed to be seen, or to offer a new interpretation, which shifts the established view of how we see things. Who knows? You might be one of these people who are in the right place at the right time and with the right knowledge and skills to see something new in the world.

If the knowledge we have about the world is indeed shifting and changing all the time, then what responsibility does that confer upon the individual? If individuals didn't question, challenge or test what is 'accepted' by the community, then knowledge would never change. In the western world, we would not have effective medicines if individuals didn't test the medieval views of the 'humours' (the idea that the human body consisted of four different types of liquids, which, in different ratios, would produce our outward 'health') and challenged the view that 'bleeding' sick patients would make them better.

With the responsibility to challenge, however, comes the duty to challenge appropriately. There are rules which must be followed – developed by the community – which are useful to manage the contributions of the individuals to that community. The rules themselves can be challenged, but they exist in order to help establish what new claims are reliable, especially if they challenge existing knowledge. Andrew Wakefield failed to meet this duty when he broke the rules of scientific research by falsifying data when investigating whether the MMR vaccine was dangerous.

The individual knower, then, faces a precipitous challenge: they must first learn and follow the rules of their community in order to be a meaningful contributor to that community, but they must also remain reasonably sceptical of the positions offered by that community. Too sceptical and they refuse to accept any claims of the community as 'knowledge'; not sceptical enough and they end up falling prey to irrational or poorly justified claims trumped up as reliable.

IA prompt

30 What role does imagination play in producing knowledge about the world?

What is the *point* of ethical theory?

We spend a lot of time thinking about what we should do and a lot of time developing theories to determine what we should do. This process assumes that the theory somehow comes before our actions, but it is not clear that this is actually the case. We consider ourselves lucky when we have the time to make ethical decisions; in many cases we do not have this time – we must decide and act quickly. In such cases, it is hard to imagine that there is some rational process at work which has considered all the things that need considering and then quickly 'tells you' what the right action should be. Very often, we see something that demands action and rather than think about what the right thing to do is, we simply act.

KNOWLEDGE QUESTION

In what ways do ethical judgments differ from other kinds of judgments?

In 2018, the internet was flooded with praise for a Malian refugee living in Paris, who, without any sense of worry for his own safety, scaled four flights of balconies to save a four-year-old child (France 24). The child had managed to climb out over the railing of his apartment's balcony and was hanging four stories over the street. The man, Mamoudou Gassama, did not spend any time thinking about what was 'right' or 'good'. He simply saw a situation that demanded his action and he acted to save the child.

Suppose, however, like in the case of the conjoined twins, we *do* have the time to consider what is right. After weighing up and applying different theories, how do we decide that we've stumbled across the 'right' theory? Suppose we conclude that the continued use of relatively cheap coal power in a developing country provides financial benefits to its people that outweighs damage to the environment. Another person, however, disagrees with this view, suggesting that long-term damage to the planet leaves everyone worse off. We might agree with them on those facts, but we might seriously disagree with them on just what those facts amount to in terms of what we should do. Ethical theories are how we link facts to what should be done, but accepting which theory best captures that relationship might have more to do with what we already want.

David Hume, an eighteenth-century Scottish philosopher suggested something like this when he argued that reason (constructing and applying ethical theory) cannot tell us how to act – any decision to act is motivated by some desire or 'passion' already motivating us. The suggestion is that we fish around for a theory until we find one that we can use to defend a course of action that we *already* want.

These cases raise the question about the point of ethical theory. If we are already prepared to act in many cases, and if in others we only accept a theory as providing the 'correct' ethical outcome if it supports what we already believe, then perhaps this type of knowledge is useless. This, however, goes too far. We generally agree with the philosopher Immanuel Kant that emotions and desires are not very good as sources of behaviour. In the moment when we're unable to think through issues, emotions and desires may be useful tools to use, but in our more reflective moments we have the opportunity to *choose* how we want to be. What sort of actions would we *want* to commit? What sorts of people do we *want* to be? This is the role of ethical theory. We develop ethical principles so we can, when we are free of the immediate needs of the moment, test ideas and make decisions about how we would want to respond to a situation. Use the QR code in the margin to read an 'Introduction to Ethical Theory', which contains information about different approaches to ethical considerations.

Learner profile

Principled

What role do our own moral principles play in knowing about and acting in the world?

One might also argue that even in the moment our immediate reactions and emotional responses are themselves the effect of a whole set of background beliefs, knowledge, habits and experiences. In 2004, it was revealed that a number of US soldiers were systematically torturing and humiliating Iraqi soldiers who had been captured during the Iraq War. When this was discussed in a TOK class, most of the students were suitably disgusted by the behaviour, but one student quietly raised his hand and said, 'but what if the prisoners *deserved* it?' This conversation stopper was a real shock, but it became apparent that there were a lot of different beliefs working in the background of students who responded differently to the situation.

At the individual or personal level, some students were themselves minorities and had been the victims of humiliation or derision by a majority. Some of the students had personal experience of the Middle Eastern communities, others had personal experience of the US military culture. At the community level or the level of knowledge shared by a community of knowers, some students had knowledge of the history of the Middle East and an in-depth knowledge of the current situation there. Others had both personal experience and understood the facts of the religious nuances at work in the political tensions in the area. The differences in background knowledge, beliefs and personal experiences all led to quite different *immediate* emotional and ethical responses to the situation.

ACTIVITY

Identify a significant ethical dilemma facing your community or the world today. Try to identify the types of beliefs at work in the various perspectives on the dilemma being taken.

1. Try to categorize them in terms of 'personal knowledge', that is, the types of knowledge and experiences that are unique to individuals. This might include the experiences that individuals have had, their culture, religion, economic position or other general political beliefs. It might also include relevant procedural knowledge that they have.
2. Then try to identify the relevant 'shared knowledge', that is, those beliefs they have that have been developed by some community of knowers. This might include their understanding of the relevant historical or scientific facts, or other propositional knowledge relevant to the case.
3. Now imagine that you wanted to develop a debate between these perspectives. How would you engage the various categories of knowledge? Would knowing different facts about the situation lead to a different perspective? Would providing different types of experiences lead to a shift in perspective? In cases such as these, ethical theory can provide a framework to explore the impact of those different perspectives and experiences.

The elements you identified in the activity might fit into different theories in different ways, but they will nevertheless help you think through the various perspectives and choices that are available in the debate. While it is not clear what is the *right* answer to many of the ethical dilemmas we face as individuals, it nevertheless is true that ethical theory gives us the opportunity to provide justification and support for our beliefs. More importantly, it will help us train our responses to situations in a way that we can exercise choice and purpose in our behaviour.

Conclusion

The Theory of Knowledge course is about knowledge and all knowledge begins, or began, with the experience and knowledge of individuals. Few of us are at the cutting edge of the construction of knowledge in the context of the areas of knowledge, but, as individuals, we certainly do create knowledge for ourselves every day. How we experience the world and the knowledge we create, though, is heavily influenced by the circumstances we find ourselves in, whether that be our educational, ethnic, national, social or any number of other circumstances. These circumstances may help us become more sensitive to certain types of knowledge or might lead us to apply certain concepts and ideas in unreliable ways. In other words, the choice of perspective or map that we apply to our experience matters. The challenges facing the individual knower and their role in relation to communities of knowers should always be on the mind of TOK students as they explore the forms and contexts of knowledge in the other parts of the course.

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Optional themes

3 Knowledge and Technology

OBJECTIVES

After reading this chapter, students will:

- understand the differences between data, information and knowledge
- be able to reflect on the nature of knowledge and consider whether computers can have it
- appreciate the fact that existing biases, prejudices and values are often built into the technology we develop
- understand what big data is and how it represents new and potentially problematic possibilities for the creation of knowledge
- be able to critically reflect on how technology is used in the creation, storage and dissemination of knowledge
- be aware of some of the ethical issues we face in relation to the development and use of new technologies.

Learner profile

Risk-takers

What risks are involved in using new forms of technology to create knowledge?

Introduction

What would a world without technology look like?

Look around. Are you surrounded by 'technology'? Have you ever been without 'technology'? At the beginning of Chapter 2, we asked you to look around and consider the different objects in the world and consider the knowledge that went into making them. Objects themselves are not knowledge, but without some pre-existing *knowing*, these objects could not have been created.

In this chapter we will consider the first of the course's optional themes and ask about the nature and role of technology in the construction, management and dissemination of knowledge. But we must first think a bit about what we think technology is. Rather than racing off to a dictionary, we've asked you to uncover some intuitions by imagining a world without technology. What does the landscape look like? What are people doing in this world?

ACTIVITY

Take a moment to consider with a partner just what a world *without* technology would look like.

1. What would be missing?
2. What would have to be added to the world to take the place of technology?
3. How are people living?
4. How are they communicating?

Now narrow your imagining to the question of technology in the context of constructing knowledge:

5. What would it be like for scientists if there was no technology available?
6. Could an artist construct knowledge?
7. Would an expert historian be able to develop the types of historical claims that you're used to?
8. How much mathematical knowledge would be available if there was no technology?

Learner profile

Risk-takers

How comfortable would you be living without your technology?

TOK trap

What *are* dictionaries? One answer to this can be found by considering the updates to the Oxford English Dictionary (OED), the online version of which is updated quarterly. In June 2019, 1400 new words were added, including *bae* and *yeesh* ('Updates to the OED'). Why does it need 'updating'? The OED, like any dictionary, *captures* the meaning of a term, rather than officially *creating* the definition. In other words, the words are already commonly in use before a dictionary then adds them. In this case, people were already using the term 'bae', the people at the OED noticed this, and once the term was common enough, they added it to the dictionary. Furthermore, sometimes the usage of terms will shift and change over time. Consider the term 'wicked'. It used to describe something morally bad or evil, but has now, in American English, also come to mean something excellent, or as an 'adverb intensifier' synonymous with 'extremely'.

What this means is that a 'dictionary definition' should never be considered the final form of a set-in-stone definition, especially in TOK, where the whole point of the course is to critically reflect on the sources of our knowledge. By appealing to a dictionary to say that 'this is the only way to use this term', you are limiting how knowledge works. Dictionaries only indicate common usage of a term, so by limiting your use of a word only to that means you might miss out on a term's nuances.

It is almost always a bad idea to use dictionary definitions in your TOK work unless you are going to challenge the definition. You might do this by suggesting that a definition is limiting (thereby exploring the limitations of language, or the role of culture in shaping our knowledge). Of course, you can use a dictionary in your thinking (sometimes you have to if you don't know what a word means), but these definitions do not always need to be part of your final product (such as in-class essays or presentations, the Essay on a prescribed title or TOK exhibition). Including a definition in an essay is a *choice*, not an obligation.

In the case of the 'definition' of technology, for example, rather than running to a dictionary we have modelled a way of coming to an understanding of the term, rather than simply swallowing a definition imposed by someone else. This shows *critical thinking*.

In the world without technology you imagined, computers and smartphones were probably missing. Imagine a world where mothers and fathers are no longer badgering young people to 'get off your computer!' or teachers are not confiscating your phones until the end of the day. Cars, airplanes and household appliances were probably missing too. Surely anything requiring electricity was absent. What about houses – were there any types of shelter in your world? Are people reading books in your technologically empty world? Are people only writing letters to one another? What are they using to write?

Our first assumptions of just what 'technology' refers to might be limited to thinking about machines and computers and smartphones, or things that eat up electricity. However, we might also consider technology more broadly, especially when we think of it in relation to Theory of

Knowledge. It is obvious to say that the vast majority of objects we interact with every day are not 'natural' objects, in the sense that mother nature didn't create them. Rocks and bushes are 'natural' in this sense, but roads and ball-point pens are not. This is an obvious point but one which might help us unpack what we mean by 'technology'. Did the technology-less world you imagined include roads? Books? Pencils? These are certainly not 'natural', but would we want to include them under the category of 'technology' and what effect would this have on our thinking about knowledge more generally?

Think back to the introduction to Chapter 2 when we considered the types of objects for which some sort of knowledge was required to exist. Clearly this applies to computers and smartphones, but it could also apply to things like microscopes. Think of the technological know-how required to create the lenses, or the slide plates, or the housing of the lenses or the stand. Even the simplest magnifying glass requires an impressive amount of skill and ability to construct. Microscopes, then, should be thought of as a form of technology. It is an object which a lot of technological know-how was required to create. We'd happily accept a scanning electron microscope as technology (not least because we have to plug it in to get it to work!), but perhaps the simple microscope you used in your middle school science class isn't as obviously considered 'technology'. It should be.

Beyond just the knowledge required to *create* the object, however, think of how the *purpose* of an object fits within a purpose or goal. We might consider a house or a shelter to be a sort of tool by which we live more safe and healthy lives. It took a lot of technological know-how to build it, but the *reasons* we built it are relevant to its status as technology: it serves a wider purpose and its creation was an attempt to meet that purpose. If someone needs to be protected from the elements and have a safe place to sleep and store their stuff, they will build this object (the house or shelter) to perform that function.

■ Technology doesn't necessarily only refer to modern computers or robots. We might consider a wide variety of objects that are built for a purpose as examples of technology

DEEPER THINKING

Epistêmê, *phrónēsis* and *technê*

Aristotle (384–322 BC) distinguished between three types of knowledge, *epistêmê*, *phrónēsis* and *technê*.

- *Epistêmê* relates to the unchanging universal claims that have nothing to do with context. This knowledge would include claims like mathematical principles. Our modern term 'epistemology', referring to the philosophical discipline focused on analysing the conceptual and metaphysical nature of knowledge, comes from this term.
- *Phrónēsis* refers to 'practical wisdom'. This type of knowledge is involved in deliberations related to how we should enact our ethical principles, or how we should behave. Wondering about what makes an action right or wrong, or the right way to do things would be examples. Aristotle felt that we could get increasingly better at this sort of thinking with practice and education, and this idea was central to his ethical theory, which is now called 'virtue ethics'.
- *Technê*, the word from which we get the term 'technology', refers to the knowledge that goes along with crafting something or making an object with some purpose in mind. This form of knowing is highly practical and context dependent.

The difference between the philosophical study of knowledge ('epistemology') and the IB Theory of Knowledge course might be unpacked by the differences here between *epistêmê* on the one hand and both *phrónēsis* and *technê* on the other. The IB's TOK course is an examination of the *practical* issues faced by experts when they construct knowledge. A genuine TOK analysis of 'what is knowledge' would be incomplete were we only to sit around and scratch our chins and wonder, 'No, really, what does knowledge *mean*?' The TOK student must conduct something like an empirical investigation into the ways that experts actually do construct knowledge, rather than merely an analysis of the concepts involved. An analysis of

■ Aristotle

those concepts is certainly crucial, and we do this in TOK when we ask questions about the scope of an AOK. For instance, we need to have a view of exactly what 'science' is meant to be or meant to do, before we can work out techniques which will help us achieve that kind of knowledge. We might also find that by examining carefully how experts construct knowledge, we are able to understand just what the nature of the subject is.

Thinking of technology as being linked to the practical actions involved in *making knowledge*, then, allows us to think of experts in the AOKs as a bit like craftspeople. As 'experts' in these communities of knowers, they have the required understanding of the nature of the subject and an understanding of what truths have been developed in the subject, the rules related to the construction of further knowledge, and the practical knowledge required to apply those rules in the actual construction of further knowledge. Students, then, are like apprentices into these communities who are learning the *craft* of knowledge construction (an idea we discussed briefly in Chapter 2). This is necessary, as part of this process is the ability to understand and use the relevant technology in that field.

With this new sense of technology as being, roughly, a tool created for a purpose, we might now narrow down this purpose to *knowledge*-related activities. These activities might include the creation, preservation, dissemination and communication of knowledge. With this in mind, we might now consider things like books, pens, paper, email, social media, online databases, telescopes, the Large Hadron Collider or the internet as a whole, as being types of technology which we can discuss under the broad heading of 'knowledge and technology'.

This chapter, then, is an attempt to do just this: explore the impact of technology on knowledge and reflect on that impact. The role it has played in the development of knowledge cannot be understated: one could argue that technology has created the conditions under which *any* knowledge could be developed or constructed. However, there have always been deep questions about the impact of the technological tools we use to construct knowledge:

- Does the use of books to record knowledge unfairly limit knowledge only to those who know how to read?
- Does the fact that the technologies used in science have a pre-set expectation about the *sort* of information to be measured mean that other information is lost or ignored or not recognized?

More recently, we have found that access to information (particularly in the construction of our political beliefs) has grown exponentially, but with unfettered access to knowledge provided by the internet we lose the ability to filter out false claims. Anyone now has the ability to disseminate their own understanding of the world. We are bombarded with claims and might struggle to weed out those not worth listening to. At the same time, however, we find ourselves at the whim of the people who manage the internet platforms; they have a lot of control over the content we see, or the content that is recommended to us.

One thing we will not be doing much of in this chapter is talking *about* technology in terms of knowledge *about* technology. Rather we'll always be focused on how technology affects how we develop knowledge, store knowledge, provide knowledge and how we (as apprentices or students) inherit knowledge from experts.

IA prompt

23 How important are material tools in the production or acquisition of knowledge?

KNOWLEDGE QUESTION

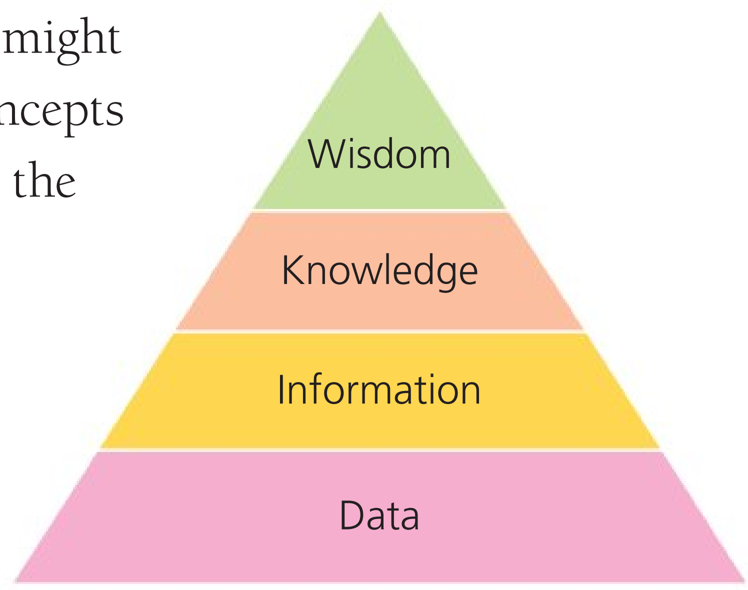
What is the difference between 'data', 'information' and 'knowledge'?

Scope

Data, information and knowledge

We use terms like *data, information* and *knowledge* pretty freely, but in the academic discipline of information technology these are fundamental concepts, in the way that 'cause and effect' might be a fundamental concept in the sciences, or 'number' or 'proof' might be fundamental concepts in mathematics. Defining and differentiating between these terms can help us understand the role that technology plays in creating knowledge.

One method of breaking down the concepts of data, information and knowledge is to explore their relationships. Commonly, this relationship is thought to be hierarchical (meaning that the level of complexity goes up as you move through the concepts) and a relationship of dependence (meaning that each upper level depends on the lower levels to exist). In this model, therefore, knowledge depends on information and information depends on data. Data is thought to be basic, in the sense that it is like a foundation – there is nothing below it and there are no other facts from which it is derived. The diagram on the right illustrates this idea.



■ These concepts are often presented in the form of the DIKW pyramid. In this text we're focusing our discussions on data, information and knowledge, but you might consider what the relationship between knowledge and wisdom is

So, what exactly do we mean by data, information and knowledge?

Data

Data refers to basic observations and facts in the world, or at least a representation of those facts. In neurobiology, for example, we might count the number of synapses in a section of the brain and those numbers might become the data representing the synapses. By counting and finding a number, we have represented a fact in the world. We might then gather more data by counting the number of synapses in the brains of people of different ages. All those numbers representing the synapses are the data.

■ Raw data is often presented as numerical data. What other forms might it take?

Information

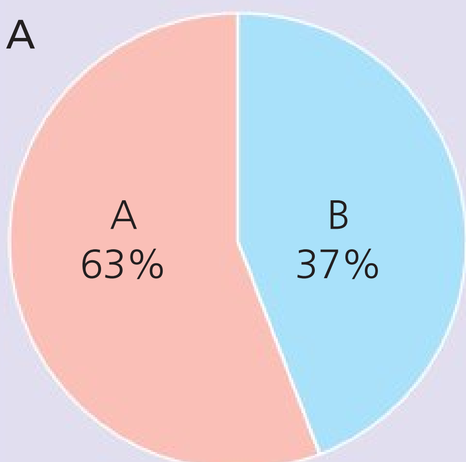
Information is the *processed* data. The data is not about anything other than the facts it represents. For data to be informative, some process must be applied to it and information is the result of that processing. That process might be **instigated** by asking questions and then searching the data for answers. In the case of the number of synapses of various samples of brains we might ask about which kinds of brains have more or fewer synapses. After processing or interpreting or simply just looking up the data we would find that there are *more* synapses in young people than in older people (Blakemore). Information can be 'read off' the data, but it might also be inferred from the data, especially when seeking information about averages. The average number of synapses, of course, cannot be observed in a brain, because an average is a mathematical statistic which requires statistical processing. The key idea here is that 'information' is *about* the world, it is a description of the world.

◆ **Instigated**: Begun. It refers to what *begins* a process.

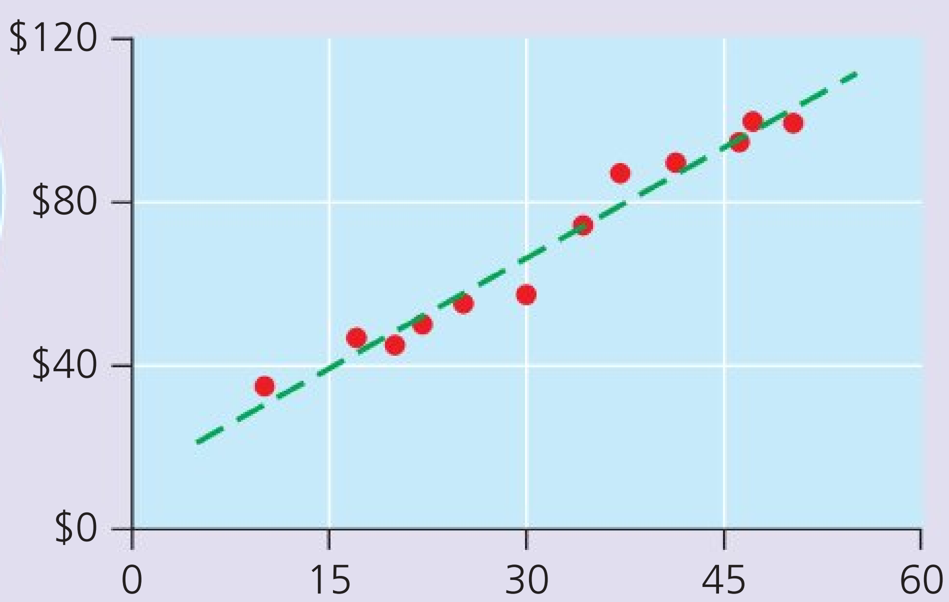
ACTIVITY

After you have completed this activity you can check your answers by using the QR code. State whether each of the examples below represents data or information. Give reasons, using your understanding of the differences between data and information.

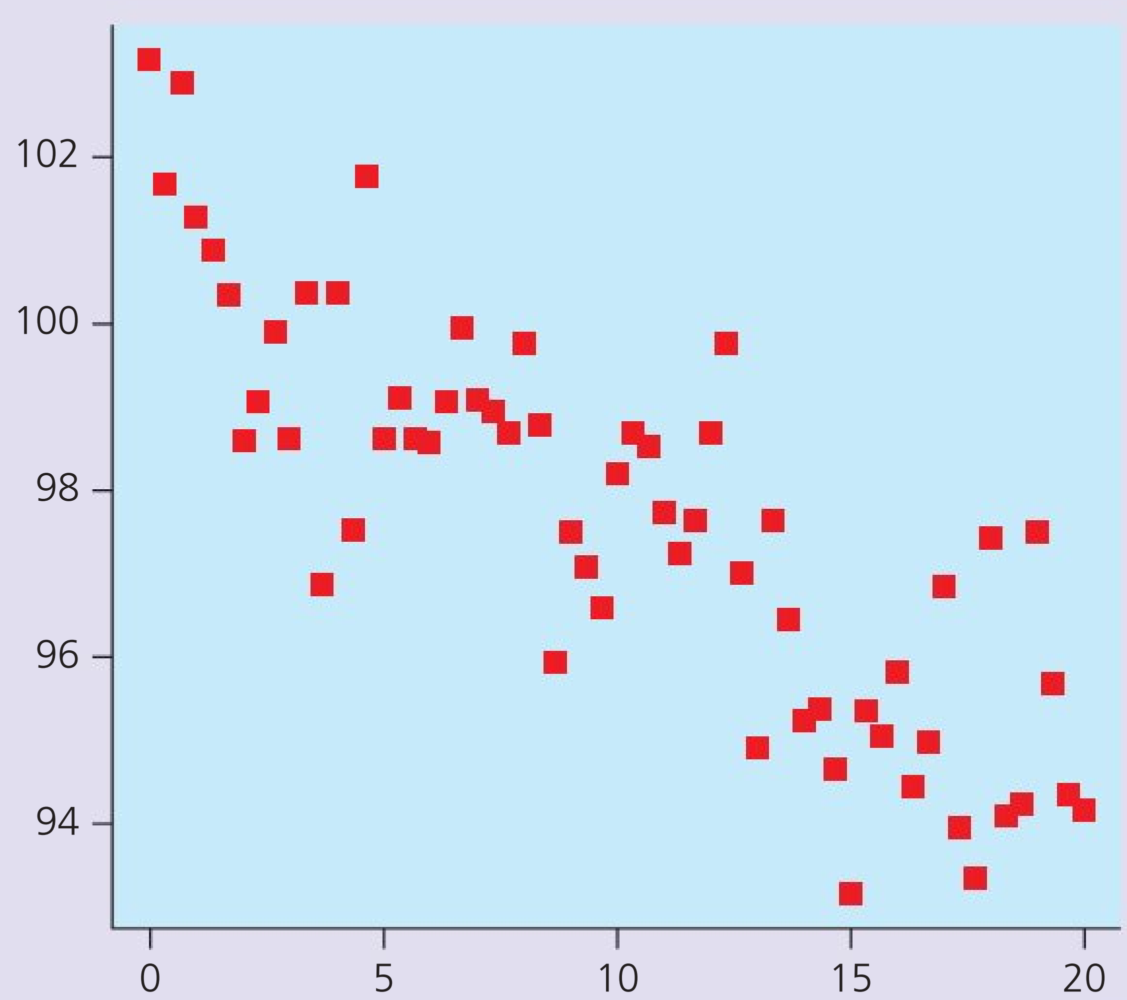
A



B



C



D

UEFA Nations League – Group A1 2018/19									
#	Team	Pl	W	D	L	F	A	GD	Pts
1	**Netherlands**	4	2	1	1	8	4	4	7
2	**France**	4	2	1	1	4	4	0	7
3	**Germany**	4	0	2	2	3	7	–4	2

Knowledge

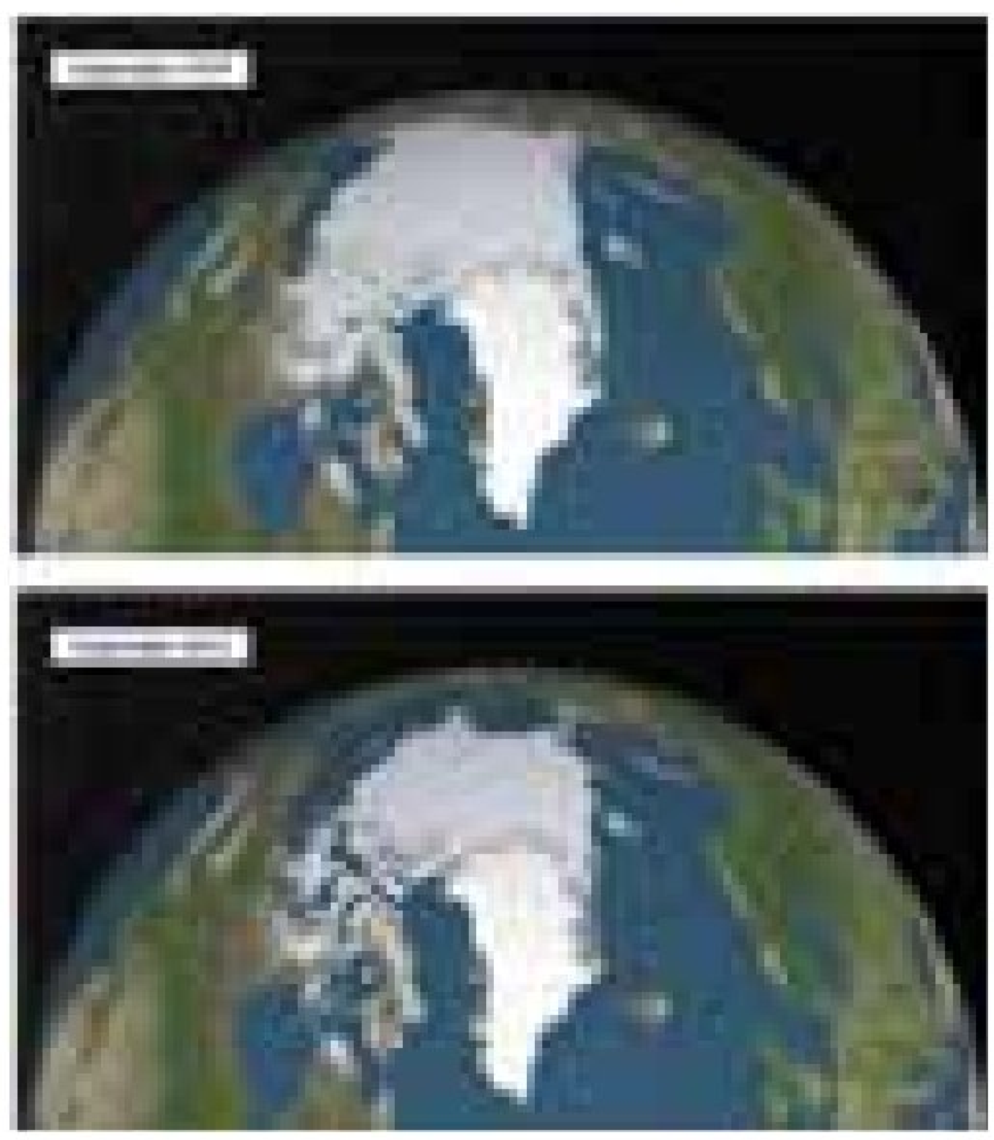
Knowledge refers to that information which has been applied or can be applied or put into action in the future. It requires a forward glance and serves as the basis for further processing or action. I might, for example, be *informed* that there are more synapses in a young person's brain than an adult's brain. Knowing that means that I have *accepted* the information as part of a wider framework of understanding (in this case, a framework of understanding the human brain) and I might now use that information to develop further questions or to *act* on it (by perhaps developing a research project to explore what happens to all those synapses as a human being gets older). That knowledge is about fitting information into a wider framework of understanding suggests that it is prone to all sorts of influence by *other* elements of the framework.

We might consider the climate crisis as a way of exploring these connections and relationships. Scientists continue to gather **quantifiable** data regarding all sorts of related phenomena, including the size of glaciers and the rate at which they melt, air temperatures from around the world, the temperature of the ocean and the number of severe storms in a year. By asking questions of this data and analysing it to produce a response, information is produced. How does the temperature data compare year by year? How does the average temperature relate to the size of the northern ice caps? This might be information about the rates of glacial melting (they are increasing), or averages of ocean or air temperatures over the years (also increasing), or the cause-and-effect relationships between, for instance, the warmer temperatures of the ocean and the number of fish, and the effect of this on animals in the Arctic (warmer waters ultimately means less prey for polar bears).

◆ **Quantifiable**: Refers to data that can be *measured* objectively. We discuss more thoroughly the distinction between quantifiable and qualitative data in Chapter 10, The Human Sciences.

This information is considered knowledge when it becomes significant or meaningful to individuals or communities of knowers. Knowledge is *held* by people and is a feature of people, whereas information is a feature of the world. Knowledge in this view might be defined as information that is organized and processed in order to promote understanding of a particular phenomenon. The focus is on information *being used* to solve problems and questions, requiring human processing, justification, skill and expertise (Allen).

'The polar ice caps are melting' is *information* when understood as a simple fact of the world. 'The polar ice caps are melting' is *knowledge* when it is *accepted as truth* by individuals or communities of knowers by being fitted into a wider system of values and meaning and when it then implies action. For example, one might accept this information as true but then think about it in terms of the natural cycles of polar ice caps growing and shrinking over time. The same information, however, might instead find itself being used to highlight the effects of human action (industrialization and pollution) on the environment. Both frameworks might accept the data and information but treat the *knowing* of that information in fundamentally different ways. The knowledge about the climate crisis might find itself in a community of expert climate scientists, in which case the expert consensus would link that knowledge to other data, information and knowledge about the detrimental effects of human waste and pollution on the environment. The information about the climate, however, might find itself in other communities of knowers where the focus and expertise is not *scientific*. A political community might link this information to other knowledge about maintaining political power or loyalty to political donors, which would override any loyalty to scientific knowledge.



■ Visual perceptions can serve as data. Comparisons between observations constitute information. General claims constitute knowledge

The challenge, then, is to remain reflective when applying various frameworks. Which framework is *better:* one which considers the information about the ice caps as part of a natural process, or one which sees it as a consequence of human behaviour? Once you start asking these questions (about which frameworks are more reliable), then you start doing the genuinely important work in Theory of Knowledge. Considering the different frameworks and the different communities of knowers which use them can help enrich a discussion or debate beyond simply disagreeing and argument.

ACTIVITY

Use the QR code to visit the 'Vital Signs' website at NASA. Review the following sub-pages:

- Evidence
- Causes
- Effects
- Scientific Consensus
- Vital Signs.

See if you can apply this discussion of *data, information* and *knowledge* by identifying discrete elements where each is being presented. Can you explain what makes it 'data' as opposed to 'information'? What is it about the presentation that suggests that 'knowledge' is being presented as opposed to 'information'?

ACTIVITY

1 Copy the table below and complete it to indicate what you think would constitute data, information and knowledge in the areas of knowledge shown.

AOK	What represents *data* in this AOK?	What *information* is provided by this AOK?	What can be *known* (knowledge) in this AOK?	Why are the claims in the knowledge column not simply information?
Mathematics				
The Natural Sciences				
The Human Sciences				
The Arts				
History				

2 Review the cognitive tools we looked at in Chapter 2 (pages 69–71). What effect do they have on the collection of data, the processing of information and the construction of knowledge?

3 In what ways might the conventions and fundamental values of different communities of knowers (not just AOK communities, but also religious, political or other social communities) influence the gathering and collection of data, the processing of information and the construction of knowledge?

Artificial intelligence

This discussion of the traditional distinctions between data, information and knowledge posits technology as something which allows us to gather raw data, which subsequently requires human involvement to be processed into knowledge. But developments in artificial intelligence prompt us to ask whether machines can themselves possess, and be responsible for the creation of, knowledge.

Artificial intelligence (AI) is a term we hear on a regular basis these days, and it is used to talk about everything from the killer robots of the *Terminator* films, to the computers analysing the massive amounts of 'big data' collected on us every day, to the systems which power our cars and tell us where to go. In what ways can it be said that these technologies are 'intelligent'? (The 'artificial' adjective is less problematic: it generally just signifies a system of knowing that is *not* human.)

KNOWLEDGE QUESTION

In what sense, if any, can a machine be said to know something?

AI refers to systems, generally computerized systems, which are designed to solve problems by taking data in, processing it and providing an outcome for its users. Examples include:

- speech and face recognition
- analysing large amounts of data and finding patterns
- monitoring external systems (like road conditions)
- adjusting how a machine responds to changing conditions (by altering how much power is transferred to the wheels of a car, for example)
- learning (often called 'machine learning').

The machines perform these functions through the use of clever programming and complex **algorithms**. These systems all solve problems: we pose a question, build a machine to take in information from the world, process that data and deliver a response. Many of these systems certainly appear intelligent, especially given that they might do things more quickly and with fewer errors than a human could ever do.

◆ **Algorithms**: Sets of rules which lead to purposeful behaviour. In computers these are the programs.

There are different types of artificial intelligence, however. Weak AI is a form of computer functioning which largely relies on the programming it has been provided with. Any output by a weak AI system is relatively predictable and explainable by the rules put into it. The types of intelligence in the list above are largely thought of as weak AI because the possible range of results of the analyses will already have been coded into the machines.

However, researchers are working on developing systems whose programming will enable them to deliver results which we might not be able to predict, even if we know all the programming put into them. This is called strong AI, because it is much more like the type of intelligence associated with human beings. If you ask your friend to pick up a drink from the store, you can largely predict what your friend will say ('yes', hopefully), but your friend might do any number of things that are relevant but unpredictable. They might shrug. They might nod or shake their head. They might say nothing or sigh dejectedly. They are certainly processing your request and behaving in a relevant way, but you couldn't have predicted their behaviour. So far, computers have yet to achieve what we would call 'strong AI': while computers might surprise us in all sorts of ways (consider the surprising capabilities of Google Translate. More on this later), we wouldn't say that they are doing things we couldn't have predicted from their programming. Some researchers suggest that genuine strong AI is still a few decades away, but the possibility of it arriving within your lifetime is real (Frankenfield). Strong AI would show intellectual capabilities that would appear to be so like our own that we might feel compelled to say that the system has genuine *knowledge*.

Learner profile

Thinkers

Are we the only thinkers?

Can computers know things?

The question of whether computers can *know* things raises some interesting questions about the nature of knowledge: just what is it? And what does it mean to have it? Does your chess smartphone app 'know' how to play chess? Well, it depends largely on how you want to define knowledge and what you think that 'knowledge' is meant to achieve.

Earlier we explored the differences between *epistêmê and technê* and suggested that one way these types of knowing relate to one another is that the *epistêmê* provides the theoretical basis upon which you might then develop the *technê*.

What does it mean, therefore, to *know how* to play chess? One response would be to say that you know *how* to play chess if you know all the rules of the game and are able to *understand* the game. This is like the *epistêmê* discussed earlier. Your knowledge of how to play chess then is the product of a set of *other* beliefs that you have – beliefs about the individual pieces, about the board, about how each piece can move. You might, for instance, have heard of the game without ever having seen a chess board and just

■ Does your computer *know* how to play chess?

■ Is there a difference between knowing the rules of rugby and knowing how to play rugby?

learned about it by reading a rule book and seeing some diagrams with various moves presented. It seems odd though to say that we can *know how* to play the game without ever really having played it.

Suppose it wasn't chess, but instead rugby. We could, presumably, learn all the rules and facts about rugby, but we'd never suggest we knew how to play unless we had actually given it a try. Rugby is a terrifically physical sport and without *actually playing it*, there are elements of the game we would miss; without that *experience* we wouldn't really say we knew how to play rugby. This is something we discussed in the last chapter when exploring the differences between knowing *that* and knowing *how*. The opposite is not the case: it seems that *being able to play* a game is enough to say that you *do* have knowledge.

Another response to this question about whether knowledge is something a computer can 'have', then, would be to suggest that knowing how to play chess is *being able* to play chess. If we want to confirm that someone knows how to play chess, rather than asking about which beliefs *about* chess they have, we might instead ask whether they are able to play it. We will then engage with them across a chess board. It will be obvious to us whether they are able to play, *even though we have no direct experience of their beliefs about or understanding of* chess. In other words, we don't have any direct access to the *way* in which they play (their strategy, or how they make decisions about how they move their pieces), all we can observe is them moving their pieces. If they are moving them in the right way with some minimal degree of competency, then we'd say they know how to play. If they beat us, then we'd say they know how to play *better* than us!

If you were to watch someone trying to play rugby (even though they might have all the relevant beliefs about rugby), you'd know pretty quickly if they don't, in fact, know *how* to play. They might be wandering all over the pitch trying to catch up and not really knowing how to follow what is a very quick game.

So, if we only need to see someone play chess in order to feel satisfied that they know how to play chess, what about the chess program on our computer or on our phone? If we lose to it and we know how to play chess, then it seems fair to suggest, or at least consider that the computer 'knows' how to play chess. It may be that we're pretty easy to beat in chess, but what if a computer defeats a Grandmaster of chess? This is precisely what happened in the spring of 1997, when reigning world champion Garry Kasparov, one of the greatest chess players of all time, was defeated by the 'Deep Blue' supercomputer built by IBM (Levy). This would seem, then, to be a case of computers having knowledge, or at least the knowledge of how to play chess well.

Garry Kasparov playing chess against Deep Blue

One worry might be that the *way* in which we know how to play chess is crucial here. For human beings our ability (know-how) to play chess requires a whole bunch of beliefs. *We* know that those beliefs are present in us, because in our own case we can experience that we have those beliefs. We also experience the relationship between that background knowledge and our abilities; those beliefs about chess are the *cause* of our ability to play chess. In the computer's case, however, we might not want to say that it can have beliefs. We would say instead that 'it was programmed' and therefore doesn't really understand its actions or that the actions were *fixed* because of its programming.

This is a subtle shift of the question, however. Now, instead of wondering about whether or not being able to do something amounts to 'having a form of knowledge', the question has become about whether computers have knowledge *in the same way that humans do*. It is clear that they don't, not least because computers are *not* human. We are not wondering if computers can 'know in the same way humans know'. We're asking a more challenging question about what 'knowing' amounts to and suggesting that having the technical ability *to* do something is a reasonable starting point.

IA prompt

1 What counts as knowledge?

Consider the types of questions that have appeared on multiple choice tests you may have taken in school. In many of these cases it was simply a matter of *recall*. You might have been asked a question like 'What is the capital of France?' or 'What is the chemical formula for ammonia?' The teachers were probably perfectly happy to say that you had knowledge of the answer provided you could tick the boxes for 'Paris' or 'NH_3' and not 'Lyon' or 'NH_2'. Teaching, if effective, had programmed you to reply in the right way.

Now imagine that you program a computer to respond properly when asked about the world's capital cities or a bunch of chemical formulas. If done properly, then wouldn't this be the same? Who cares *how* you recalled them? You and the computer both answered correctly. In fact, a computer system named *Aristo* recently took an 8th grade/Year 9 science exam and passed with 90 per cent! It also achieved 80 per cent on a 12th grade /Year 13 exam. Questions were multiple choice, so some were memory recall questions, but there were also more challenging questions requiring logic, such as the following:

> Which change would most likely cause a decrease in the number of squirrels living in an area?
> (1) a decrease in the number of predators
> (2) a decrease in competition between the squirrels
> (3) an increase in available food
> (4) an increase in the number of forest fires (Metz)

If your science teacher is satisfied with your knowledge when we select (4), then wouldn't they also be satisfied with the computer's 'knowledge' if it selected it too?

Another point related to whether or not computers can have knowledge has to do with claims like 'computers cannot come up with new knowledge'. Critics might suggest that while computers might 'know' the chemical formula of ammonia, they certainly couldn't construct or design a scientific experiment. This might be true, but the principle here seems to be that computers can only know if they can know to the same extent as an *expert*, or be able to do what an *expert* can do. You might have very little knowledge of how to design or conduct higher level physics experiments, but it would seem unfair to say that you therefore cannot have knowledge in physics. You clearly do have *some* knowledge of physics, but you certainly don't have *all* the knowledge that experts in the field do. So why would we expect a computer to have *all* the knowledge in a field before we grant that it can have knowledge?

Can computers learn things?

Another reason often given for arguing that computers cannot have knowledge is that they cannot *learn* new things. But what must this learning look like? Perhaps someone just *tells* us how to do things. Much of school-level mathematics involves teachers *telling* students how (ie, programming them) to solve certain equations in certain ways. Learning how to 'complete the square' is just learning how to do it. If we develop a program and 'teach' it to a computer, how different is that from us learning to complete the square? Do we know how to 'complete the square'? We can show we *do* know how, by doing it, regardless of how we learned it. But the calculator that you use for IB Mathematics can do it too. Does it 'know how'? Input the variables and see if it does.

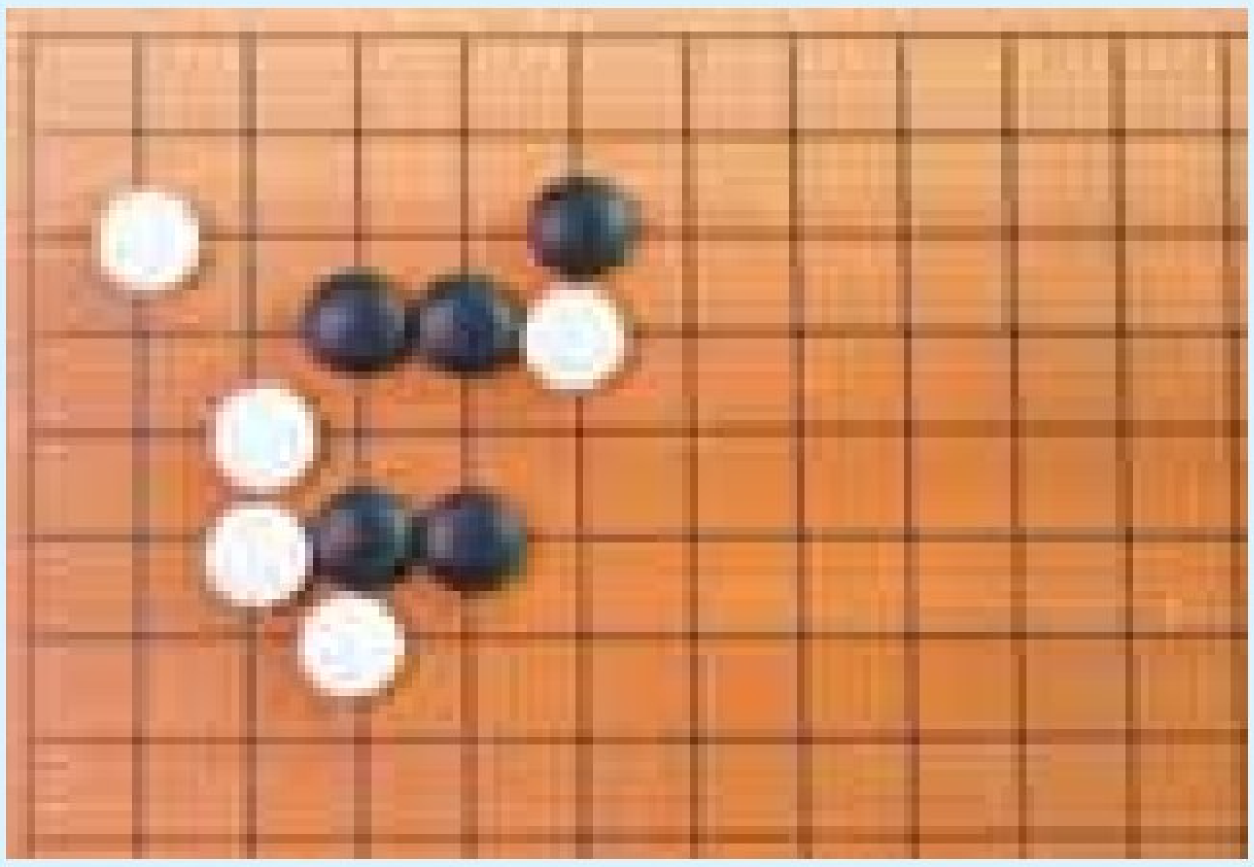
Moreover, as the two following examples show, machines are becoming more and more capable of learning independently of what they have been programmed to do.

CASE STUDY

AlphaGo

In 2016, a computer program called 'AlphaGo' beat Lee Sedol, one of the best 'Go' players in the world in a convincing 4–1 match. (Go is a board game that originated more than 3000 years ago and involves multiple strategies, making it more complex than chess (DeepMind).)

DeepMind, the company behind AlphaGo, went on to develop another program called AlphaGo Zero, which has also become an expert in Go. However, rather than following specific rules programmed into it, and without developing strategies based on knowing the final objective of the game or studying thousands of other games of Go (which is how AlphaGo perfected its abilities), AlphaGo Zero developed its own strategies through a process called 'self-play'. In self-play, a program knows only the most basic rules of a game and does not yet know what is the best *strategy* for that game. AlphaGo Zero was given the rules of the game, then played 4.9 million games over three days *against itself* and developed strategies and skills surpassing AlphaGo's abilities (AlphaGo developed its strategies over many months of evaluating other games played by expert Go players). The next iteration of the program, simply called Alpha Zero, learned the strategies necessary to beat AlphaGo Zero after only 24 hours of self-play.



The board game Go

The point here is that these programs developed their own strategies. The information programmed into them was kept to a minimum (just the basic rules of the game) and they then worked out for themselves what was needed to become experts.

CASE STUDY

Google Translate

In 2016, Google Translate announced an interesting example of what might be called 'learning'. Engineers at Google programmed the Translate software to translate between Korean and English and Japanese and English, using a new process which considers the *sentences* rather than merely the words in those sentences. What surprised them, however, was that *without being programmed* to do so, the Translate program could manage translations between Korean and Japanese (Coldewey). There is some debate about what this amounts to, but it nevertheless suggests that, in some cases, programs are able to develop skills and abilities that are surprising to us (Gedalyah).

What, then, are we to make of this discussion about knowledge and computers? Were you to discuss this in the context of a class or assessment, you should not treat it as if it were a question about computers. What you want to ask, as we did at the start of this discussion, is 'What is knowledge?' or 'What is knowing?' in order to see whether that can be applied to non-human technological systems. We've offered a short argument here to suggest that it is at least not *obvious* that knowledge cannot be applied to computers.

One thing we might conclude from this discussion is that it makes sense that computers *store information* and that this might legitimately be called a form of knowing. We store all sorts of information in our 'minds' or brains about all sorts of things. We store memories and facts and we can be said to know them, even when we are not thinking about them. For example, we *know* what the capital of France is even when we are not thinking about it. One thing technology provides us, then, is a way of *storing* information such as this. Dictionaries, encyclopedias and the pages of an atlas store information in the form of drawings and words; when we don't know a fact, we can look it up. The information is preserved in those books.

It's a stretch of the term to say that a book 'knows' things, however. A booklet with all the rules of chess cannot be said to know anything about chess even though the information is all there. Computers might be different here, in that at least computers (like Deep Blue) *process* information, then apply the information in a way that results in an outcome.

Perspectives

For all the advantages offered by new technologies, the positive effects that they have on our lives are often contingent on a number of social and economic factors, such as nationality, income, gender, race and language. The emergence of the world wide web in the late twentieth century was heralded as a democratization of knowledge, providing people around the world with equal access to information and equal opportunities to learn. However, several decades on, it has become apparent that many of the embedded biases and hierarchies present in wider society are reflected online. Focusing on the internet, this section addresses a few of the problems that have arisen as a result of new technologies, and asks us to think about how our individual perspectives affect what technology allows us to know.

Access to the internet

A significant issue arising is the question of *access* to the internet. Do people around the world have equal access to the internet and does having no or limited access mean that we cannot fully engage with our culture?

ACTIVITY

How do you access the internet? Do you use your smartphone? Your computer at home? The computers at school?

1 Make a list of all the 'access points' that you can take advantage of to access the internet. Copy and complete the table to identify why each access point is available to you, as well as what might make that access point *un*available to you.

Ways in which you access the internet	Why are you able to take advantage of that access point?	What might *limit* your access to that access point?
School computers	I am enrolled in *this* school	My school might not be able to afford to buy computers My family might not be able to afford to send me to school

2 Review your list and consider all the ways in which the availability of the internet might be limited by people, institutions or circumstances beyond your control.

3 What effect would this have on your status as a 'knower'? What communities of knowledge would still be available to you? What communities of knowers would you lose access to? How would this affect your ability to construct knowledge?

KNOWLEDGE QUESTION

How might technology exacerbate or mitigate unequal access, and divides in our access, to knowledge?

Hopefully, this activity and the discussion it created will show that not everyone has equal access to the internet. Access to the internet requires access to sophisticated computers and WiFi/data infrastructure and, given that so much of the world's commerce and communication takes place *on* the internet, it is becoming increasingly difficult to engage with the world without it.

Access to knowledge has always been a problem. Historically, access to knowledge has been limited to those who have the wealth necessary to attend school, buy resources and take time away from earning money to devote to learning. People generally needed to be literate and have the political freedom to participate in the activities around knowledge construction and dissemination. This sort of access, however, has often been limited to those who had enough wealth to engage, or were part of the power majority, meaning those in the minority have had less access. There is no reason to think that the internet isn't also affected by these issues.

Article 27 of the UN's Declaration of Human Rights says that 'everyone has the right freely to participate in the cultural life of the community, to enjoy the arts and to share in scientific advancement and its benefits' ('Universal Declaration of Human Rights'). Increasingly, the types of knowledge and knowing offered in culture, arts and scientific advancement are played out on the internet, and the UN 'underscores the unique and transformative nature of the internet not only to enable individuals to exercise their right to freedom of opinion and expression, but also a range of other human rights, and to promote the progress of society as a whole', meaning that all states should prioritize 'universal access' to the internet (LaRue). Some even argue that *access to the internet* has become a human right (Edwards).

Eleanor Roosevelt holding a poster with the UN Declaration of Human Rights in 1949. Do you think access to the internet is a human right?

CONCEPT CONNECTION

Power

In Chapter 1, we explored the relationship between power and knowledge through two perspectives: knowledge providing us power over how we live our lives and the power structures that limit or constrain people's access to knowledge. Both of these elements are present in this discussion about access to knowledge. On the one hand, many of us use the internet in such a way that our everyday lives *depend* on good internet access (for our learning, communication and work). On the other hand, our access to the internet is provided by 'internet providers', telecommunication companies and governments who might not have any notion of 'human rights' in mind when deciding what access we have to the internet. This might be thought of as an imbalance of power in relation to knowledge: access to the internet and the knowledge provided is a tool in the methods through which power-majorities maintain their power.

There are many examples from all over the world of how individuals' access to the internet is limited. Sometimes it is through the limitations imposed by companies who charge for access and sometimes it is limited by political bodies and their attempt to only allow access to certain websites, with censorship of the information provided on those websites. This highlights how financial and political dynamics affect the dissemination of knowledge, which, sadly is not new.

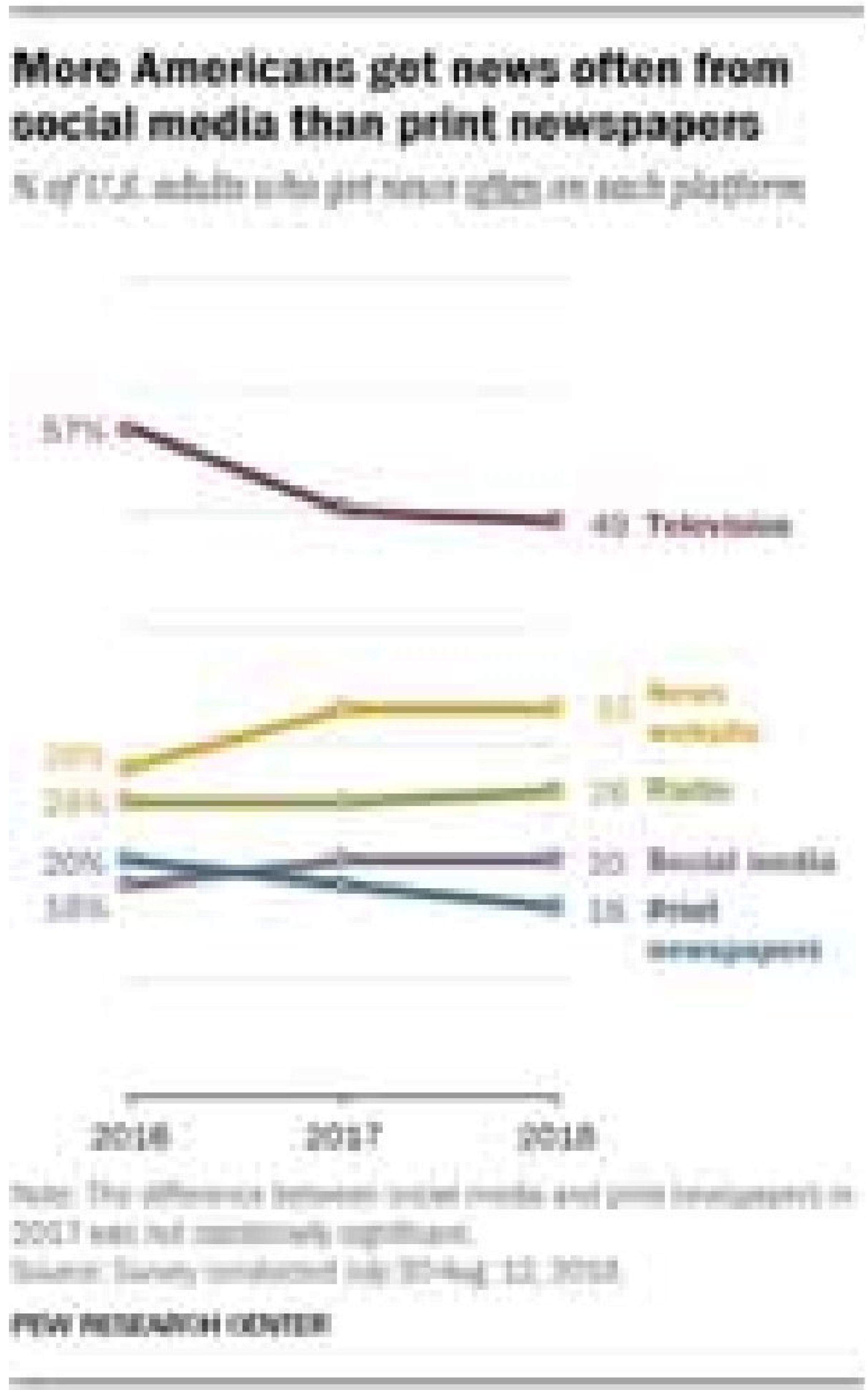
KNOWLEDGE QUESTION

Do social networks reinforce our existing perspective rather than boost our engagement with diverse perspectives?

Is knowledge on the internet reliable?

In addition to the general worry over who has access to the internet, individual knowers have a new burden to overcome. Prior to the internet, most of the world's knowledge was transmitted through teaching institutions (schools and universities) and printed media (books, journals and magazines). Each of these have built-in quality assurances: schools and universities require their teachers and lecturers to have qualifications and print media publishers vet the information that they put into their publications. They provide knowers with an assurance that the material presented is *credible* to some extent. This does not mean that the systems are without fault, nor does it mean that the information is always *true* or *reliable*, but it does mean that someone is 'standing behind' the knowledge presented.

As we all know, however, the internet is not like this. The ease of access means that nearly anyone can add their thoughts, ideas or 'knowledge' to the repository of knowledge that is the internet. This is a well-known issue with social media sites like Twitter and Facebook, and recent data suggests that, in the US, more people get their 'news' from social media sites than from printed newspapers (Shearer). The graph on the right shows how US citizens consume news.



■ How US citizens consume news

Source: Pew Research Center

Given the strict journalistic values around credibility and the complete lack of anything like that in the social media sphere, this is a major concern. Social media sites have basically one goal: to hold people's attention for as long as possible so they will see more advertisements. The credibility or reliability of the content is not part of this dynamic, and in some countries, like the United States, they don't have any *responsibility* to vet information ... nor do they (in the United States anyway) have any *responsibility* to vet information disseminated on their networks (Wakabayashi).

The freedom of individuals to post whatever they wish (within existing frameworks of 'freedom of speech') means that we are exposed to content that may or may not be true, leaving individuals to make their own decisions about whether it is credible or reliable. This sounds like exactly the sort of thing we should want – the ability to make free and informed decisions for ourselves. However, as we will explain later, the biases and prejudices inherent in face-to-face society find their way onto the internet and the ways in which social media affects us in non-conscious ways are numerous. The recent debates over the role of 'fake news' in the US elections of 2016 and the UK referendum on whether the UK should leave the European Union are clear examples of how easily people can be swayed (in both directions!) by clever, subtle and misleading uses of the dissemination of information on the internet.

YouTube's recommended video algorithms are an interesting case in point. Initially, YouTube's 'next up' algorithm ranked videos according to one data point – view counts – so the most popular videos were presented to the viewer to watch next. However, the algorithm has shifted towards matching us to videos that will interest us in order to prolong our viewing time (Cooper, Lewis). The more time we spend on YouTube, the more advertisements we will see and the more money YouTube makes. The effect of this is two-fold: firstly, our 'knowledge' base is severely limited as videos outside our 'interest' will not be presented to us. Secondly, content which is watch worthy, rather than 'true', tends to be promoted. The 2016 US presidential election was tainted by accusations across the political spectrum that people were fed lies and falsehoods or 'fake news'. Videos promoting all sorts of scandalous and sensationalist stories about both presidential candidates were being recommended by the algorithms without any

ACTIVITY

Think about how you construct your political beliefs.

1. What are your sources of political knowledge? Do you use mainly print media or online sources?
2. Monitor your internet usage for one day. How often did you click on the 'next video' or the 'recommended' posts on your social media? Why do you think *that* video or post has been recommended to you?

view to the truth of their content. Despite this, people watched, perhaps because the sensationalist nature of the content and the presentation of that content made them very 'watchable' and the more watched they were, the higher up the 'recommended' list they climbed.

Bias and technology

In early 2018, Google Translate suddenly found itself being challenged for **propagating** social stereotypes. One example was in translating phrases from languages which have gender neutral pronouns into English, which does not. So, the Turkish '*o bir muhendis*' was translated as 'he is an engineer', while '*o bir hemsire*' came back as 'she is a nurse'. Turns out the search engine Bing was also not immune, translating 'the table is soft' into German results in *die Tabelle* which is the *feminine* noun referring to a table of figures, which is not at all the meaning of the original (Olson).

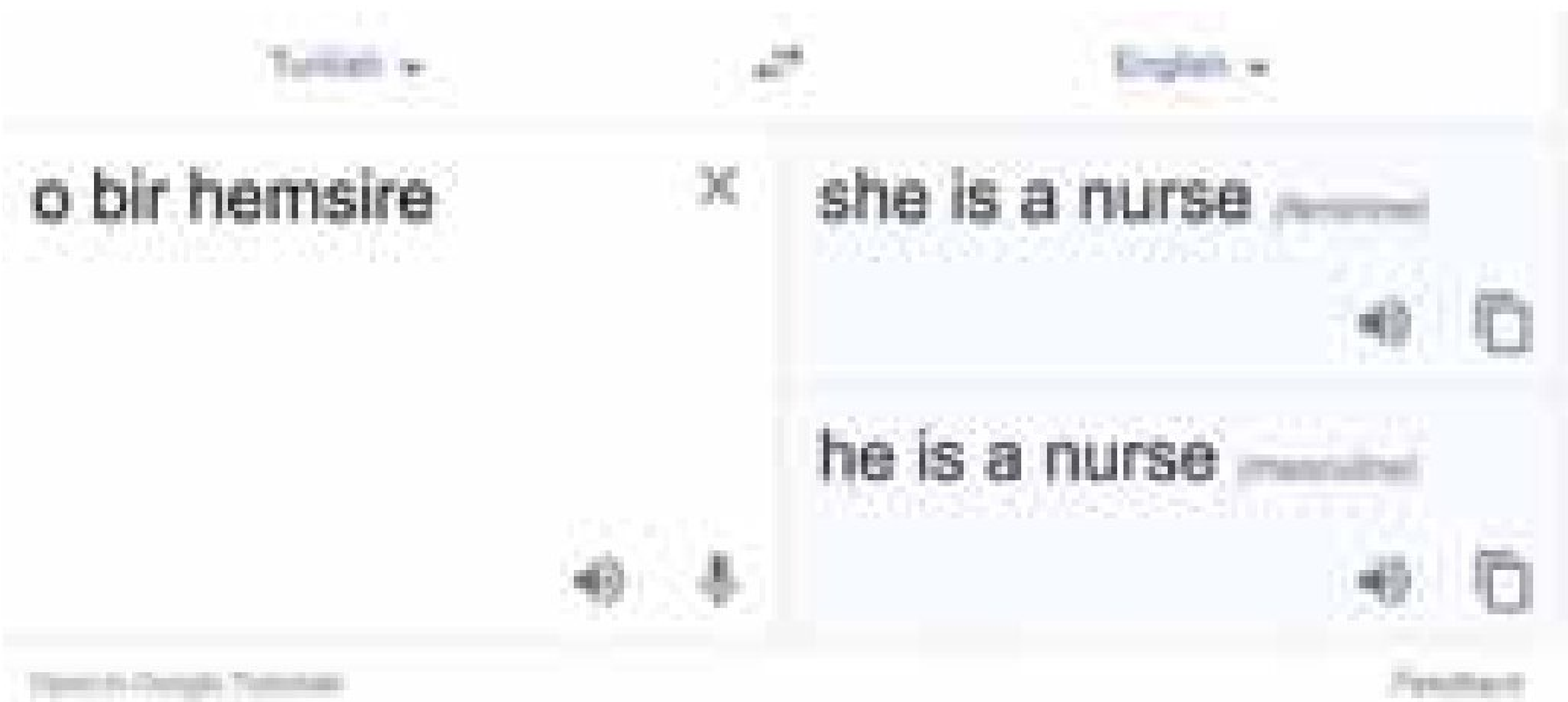
◆ **Propagate**: A verb meaning to pass on or distribute more widely an idea or concept.

So why would Bing change the meaning and include a *feminine* noun? Why would Google have returned 'she' for nurses and 'he' for an engineer? One reason is the rules written into how the programming works. The translation programs are not one-for-one translations, rather they use a process called 'word embedding', where they look at various uses of words and link words together by the words they tend to be associated with. In the real world, words like 'nurse' are usually associated with words designating women, so in processing a translation the algorithm feeds back the English word 'she' in relation to the Turkish word '*hemsire*' ('nurse').

KNOWLEDGE QUESTION

Can algorithms be biased?

Perhaps, you say, this is just a reflection of the actual use of the word so is a reasonable translation. However, the social context in which the word 'nurse' became identified as a *feminine* role is itself the result of deeply embedded social dynamics which are today considered prejudiced. The problem is more sinister in the case of 'engineer'. Women have traditionally found it a challenge to break into a number of professions, like engineering. Developing algorithms which don't take these social dynamics into consideration could be seen to propagate unconscious biases and prejudices. Sexist assumptions are made clear in the example of 'the table' being translated as 'die Tabelle'. The reason why is because of the word 'soft', which has been given a feminine interpretation. The algorithm associates 'soft' with women, so finds the feminine noun *die Tabelle* and uses it, although this destroys the original meaning of the English phrase.



■ Google now translates non-gendered pronouns into both masculine and feminine

How does this bias occur? We wouldn't suggest that the machines themselves are prejudiced or discriminatory; in fact, one of the reasons why we have hope in technology and computers is so we might become *less* prejudiced as a society. The problem, of course, is that the values and biases already in the human population get encoded into the programs and technology that *we* create.

Indeed, instances such as these aren't isolated to the web. The development of photographic film processing by companies like Kodak, for instance, was historically calibrated towards lighter coloured skin tones, which meant that special filters and processing was needed when photographing people with darker coloured skin (Lewis 2019). This underscores how a social bias (valuing lighter skin over darker skin) can be encoded into a piece of technology (film-processing).

Assessment advice

When considering what sorts of objects to consider when completing your TOK exhibition, you want to be thinking about the beliefs and ideas *behind* the object. The 'Shirley Card' might be one example. Here we see objects which illustrate the way in which social values and prejudices might impact technology and vice versa.

Kodak, a photographic company in the United States, calibrated their film development process towards whiter skin tones. Kodak produced a 'colour guide' with its film processing machines so technicians could test whether they had developed the film properly. However, only women with light skin tones were on the card. This translated into technical difficulties for photographers when trying to photograph people with darker skin and often required different processing techniques or required the use of coloured filters on the camera's lens. It wasn't until 1996 that the company provided cards showing a more diverse range of skin tones. Use the QR code on the right to read an article about Kodak's Shirley Cards.

The non-conscious value embedded in this process was that having darker skin was something outside the norm. As society changed, so did the film development process: in 1996 a new version of the colour testing cards were included with the colour guide, showing a wider diversity of skin tones (Ollinger).

IA prompt

21 What is the relationship between knowledge and culture?

IA prompt

35 In what ways do values affect the production of knowledge?

Military and police protective equipment might be poorly designed for women's bodies

Gender bias can also be found in the *objects* and processes developed by our society – another instance of bias in 'technology'. From the size of bricks (just about the right size for a grown man's hand) to the size of the A1 architect's portfolio (just about the right size to tuck under a grown man's arm), the objects we've created for ourselves often are really created for the average man. While bricks and portfolios are not life threatening, there are other technologies that might have a life-threatening bias built into them. The standards for protective clothing, safety equipment and even police body armour in the EU are designed around *men's* shapes and sizes, and differences in the shapes and sizes of women's torsos, legs, hips and waists might mean the equipment is inadequate even at smaller sizes.

Google's voice recognition is 70 per cent more likely to recognize male voice patterns. Crash tests for cars use crash test dummies modelled on the average male, meaning that women are 47 per cent more likely to be seriously hurt in a car crash – the cars simply are not designed to protect drivers with smaller bodily dimensions (Criado-Perez). Other examples of gender bias in technology include the size and shape of space suits, scientific equipment and military equipment (Prasad).

Other examples of bias entering into the algorithmic thinking of our computers include Facebook's software disallowing certain Native American names, like 'Dana Lone Hill' or 'Lance Browneyes' because they were thought to violate Facebook's 'real name' policy (Bloomberg). The algorithms in charge of screening Amazon's job applicants were programmed to 'learn' from successful resumes over the previous 10 years, in order to automate the initial screening process for new applicants. New applications had always tended to be from men, a reflection of the social fact that more men were in the tech industry, especially in the early years. However, the algorithm then learned to deselect resumes which contained the word 'women' (as in 'President of the Women's Debate Team') or applicants from all-women colleges. Amazon has since abandoned this automation project (Dastin).

So how does bias find its way into various forms of technology? The important thing to remember is that *human beings* begin the process. Any new technological development will have been conceived, designed and implemented by human beings with whatever background beliefs and ideas they have. They may not *consciously* build their bias into the new technology, but their background beliefs and unconscious biases may be reflected in those products.

Big data

The advent of the 'digital age', where we are able to store a massive amount of data has ushered in a new form of analysis thought of as 'big data'. This refers to diverse sets of ever growing 'raw' data that we have the ability to create and store, but which is unanalysable by traditional human processes. It is unanalysable simply because of the volume of it, the speed at which it grows and the diversity of data points. (It might be helpful to review the differences between *data, information* and *knowledge*.)

For example, every time we visit a website, a wealth of data is collected about our visit, including how much time we spent on it, how many clicks we made while there and what we clicked on, and the unique internet address we used to arrive at the site. This data is collected every time anyone visits any website. Internet companies like Google collect this data and use it to create a digital version of *us* which they can then pass on to other companies who might try to sell us things. In 2008, Google was collecting 20 000 TB of data on its users every day. In 2019, US retailer Walmart was collecting 2500 TB of data on its customers *every hour* (Pierce, *et al*).

The diversity of the data is also important. For instance, a doctor might collect a lot of data about their patient's brain, but this will only be 'a lot of data'. It becomes big data when the information is linked to the patient's wider medical records, and data about where they lived and then perhaps the amount of sunlight for that location, and when the same data is available for many other

ACTIVITY

1. Carry out some research into the data that different organizations hold about you. Does anything surprise you? Why is this data so valuable?
2. If you have a Google account, click on the QR codes to learn more about how to delete the search and location data that Google holds about you.

people. The types of questions we can ask of the 'big data' sets then might include questions like, 'What is the relationship between the amount of sunshine a patient receives and the progress of their disease?' The information provided by the big data, then, is of an entirely different sort than previously available and could provide new insights and connections never before imagined.

The use of this big data, however, raises difficult questions. In Chapter 10, we will discuss the fact that at the individual level, human behaviour is difficult to predict, but at the *aggregate* level (considering large human populations and developing how people *tend* to behave) humans are more predictable. Disciplines like economics and psychology rest on assumptions that people's behaviour can be predicted to a large degree. But when the information about how people in a population *tend* to behave is used to predict an individual's behaviour, issues arise.

CASE STUDY

Sentenced by software

In 2013, Eric Loomis was convicted of running away from police and unlawfully driving a car. When sentencing him, the judge used information derived from a computer program which analysed data about *people like* Loomis, including data about age at first arrest, prior arrest history, employment status, community ties, substance abuse, criminal associates, educational status and residential stability (Kowalkiewicz). The analysis showed that *people like* Loomis tended to reoffend, and so the judge gave Loomis a longer sentence.

ACTIVITY

1. Could the judge be said to *know* that Loomis would reoffend, given that the data suggested people in similar positions tended to do so?
2. Couldn't Loomis have been in the population of people with all the same data points, but who *didn't* reoffend?
3. Was it *fair* for the knowledge related to others to be applied to him?
4. In what ways does your school conduct testing that compares your individual results with the results of other students *like* you? What decisions does your school make based on that comparison?

KNOWLEDGE QUESTION

Is big data creating a new cognitive paradigm?

The use of big data analysis is also used to help colleges and universities make admissions decisions, where they use information about an applicant's internet use, email open rates and social media engagement. Again, these institutions develop a personal profile of an individual then compare that profile to the data about people with similar profiles, to see what *those* students did (for instance, did they accept the place the university offered? Did they stay enrolled and get their degree? Did they do well?) and then decide whether to accept them (Legatt).

Because so much of our life involves engaging with technology, we can hardly do anything without creating more data. Even wandering around with a smartphone can create data about where that phone has been. The more big data collected on *people like us*, the more others might be able to 'know' what we are like and what we are likely to do in the future. Is it possible that information about us gathered from big data is more reliable than what *we ourselves* say about ourselves?

The advent of 'big data' and the power it offers provides companies and whoever can access the data to analyse it with an entirely new viewpoint or perspective in the world. The information and correlations being uncovered by 'crunching the data' will undoubtedly affect us more and more as increasing amounts of data about us, and everyone around us, is collected and used to provide predictions about how we behave.

The internet is a hugely beneficial tool in modern knowledge; we are able to both publish our own knowledge and are able to find the world's knowledge in a second. We can directly engage with the ideas from anyone around the world and push our own knowledge to everyone on the planet. No longer do we have to rely on experts to disseminate their knowledge through universities or print publications, where our access was filtered and controlled. This *democratizing* effect on knowledge (creating a space where everyone, in theory, has direct access to knowledge), has been as revolutionizing an effect on what and how we know in the modern world as Gutenberg's printing press was in the Renaissance and the Age of Enlightenment.

However, there are major tensions when considering just how free our access to this knowledge actually is. On the one hand, our ability to get to the knowledge is massively fixed on a very low number of access points. Since 2010, Google has enjoyed a 90 per cent market share for search engines and 63 per cent of the sites on Google are from the USA (Gordon). While not every use of the internet *starts* with Google, just think of the last time you typed an internet address into the URL bar of your browser; how often do you instead type a couple of keywords into Google, find your site and then head off into the internet? It is also likely that those sites were heavily influenced by only *one* of the world's cultures: the USA. The algorithms for the search engine of this *one* company are massively influential in our internet experience. Furthermore, companies spend much time gaming the system so that their company is shown at the top of internet searches. These facts alone are good reasons to challenge the idea that the internet is a step towards anything like free and unfettered access to the world's knowledge.

Methods and tools

We might break down the influence of technology on our knowledge into three broad categories: creation, storage and dissemination.

Creation of knowledge

One might argue that the construction of knowledge, in nearly every case, requires some element of technology. From complex technology, like microscopes to study cells, telescopes to study the stars and computers to analyse data, to less advanced technologies like pens and paper, our ability to construct knowledge is inherently tied to things we've created for the purpose of finding new knowledge about the world.

Since the Enlightenment, the basic premise regarding what makes robust 'knowledge' has much to do with *observational evidence*, and technology is making a huge impact on human ability to create new and ever-more powerful observations. In the seventeenth century, Antony Van Leeuwenhoek built on existing knowledge using magnifying glasses and other lenses to fashion the first recognizable microscope, allowing us to first observe cells (Cox). A further advancement occurred 350 years later, with the invention of electron microscopes, which enabled us to observe individual atoms (Cordouan Technologies).

There is a similar story of development to be told about telescopes (like the Hubble Telescope currently orbiting our planet), X-ray and other internal imaging machines such as MRI (magnetic resonance imaging) and other processes which provide *observations*. The common theme is that the technology builds upon itself in a way that means there are a large number of other elements required for the 'observations' to be produced in a way that researchers find useful. High powered computers, complex laboratory environments and even space technology all contribute to producing usable *data*.

Technology provides observational evidence in a way that makes up for the relatively narrow human sensory experience

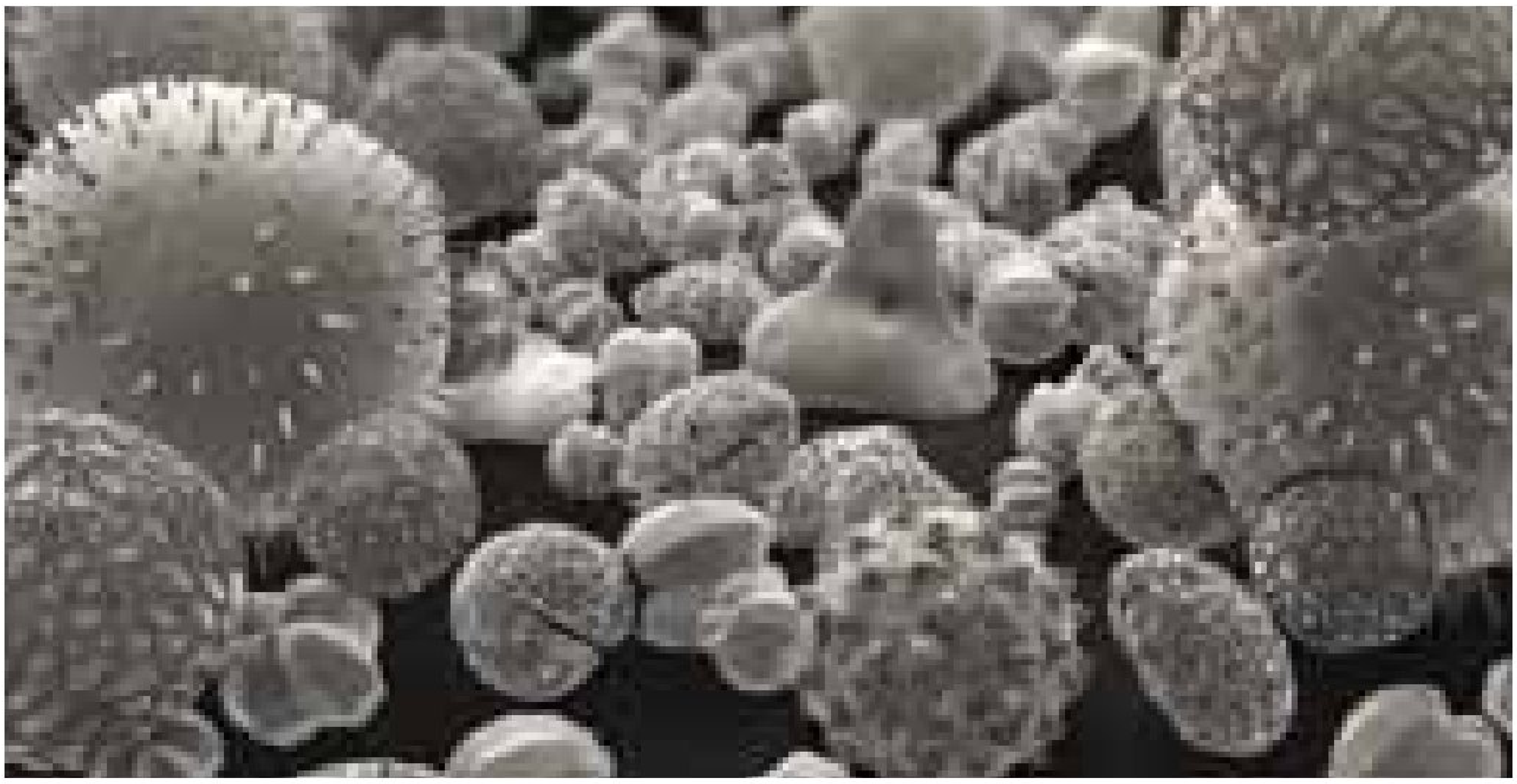
ACTIVITY

Use the QR code to research how electron microscopes work. They are fundamentally different from the optical based microscopes that you're used to from your science labs.

1 Would you say that the electron microscope provides genuine 'observations' of the sort that is prioritized by the scientific method? (See Chapter 9 to learn more about the scientific method.)
2 What *other* technologies were needed to develop the electron microscope?
3 Do the environments required for the electron microscope to work (like the specimen being in a vacuum) change the nature of what is being observed?
4 Do you think that the difference in how traditional microscopes and electron microscopes function lowers the reliability of the science produced by them?
5 Do you think that the limited access to electron microscopes limits the construction of knowledge? Who gets to use them? Does it matter that they are relatively hard to find and use?

KNOWLEDGE QUESTION

How do the tools that we use shape the knowledge that we produce?



Electron microscopes allow us to visualize objects far too small for the human eye to see. This image shows pollen

DEEPER THINKING

Data and technology

Does it make sense to call what we learn from highly technical machines, used to create new observations, 'data'? We differentiated between 'data' and 'information' earlier, suggesting that information was a processed form of the data. The output of an electron microscope has been *processed* through the use of computers and all sorts of complex technology, translating the input into a visual representation, so how can this be 'unprocessed' data? The many decisions about *what* and *how* to create these machines might suggest that there are other sorts of data that the machines are simply not calibrated to 'see', in which case we are not getting *all* the data. For example, electron microscopes use electron beams, so only can capture what the electrons can interact with. We are only getting the data that it is *possible* to get with the machine we have created.

Does this influence what you think of the status of these machines as producing useable information upon which to build knowledge?

Storage of knowledge

Without the means of preserving knowledge, the only way to store it previously would have been to memorize it and the only way to disseminate it would have been to *tell* others. Often societies are called non-literate to signify that they lacked the knowledge and technology to develop a written language, but this term often implies that a society lacks knowledge more generally. This is not necessarily the case, however. Many societies, early in their development, established a rich and powerful *oral tradition* where knowledge was stored in the stories and practices of the community, rather than in books. In Islam, the *hafiz* or *hafiza* is the term for a man or woman who has memorized the *entire* Qur'an (some 80 000 words), a powerful illustration of the role of the oral tradition. A society's knowledge would be preserved, so long as these oral traditions were passed on verbally, but they would also be preserved in the practices and rituals of the society. These forms of storing knowledge are discussed further in the chapters on Indigenous societies and religion.

The history of technological knowledge storage starts about 20 000 years ago with the very first attempts to store information as nicks on what is known as the Ishango Bone (Marr). It is thought that the practice of writing was independently developed in four cultures (Diamond 218). When you think of it, this is a remarkable step and implies a huge leap in technological know-how. Firstly, the culture has to make the cognitive leap tying verbal sounds (language) to written symbols, and to suggest that the spoken sounds *the chair is blue* and the written signs (words and sentences) 'the chair is blue' are related to the fact that there is a blue chair.

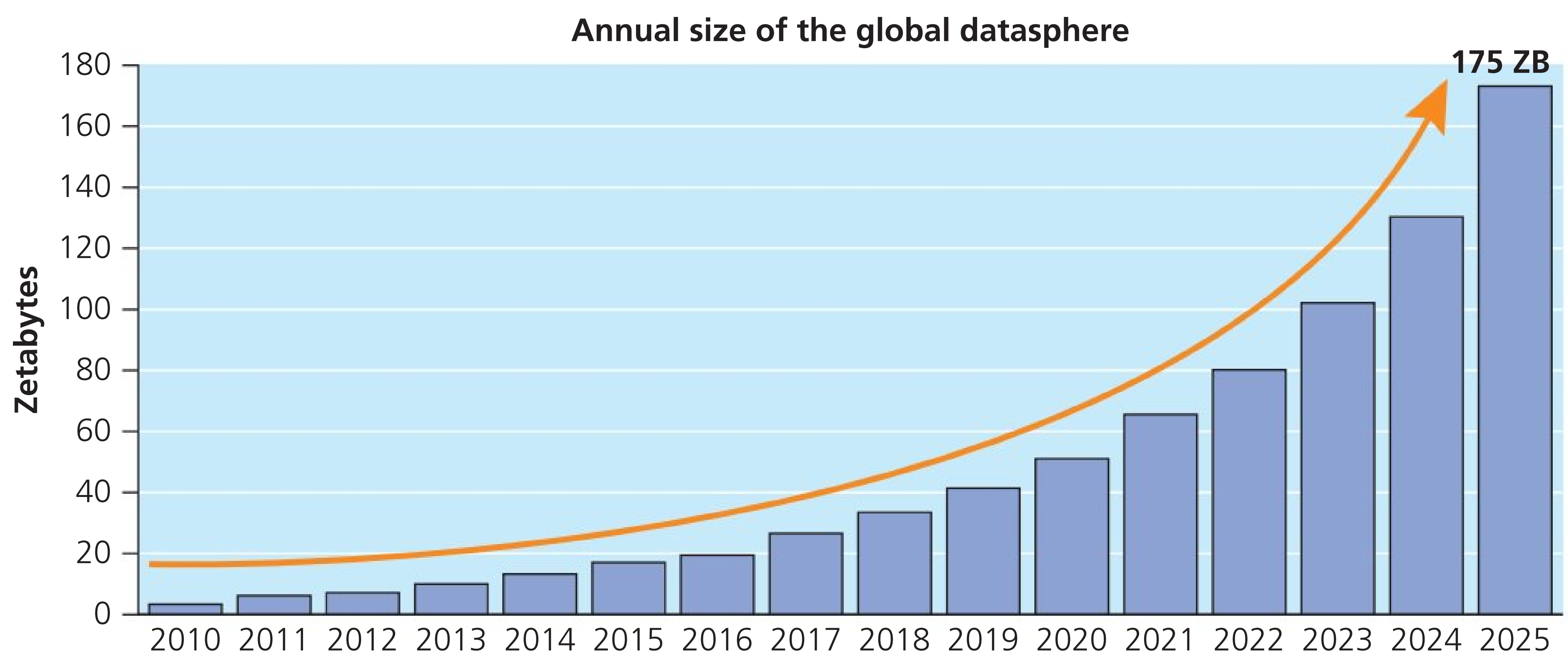
Secondly, there has to have been a significant technological leap for these languages to have developed as well; objects had to be created which would enable us to write. Instruments like the *stylus* used in the early Mesopotamian culture of Sumer and the *papyrus* (the first form of paper) of Egypt were both developed in the fourth millennium BCE and kick started a revolution in the storage and transmission of knowledge. These new instruments were crafted for the purpose of knowledge storage and transmission and represent technological advances which transformed our protection of knowledge and our access to it. No longer did knowledge need memorizing; instead it could be written down and passed on to others. Interestingly, the first knowledge captured seems to have been relatively mundane and practical facts about accounts, business interactions and politics. Seemingly, the genuinely *important* knowledge of the cultures (religious beliefs, for instance) were still transmitted orally.

In the millennia between then and now, the processes by which we record knowledge have become increasingly sophisticated, allowing for ever more content to be created and stored. Table 3.1 describes a few of the key moments in that history (this list is *not* complete!) ('The History of Computer Data Storage', 'Memory and Storage').

Table 3.1 Key historical dates in the recording of knowledge

Date	Type of knowledge recorded
4th millennium BCE	• Cuneiform writing (Sumer) and papyrus (Egypt) developed • Scrolls made from animal skins are used instead of paper, where paper is not available (particularly in Rome and Israel) • Wax tablets also used in writing
1st–2nd century CE	• Paper is developed in China
13th century	• Paper becomes widespread in Europe • China and Korea develop the first movable type used in printing
15th century	• Johannes Gutenberg develops the first reliable movable type printing press • Printed and bound books become the norm
1932	• Magnetic drum memory developed with a capacity of about 10 KB
1956	• The IBM Model 350 is developed – the first hard disk drive with about 5 MB capacity. This would hold about one text file of the Bible (4.5 MB)
1972	• IBM creates the first portable memory storage technology, the floppy disk. It holds about 80 KB

Date	Type of knowledge recorded
1980	• The IBM 3380 has the first hard disk with more than 1 GB of storage. It is the size of a refrigerator and weighs 250 kg. It costs between $80 000 and $140 000 USD. It can hold about 227 text file copies of the Bible
1997	• Writable compact disks with 700 MB are introduced
2000	• The first USB Flash Drives with 2–4 GB storage introduced
2006	• Amazon introduces cloud-based storage, followed by Dropbox and Microsoft OneDrive in 2007 and Google Drive in 2012
2007	• Hitachi introduces the first 1 TB internal hard drive. It is about 14 × 10 × 2 cm big and weighs less than a kilogram (compared this with the 1980's IBM 3380!) • Whereas the IBM Model 350 could just about hold *one* 4.5 MB text file of the Bible, the Hitachi 1 TB can hold nearly 2.4 *million* copies of the Bible
2010	• As much data is now being created every two days, as was created from the beginning of human civilization to the year 2003 (Marr)
2019	• It is estimated that there are 65 billion web *pages* indexed by Google and about 1.7 billion discrete *websites*



■ The amount of data created and stored grows rapidly each year

Source: Data Age 2025 using data from IDC Global DataSphere

ACTIVITY

1 With all the knowledge, information and ideas that are now stored digitally on computers and on the internet, does this mean that the overall value of knowledge or information is less?

2 What processes do we have to guarantee that the knowledge that we 'take in' is reliable?

3 How effective do you think a class like this Theory of Knowledge course is at helping knowers make decisions about what they should accept as 'knowledge'?

Dissemination of knowledge

Knowledge being stored does of course provide the opportunity for it to be distributed. Here, we will look in detail at two of the developments listed in Table 3.1, both of which represented great leaps forward in terms of the ease with which data is disseminated.

In the middle of the fifteenth century, Johannes Gutenberg built on the existing technology of the printing press (where inked plates – often woodcuts – would be pressed onto paper, transmitting an image or words onto the paper) to develop a movable type press. Now, rather than an expensive and unchangeable wood cut, printers could use individual letters over and over again to print any sort of document. Clay movable type had been invented by earlier Korean printers, but it broke easily during use. Gutenberg's use of lead type was the industry norm well into the nineteenth century.

Given more recent advances, we might think that the importance of Gutenberg's printing press is limited, but its importance cannot be overstated. After Gutenberg, the actual process of storing an idea, in writing, on a page was quick and far cheaper and as the number of books grew, so too did the number of ideas and the 'amount' of knowledge. Gutenberg's invention meant books could more easily be created, thereby storing and transmitting the knowledge previously stored

Learner profile

Communicators

How has technology changed the way we communicate our knowledge to others?

in handwritten and hugely expensive manuscripts. The proliferation of books available after Gutenberg saw literacy rates begin to rise (previously the manuscripts were largely only written by and read by the educated clergy and the extremely wealthy). The knowledge transmitted created the conditions under which the European Renaissance and the Enlightenment could take hold. These periods saw a huge growth in knowledge and culture (and not only in Europe), resulting in the modern world we see today.

■ The Gutenberg Bible, one of the first books to be mass produced. To what extent can we say that Gutenberg's invention shaped the modern world?

The invention of the internet during the twentieth century, however, has seen a revolution in knowledge storage and transmission which outstrips even Gutenberg's printing press. It was 1965 when the first two computers communicated through the technology later used in the internet (Zimmerman and Emspak). Within 32 years, only about 2 per cent of the people on the planet were internet users. That number grew to 22 per cent in the 10 years after that. During that same 10-year period, the percentage grew from 11 per cent to 62 per cent in developed countries. In terms of how much *data* is now stored on the internet, we enter a world of numbers that we can't really understand. In 2014, it was estimated that there were 10^{24} bytes on the internet, which is about a million 'exabytes', where *one* exabyte is a billion billion bytes (Pappas). As of September 2019, it is estimated that there are 65 billion web *pages* indexed by Google ('The size of the World Wide Web (The Internet)'), which translates into about 1.7 billion discrete websites ('Total number of Websites' 2019).

This data shows the massive success of this technology and only hints at the amount of data that it can collectively store. One could argue that our *collective* memory is expanding too. In Chapter 11, we will explore the role journalists play in the collection and recording of facts and information which can then be processed by later historians. The internet might also be considered as *where* we as a culture store our own record for future historians. All the tweets and posts and blogs and vlogs and podcasts and uploads and downloads represent pretty much everything we as a species know. Just as writing and books removed the need for us to *memorize* our culture's history in order to see it preserved, perhaps now the internet acts as an external memory source, not just for each of us as individuals but for us as a culture.

KNOWLEDGE QUESTION

How does technology extend or transform different modes of human cognition and communication?

We say 'a culture' here as if we are living in *one* culture. This could be seen as insensitive to the great variety of the world's cultures, but we say one culture here for a reason. The history of civilizations on our planet seems to be a story about societies and cultures becoming increasingly integrated and interconnected and *uniform* as they interact and share information and knowledge. The data about the numbers of internet users suggest that we have entered a new phase of global integration. While there might be a huge variety and diversity of 'communities of knowers' on the internet, and our individual experiences of the internet might vary, there nevertheless is *one* internet, and the rules and processes for putting information and knowledge onto the internet are necessarily uniform. We do not simply 'upload our thoughts' to the 'net – we have to access certain technologies to turn our thoughts into *electronic data* so that it can be put onto the internet. Companies like the various internet providers and YouTube, Facebook, Google, Twitter, Amazon, Apple and Netflix are the gatekeepers of the world's use of the internet, and the decision makers at these companies represent a vanishingly small percentage of the total users of the internet. Their influence on the internet and its status as the 'collective memory' of the species then might be wildly disproportionate. This represents a huge amount of social and political power that translates directly into a discussion of the old saying 'knowledge (and access to it) is power'.

An interesting example of this comes from Wikipedia, the internet's encyclopedia and an incredibly successful experiment in the notion of ensuring that our collective knowledge is constructed and preserved. You're no doubt well aware of the dangers of using Wikipedia as a primary source, but many consider it an excellent first port of call on the internet when searching for information. Even here, however, we might find that there is an *undemocratic* element when you consider that 35 000 of the original articles have been written and over one third of *all* the over 5 million pages have been edited by a single individual, Steven Pruitt from Virginia in the USA (CBS News). In 2017, *Time* magazine named him one of the 25 most influential people on the internet and he is currently working with Wikipedia to overcome the gender imbalance as part of their 'Women in Red' campaign (*Time*).

As *knowers*, then, the technology of the internet provides individuals with the ability to join nearly any sort of knowledge community they wish. Individuals can even earn university degrees online, thereby giving themselves access to those knowledge communities traditionally limited to those with a physical university education. Without leaving your house you can access knowledge about how to play guitar (even how to *make* a guitar), or how to organize a protest. You can access facts and knowledge coming from archaeological digs, find data to help you analyse economic trends and the very latest knowledge about medical advances.

KNOWLEDGE QUESTIONS

Does the fact that so few companies manage the vast amount of knowledge on the internet have a detrimental effect on the *quality* of our knowledge?

In what ways might our knowledge be unfairly shaped by these companies?

Ethics

In many cases our developing technologies require an engagement with explicit ethical considerations. Two questions seem paramount here:

- First, how shall we decide on what ethical values a technology should have? This is not to suggest that the technology itself has any sort of *ethical beliefs*, rather we wonder in what ways the technology, its processes, the way it engages with our world and the 'decisions' it makes are manifestations of the ethical beliefs of the creators.
- The second question is a straightforward *ethical choice*, namely 'should we be developing certain forms of technology'?

The second question is one that is rather more general and pushes us to the boundaries between TOK thinking and ethical deliberation. We will explore the first question first, and then offer a few remarks on the second.

What ethical principles should our technology follow?

The challenges we've already discussed in terms of the bias and prejudice creeping into technology will undoubtedly influence even the most carefully designed systems. A genuine tension then, in the development of new technology arises between our own ethical value systems and the technology we develop. It is a **truism** to say that 'different people have different ethical values', but it is not at all clear what ethical values our technology *should* have.

Perhaps you might want to claim that our technology shouldn't have *any* values written into it. We've seen, however, that the technology we build and the processes we program into it contain the sorts of biases and prejudices that already exist in our social and political environments. We've considered the biases that sneak into the technology in subtle and non-conscious ways (like body armour not fitting women's bodies properly or the chemical processes involved in film developing being calibrated with lighter skin tones in mind). However, the subtlety and the non-conscious nature of these biases are exactly what makes them so **pernicious** and damaging. We've suggested that, although the technology itself might be thought to be 'neutral', there are values and practices built into them.

◆ **Truism**: A claim that is obviously true and doesn't therefore claim to say anything new or anything that wasn't already known.

◆ **Pernicious**: Something that causes damage but in a gradual or subtle way.

A focus throughout this chapter has been on technologies that demonstrate some sort of 'thought process' and some level of autonomy when it comes to *acting* in relation to those thoughts. Whether we consider these processes a reflection of genuine thought or whether we think of these processes as only imitations of human thought, the fact that the technology will be exhibiting free behaviour in the world raises further questions. If our technology has real-world effects on people's lives, then we must consider what sorts of ethical principles or theories we want to use to govern those effects. If our technology was *only* involved in translating language, we can adjust for prejudice, but when our technology is making its own decisions, in other words as they begin to act more *autonomously*, then we need to think carefully about what sorts of general rules of behaviour we program into it.

We'll discuss two distinct categories of autonomous technology. The first actively engages in moral (or immoral) behaviour as an extension of human action already decided upon. In this category we might include things like police or military recognition software used in policing or war technology. The second engages in its own behaviour and must be prepared to act in ways which would be considered 'moral' (or immoral) when the situation calls for it. In this category we'll include autonomous vehicles.

Let us consider technology in the first camp. Rather than being 'neutral', facial recognition programs are actively out to *find people*. Police and border patrol officials use computers to visually identify faces and compare them to a database in order to identify people they are looking for. This behaviour is based on an ethical principle which we are largely happy to accept, namely the principle that the 'police have the right to find and detain criminals'. Facial recognition software is merely an extension of this. However, there are significant differences between flesh-and-blood police doing their job and computers doing it for them. A real police officer at the border will look at you, see that you do not match the criminal they is looking for, then forget your face. Computers, though, will never forget your face; even though you've done nothing wrong, you will have just become part of a database somewhere, perhaps to be used later for some other purpose. This could be seen as a violation of your rights, if not now, then perhaps in the future when that data is used against you. The technology seems to be harmless at the beginning, but quickly finds itself in a troublesome ethical domain. Take facial recognition programs, add in the bias and prejudice that we have seen creeping into the technology and there is genuine cause for concern.

ACTIVITY

1. Research some of the ethical considerations of automated facial recognition software. Try entering 'ethics of facial recognition' into your search engine.
2. Try to construct an ethical principle which you might appeal to, first to *justify* the use of this software, then an ethical principle which you might appeal to to *challenge* the use of the software.
3. In cases where there are conflicting ethical beliefs, how do you think we decide which principle should take priority? What methods can be used to decide what is the *better* principle?

Note: Take care not to get caught up in a debate about whether the facial recognition software 'is ethical'. You could easily argue both sides of this position. The TOK approach is to explore the construction of the principles used in such a debate and to explore what happens when various principles conflict.

Now consider if we were to give machines the ability to identify *categories* of people rather than specific individuals. Suppose we programmed machines to engage with enemies in a combat situation, in order to save the lives of real human soldiers. In this case, we would program our machines (robots) to identify enemy soldiers and engage them. Here again, the robots are already engaged in a morally difficult situation (war and killing), so they are *enacting* ethical principles already accepted by society; in this case, something like 'this war is just and killing enemies is ethically justified'. You may be uncomfortable with any ethical principles justifying war, but it has been a commonly 'accepted' practice in history. As mentioned in the activity above, *whether* war can be justified isn't our question in TOK. Instead we wonder about the role of ethical principles in the shaping of our knowledge in the world of technology.

The scenario of robots being engaged in war, however, is an entirely new facet to the age-old practice of war and requires careful thought. If visual recognition software is being used to allow the robots to identify and engage freely (without a soldier telling it what to do, as is the case currently with weaponized drones), then all the problems we've already discussed in terms of bias, prejudice and mistakes come into play. In this case, however, *people might die,* and civilians might be mistakenly identified as soldiers and end up being targeted. Civilians are often caught up in battle, sometimes purposefully killed, but, in a real situation with human soldiers, at least there is a real human being who can be said to be *responsible* for the mistake. This helps wade through the resulting ethical consequences.

If a robot makes a mistake, who is *responsible*? Are the software engineers who weren't even involved in the war to be held responsible for mistakes a robot running their software made? Are the civilian manufacturers of the robot, working in factories and laboratories far from the battlefield to blame? What about the commander of the unit who wasn't even on the battlefield and who had no direct connection to the choices the robot made? If *responsibility for our consequences* is an important part of the construction of our ethical principles, then the use of autonomous 'killer robots' seems to raise profoundly difficult questions.

■ To what extent can we talk about the ethics of warfare? How does the prospect of entirely autonomous military technology affect this?

Now consider a rather less dramatic, but no less troublesome example: autonomous cars. They are already on the road, though at the time of writing we are yet to see *fully* autonomous cars in widespread use (generally the autonomous cars of today have a driver who will step in the minute the car makes a bad choice). We cannot write a program for every event an autonomous car will encounter in real time, so developers must program these cars with general principles and routines that the car then employs when situations call for it. For example, the car wouldn't be programmed to 'stop at *that* red light, and *that* red light and *that* red light' for every red light in the city. Rather, it would be taught to identify *any* red light and given the *general* rule 'stop at any red light you see' and then we would let the car get on with the business of finding red lights. The first is a series of particular rules, the latter is a general or abstract rule. These general rules are what autonomous cars or other machines that must make 'decisions' are programmed with.

KNOWLEDGE QUESTION

Should we hold people responsible for the applications of technologies they develop/create?

What about the principles the car will employ when faced with a 'moral' decision, one that will have significant consequences for its passengers and others? Suppose, for example, the autonomous car has suffered catastrophic brake failure and so cannot stop. Suppose now the car is racing towards a busy intersection full of pedestrians. It is perfectly rational to suppose this sort of thing *could* occur, so programmers will need to give the car instructions about what it might do in these situations (especially if there is no 'safety-driver' sitting behind the wheel just in case this happens). Suppose that the car *could* avoid killing the pedestrians by swerving off the road and into a barrier, but at the risk of killing the passenger. What if the car simply coasted to a stop, but risked killing the pedestrians?

ACTIVITY

1. Consider the dilemma above. What would you instruct the car to do in this case? Use the QR code to read an 'Introduction to Ethical Theory' and think about which approach your choice best illustrates.
2. Now consider other ethical dilemmas like the one above, but with different specifics (perhaps there are more people in the car with the passenger, or perhaps the pedestrians are all parents with their children). Does the principle you chose in the first instance still seem like the right one to choose here?
3. What do you think this says about the challenges of developing ethical principles in general? What challenges for the development of technology do you think this raises?

What this example illustrates is that, like it or not, we cannot leave machines to make these decisions entirely on their own; they *need* the general principle programmed into them from the start. But *choosing* which ethical principle to give to the machine is not an easy question to answer. How should autonomous cars be programmed to make decisions in cases where any decision will inevitably lead to the death of others?

In the 1940s, science fiction writer Isaac Asimov offered three laws of robotics which have become something of an unofficial set of laws governing the programming and development of artificial intelligence (AI). Although Asimov was a science fiction writer, he wanted to suggest that robots might actually be the sorts of things which wouldn't necessarily rise up and kill us all, which was the common impression of robots in the writing of his time. Asimov suggested the laws as a framework with which we could think of autonomous robots as 'moral' beings. His three laws are:

1. A robot may not injure a human being or, through inaction, allow a human being to come to harm.
2. A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.
3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws (Salge).

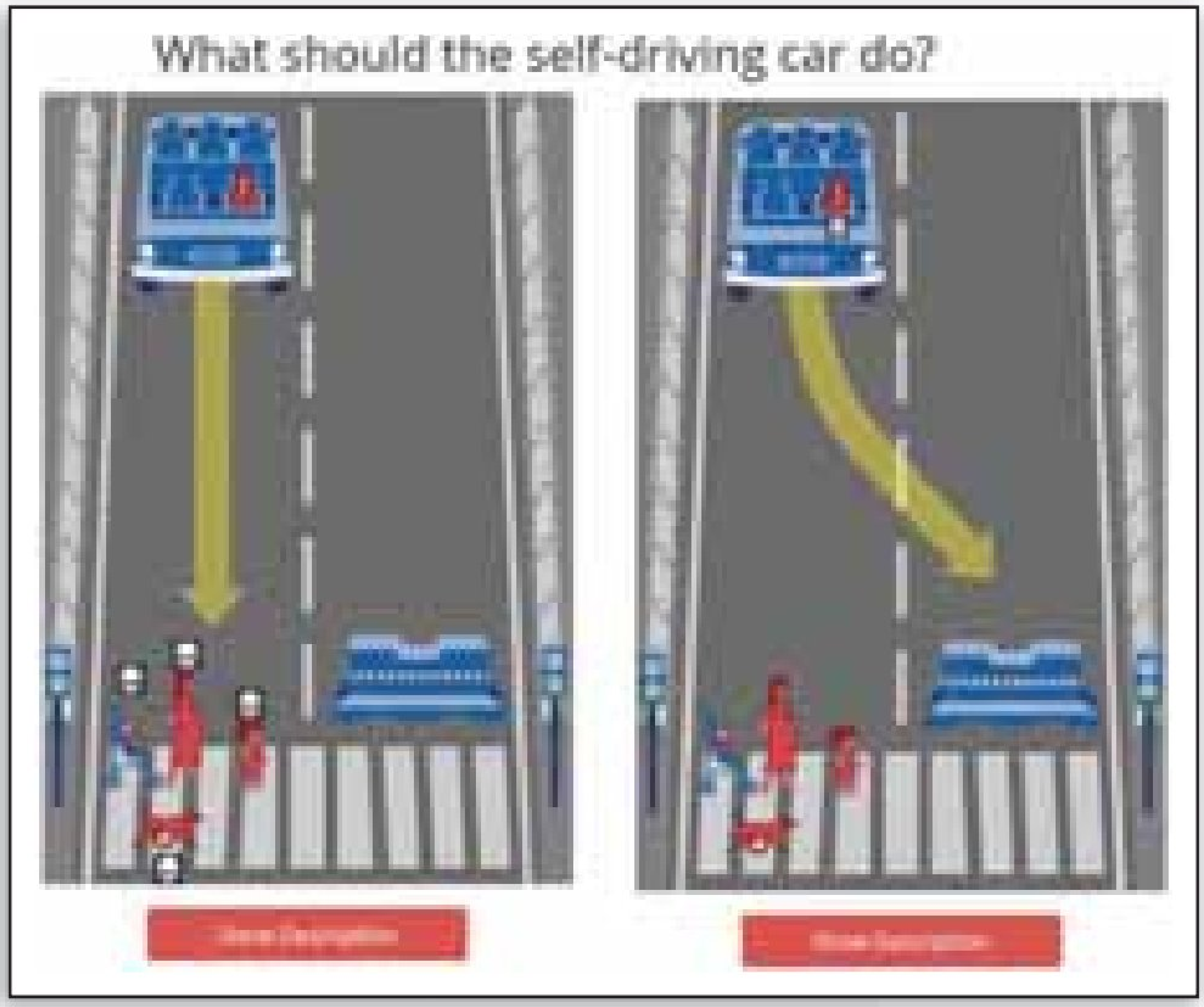
The rise of automated cars offers an interesting test case for these laws, because the scenario we outlined on the previous page would conflict with rule 1. The car cannot careen through the pedestrian crossing or ditch into a wall because of rule 1. If the programmers give the car the instructions to protect the passenger in this case, then rule 2 is broken.

Recognizing that the growth of autonomy in robotics will lead to the need to give them moral principles to follow, the Moral Machine research group at the Massachusetts Institute of Technology (MIT) is gathering information about how *humans* make ethical choices in the hopes that they will then be able to help machines make moral decisions. The group offers visitors to their website a number of scenarios where an autonomous car is going to crash but users can make one last-minute decision about the outcome. In the scenarios provided by MIT, for instance, the imaginary car has suffered sudden brake failure but can take one of two courses of action: does the car run through the crossing and kill the pedestrians or does the car swerve to avoid them but then kill the driver in the resulting crash? Do you program the car to always act in a way that minimizes suffering (consequentialism)? Do you tell the car to protect the driver in all cases (deontology)? Does your thinking change if you consider yourself as one of the pedestrians? How do you measure the consequences of either action? Are there certain things that the car should *never* choose? Use the QR code to read our 'Introduction to Ethical Theory' and remind yourself about the different theories mentioned above.

The ethical dilemmas being considered here are not unique to an autonomous car scenario – they would apply for any driver, or in any number of ethical situations. What the exercise does emphasize is that it will be necessary to provide some level of guidance for these cars as they make spur-of-the-moment decisions. Our own moral codes, then, will be extended into the world of AI. However, the world of autonomous technology raises difficult questions, largely because

ACTIVITY

1 Take the MIT Moral Machine quiz using the QR code and see what ethical intuitions you have.
2 What general principles do you think you were using when making the choices you did?
3 Would those general principles be the sorts of things you would want a car to hold?



What would you program the autonomous car to do?

they are of an entirely new *type* of ethical dilemma: beyond knowing what the 'right' course of action would be, we don't even really know *who* or *what* is *responsible* for that behaviour.

One response to this whole dilemma of autonomous machines being charged with protecting soldiers by doing the dangerous work of war themselves or having to make split-second decisions to save some lives at the expense of others, is to avoid the technology altogether.

Should we develop certain types of technology?

I have no right to judge the morality of napalm just because I invented it.

Louis Fieser

The question posed by the above heading is an excellent ethical question and one which we could look at from a variety of perspectives. Did we *really* need to build a bomb after we learned to split the atom and release massive amounts of explosive energy? Fritz Haber made a name for himself by inventing processes to synthesize ammonia from nitrogen gas and hydrogen gas, thereby making artificial fertilizer possible, *and* thereby saving untold numbers of lives by making food production so much more efficient. But did he *really* need to then go on to develop processes to weaponize chlorine gas during the First World War, thereby killing tens of thousands of soldiers? What about Louis Fieser, who discovered a process to synthesize vitamin K, a blood clotting agent, which helps newborn babies avoid bleeding to death immediately after birth. Why did he need to go on to work with Dow Chemicals to produce a better, more effective napalm (the chemical that is used in flame throwers, firebombs and other incendiary devices)? Fieser didn't seem to have any ethical concerns about this technology, arguing 'I have no right to judge the morality of napalm just because I invented it' (Neer).

As a question, 'Should we develop certain types of technology?' really belongs *within* the discipline of ethics and philosophy. The TOK issues here would have to do with how such questions are answered, how the ethical principles are developed and perhaps the ways in which ethical principles limit the construction of new technologies or limit the growth of scientific knowledge. In the final analysis, it seems unrealistic to say 'no' to a new technology *before* it is invented. Perhaps the best we can do is remain reflective in our uses of the new technologies and think critically about the ethical principles we draw on to guide our use of them.

Conclusion

A world without technology would really be nothing other than the *natural* world. Human beings have been called *homo faber* ('man the maker'). The idea seems to be that it is essentially human to make things; through the design, creation and use of tools we shape the natural world around us into something that better suits our needs. We use technology in all shapes and sizes, from the humble pencil to the most complex scanning electron microscope. We even have developed technology to extend our human reach into outer space.

The final story about the effect of technology on *homo sapiens* ('wise man'), however has yet to be written. In fact, that story can never be written, because, whenever new technologies are invented, especially new 'information technology', the effects on how human beings *know* will need reimagining as well. Initially, we stored our knowledge in manuscripts and printed books, then we stored it in computers and the internet. We are also now attempting to create our own human intelligence *artificially*, opening up the possibility that the world's newest knowledge will be created by and be *known* by the very machines that we created to store it. The *way* human beings *know* has changed since even the invention of the smartphone in the late first decade of the twenty-first century, in ways that were unimaginable before that, except perhaps only to the writers of science fiction. Where our knowledge will take us in the future and the ways in which we will know it, remains equally unimaginable from our perspective today.

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4 Knowledge and Language

OBJECTIVES

After reading this chapter, students will:

- be able to identify the features that make something a language
- appreciate the difference between language as a thing itself and language as the product of cognitive processes
- understand the difference between human language and animal communication
- appreciate the close association between language and culture
- understand what we know when we know a language
- understand how we acquire knowledge of a language and how we acquire knowledge of other things through language
- recognize the differences between ethical and unethical uses of language.

Learner profile

Communicators

How important is language in communicating and sharing knowledge?

Introduction

ACTIVITY

Read the following paragraph and then answer the questions which follow below.

Poyesera kumvetsetsa mgwirizano pakati pa chidziwitso ndi chinenero, zingakhale zothandiza kuganizira momwe moyo udzakhalira - kapena-ngati anthu omwe amakhala kapena kupita kwinakwake kumene chinenero chimene chikulankhulidwacho sichinthu chosamvetsetseka kwa iwo. Ngati mungathe kuwerenga ndimeyi, ndiye kuti sakukupatsani chitsanzo cha mtundu umene tikuuzani. Ngati mumalankhula nyanja, chinenero cha Bantu chomwe ndi chilankhulo cha Malawi ndi Zimbabwe, ndiye kuti simukudziwa kuti ndimeyi ikunena chiyani. Ngati simukutero, ndiye kuti mukuwona kufunikira kwa ubale pakati pa chinenero ndi chidziwitso. Ngati simukudziwa chinenero chimene chidziwitso chimafalitsidwa, ndiye kuti simungathe kupeza chidziwitso chimenech

(Translation by Google Translate)

1 What is the main idea of the paragraph?
2 In what countries is Nyanja an officially recognized language?
3 What, according to the paragraph, is the relationship between knowledge and language?

KNOWLEDGE QUESTION

Do people from different linguistic or cultural backgrounds live, in some sense, in different worlds?

In Chapter 3, you read about some of the problems that occurred in 2018 when it was noticed that algorithms used to guide the translation in Google Translate contained some built-in cultural and gender biases. We expect that most readers of this text will be unable to answer the questions, as they will not speak the language in which the paragraph containing the answers is written. Did you recognize the language? It is the Nyanja dialect of the Bantu language Chichewa. If you speak and read Nyanja, or if you know someone who does, what do you make of the machine-generated translation? Would you say that the machine adequately represented your language, or are there substantive errors in usage, meaning, or style? We will discuss the problems of translation in detail later in the chapter.

Here is the paragraph in English:

> In trying to understand the relationship between knowledge and language, it might be useful to consider what life would be – or is – like for people who live or travel somewhere where the language which is spoken is completely incomprehensible to them. If you can read this paragraph, then it is not providing you with an example of the kind of experience we are talking about. If you speak Nyanja, an official language

of Malawi and Zimbabwe, then you have no problem knowing what this paragraph says. If you do not, however, then you are experiencing directly the importance of the relationship between language and knowledge. If you do not know the language in which the knowledge is transmitted, then you cannot attain that knowledge.

We began the chapter on language and knowledge with this demonstration because it helps provide an immediate and striking experience of the importance of language in helping us to gain knowledge.

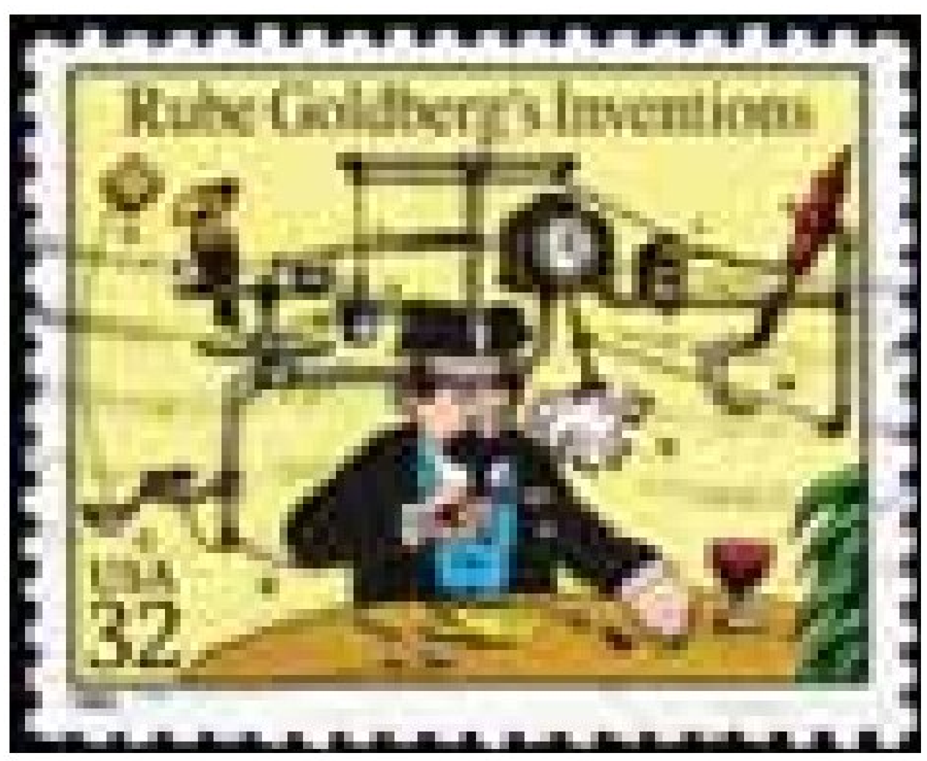
Quite a large portion of the knowledge that any individual gains is gained through language, either from reading or from listening. We do make knowledge in other ways – direct observation of events, for example, can provide us with knowledge about the world around us, but even then, we are likely to process those observations in our thoughts using words.

ACTIVITY

Use the QR code to go to a video which shows some events without words. Observe the events and then answer the questions below.

1 What was happening?
2 Was just seeing and hearing the events sufficient for you to know what was going on? Or did you use words in your thoughts to help you understand?
3 There were a few words in the title of the video, in the lyrics to the song, and on some of the objects in the video. Did these words relate to what was happening? Did you need the words to understand what was happening, or could you have understood just as well without them?
4 In trying to answer these questions, of course, you have to use words. What does that fact suggest to you about the relationship between words and knowledge?

Probably in doing that activity, you discovered that you could understand what was happening just fine without words, but that you could not begin to share that knowledge with anyone else without them. If we think a little more carefully, though, we raise some interesting questions. Probably everything in the video was familiar to you, even though the objects were not being used for their usual purposes. You probably noticed such items as ping pong balls, rulers, plastic cups, playing cards, a basketball, chairs, a cup of water, boxes of cereal, books and dominoes, among others. Try to imagine that you were watching this video without knowing what these objects are and having no name for any of them. What would that experience be like? Do you think you would understand it as well as you could when you were able to recognize and name all the objects? If you did not know that all of these objects have purposes different from what they were used for here (part of the background knowledge that you have associated with their names), would you have had the same reaction to the cleverness and the effort that went into making this Rube Goldberg machine? (Rube Goldberg was a cartoonist – an example of his work is shown on the right.)



■ Rube Goldberg was a cartoonist who drew needlessly complicated machines performing simple tasks. What lessons might his cartoons have for the way we use language?

It might be quite difficult to imagine how you would feel in such a situation, but that question points out one of the interesting issues related to language and knowledge: the question of whether the language that we know actually shapes what we can know. This and many other questions will form the basis for our exploration into the nature of language and knowledge in this chapter.

Scope

What is language?

Linguist Charles Hockett, in a *Scientific American* article called 'The Origin of Speech', published in 1960, described a **constellation** of features which he proposed as the defining characteristics of language. This list of 13 separate features has had a long-lasting influence in the field of linguistics – the study of language – particularly in terms of describing what language is. Use the QR code on the right to view an illustration of these features. Although Hockett listed 13 separate features, we will consider 6 here:

- Semanticity
- Displacement
- Productivity
- Arbitrariness
- Duality
- Traditional transmission

◆ **Constellation**: In this instance, a metaphor for the idea that a group of things can go together to create a group which functions together in a particular way, which is recognizable, and which can be named. You are probably familiar with the word 'constellation' as it refers to clusters of stars which create shapes that are recognizable and named.

Semanticity

This feature of language refers to the fact that language is made up of units of meaning, or words. In written language, words are made up of letters, while in spoken language words are made up of sounds. Another feature of the semanticity of language is that the words – whether written or spoken – have stable meanings (Hockett 6). A cat is always a cat; it is never a rat or a hat or a bat, regardless of the fact that all of those words have similar sounds and similar letters. The English word 'cat' has stood for the domestic feline that we are used to since its appearance in Old English around about the year 700 ('Cat (n)'). We can count on 'cat' referring to felines next month, next year and on into the future as far as we can see.

The word 'cat', its letters and its sounds, represent a domestic feline animal, like this one

Arbitrariness

This feature of language refers to the fact that the words do not have any kind of essential connection to the things that they stand for. A cat is not like the word 'cat'. It isn't a short sort of squished object made of three parts. It doesn't make a noise like 'cat'. It isn't shaped like something that is partly semi-circular, partly triangular and partly cross-like. Hockett used the examples of the word 'whale', which is a pretty small word for a very large animal contrasted with the word 'micro-organism' which is just the opposite – a very large word for a very small creature (Hockett 6).

These are all examples of the arbitrariness of language, and the implication of this feature is that language is symbolic. The words and sounds of language stand for things other than themselves. If language was not arbitrary, then all languages would be identical. Words would have to be the same because there would be some indivisible relationship between the word and the thing it stood for. Instead, the word for the animal known in English as 'cat' is different in French (*chat*), Spanish (*gato*), Russian (*кошка* – pronounced 'koshka'), Swahili (*paka*) and so on.

An actual cat is not like the word 'cat'

KNOWLEDGE QUESTIONS

Can all knowledge be expressed in words or symbols?

Is it possible to think or know without language?

Hockett contrasted the size of whales and micro-organisms, as well as the lengths of their respective names, to demonstrate that words don't resemble their referents

DEEPER THINKING

Language and ambiguity

One important aspect of the semanticity of words is that words have meaning. That may seem a very obvious point to make, but one of the common barriers to communication is the failure to say what one means precisely. People sometimes resort to **ambiguities**, intentionally or not, and sometimes they just use words incorrectly. Sentences might be ungrammatical. One very common problem that results in lack of clarity is the failure to actually state assumptions. It is easy to assume that what you mean will be clear in context, but very often the context is not enough for your listener or reader. An important part of your job as a speaker or writer is to ensure that you are clear enough for your audience to understand what you mean. Consider the examples given in the table below.

◆ **Ambiguous**: Something that is not clear. More precisely, an ambiguity is a word or phrase or sentence which is capable of more than one interpretation, so that the listener or reader cannot make out what was actually intended.

Table 4.1 Ambiguous sentences

Unclear sentence	Nature of the problem
That suggests that this won't work.	Two pronouns which ought to be followed by explanatory nouns but are not. Contrast with this sentence: 'That obstacle suggests that this plan won't work.' Better still: 'Your mother's objection to our plan suggests that the plan will not work.' Each of these sentences is more precise than the previous one, and the more precise the sentence, the less likely it is to be misunderstood.
'Ahmed wanted me to explain myself, but I was reticent to repeat the mean statement that I overhead.'	'Reticent' is the wrong word in this situation. 'Reticent' means that I am a person who doesn't speak much, but it is a more general term than 'reluctant', in that 'reticent' describes someone who generally doesn't like to speak up. We can say, for example, 'My friend Asha is a reticent person. It is hard to get to know her'. 'Reluctant' is what is wanted here. 'I was reluctant to repeat the mean statement that I overheard' is a clear and proper sentence.
The car stopped at the rest stop for a soda.	This sentence is ambiguous, because it is ungrammatical. The car did not stop for a soda – the car cannot drink a soda. The car didn't actually stop itself, either. The grammatical problem is that the subject of the sentence, the car, cannot do the actions assigned to it. One way to fix the problem would be to say: 'We stopped at the rest stop so we could all get sodas.' We have to remove 'the car' as the subject.
Everything is terrible.	This is a gross overgeneralization. It is never true that 'everything' is terrible. Somewhere in the world, someone is laughing and happy, someone is giving a gift to someone else, or helping someone solve a problem. Some discovery is being made. Someone who was very ill is now getting better. The word 'everything' is just way too general. It would be much better to say: 'The family dinner turned out to be a disaster. The dinner was overcooked, the cat got into the dessert and ruined it, there was a malfunction with the alarm system and the fire department came and blasted the house with their hoses before they realized there was no fire. And Great Aunt Matilda showed up and insulted everybody present, one after the other.' Obviously, this description of what happened is much longer, but it is much more precise, and it is more likely to generate genuine sympathy than the generalization is.

Displacement

This feature of language refers to the fact that language allows us to recall, describe and share information about events, people, objects and ideas which are removed from us in time and space. We can talk about the time that Kevin Martin's rink won the Olympic Gold Medal in Curling in Vancouver, Canada, in 2010, even if we are sitting in Christchurch, New Zealand, in 2020. We can talk about how the word 'cat' arose in Old English (as *catt*) in about 700, even though Old English shifted into Middle English in about 1100 and then modern English arose in about 1500, so none of us have any direct experience with Old English. We can use language to discuss the beginning of the Raj in India in 1858 and the end of the Raj in 1947 (Kaul), as well as the fact that the Raj was the colonial rule of India by Britain, and we can talk about these things today, from wherever we are reading and thinking about or discussing this paragraph. The concept of displacement shows us, in other words, that language allows us to know about things that we have had no opportunity to experience – and which we can never have any opportunity to experience any other way.

Duality

The duality of language refers to the fact that a language is made up of a set of sounds or letters which are then recombined into larger units – words and sentences. In English, for example, the letter 'q' doesn't mean anything by itself, nor do the letters 'u', 'r' or 'k', but combined with 'a', they do, altogether, make up the word 'quark', which is a word that refers to a particular kind of **subatomic** particle in physics.

◆ **Subatomic**: Smaller than an atom.

In English, there are a very few letters which can, depending on how they are used, be words all by themselves. 'A' and 'I' can each be used as words in sentences, but they can also be used in other words in which their meaning, when they stand alone, is completely irrelevant. Compare these two sentences:

> **I** bought **a** book yesterday at **a** school book sale.
> The book s**a**le gener**a**ted funds for the pr**i**m**a**ry school.

Productivity

This feature of language is related to the idea of duality. Languages are made up of a relatively small number of symbols – letters, words or other characters, such as the kanji in Japanese. Despite the small number, however, we can combine these symbols to create a virtually unlimited number of utterances or sentences (Hockett 6). 'Productivity' also describes the fact that you can create a sentence which no one has ever created before, but which will be perfectly understandable by fluent users of the language. Consider this sentence, for example:

> After finding the geocache called 'The Bard' in Dallas, Texas, my brother and I were so excited that we decided that we would take on the challenge of designing a comparable challenge for geocachers in Virginia, and that we would include, as part of the caching challenge, a specially-built puzzle using a wood block and some dowels.

Perhaps you need to know a little something about geocaching in order to fully understand that sentence, but it is a perfectly grammatical sentence which describes a perfectly plausible real-world situation, and the odds that anyone else has written or said exactly this sentence are extremely small. Productivity also describes the fact that we can create perfectly good sentences which describe events or people that do not exist in the real world. Here's an example:

> The Venusian traveller arrived at the intergalactic space station low on fuel and desperately hungry, hoping like crazy that there would be Ogolunic Stew available for dinner.

ACTIVITY

Try productivity for yourself:

1. Write three sentences which you feel confident have never been written or uttered before. If you speak more than one language, try it in each language.
2. How difficult was it to do this?
3. Do you think any other speakers of that language or those languages would have any difficulty understanding your sentences?
4. What does the concept of productivity reveal about the scope of language in terms of its relation to knowledge?

The productivity of a language is increased by the fact that often words can mean entirely different things in different contexts. The word 'quark', which we saw on the previous page is the name of a subatomic particle and is also the name of a soft white cheese related to cottage cheese and which originated in eastern Europe ('Quark'). When a word can have different meanings, we know the meaning by how it is used in context. If we were talking about cheeses from Poland and happened to mention quark, no one would be confused and think that we were talking about the subatomic particle, and if we were talking about how, in physics, there are particles which are smaller than atoms, no one would think we were talking about cheese.

A final feature which contributes to the productivity of language is the fact that we can use a word to describe something that we have never seen before because we recognize the features of the object. Consider all of these pictures of cats, for example:

Different breeds of cats

We recognize them all as cats, even though they look quite different from each other in some ways. We can also recognize the following animals as cats, even though they are very different from the cats above:

Members of the cat family

The word 'cat' consists of only three letters, but it can be used to name a huge variety of animals. We would not be confused about what animal was being referred to because the context would let us know. This capacity of a symbol to stand for many things also contributes to the productivity of languages.

Traditional transmission

This final feature of language that we are going to discuss refers to the fact that language is passed from one generation to the next. We are undoubtedly born with some innate capacity to learn language, but the specifics of the language that we learn are acquired from exposure to the culture around us. Babies born to English-speaking parents in Australia learn Australian English. Those same babies, however, had they been born to Japanese-speaking parents in Japan, would have been native speakers of Japanese. Some children are born to bilingual families and so learn to speak two languages natively. Perhaps you are friends with students whose parents immigrated from another country and who were born into households where the parents speak one language because they were raised entirely in a country where another language is spoken. Those children might be native speakers of your country and may speak their parents' language only a little or not at all. Language is learned. What language you speak depends on the language that was transmitted to you by the people around you.

A final implication of the fact that language is traditionally transmitted is the fact that it allows us to preserve knowledge and pass it down from one generation to the next, so that, over time, human understanding of the world increases. Technological development is a direct result of the fact that language is transmitted rather than inborn. We create more and more complicated technologies by building (literally and figuratively) on the knowledge that came before.

We have been discussing spoken and written language so far, but other familiar forms of language also share these characteristics: sign language and braille, for example, exhibit all of these features and can be understood, therefore, as fully developed languages. 'Body language', on the other hand, although it is called language, does not have most of these features. Certainly, we can communicate with our bodies – we are particularly good at conveying emotions through gestures and facial expressions – but 'body language' does not have any of the six features that we named on page 114.

KNOWLEDGE QUESTION

Does the transmission of knowledge from one person or generation to another depend on language?

Do animals have language?

So far, we have been considering language as a human behaviour, but we can use these same characteristics to consider whether and to what degree other animals may have language ability.

Scientists have established that Vervet monkeys have three quite distinct alarm calls depending on which predator is spotted. They make a different sound for a leopard, a martial eagle and a python (Ho). Use the QR code to listen to the three different alarm calls and see for yourself how different they are.

Vervet monkeys make different warning sounds depending on the type of predator they have spotted

Equally interesting is the fact that the behaviour of the other monkeys when they hear the calls differs depending on the alarm that is sent:

> The 'snake' alarm call would cause the group to stand up and study the ground, while the 'eagle' alarm call would see them dive into bushes or the middle of trees where an aerial predator could not reach them. The 'leopard' alarm call would send individuals scuttling up to the very tops of the trees. (Sayfarth, *et al*)

These facts about the Vervet monkeys would seem to suggest that they have at least some language – there are apparently semantical units, specific calls, with fixed meaning, and enough information is conveyed through those calls to tell the other monkeys what they need to do in response. The sounds also seem to be arbitrary – they don't mimic the sounds that leopards or pythons make, for example. Infant monkeys do not make the calls perfectly; they make mistakes. Juveniles are better, and Vervets seem to master the making of the three different calls over time. So, the calls are to some degree, apparently, transmitted from generation to generation, rather than being instinctive. That, however, seems to be the limit of Vervet 'language'. The sounds are fixed in meaning; the sounds of the communication system are not dual in nature, and so the 'language' is not productive as human languages are. Vervet monkeys can alert each other to an immediate danger in the here and now, but they cannot 'discuss' events from other times or places. We can say that, although their communication system has some features of language, it is not a fully developed language.

The honey bee is another creature who seems to have language of a kind. Scout honey bees are famous for being able to convey to the bees back in the hive where they can go for rich sources of pollen. There are two types of dance: the round dance and the waggle dance. The former alerts the other bees to the fact that there is a nectar source relatively nearby – from 25–100 m away ('Dance Language of the Honey Bee'). This dance does not offer any information about direction, and the bees simply fly out of the hive in all directions looking for the nectar source. The waggle dance, on the other hand, conveys information about distance to a nectar source which is further away. The bee communicates the direction the other bees need to go by facing a direction during the straight portion of the waggle dance which indicates the relationship of the nectar source to the Sun. Distance is conveyed by the amount of time that it takes the dancing bee to complete one circuit of the dance. 'For example a bee may dance 8–9 circuits in 15 seconds for a food source 200 meters away, 4–5 circuits for a food source 1000 meters away, and 3 circuits in 15 seconds for a food source 2000 meters away' ('Dance Language of the Honey Bee'). You can use the QR code on the right to watch an example of honey bees doing the waggle dance.

■ Honey bees use a dance to communicate the proximity and location of rich sources of pollen

This 'language' seems to be in some ways quite sophisticated and also somewhat more flexible than the communication system of the Vervet monkeys. Like the monkeys, the communicating bee is passing information along which causes particular behaviours on the part of the receivers. The dance can be seen to be semantic, in that the shapes the movement takes have particular meanings. The 'language' is also to some degree productive, since there is a wide variety of information that can be conveyed with the few segments of the dance, but the productivity is limited to how far away and in what direction nectar sources reside.

Honey bee language is not dual in nature, and although it does indicate where something is in a place other than where the bees are, it is not capable of full displacement, as they cannot 'discuss' events removed in time. It is not known for sure whether the dance behaviour is instinctive or learned (Donnelly), but as honey bees live only six weeks, there is not a lot of time for this skill to be passed along through traditional transmission with its **consequent** need for trial and error and improvement over time. We would say, then, that although the honey bee's system of communication is quite sophisticated, it is also limited to one particular – **albeit** very important – subject, and so must be seen as a communication system, rather than as a language.

◆ **Consequent**: Means that one thing has caused another, which follows. In this case, the point is that where traditional transmission occurs, there is an inevitable result that time is required for learning to take place.

◆ **Albeit**: A word that indicates that the writer is acknowledging an idea which might seem to be a contradiction to the main point being made. In this case, the sentence is saying that honey bee communication is limited, so the 'albeit' signals that despite this fact, the subject about which the bees can communicate is very important to the bees.

ACTIVITY

Use the QR code to watch a video about Einstein the talking parrot and then answer the following questions.

1 Do you think that Einstein speaks English as a language?
2 Which of the six features of language that we've investigated does his speech demonstrate?

Other potential languages

As you go through the TOK course, you will discover that all the different areas of knowledge and each of the different knowledge-related themes have a vocabulary specific to them. But there are two particular areas of knowledge which seem to use language differently from the way that various practitioners of history or the natural sciences, for example, develop a technical language to describe the knowledge in that area: the arts and mathematics.

The arts

Language plays a central role in some art forms, of course: poems and novels, for example, consist of words. In drama and songs with lyrics, words are only a part of the artwork, but they play a significant central role. In other art forms, however, words play a minimal role or are absent altogether. Think of paintings and sculptures, which may involve no language other than a title – and which may even be untitled. Classical music may sometimes involve words, as with the 'Ode to Joy' in the final movement of Beethoven's Symphony No. 9. That symphony was, in fact, the first time a major composer included vocal music in a symphony (Bonds 387). More often there are no words at all in classical music, as with Beethoven's other eight symphonies. Dance usually relies on movement alone without words. So for most artworks, it would seem that language does not play a significant role; however, some kinds of paintings do rely on sets of fixed symbols to convey messages to viewers, and so we might consider whether in those cases at least, art is, or has, a language.

In the Netherlands, the Vanitas school of still-life painting was popular from about 1550 to about 1650 (The Editors of the Encyclopaedia Britannica). The word 'Vanitas' is the Latin word for 'vanity', and the paintings focused on the vanity of life in the face of inevitable death. These paintings relied on a number of fixed symbols that would have been easily recognized by viewers in the seventeenth century. The painting on page 121, *Vanitas Still Life With Flowers and Skull* (1642) by Adriaen van Utrecht, used many of those set symbols.

■ *Vanitas Still Life With Flowers and Skull* (1642) by Adriaen van Utrecht

The skull is an obvious symbol of human death, and, in this painting, it is surrounded by many objects that symbolize self-indulgence and the greed for material objects. The pearls, the gold chain, the ring and the coins represent the idea of wealth. The open chronometer (a portable timepiece similar to a modern-day pocket watch) ticking away next to the coins and pearls symbolizes the relentless passing of time ('*Vanitas Still Life With Flowers and Skull*'). The flowers, which seem to provide a striking contrast to the skull, are cut flowers. They are dying, and we can see that in some cases, the flowers have dropped out (such as the rose which is drooping off the edge of the table) and are already withering ('*Vanitas Still Life With Flowers and Skull*'). Other symbols in the painting are the hourglass in the wooden case at the back of the painting, which, like the gold clock, signifies the passing of time and the pipe (the long white object on the book) and wine glasses, which symbolize the waste of time in indulging oneself in idle pleasures (Najarian). The nautilus shell came from what was seen as an exotic sea creature – another sign of the wealth of its owner. Finally, the book represents human knowledge; the fact that the skull is placed on the top of the closed book suggests the limit of human knowledge – another sign of the vanity of man in the face of his inevitable death (Najarian).

In this painting, therefore, we can see some features of language: there are objects which have specific meanings and they combine to create a message; thus, this system of communication can be seen to have semanticity. The objects are obviously symbolic, but perhaps we cannot really consider them to be arbitrary. The human skull certainly came from a dead human, and the dying flowers are actually dying flowers. Money is the form in which wealth is traded in the world. The timepieces do actually keep time in real time and a book is a **repository** of human knowledge. The 'vocabulary' of this 'language' can be used to create a wide range of works of art, but the message in all of the paintings was essentially the same: he who spends his life in pursuit of wealth and luxury is vain; wealth and luxury cannot keep you from your inevitable death. So, we cannot really consider that the 'language' of this school of art is productive.

◆ **Repository**: A place in which one puts things for safe-keeping or storage. In this instance, a book is an object which stores human knowledge.

We will explore the arts and the methods of creating and understanding meaning in greater detail in Chapter 12, but this example serves to introduce the idea of meaning in art and the way that symbols can be used to convey ideas.

Mathematics

Mathematics is another area of knowledge which might be seen as being or having a language. You are probably familiar with the 'alphabet' of mathematics: numbers and a variety of symbols such as +, –, =, ≥ and ∞. Mathematics can also use letters of the alphabet to stand in for a number which is unknown. Unlike the letters of the English alphabet, numerals do have meaning in their own right: 3, 8 and 9 all have recognizable meaning. Like the letters of the English alphabet, however, they can be combined in a virtually limitless number of ways to create new statements. Here are a few examples:

$9 \times 4 = 36$

$a^2 + b^2 = c^2$

$(2x + 3) - (y + 4) = 39$

We can already see, then, that the language of mathematics features many of the characteristics that we examined earlier: semanticity, arbitrariness, duality, productivity and, certainly, traditional transmission. No one is born knowing the language of mathematics; it has to be taught and it does allow us to preserve knowledge for future generations. As you will see in Chapter 8, the fact that new knowledge builds on old knowledge is possibly even more significant in mathematics than in other areas of knowledge – indeed, it is central to the whole pursuit. We can also consider that mathematical language is capable of displacement, since mathematics describes features of reality in general and throughout time. Mathematics, then, unlike the communication systems of Vervets and honey bees, and in contrast to the symbolic function of elements of Vanitas still-life paintings, can be seen as having a fully-fledged language.

ACTIVITY

Working with a partner, think about the following question, which is debated among mathematicians:

Does mathematics *have* a language or *is* mathematics a language?

Another way to define language

The characteristics from Hockett's work define what a language is from the perspective of thinking of language as a sort of object, a thing in and of itself. In recent years, however, some objections have arisen to Hockett's system of classification. One of the reasons for this is that Hockett's way of looking at language as a thing in and of itself ignores the very significant fact that language is produced out of a set of cognitive abilities on the part of the users. The idea, then, that language is integrally connected to the way that human – or other – brains function is another way to consider what a language is.

CONCEPT CONNECTION

Perspective

The effort to determine what we are talking about when we are talking about language reveals two very important perspectives:

- the perspective that language is a thing whose features we can identify and describe
- the perspective that the object part of language cannot be separated from the minds which produce and use language.

Language development as a result of cognitive ability

Sławomir Wacewicz and Przemysław Żywiczyński are Polish linguists working on evolutionary linguistics – the question of how the capacity for language has evolved in different species over time. They have pointed out that too strong a focus on the superficial features of language as produced by humans tends to drive thinking about language evolution as a matter of the development of the physical machinery required to make speech. They propose that we ought, instead, to be considering the way in which language evolved along with various cognitive abilities – changes in the physical brain which allowed for different kinds of thinking processes to occur. A few of the mental abilities that Wacewicz and Żywiczyński identify as being needed for language are:

- the ability to cooperate with non-relatives
- the ability to understand that others have minds and thoughts separate from one's own mind and thoughts
- the ability to mimic others intentionally
- enhanced memory. (Wacewicz and Żywiczyński)

It is not too hard to understand how these mental abilities relate to language. If we cannot cooperate with others, our need to communicate is severely limited to those in our immediate families. We might imagine that much of the complexity of language would not need to arise if we did not need to deal with those outside of our immediate circle and who have, therefore, much less shared experience. A lot of shared experience means many fewer words needed. The idea that we need to be able to understand that others have minds before we can communicate with them through language makes sense because if we don't understand that, then we have no reason to think that communication would even be possible. The very essence of communication is to transfer an idea or information from one mind to another. We learn language by mimicking our parents and others around us, so the cognitive ability to mimic others – and to do so at will, when we want to learn new language – is necessary to the development of any individual's language skills. Enhanced memory is needed in order to be able to store the vocabulary, grammar and other nuances of language that we need in order to be fluent in that language.

The perspective that language can be considered in terms of the cognitive abilities needed to make language possible provides a different kind of test for determining why animals who have communication systems do not have language.

Some other interesting features of language are that once we have developed it, we cannot stop using it (Szczegielniak). We saw in Chapter 2 that words on a page are really just squiggly lines (that is, they are arbitrary), but we don't see them that way – we see words, unless we are looking at words in a foreign language or in a foreign script, in which case the words become squiggly lines, because we cannot attribute any meaning to them. When it comes to our own language, however, the attribution of meaning is automatic and uncontrollable. Although we might not understand everything we read or hear if, for example, we don't know all the words, we can't make our brains stop taking in the words or sounds and trying to process them. Consider this sentence, for instance:

> Cytochrome P450 is a heme protein capable of hydroxylating unactivated alkane C-H bonds.

You probably don't know what that sentence actually means because it has many words which are highly technical (it is a description of a particular kind of protein that an inorganic chemist might want to know about), but, so long as you can actually read it, you couldn't stop your mind trying to make sense of it. You can almost certainly identify which of those words are nouns and which are verbs or adjectives. You can recognize that it is a grammatical sentence. Contrast that with the following sentence:

EE links

An exploration into the history of linguistics and how beliefs about language have changed over time as we have come to know more about the psychology both of humans and of other animals could be the basis for an interesting extended essay. A possible EE research question might be:

How have changes in understanding about psychology over time influenced our knowledge of what a language is?

and but cat cat cat, chase fox fox had of on out run. The the the the the the to to tried turned yard,

Even though all of those words are short and very familiar, you know instantly that you can make no sense out of that 'sentence'. You can certainly abandon the effort to make sense out of language that you can immediately tell is not recognizable as a language you know, but you cannot stop yourself processing language that you do recognize. The 'sentence' above, by the way, has been rearranged from a perfectly good English sentence. Try reading it in its original form and try deliberately not to understand it:

The cat tried to chase the fox out of the yard, but the fox turned on the cat, and the cat had to run.

If you read it, you understood it. You could not help it.

Spoken language works the same way: spoken language consists of a series of arbitrary sounds. If you don't speak the language, you will perceive the sounds as meaningless noise.

Try it: use the QR code to listen to the audio clip in which a man from the San culture in the Kalahari desert is speaking in the click language of Khoisan. We are betting you cannot understand what the sounds mean. If you listen to someone speaking in your native language, however, the words automatically take on meaning. You couldn't keep them from doing so. Language is wired into your mind in such a way that you do not have conscious control over whether it is on or off. It is automatic.

Considering language from the perspective of cognitive ability provides us with a more complex understanding of what we are talking about when we are talking about language – not just the sounds or written symbols, but also the thinking skills which are part of the system.

What do we know when we know language?

Perhaps the first thing you think of when you consider what you need to know when learning a language is vocabulary. Your Group 2 teacher might give you vocabulary lists to memorize, and maybe you have put Post-it® notes on objects in your house with the names of those objects in the target language to help you learn them. Vocabulary is unquestionably a very significant part of knowing a language. According to a study of 1 million participants in 2016, average adult native speakers of English have developed a vocabulary of more than 42 000 words by the time they are 20 (Hays). What is meant by having such a vocabulary, however, is that native speakers of English will recognize and understand that many words. The study also found that adult speakers learn, on average, a word a day until middle age, so by the age of 60, that number goes up to about 48 000 words. If we consider, however, the words that native speakers actually produce themselves when they are speaking, that number is much lower, around 5000 (Bateup).

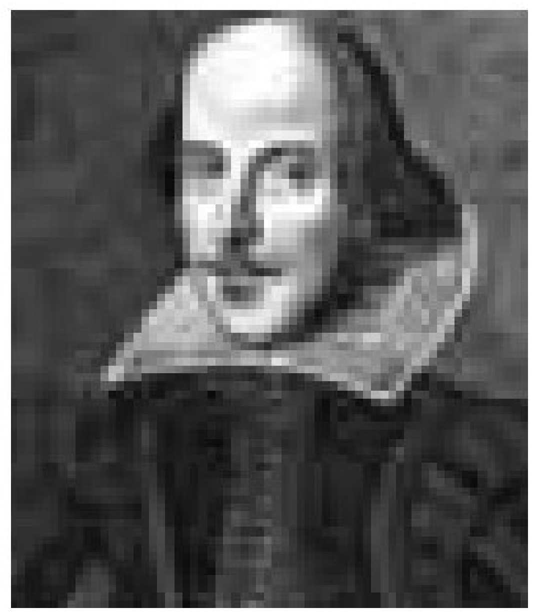
Another big study in 2015 showed that learners of a foreign language develop a vocabulary of about 4500 words, but if they then live abroad, they will increase that vocabulary to about 10 000 words ('Lexical Facts').

Some people, of course, develop much bigger vocabularies than others. William Shakespeare, often considered to be the greatest writer in English, used many more than 5000 words: in all of his plays combined, he used between 25 000 and 30 000 words (Huld), depending on how the person counting determines what constitutes different words. Shakespeare – or the printers who printed his works – often varied the spelling of words, for example.

One final observation about vocabulary: in general, the bigger the vocabulary you have, the more you can know (this idea will be explored in more detail later). The reason for this claim is that we tend to learn easy, simple words first, and then we develop a more sophisticated vocabulary as we grow

IA prompt

6 How does the way that we organize or classify knowledge affect what we know?



William Shakespeare used between 25 000 and 30 000 different words in his plays and is responsible for introducing many words and phrases into common usage older and learn more – whether from formal schooling or from other experience in the real world. We can also define 'more sophisticated vocabulary' as vocabulary which conveys subtle, nuanced meanings. The word 'implement', for example, is a more sophisticated word than 'use'. They are not interchangeable: to use something just means that that thing is a tool to help someone achieve a purpose. To implement something, however, means more than just to use it: to implement something is to put it in place for the first time. We can implement a new programme of employee evaluation, or a new tax code, or a new curriculum, but we cannot implement a hammer or a book or a potato peeler. It would be correct and clear to say that we are using a programme of employee evaluation or a curriculum, but the verb 'use' does not have the additional implication that those programmes are new to the organization in which we operate. Other examples of nuanced knowledge of vocabulary include the difference between 'imply' and 'infer' and the difference between 'reluctant' and 'reticent'. Many people misuse these words, and, in so doing, they may be miscommunicating their intentions, because they may be talking to people who do know the correct meanings.

ACTIVITY

1. Look up the words 'imply' and 'infer', and 'reluctant' and 'reticent', and make sure you understand the differences between the two words in each pair.
2. Write a sentence for each one of the four words and make sure that your sentences include context which reveals the precise meaning of each term.
3. What do the responses to questions 1 and 2 reveal about the relationship between language and knowledge?

IA prompt

20 What is the relationship between personal experience and knowledge?

The ability to use vocabulary precisely, and to understand vocabulary precisely, results in more nuanced understanding. For this reason, in this textbook we have decided to use more sophisticated vocabulary when that vocabulary conveys important *connotations*. Because those words may very well be unfamiliar to many readers, we have provided detailed explanations of what they mean on the pages where the words are used. This will allow you to understand the writing here better, and it will help you to develop your own vocabulary. (The word 'connotation' is defined on page 15.)

Regardless of how many vocabulary words you know, they are, in and of themselves, only a part of what you know when you know a language. If you are a fluent user of a language, you also know a great deal about how the grammar works – even if you cannot use all the technical terminology for grammatical structures and functions. You know, for example, about the following:

- word order (as we demonstrated earlier with the sentence about the cat and the fox)
- verb tenses
- punctuation (if the language is written)
- how tone contributes to meaning (both in spoken and in written language)
- when language is metaphorical or satirical or sarcastic
- how context changes meaning (as we saw with the example of the word 'quark' on page 116).

Let's take a look at just two sentences written in English and see how many things we can identify that demonstrate what we know when we know English. These are the two opening sentences of Jane Austen's novel, *Pride and Prejudice*:

> It is a truth universally acknowledged that a single man in possession of a good fortune must be in want of a wife. However little known the feelings or views of such a man may be on his first entering a neighbourhood, this truth is so well fixed in the minds of the surrounding families that he is considered as the rightful property of one or other of their daughters.

Here is a list of some of the things, other than vocabulary, that a person who truly understands these two sentences knows about how English works:

- 'Universally acknowledged' in the first line refers to people and not to the Universe. The suggestion is that every human knows what is about to follow in the rest of the sentence.
- To say that something is 'universally acknowledged' is hyperbole. There is probably no belief which is held by every human being.
- The use of hyperbole in this situation is ironic.
- The use of the verb 'must be' here suggests an inevitability to the situation. All men who are single and wealthy, in other words, want wives. This is not a matter of choice.
- Cultural context: the use of the phrase 'a good fortune' suggests an older time period. We would be unlikely to use that term today to describe a wealthy man – we would say that he is wealthy or that he is rich.
- The full stop (period) at the end of the first sentence signals the end of the sentence.
- The use of 'however' at the beginning of the second sentence does not mean 'but'; rather it is a modifier which works with the word 'little' to suggest that it doesn't matter if no one knows even a little bit about the feelings or views of this man. His views, in other words, are completely irrelevant.
- The whole long phrase beginning with 'However' and ending with the comma is an introductory phrase; the sentence is actually about 'this truth', which is the actual subject of the sentence.
- We may or may not know that the clause before the comma is a dependent clause and the bit after the comma is an independent clause and together these two clauses make up what is known as a complex sentence.
- You know that the comma signals that the first clause is dependent – even if you don't know the term 'dependent clause'.
- Cultural context: the idea that the man in question here is considered to be the rightful 'property' of one of the daughters of the neighbourhood is ironic, because in the very early nineteenth century, married women were not allowed to own property – their property became the property of their husbands.
- The tone of the narrator in these two sentences is satirical: in the first sentence, she makes a statement which is actually fairly outrageous: on the surface of it, the sentence offers us a simple idea that every rich single man is looking for a wife. That statement cannot possibly be true, any more than the statement that everyone knows that was, but in the second sentence, she lets us know that we are going to encounter people in a particular neighbourhood who think this way, and the narrator wants the readers to realize that we are intended to see these people as being rather silly.
- Even reading the two sentences silently to yourself, you probably could hear, in your mind, how the words are to be pronounced. If you were to hear them read out loud, you would recognize the way the tone and stresses the reader used contributed to the message that this passage is satirical. If you were to read it out loud, you would show that you know how to say the words and where to put the stresses.

The above list names just a few of the things that we know when we know a language. Neither of these two sentences contained a metaphor or a symbol or a literary or historical allusion. Nor did they contain an idiom, such as 'it's raining cats and dogs', which is a phrase meaning that it's raining very hard, even though rain would not seem to have anything to do with cats or dogs.

We do not have space in this chapter to try to identify in detail all the nuances of language use that reveal what people who speak a language fluently and with skill know when we say that they know a language. This short look at the question, however, should give you a good idea of the kinds of

Learner profile

Thinkers

How does thinking critically about language help us to develop a richer understanding of a literary (or other) text?

things that are involved in knowing a language. Knowing a language is a spectacularly complex skill, and as you work through your TOK course, we encourage you to pay attention to the different ways that language is used in different areas of knowledge and in different knowledge situations.

What do we know with or through language?

We noted above that one of the thinking skills that had to evolve in our species before language could develop was the ability to know that we have minds and that others have minds. When it comes right down to it, the reason that that particular cognitive skill is crucial is that the primary function of language is so that thoughts, ideas, feelings and observations in one mind can be transmitted to another mind. What we mostly know through language is what is inside another person's head.

Language enables us to know what is inside another person's head

For knowledge to be knowledge, someone has to know it. That is, for knowledge to be knowledge, it has to be inside someone's mind. That's true of all knowledge in all areas of life. Language, then, gives us the ability to transmit any knowledge of any subject from one mind to another. The scope of language, therefore, in terms of what we can know by using language, includes everything that it is possible to explain in words in any subject in any place in the world. Mathematics and the arts come under the scope of language, as do politics, technology, religion, psychology, zoology, physics, history, geography and personal feelings and observations. In comparison, some tools for making knowledge can really only be used for some subjects – a particle accelerator, for example, is very useful for physicists trying to learn about the characteristics of subatomic particles like the quark, but it is not useful for historians trying to understand what led to the massacre of the Cheyenne and Arapaho Tribal Nations at Sand Creek, nor can a politician use it to try to understand what his constituents need him to advocate for. Kendrick Lamar cannot use a particle accelerator to help him write or perform one of his songs. You cannot use one if you are trying to learn how to bake Roscón de Reyes for Three Kings Day. Language, however, can be used by all of those people to aid them in their various and widely diverse pursuits.

This is not to say that language is our only means of knowing things, nor can we say that language alone is sufficient for us to be able to make knowledge. In Chapter 2, you saw how the various kinds of tools that we have as individuals to help us make knowledge – reason, sense perception, imagination and so on – work together in tandem. Language, however, is our primary means of transmitting ideas, hypotheses and conclusions from one person to the other.

The proposal that the scope of language as a means of conveying knowledge is virtually unbounded leaves us still with several important questions related to the scope of language as it pertains to knowledge:

- If the primary function of language is to connect minds and transmit ideas, thoughts and feelings, does this mean that individuals working on developing new knowledge on some particular topic can do so without using words? Can new knowledge, in other words, ever be developed without language playing a role?
- Can we put all knowledge into words – either written or spoken? Is there knowledge which either cannot be transmitted from one person to another or which must be transmitted using some other method, such as touch?
- Does our language limit or define what we can know?

We will consider these three questions in the next two sections of this chapter.

Perspectives

According to *Ethnologue: Languages of the World*, a resource committed to providing the most up-to-date information about world languages available, as of June 2019, there were 7111 languages still being spoken in the world. This number is contradicted in other sources which give a number closer to 6000 languages. Because some languages are spoken only by a very few speakers – many languages have fewer than 1000 speakers – it is hard to pin down exactly how many languages there are still alive in the world. The number also depends on who is doing the counting. Some sources group similar languages that occur in the same place. Nearly two thirds of the active languages are spoken in Asia and Africa; however, more than 85 per cent of speakers use Asian or European languages ('How many languages are there in the world?').

As you can imagine from these numbers, this means that the variety of languages in the world is not evenly distributed over the globe. In fact, in Papua New Guinea alone, 840 languages are spoken, with another 710 spoken in Indonesia. By way of contrast, only 1058 languages are spoken in all of the Americas, and only 288 in all of Europe. You can use the QR code to view an interactive version of a world map, which allows you to explore the diversity of languages in the world. Visit your country and see how many languages are spoken that you were not necessarily aware of.

KNOWLEDGE QUESTION

To what extent does language allow us to make our private experiences public?

IA prompt

21 What is the relationship between knowledge and culture?

CONCEPT CONNECTION

Culture

We noted earlier in this chapter that the language you learn is the language of the culture in which you are raised. If you had been born in some other country where a language other than your native language is spoken, you would have grown up learning that language. Language is necessarily related to culture – there are words for things in one culture that don't exist in another culture. Do you have a word for the object in this picture, for example?

The object in this photo is called a *qulliq* and is used by the Inuit people for a variety of purposes. It is a lamp which is lit with oil and burns a wick made of Arctic cotton called *suputi* and a special moss called *ijju/maniq.* It is tended with a hook called the *taqquti.* The lamp symbolizes the flame keeper in the home – the woman. The qulliq can be used for many purposes including drying clothes, melting ice, lighting spiritual ceremonies and providing warmth and energy in the home ('Fact Sheet: Information About the Qulliq').

You can see that the qulliq is an important article in the Inuit culture. There are a number of other vocabulary words associated with the qulliq, some of which we have provided above, but we can be pretty certain that there are many more. How many words, for example, can you list that are related to a familiar object such as a fireplace or a car? If you don't know the word, you also don't know the other related words, and, more significantly, you don't know anything about how the use of the qulliq makes the object important in this culture. We told you, in the paragraph above, a little bit about how the qulliq is used, but you only know that much, and you only know it intellectually. You don't have any emotional, intuitive or imaginative sense of the qulliq and its role in the culture.

ACTIVITY

Think of an object which is significant in your life. If you are a religious person, perhaps you can think of an object which is important to your religion. Or you might decide to choose something important to your religious community.

If you are not religious, or if you prefer not to choose an object related to your religion, choose something else of significance to your family or another cultural group in which you live, such as an important document, a flag, or maybe a statue which has significance in your town or country. For this exercise, it would be better to pick an object that has shared meaning in a community, rather than something which has personal meaning just for you individually.

Now think about all the associations you have with that object.

1. What feelings arise when you think about it or work with it?
2. What is its symbolic significance?
3. How would you feel if someone stole or destroyed that object?
4. What is the role of the object in your community, and what is the effect of the object and its use on the community?
5. Now imagine how much a person who has no idea what that object is does *not* know about the object itself and about the greater community to which the object has importance. If you named the object for that person and told them a little bit about its function, what would they still be missing?

This activity should give you some sense of how much you don't know about the Inuit people and culture unless you are Inuit because you don't know what the qulliq is.

KNOWLEDGE QUESTION

What knowledge might be lost if the whole world shared one common language?

The understanding that you can lack some significant understanding of a culture because you don't speak its language is one kind of way in which we can think of language as shaping what we know and what we don't know. Another way that language influences knowledge is the varying nature of how different languages depict the world differently.

Language mapping the world

Does our language limit or define what we can know?

From where you are sitting right now, answer the following questions:

- What is to your left?
- What is to your right?
- What is behind you?
- What is to your immediate northeast?
- What is to the south?
- What is to your southeast in the middle distance?

Now turn directly around 180° and answer the same questions again.

It was probably much easier for you to answer the questions about what is to your left and right than it was to answer questions about your relationship to things in various cardinal directions. Possibly you could figure out what was to your northeast, if you either happen to know what direction the building you are in is facing and how you are oriented to the front of the building, or if you are somewhere where you can see the Sun, and it isn't high noon or nighttime, when you cannot tell where the Sun is relative to the east–west pattern it travels during the day.

The fact that the former questions are easier for English speakers than the latter is directly attributable to the way in which we use language in order to orient ourselves in space. Other languages, however, do not use 'left' and 'right', but, rather, require speakers to identify themselves in terms of their orientation to the cardinal directions in order to discuss their location in space.

Learner profile

Open-minded

How can learning about the way that other cultures perceive the world help you to develop the trait of open-mindedness?

CASE STUDY

Kuuk Thaayorre

One language that requires speakers to use cardinal directions to discuss their location in space is Kuuk Thaayorre, a language of the Pormpuraaw community on Cape York in northern Australia. The ability to identify one's own orientation to north, south, east and west is deeply embedded in the language. Even to say 'hello', one must know where one is facing: 'So the way you say hi in Kuuk Thaayorre, one of the languages spoken here, is to say, which way are you heading? And the answer should be, north, northeast in the far distance; how about you?' (Boroditsky).

It is difficult for us to imagine what it would be like to operate in a language which doesn't use 'left' or 'right'. Suppose that you were gardening with a member of the Pormpuraaw and you wanted to alert him to the fact that he had cut the little finger on his left hand. You can't say: 'Look! The finger on your left hand is bleeding!' You would have to say: 'Look! The finger on your southwest hand is bleeding!'– or 'north', or 'northeast', or whatever direction is the correct one for how that hand is oriented to the way that the person is facing. If the person then turns around to look at you blankly, because he can't feel any blood and he can't figure out who you're talking to, when you repeat the warning, you have to change what you say, because now the person is facing a different direction and his hand, therefore, is oriented differently to true north.

Speakers of the Kuuk Thaayorre language in Australia use the cardinal directions to orient themselves, instead of left and right

Lera Boroditsky, a professor of cognitive science at the University of California, San Diego, has studied Pormpuraaw languages extensively:

> The fun example I give my students is imagine playing the hokey pokey in a language like this. You know, there's no left leg or right leg. As soon as you move the leg, it becomes a different leg. So you may start with moving your southwest leg in, but then you have to move your northwest – northeast leg out. (Boroditsky)

The idea of such a language is actually rather fascinating. English speakers, we can see, are less integrally attached to the world around them. We know left, right, back, front, up and down. Although we're perfectly comfortable with the fact that those directions change if we move, we don't see ourselves as being tied to the movement of the Earth and the Sun the way that speakers of languages which require exactly that knowledge do. Try to imagine the kind of internal map that speakers of such languages must have in order to be able to speak. Boroditsky describes what the mental experience of mapping oneself was like, once she learned how to do it in order to be able to speak Kuuk Thaayorre: 'It was like a little bird's-eye view of the landscape that I was walking through, and I was a little red dot that was moving across the landscape. And then when I turned, this little window stayed locked on the landscape, but it turned in my mind's eye.'

The ability to locate oneself in space has other ramifications. Our understanding of time is related to the way that we think about space. If an English speaker is asked to take a bunch of events and organize them into the order in which they happened, the timeline moves from left to right, just as our eyes do when we read. We think of time as moving in that direction. Japanese speakers, however, if asked to demonstrate the way that time moves, will organize the events on a timeline from right to left, the way that they read. The Pormpuraaw, however, organize time from east to west, possibly because that is the way the Sun travels, which means that their sequence of events is organized differently depending on the way that the speaker is facing when asked to organize them. If the Kuuk Thaayorre speaker is facing south, they will organize the sequence of events from left to right, because east is to their left. If another speaker is facing east, they will organize those events from top to bottom, starting from the east and moving west (Boroditsky). The Prompuraaw idea of time is not fixed in relation to the people; it is fixed in relation to the cardinal directions.

If you are interested in learning more about how different languages require different thinking skills, use the QR code to listen to an interview with Lera Boroditsky and several other experts in language use.

The way that languages shape our understanding of ourselves in terms of our location in time and space is just one example of how language shapes thought. There are languages which have no numbers. You can imagine that without numbers, mathematics cannot exist – at least not in anything like the form in which we are used to it. What would your world be like if there was no such thing as counting or its subsequent ability to keep track of things by number. Could there be anything like money?

KNOWLEDGE QUESTION

Do people from different linguistic or cultural backgrounds live, in some sense, in different worlds?

Many languages assign gender to nouns. The gender of inanimate objects, it turns out, influences the way that people think about those objects. In German, for example, a bridge is feminine: *die Brücke*. In Spanish, however, a bridge is masculine: *el puente*. Many other objects have the opposite genders in those two languages. When speakers were asked to describe characteristics of the objects, speakers of Spanish focused on more 'manly' characteristics such as strength and endurance, while speakers of German tended to focus on more 'feminine' characteristics, such as elegance and beauty (Deutscher). The ramifications of these unconscious associations are not yet widely understood, but they could be quite far-ranging. Guy Deutscher, writing for the *New York Times*, suggests that when young minds associate gender with language, those language learners begin to associate objects in the inanimate world with the kinds of emotional responses they have in response to human genders. He asks us to consider whether thinking of bridges as either male or female might influence the way one designs a bridge. Current knowledge of the way that gender is encoded in our brains cannot answer that question, but we can imagine that our social attitudes toward gender might be naturally associated with inanimate objects that we think of as having a gender.

When we think about what we know when we know a particular language, then, we see that the language we speak helps to shape our understanding of our place in the world, our understanding of time and the nature of physical objects – among many other things. The fact that our language shapes what we must know, does not, however, shape what we can know.

In 1940, linguist Benjamin Whorf published a now-discredited idea which came to be known as the Whorfian hypothesis, claiming that language shapes what it is possible for us to think. The theory held on for a long time, although it eventually collapsed when it turned out that Whorf had falsified the evidence upon which he based it (Deutscher). If you think about it a little more closely, Whorf's claims cannot possibly be true. If it were not possible to think about anything for which we do not already have words, then it would not be possible for us to learn anything new. You probably had no concept for a qulliq a few minutes ago, but you saw a picture of one and learned the word for it, and now you do have such a concept. You were able to think about the qulliq – to perceive it in your mind – before you knew the word. Language does not shape what it is *possible* for us to think, but it does shape what we *do* think, at least initially.

■ The Oberbaum Bridge in Berlin, Germany and the Bridge of Segovia in Madrid, Spain. Could the contrasting genders of the word for 'bridge' in German and Spanish have affected the way bridges are designed?

Dying languages

All over the world, languages are in the process of becoming extinct because they are no longer being transmitted to children, who instead learn a language in the region which is spoken by many more people. In the United States, for example, where there used to be hundreds of native languages, a recent survey counted fewer than 200, only 33 of which were actively being spoken by both adults and children (Woodbury). Those 33 are the only ones which might seem to be safe, but over time, as more and more people speak English, those languages, too, might become endangered or extinct. Worldwide, some estimates suggest that half the existing languages could become extinct in the next 100 years. Other estimates are even more dire: they suggest that in a century only a few hundred languages might remain.

Given the intimate relationship between culture and language, what is lost every time a language dies out? What will be the consequences to our shared knowledge if 50 per cent or more of the world's languages are lost? What perspectives on human experience might be lost to us permanently?

IA prompt

14 Does some knowledge belong only to particular communities of knowers?

KNOWLEDGE QUESTION

If a language dies, does knowledge die with it?

Translation

Having now seen how languages differ from each other in fundamental ways, we might imagine that it must be quite difficult to produce a translation of a particular work from one language to another. We translated 'qulliq' for you as a lamp. But a lamp in English doesn't have anything like the same meaning to our culture as the 'qulliq' has to the Inuit culture. If someone is translating for us from Inuit to English, and uses the word 'lamp', our impression of the use and importance of the object is going to be entirely wrong. Suppose that what is being translated is a message from one Inuit speaker to another, and the letter mentions a qulliq: what is the translator to do? Should she just use the word 'lamp' and hope that the rest of the message will provide the context that would be needed for a reader of the translated version to understand its import? Or should the translator add in a lot of additional information which was not explicitly given in the message, so that the reader of the English version can appreciate the implications of the message more thoroughly? If the translator is translating while the speakers are actually speaking, then it is unlikely there will be much time for making decisions like this. If the translator does embark in English on a lengthy explanation of what the cultural significance of the qulliq is, the Inuit speaker is going to start wondering what the translator is saying, because clearly the translator would have to be saying much more than what the Inuit speaker says. Surely such a choice would lead to distrust in the translator.

The problem is, then, that anyone learning something through a translation is not likely to be able to know in a truly detailed and nuanced way what the original speaker or text actually said. Knowledge gained from a translation is knowledge gained from a new speech or text based on an original, but not an exact copy.

KNOWLEDGE QUESTION

Do professional interpreters and translators have any special ethical obligations?

CONCEPT CONNECTION

Interpretation

The problem of translation brings up the concept of interpretation. Often when we think about interpretation, we are thinking about interpretation of particular data or observations or evidence, but in the case of translation, we are dealing with an interpretation of an original written text or act of speech (Campbell). The translator has already had to interpret what was being said and make decisions about what to pass along. The reader or listener of the translation must also then try to interpret the significance of what he heard, and so the knowledge that comes out of that interaction is the result of twice-interpreted information.

DEEPER THINKING

Translation and technology

Another issue that arises out of translation comes about because of developing technology. In Chapter 3, we saw some of the ways in which technology influences knowledge. At the beginning of this chapter, we considered the question of how well Google Translate represented the paragraph in Nyanja. With regard to language and translation, another important technology is the development of the universal translator. At the time of writing, there are a good number of universal translators available for sale and they have proven to be quite popular for travellers.

The term 'universal translator' has its origins in the television series *Star Trek* where a technological gizmo allowed for the crew of the starship Enterprise to communicate with alien species throughout the galaxy, no matter what languages those species spoke. That is a very fanciful device, and it is quite difficult to understand how such a device could work, because until the crew of the Enterprise encountered the alien species, there was no way for the designers of the technology to analyse the language, develop a lexicon and program the translator. The 'universal' translators available to us today, cannot, of course, translate every one of the more than 7000 living languages. You can, at the present time, get the Smart Voice Translator Device which (the advertising claims) can translate 70 languages. Another device, the WT2 Plus Translator, offers translation of 36 languages but 84 accents. Those may not be 'universal', but they certainly make it easy for most travellers to be able to converse pretty much anywhere they are likely to want to go.

The same problems of translation arise, however, with the technological universal translator as arise with a human translator, without a human on the spot to make any snap decisions. The translation decisions must be made in advance, as it were. Nevertheless, most travellers will likely find that the translator does a good enough job for their needs, allowing them to ask for directions and order meals and make reservations at hotels. We can imagine that in the future, the technology for such translators will improve and the cost will go down – this is what has historically tended to happen as new technologies arise and develop – and perhaps many more people will use them. This leads us to some questions about knowledge.

If we eventually come to rely heavily on cheap, portable technological translators:

- Will the technology eliminate the need for learning new languages?
- If we rely on universal translators, what kind of knowledge about other cultures will we be failing to develop?

If you would like to watch a demonstration of a universal translator at work, use the QR code.

We have seen that language is one of our primary means of making and sharing knowledge in virtually every arena in which knowledge is produced. We have seen how the language that we speak requires us to perceive the world in particular ways, so that the wide diversity of world languages that we presently have reflects an equally wide diversity of perspectives on what it means to be human. We have also seen how thoroughly interconnected language and culture are, so that to be truly fluent in a language means that we must have rich knowledge of the culture in which that language flourishes. In the next section, we will consider the methods which we use for making knowledge of languages, and we will investigate language as a method for making knowledge in other areas.

Methods and tools

How do we know language?

The learning of our native language is an automatic process. We are immersed in a community in which a particular language is spoken all around us, so that we are exposed to that language extensively and often. We learn that language by observing – watching and listening – and by mimicking those around us. The process is not deliberate or even conscious. We are hard-wired to learn a language, and we learn the language (or, if we are lucky) languages by which we are constantly surrounded.

The process of gaining competence in your native language was probably simple and painless. You just soaked it up as you went about living your life. You were most probably a fluent speaker of a colloquial form of your native language, albeit with a relatively limited vocabulary, by the time you started school. Colloquial language, however, very often differs a great deal from the formal version of the language, and so in school, you are taught the more formal version.

CONCEPT CONNECTION

Power

Competence in a language is certainly highly desirable. If you are a competent speaker of a language, you can navigate your way through the world wherever they speak that language. You can make yourself understood and you can probably get much of what you want. That ability is a huge benefit: if you can make yourself understood, you have a certain amount of power in the world that people who cannot speak that language do not possess.

The better you are at using your language, however, the more power you have over your ability to navigate the part of the world where that language is spoken. You have possibly discovered that to make yourself clear – especially in writing – is a much more difficult proposition than having a casual conversation with a friend or even with a stranger on the street. If you want to have the ability to persuade others to see things the way you do, you need to have the kind of language skills that allow you to be persuasive: control over tone, the ability to organize your thoughts in a logical way and the ability to make your listeners feel that what you are saying is *right* – both in the sense of true and in the sense of morally right.

David Crystal, an expert in linguistics and author of many books about the English language, describes the ability to sway others with your language this way:

> There's nothing quite like the thrill of successful eloquence, of knowing that you've said what you wanted to say in the most effective way and caused an audience … to be delighted, enthused, persuaded, and moved by the way you've said it. (Crystal xi)

If you have the power to make yourself both understood and convincing you are in a much better position to have power over your life: to get people to do what you want them to do, or to let you do whatever it is that you want to do and to take a leadership role in the workplace when problems need to be solved or projects need to be developed. Perhaps most importantly from a TOK perspective, the more mastery you have over your language, the less others will be able to manipulate you into going along with a version of the world which benefits them, but not you, or to convince you to believe what is not true.

David Crystal

An example of how skilled knowledge of language can keep you from being swayed by inaccurate information can be seen in a blog post that went viral at the end of June 2019.

Blogger Phaylen Fairchild wrote a post in which she claimed that JK Rowling, famous author of the *Harry Potter* series, had 'confirmed [her] stance against transgender women' (MacGuill). Fairchild also claimed that, 'It's been a long time coming, but finally we have a definitive answer. JK Rowling is a TERF [trans-exclusionary radical feminist]' (Fairchild). A skilled reader, with the power that comes with detailed knowledge of vocabulary and sentence construction, will not be swayed by this argument. The claim is that Rowling has 'confirmed' her stance against transgender women; however, nowhere in the post is there any evidence that Rowling has made public any stance at all.

The word 'confirm' means that a previous statement exists and that there is now a new instance which backs up that original claim. If there is no original statement, then there is no confirmation. Note, too, that the careful reader also understands that the misuse of the word 'confirmation' does not mean that Fairchild's opinion is wrong, it just means that this argument is not well-constructed and further information is needed.

If you are a knowledgeable user of language you have the power to keep yourself from being swept away by claims that are highly emotionally charged and to wait for – or look for – more facts before you decide what is and what is not true.

In order to become skilled with your language, however, you have to do a lot of much more conscientious work. In school, you likely studied (and continue to study) formal rules of your native language, grammatical structures, the correct use of verb tenses, the various ways you can construct complete sentences and more vocabulary. Your teachers set you writing tasks of increasing difficulty over time, and, ideally, your skill with the written language gradually increases.

Practice, in other words, is the means by which we develop mastery, and even artistry, with language.

ACTIVITY

Read the following letter, written during the Civil War in the United States by a soldier who was just about to go off to his first battle. In the letter, he tries to explain to his beloved wife why he feels that he must do his part as a soldier, despite his love for her. A week later, Sullivan Ballou died at Manassas, in the first major battle of the War. After you read the letter, discuss the knowledge that Sullivan Ballou had of language. What skills did he exhibit in writing the letter? What skills do you, as a reader, need, in order to read and appreciate its beauty, beyond its straightforward meaning?

How do these skills help you to know more effectively?

Headquarters, Camp Clark

Washington, DC, July 14, 1861

My Very Dear Wife:

Indications are very strong that we shall move in a few days, perhaps to-morrow. Lest I should not be able to write you again, I feel impelled to write a few lines, that may fall under your eye when I shall be no more.

Our movement may be one of a few days duration and full of pleasure and it may be one of severe conflict and death to me. Not my will, but thine, O God be done. If it is necessary that I should fall on the battle-field for any country, I am ready. I have no misgivings about, or lack of confidence in, the cause in which I am engaged, and my courage does not halt or falter. I know how strongly American civilization now leans upon the triumph of government, and how great a debt we owe to those who went before us through the blood and suffering of the Revolution, and I am willing, perfectly willing to lay down all my joys in this life to help maintain this government, and to pay that debt.

But, my dear wife, when I know, that with my own joys, I lay down nearly all of yours, and replace them in this life with care and sorrows, when, after having eaten for long years the bitter fruit of orphanage myself, I must offer it, as their only sustenance, to my dear little children, is it weak or dishonorable, while the banner of my purpose floats calmly and proudly in the breeze, that my unbounded love for you, my darling wife and children, should struggle in fierce, though useless, contest with my love of country.

I cannot describe to you my feelings on this calm summer night, when two thousand men are sleeping around me, many of them enjoying the last, perhaps, before that of death, and I, suspicious that Death is creeping behind me with his fatal dart, am communing with God, my country and thee.

I have sought most closely and diligently, and often in my breast, for a wrong motive in this hazarding the happiness of those I loved, and I could not find one. A pure love of my country, and of the principles I have often advocated before the people, and 'the name of honor, that I love more than I fear death', have called upon me, and I have obeyed.

Sarah, my love for you is deathless. It seems to bind me with mighty cables, that nothing but Omnipotence can break; and yet, my love of country comes over me like a strong wind, and bears me irresistibly on with all those chains, to the battlefield. The memories of all the blissful moments I have spent with you come crowding over me, and I feel most deeply grateful to God and you, that I have enjoyed them so long. And how hard it is for me to give them up, and burn to ashes the hopes of future years, when, God willing, we might still have lived and loved together, and seen our boys grow up to honorable manhood around us.

I know I have but few claims upon Divine Providence, but something whispers to me, perhaps it is the wafted prayer of my little Edgar, that I shall return to my loved ones unharmed. If I do not, my dear Sarah, never forget how much I love you, nor that, when my last breath escapes me on the battle-field, it will whisper your name.

Forgive my many faults, and the many pains I have caused you. How thoughtless, how foolish I have oftentimes been! How gladly would I wash out with my tears, every little spot upon your happiness, and struggle with all the misfortune of this world, to shield you and my children from harm. But I cannot, I must watch you from the spirit land and hover near you, while you buffet the storms with your precious little freight, and wait with sad patience till we meet to part no more.

But, O Sarah, if the dead can come back to this earth, and flit unseen around those they loved, I shall always be near you in the garish day, and the darkest night amidst your happiest scenes and gloomiest hours always, always, and, if the soft breeze fans your cheek, it shall be my breath; or the cool air cools your throbbing temples, it shall be my spirit passing by.

Sarah, do not mourn me dear; think I am gone, and wait for me, for we shall meet again.

As for my little boys, they will grow as I have done, and never know a father's love and care. Little Willie is too young to remember me long, and my blue-eyed Edgar will keep my frolics with him among the dimmest memories of his childhood. Sarah, I have unlimited confidence in your maternal care, and your development of their characters. Tell my two mothers, I call God's blessing upon them. O Sarah, I wait for you there! Come to me, and lead thither my children.

– Sullivan

Practice with language consists of more than school lessons. In order to become truly a master of your native language, you must expose yourself to, or be exposed to, as much high-quality language as possible. If you surround yourself with written and verbal language which uses sophisticated structures and techniques, such as metaphor and allusion, and which uses a great range of vocabulary, then you will begin to absorb those patterns of language. People who are not exposed on a regular basis to complex language will find it much more difficult to develop their own language skills.

IA prompt

2 Are some types of knowledge more useful than others?

DEEPER THINKING

Use of language in the technological world

Consider the language by which you are surrounded on a regular basis. Do you watch a lot of television? Spend a lot of time reading on the internet? How rich and sophisticated is the language which you encounter in those places? Think about the language that people use in texting.

Text messages tend to abbreviate language, both in terms of spelling and in terms of sentence structure. Can one develop one's skill as a reader and composer of text messages in the same way that one can develop one's skill as a reader and writer of elegant prose? For many people in today's world, texting is probably a more useful skill than the knowledge of how to produce eloquent speech and writing is. Certainly, most people will send text messages far more often than they will be called upon to write a powerful essay or speech or to stand in front of an audience and try to persuade its members to feel passionately about something.

What knowledge, if any, of language do you think is lost if we confine most of our written interactions with each other to text messages? What knowledge, if any, is lost if most people were to fail to develop the capacity for powerful, eloquent language? Is the utility of language, that is, its usefulness, the most important determiner of what knowledge of language we should have?

Methods of learning a foreign language

Think of the methods and tools that you have used in the study of a second language for your IB Diploma Programme. You will probably recognize that in trying to learn a foreign language, you use many of the same methods that you used to learn your native language. The biggest difference, however, for many people, is that they don't live in a community where that second language is spoken, and so they do not have the opportunity for learning – or augmenting their school learning – by immersion in the language community. That lack of immersion explains why the development of vocabulary, as we discussed earlier in the chapter, tends for most learners to lag far behind the development of vocabulary in a native language.

ACTIVITY

Think about your own experience learning a second language. Ask yourself the following questions:

1 What are the primary resources that you rely on to help you learn the language? Your teacher? Textbooks? Television programmes in the target language?
2 Do you have access to many native speakers of that language while you are studying it?
3 Do you know someone who is learning a second language in a community in which that language is spoken? Perhaps you live in an English-speaking community and you have an immigrant friend who is learning English. Or perhaps you live in a Spanish-speaking community and you know a native speaker of English who is learning Spanish. Or perhaps you are a person in this situation. How does that experience of learning a new language contrast with the experience of learning a language without the immersion in the community?
4 Which resources and tools have you found to be the most helpful for making knowledge of a new language?

How do we know other things via language?

Language is one of the main ways that we learn. We learn from speaking to our friends and family, from listening to our teachers at school, from reading about current events in newspapers or on the internet, from hearing religious leaders speak and by speaking and listening in many other situations that we encounter every day. In more formal ways, people who are working in various areas with the object of generating new knowledge in, say, psychology, entomology (the study of insects), geology, mathematics and history, rely on language every day. In fact, we might first wonder whether it is possible to learn anything at all without language.

If the primary function of language is to connect minds and transmit ideas, thoughts and feelings, does this mean that individuals working on developing new knowledge on some particular topic can do so without using words? Can new knowledge, in other words, ever be developed without language playing a role?

KNOWLEDGE QUESTION

Is it the case that if we cannot express something, we don't know it?

ACTIVITY

1. Use the QR code on the right to watch the video. As you watch, try to figure out what the magician is doing. Notice what happens in your mind as you watch.
2. Were you able to just observe and take in the images without using any words?

Remembering that once we learn language, it becomes automatic, we're betting that you were not able to separate the words out of your observations. What you saw probably generated questions and those questions took the shape of words. Maybe you had some ideas about what the magician was doing to create the illusions. If so, those ideas most likely took the shape of words. You experienced something similar at the beginning of this chapter when you watched the video of the Rube Goldberg machine and tried to understand what was happening.

CONNECTION TO THE CORE THEME

Individuals and communities of knowers

Jane Goodall

This relationship between observation and thought is not confined to personal knowledge and personal experience. If you think about a scientist in the field, even if she is alone, observing, say, chimpanzees, as Jane Goodall did for so many years, language is still an important part of the tools that she uses. Goodall writes down what she observes in order to document the data. She formulates hypotheses to test. She asks herself questions and poses possible answers. That individual knowledge will translate into communal knowledge when she evaluates her findings and communal them with the scientific community and the public. You will learn more about this process in Chapter 9 when we explore the natural sciences.

Indeed, as you go through the Theory of Knowledge course, you will investigate with each topic the methods used to generate knowledge. Language will play a significant role in each of those areas. Each of the different areas of knowledge have technical terminology which is unique to that area because particular language is needed to describe phenomena which do not exist in other areas – or which plays a specific role in one area that it does not play in another. The word 'theory', for example, has a different meaning in the natural sciences from what it means in the study of literature, and both have a different meaning from the way it is generally used in colloquial English, where it means, roughly, 'unsubstantiated idea'.

So, one important aspect of language that you will be investigating throughout the course is the use of technical terminology. Another important role that language plays in all areas of the pursuit of knowledge is the role of communicating findings to others. We noted above that Jane Goodall gathered a lot of knowledge about chimpanzees by herself, making it first her own personal knowledge. That knowledge would have done no good for the wider scientific community or for the world in general – or, indeed, for the chimpanzees! – if she had not shared it.

CONCEPT CONNECTION

Power

An ability with language can, as we have seen, give a person considerable power over many aspects of their life. We have also seen how one person might have power over another person if language is used as a weapon. Language is not, however, all-powerful. There are only a very few circumstances in which language has the power to create a reality: just saying something is so almost never makes it so.

ACTIVITY

Language can sometimes shape reality:

- Your teacher is empowered to decide when your next unit examination will be, and they can then make that date the actual date simply by telling you that it will be so.
- Religious leaders such as a Catholic priest or a Muslim Imam can make a declaration of marriage, as can people who have been officially licensed by the appropriate government office, such as judges and county clerks. When those people pronounce a couple 'man and wife', that couple is, legally, married. If you pronounce someone married, unless you have been properly licensed, no marriage takes place.
- A boss can fire an employee simply by declaring 'you're fired'.

How many other instances can you think of in which the simple declaration of a fact by a person who has the actual authority to declare it has the power to create a particular reality? List as many as you can.

CONCEPT CONNECTION

Culture

The role of language in giving people the power to make pronouncements of marriage is culturally determined. You cannot simply declare someone married, unless you have been properly licensed in your country, but neither can the Catholic priest in all situations. A priest or Imam cannot just stop two people on the street and declare them married. The power of the words exists only in the particular context of the marriage ceremony. Chapter 5 (Knowledge and Indigenous Societies) discusses the power of ritual for transmitting language in much more detail.

The fact that making a declaration only makes something true in a very few instances means that any professional practitioner who wishes to establish that their knowledge is true and justified must go through the process of not just sharing that knowledge with others, but also of explaining and justifying the claims. You will find that this process is necessary in every knowledge-making endeavour. It is important not to just accept claims at face value, but rather to assess and validate them. The same thing is true in mathematics, science, history and so on. As you study each of the topics in your course, look for the processes which exist in each area for the sharing and checking of the knowledge claims made in that subject.

You will investigate these processes in more detail later, but here is one example.

CASE STUDY

Andrew Wiles and Fermat's Last Theorem

In 1993, Andrew Wiles, a mathematician at Princeton University, gave a series of three lectures at a maths conference in Cambridge, England (Rubin and Silverberg). The lectures built up to an announcement that Wiles had solved a 300-year-old maths problem: Fermat's Last Theorem. His announcement, however, was insufficient for the mathematical world to simply accept the claim as true – even after lectures over three days. The work was sent, as all mathematical work is, for peer review.

You may have experienced peer review of some of your schoolwork, in which one of your classmates read your work or listened to your presentation and gave you feedback about how to improve it. Professional peer review is similar in the sense that a colleague – an expert in the area in which the new knowledge claims are being made – reads the work and comments, but beyond that, professional peer review is rather different from your classroom experience. You can generally choose whether or not you are going to attend to the advice that your peer reviewer gives you; however, a professional researcher – in this case, Andrew Wiles – does not have that option. A professional peer reviewer has the power to stop something from being published altogether. If they find an error, they will send the work back and require that it be revised – even if revision means re-running experiments or starting almost entirely from scratch. If a professional cannot justify their claims to the satisfaction of the peer reviewer, then their claims are rejected and do not become a part of the accepted knowledge in that area.

In the case of Andrew Wiles, in fact, after a few months, an error was found. The error could not be easily corrected and after a few tries, the paper was rejected. The problem of Fermat's Last Theorem was not, after all, solved. Wiles had to work for two more years before, following another round of peer review, the proof was published in *The Annals of Mathematics,* where, because it was so long and complicated, it took up two full volumes (Castelvecchi). The final publication was the signal that the mathematics community had accepted Wiles' work as knowledge. Wiles won the 2016 Abel Award – the mathematics equivalent to the Nobel Prize – for this proof (Castelvecchi).


Arithmeticorum Lib. II.

■ Seventeenth-century mathematician Pierre de Fermat declared that he had a proof for his theorem, but that it was too lengthy to fit in the margin of this page

CONCEPT CONNECTION

Certainty

The example of Andrew Wiles' journey in trying to establish his proof as knowledge illustrates a process which is widely used in many areas of knowledge. This debate – with language as the primary method – is integral to establishing the credibility of knowledge claims.

In mathematics, the standard for acceptance of a proof as knowledge is absolute certainty, and the process of peer review was able to establish Wiles' work to that standard. In other fields, however, the explanation and justification of a knowledge claim does not necessarily result in absolutely certain knowledge. In some areas of knowledge, the claims are made, explained and justified, and then acceptance may be widespread, or it may be the subject of significant debate. Other ideas may be proffered as equally good or better explanations of the same observations. In some areas, such as the arts and history, the object is not necessarily to establish a single **unassailable** knowledge claim, but rather to offer differing interpretations, all of which may have equal credibility. In those areas the process of explaining and justifying is still vital, but our understanding of any particular work of art or any particular historical event can be made richer by the effective justification of ideas from differing perspectives, a process quite unlike the search for absolute certainty in mathematics.

We have seen that the methods of making knowledge of a language can make a difference in the degree of mastery that the speaker will eventually attain. We have also seen that mastery in a language can give an individual power in the world, both in terms of what that person can accomplish and in terms of being able to resist other people's attempts to deceive or manipulate. Language is also an important tool in making, justifying and sharing knowledge in all other situations, including the professional development of knowledge. Given the importance of language in the knowledge-generation process, the question of whether language is used ethically takes on great significance.

◆ **Unassailable**: Something which is unassailable cannot be successfully attacked and defeated.

Ethics

> Sticks and stones may break my bones but words can never hurt me!

This common **aphorism** suggests that language has no power to wound, but few people, if any, get through childhood without learning that this saying is simply not true. Bullying very often consists of words. Name-calling, slurs, slander and the promotion of lies about someone can all do great harm to a person's self-esteem and reputation. Cruel people can use language cruelly, and such a use is one example of the unethical use of language.

◆ **Aphorism**: A fairly short, succinct and widely-repeated saying that purports to convey some universal truth about human experience.

Another obviously unethical use of language is the telling of lies.

Truth and lies

ACTIVITY

Read the following very short story – a 2009 contribution to the 'Six Word Stories' website – written by Richard Powers:

> Lie detector eyeglasses perfected: Civilization collapses. (Powers)

1 What does the story suggest about human nature?
2 What does the story suggest about the power of lies?
3 Since civilization seemed to be stable enough before people could see all the lies for what they were, does that suggest that lies are fine as long as no one finds out?
4 If a lie causes tremendous damage, but no one ever finds out that the cause of the problem was a lie, does that mean that the lie was not unethical?
5 Why might having to face the fact that lies are lies cause civilization to collapse?

The story is intriguing because it seems to suggest that the world can run along just fine so long as no one finds out about lies. That in turn suggests that lies don't have any real effect on the world – it's only our knowledge of lies that has an effect on the world. In *The Winter's Tale*, William Shakespeare's tyrant king, Leontes, has a speech in which he describes what it's like to find out about something he didn't know about previously:

> There may be in the cup
> A spider steeped, and one may drink, depart,
> And yet partake no venom, for his knowledge
> Is not infected; but if one present
> Th' abhorred ingredient to his eye, make known
> How he hath drunk, he cracks his gorge, his sides,
> With violent hefts. (Act II scene i 50–56)

This is a striking image: if you drink a cup full of water and you don't know that you swallowed a spider, then you are not bothered at all, but if you drink a cup of water, and you swallow a spider that you see at the last minute – too late! – you are horrified, and likely to vomit the spider back up.

The idea that lies have no effect if no one knows about them parallels the spider in the cup. There is one universal ethical principle with regard to the making of knowledge, and that is that we are obligated, individually and communally, to always do our very best to make accurate knowledge. If, at any point, it turns out that the 'knowledge' we developed was wrong, and therefore not knowledge at all, then we are obligated to go back to the drawing board, as it were, and try again. We saw that principle in play with Andrew Wiles: when his 'proof' turned out not to be a proof, he had to go back and do it over until it was right.

An error, therefore, is not a violation of that ethical principle, so long as we acknowledge the error and make an honest effort to figure out what the problem is.

Learner profile

Principled

How does our use of language contribute to our being principled? How does our desire to be principled influence our use of language?

CONCEPT CONNECTION

Truth

There is a close relationship between language and truth. We need more than language, of course; we need the speaker to have the knowledge necessary to recognize, understand and appreciate the truth, but if we assume that that knowledge is in place, then language is the tool we use in order to transmit the truth from one person to another. Lies are a matter of the deliberate misuse of language. To tell the truth properly, however, we need more than just intention: we need the speaker or writer to have mastered language well enough to be able to say exactly what is intended in the most clear and effective way possible.

As receivers of language, we also need to have mastered language well enough to be able to understand the connotations of words as well as the denotations. We need to be able to understand nuances and implications, beyond the surface level of what is being said; otherwise, we will misunderstand what is being said, and the truth will escape us. As receivers of language, we also need more than mastery of language: we need the mental capacity and commitment to avoid willful misunderstanding.

From both parties engaged in a communicative act, then, for truth to be conveyed, we need knowledge of facts, mastery of language and commitment to truth.

ACTIVITY

Discuss the following questions with a partner, and then with the rest of your class.

1 Is a lie a violation of our obligation to try to be accurate?
2 If a person knows the truth about the answer to some problem, and then lies about it for some reason, would we say that that person is not making a good-faith effort to find out the truth, but they would be instead making a deliberate effort to hide that truth? Can you imagine any situation in which someone would do that? For what reason might such an action be taken?
3 If a person does not know the truth about the answer to some problem, and then lies and says that he does, is that the same thing as failing to make a good-faith effort to make accurate knowledge? Can you imagine a situation in which someone would do that? For what reason might such an action be taken?
4 In either of the two situations above, if no negative consequences ensued, would the lie be unethical?
5 If some negative consequence results in the world because of a lie, must the liar inevitably be caught? If a liar is *not* caught, does that mean that no negative consequences resulted from the lie?
6 Do we each individually have a responsibility to work to become expert users of language in order to be able to understand and to transmit truth?

IA prompt

10 What challenges are raised by the dissemination and/or communication of knowledge?

IA prompt

27 Does all knowledge impose ethical obligations on those who know it?

Ultimately, it is difficult to imagine how a lie about anything of real import could fail to have a negative consequence in the world. Imagine what would happen if a mathematician lied about what is and isn't true in mathematics: mathematics is used in thousands of situations, from the design of bridges and buildings to the calculation of how much money you have in the bank. If we didn't know how maths really works, the bridges and buildings would probably collapse, and the money you thought you had might turn out to be non-existent. If a scientist lies about his findings, then we lose our ability to predict and control the world around us. If a politician lies, we cannot make good decisions at the ballot box when we vote. If a technology expert lies, we cannot trust the equipment that that expert built. If a religious leader lies, then we cannot form a good understanding of the spiritual world that that religion describes. If holy texts are in essence a contract with our god, lies about what those texts mean could conceivably destroy that relationship. We count on the experts to be telling us the truth because those truths form the basis for almost everything we encounter in our daily lives.

We can see, therefore, that people who make knowledge and disseminate it to others have an ethical obligation to be truthful. One final consideration, however, is that since some people do lie, and we know that we cannot always trust the word of every 'expert', we each also have an ethical obligation to check what we are told. We are always partly responsible for our own knowledge.

Language and power

Because language has power, any abuse of that power would necessarily be an unethical misuse of language.

- People can, in some cases, use language to create certain realities.
- Language is a tool which individuals can rely on in order to have power over their own understanding – the power to protect oneself from being manipulated by others.
- People who are masters of the use of language can use their language as a tool to convince others to see the world from their perspective.

Given the power of language in these situations, we can see that abuse of power is always possible, and anywhere there is a potential for abuse of power, there is a need for ethical behaviour on the part of users. A misuse of language in any of these situations must certainly be considered to be unethical.

KNOWLEDGE QUESTIONS

In what ways can language be used to influence, persuade or manipulate people's emotions?

Is ambiguity a shortcoming of language that must be eliminated, or can it also be seen as making a positive contribution to knowledge and knowing?

Standard dialect

A final kind of power that we have not yet considered is the power of a standard dialect. A dialect is a variation of speech which is related to where people live. Different dialects of English have different systems of punctuation and grammar. Commonly, the 'standard' dialect in any language is the language of the people in power. In the United States, for example, the standard language is the language of white culture, and it came to be the standard dialect because it has been white people – largely wealthy white people – who have held the political power in the US for centuries. People who speak non-standard dialects – particularly dialects of minority races, but also dialects from some geographical parts of the country such as the Appalachian Mountains, are all too often looked down upon by people who were born to the standard dialect.

Probably you have noticed the same phenomenon in your country: people who speak with certain accents are often automatically considered by many people to be less intelligent, poorer, uneducated or even morally bad. People who don't speak a dialect which is close to the standard dialect cannot get certain kinds of jobs. Language can keep some people trapped in a cycle of poverty for generations, simply because of the prejudices which the particular dialect they speak trigger. This problem is not the result of unethical use of language, but rather it is an unethical belief about the nature of language itself. Language is a learned skill; it is not a reflection of any inborn ability or character.

CAS links

You could develop a CAS project which involves learning about which dialects of your community's language are spoken in your area and then helping to educate your classmates or others in your community about the history and culture of the dialects. You could host a fair with displays about each of the different dialects and begin collecting samples of the dialect to add to the collection of a local historical museum as a celebration of the rich culture of the area, and as a means of combatting ill-informed prejudices about language.

Conclusion

Language is an important tool in all of our knowledge-making situations. In this chapter, we have looked at some general features of that tool – what it is, how it is learned, how it helps us learn. As you continue through your TOK course, keep these features in mind and ask yourself how the particular knowledge situations you encounter are influenced by the role of language in those situations.

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5 Knowledge and Indigenous Societies

OBJECTIVES

After reading this chapter, students will:

- understand the practical and ethical challenges of attempting to define the word 'Indigenous'
- understand common features of Indigenous knowledge systems
- recognize the impact of these features on the methods and tools used to develop knowledge
- understand the role of myth and ritual in establishing relationships between individuals and communities
- recognize the threat to Indigenous knowledge systems and the importance of education to protect these systems.

Learner profile

Caring

Can we empathize with other cultures and remain objective?

Introduction

In October 1882, a 22-year-old Navajo man arrived in southern Pennsylvania, transported there from his native homelands in the southwest of the United States. He was joining the Carlisle Indian Industrial School, established in 1879, and was given a new haircut, new clothes and a new name: Tom Torlino, a poor approximation of his Native name: Hastiin To'Haali (Yurth). He was forbidden from then on to speak his native language. Students like Tom would have learned English, maths and world history, as well as how to march, and how to play American football, baseball and musical instruments. Instead of living free with his people, he now took his exercise in the school's gymnasium, 'where liberal provision is made for exercising the muscles and fortifying the constitution against sickness' ('Description of the grounds'). He was there, in the words of the school's founder Richard Henry Pratt, in order to gain 'a civilized language, life, and purpose' ('Ephemera relating to Tom Torlino'). The idea was that this school, and all it offered the boy, was ultimately for his own good.

Left: A young man from the Navajo Nation, known as Tom Torlino aged 22 in 1882. Right: Tom three years later. Tom was with the school for five years

ACTIVITY

1. Look at the two pictures of Tom Torlino and list the ways in which his appearance has changed.
2. Why do you think Richard Henry Pratt and the staff of the Carlisle Indian Industrial School were so keen to change their students' physical appearances?

Towards the end of the nineteenth century, the United States' expansion into the Great Plains of the North American continent was nearly complete. California and Oregon on the west coast of the continent had already become states, leaving only the Rocky Mountain territories and the western plains to be incorporated into the Union. The number of Indigenous people that had been living in what would become the United States had been steadily diminishing since the arrival of Europeans in the sixteenth century, and at the close of the nineteenth century it was a widely-held belief that the Native Americans and their cultures would ultimately disappear. While not a solution to the diminishing numbers, assimilation into the dominant culture was considered at the time the only opportunity to support individual Indigenous peoples; to save the individual, they would need to stop being part of their Native tribe and become a fully **enculturated** citizen of the United States. Towards this goal, Richard Henry Pratt, a United States Civil War commander, working in conjunction with the United States government, opened The Carlisle Indian Industrial School in 1879. His goal was one he believed to be charitable:

> When we cease to teach the Indian that he is less than a man; when we recognize fully that he is capable in all respects as we are, and that he only needs the opportunities and privileges which we possess to enable him to assert his humanity and manhood; when we act consistently towards him in accordance with that recognition; when we cease to fetter him to conditions which keep him in bondage, surrounded by retrogressive influences; when we allow him the freedom of association and the developing influences of social contact – then the Indian will quickly demonstrate that he can be truly civilized, and he himself will solve the question of what to do with the Indian. ('Excerpt from Pratt's speech')

◆ **Enculturated**: To learn the basic rules, beliefs and practices of a culture. Most of us are enculturated to our native culture just by growing up in it. Some of us move to a new culture and have to learn the basic beliefs and practices of that new culture.

For 30 years, the school took young Native Americans away from their lands, their homes and their families and sent them to the Carlisle School in southern Pennsylvania. Over the duration of the school's life, nearly 10 000 Indigenous boys and girls were made to be less like what they were at birth and more like what the new country thought they should be. They were forced to abandon their language and their religions and, under harsh military discipline, learn English, Christianity and everything it meant to be a US citizen at the close of the nineteenth century.

■ Richard Pratt (seated on the bandstand) with a class of Carlisle students. Tom Torlino is seated in the front row, first on the left

Pratt's falsely charitable belief that he was improving their lives was built on a deeper assumption that the people needed improving. Despite the fact that their cultures were getting on happily with life for thousands of years before the Europeans arrived, there was the pervading notion that they needed to be 'civilized'.

Pratt argued that:

> it is a great mistake to think that the Indian is born an inevitable savage. He is born a blank, like all the rest of us. Left in the surroundings of savagery, he grows to possess a savage language, superstition, and life. We, left in the surroundings of civilization, grow to possess a civilized language, life, and purpose. Transfer the infant white to the savage surroundings, he will grow to possess a savage language, superstition, and habit. Transfer the savage-born infant to the surroundings of civilization, and he will grow to possess a civilized language and habit. ('Excerpt from Pratt's speech')

Pratt's attitude towards the Indigenous populations, their cultures and their individual capacities was not uncommon; it is a view shared by colonizing cultures the world over.

The United Nations estimates that there are currently over 370 million Indigenous peoples living across 70 countries worldwide, or between 15 and 20 per cent of the world's population. This may seem like more than you would expect, but consider this: in 1492, Columbus arrived from Spain at the island of Hispaniola where Haiti and the Dominican Republic are today. It is estimated that at the time there were about 3 million Native people living there. Within a generation, because of disease and violence, there remained about 11 000 (Lord). This, again, is the story of colonization's impact on Native populations around the world. As the cultures fade away, so too do their languages, their rituals, their traditions and their unique way of life.

There is a huge diversity across the groups who are recognized as Indigenous, but there is one common theme to their stories, that of being part of a group which is under threat by some other dominant society and culture. Caught in the pervasive power of a 'global society', the Indigenous cultures in every corner of the world are struggling to survive. As the world becomes more and more similar, the links to specific geographical regions and traditions become harder and harder to maintain. Aside from Antarctica, each of the planet's continents has been witness to the process of colonial expansion and the weakening of Indigenous societies' ties to their own lands. The histories and challenges faced by Indigenous cultures have become more well-known over the last half century and the aim of this chapter is to further explore what have been called 'Indigenous knowledge systems'. Unfortunately, the Carlisle School's founder, Richard Henry Pratt, was not alone in his assumption that the Indigenous systems were simply a poor shadow of the 'right' way to know the world, but this chapter hopes to provide a framework and an understanding of Indigenous knowledge systems in a way that brings out their value for the future.

KNOWLEDGE QUESTION

How have government education policies and systems compromised the transmission of Indigenous knowledge?

ACTIVITY

Identify and research an Indigenous culture. It could be one in your own country or on the other side of the world. Perhaps you belong to an Indigenous culture.

1. In what ways do you think that culture is under threat by a dominant culture?
2. How has the threatened culture tried to reassert itself in the face of the dominant culture?
3. Can you articulate the struggle for survival in terms of *knowledge*?
4. Keep in mind what you find out as you read through the rest of the chapter. Does what we discuss have relevance to the culture you've studied?

Indeed, not all attempts to erase a culture are successful. Individual loyalty to one's own culture and tradition is hard to eradicate. Hastiin To'Haali remained at the Carlisle Indian Industrial School as Tom Torlino until August 1886, when he left and returned both to his childhood lands in New Mexico and to his people's language, culture and traditions. Pratt's attempt to 'Americanize' Hastiin To'Haali wasn't successful: Hastiin To'Haali lived out his life as a successful rancher and medicine man and only made use of his Carlisle education when asked to write letters in English or communicate with outsiders (Yurth). Hastiin To'Haali, as an individual, was lucky. The same cannot be said for his culture or the other Indigenous cultures around the world. Boarding schools like Carlisle had already been set up in his native lands and the westward expansion of the United States was unrelenting.

In 1868, the Navajo Nation held only 10 per cent of its ancestral homeland, first taken by Mexican expansion, then later US expansion, though much of this has been reacquired (Birchfield). The 1872 census was the first genuine attempt at identifying the number of 'Indians' across the US, counting about 38.5 million (Jobe). By 2010, the number had dropped to 5.2 million (Norris, *et al*). There are only about 100 communities considered 'uncontacted' in the world today (meaning that they have not yet made any contact with any wider culture), but this number is destined to change in the face of unstoppable globalization (Holmes). Although many Indigenous communities remain strong and some are even growing, the challenges they face continue to be ever-present.

Scope

Defining Indigenous societies

One of the first challenges we are faced with in a discussion of Indigenous knowledge systems is the problem of definition: how shall we define 'Indigenous'? A definition is a form of knowledge, but applying a definition onto something is also an act of *creating* knowledge.

Identifying an essential element

One way to develop a definition is to identify some essential element and link a definition to that essential element. By doing so, all things which are defined in this way have that essential element. If we say that some thing or object should be given some label or definition, we are thereby linking it to other things. Finding an essential element shared by all 'Indigenous' knowledge systems, however, seems like a fruitless task. We can see that there are communities which we call 'Indigenous' all over the world, and trying to describe just *one* feature that they all share or *one* way in which they make knowledge in their communities and which would then differentiate them from all non-Indigenous cultures or knowledge systems would be impossible. The fact that the UN seems confident enough to offer a rough count of 'Indigenous' people, suggests, however, that there is a working definition.

DEEPER THINKING

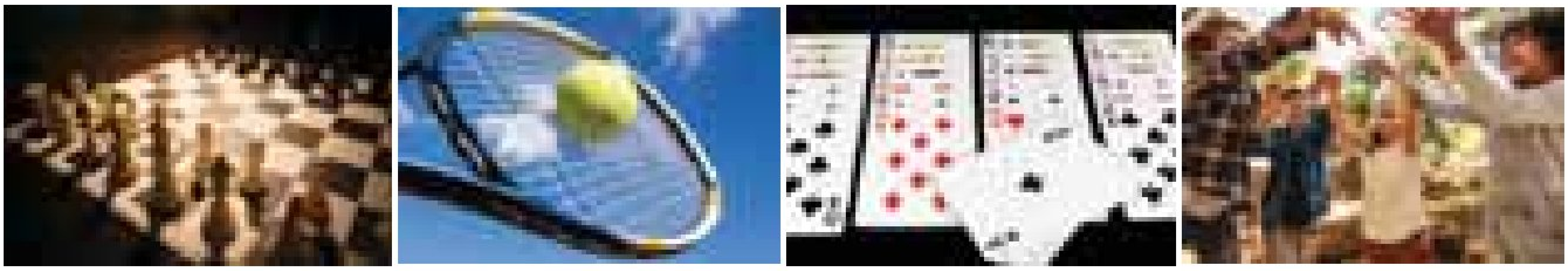
Categorization

Much of our knowledge of the world is aimed at *categorizing* different things into various groups with others that share similar features. Creating these categories and using them to describe objects is a form of knowledge construction. Are there such things as 'natural categories' in the world or do we create them? In what ways do our own desires and wishes and paradigms dictate how we impose categories onto the world?

IA prompt

6 How does the way that we organize or classify knowledge affect what we know?

Identifying overlapping characteristics



What is the common factor between all these things we call games? The philosopher Ludwig Wittgenstein suggested that some terms cannot be defined by well-defined criteria, but rather by a set of overlapping characteristics

A better option might be to identify a set of overlapping characteristics which different groups that we identify as 'Indigenous share, but without expecting that there is some single characteristic that they all have in common. This would be like what twentieth-century philosopher Ludwig Wittgenstein called a 'family resemblance'. He suggested that certain concepts do not have one clearly definable definition that can be applied to things in the world. He used the concept of games as an example, suggesting that the things we call 'games' are all similar, but that there is no single feature common to them all, like the way members of families *resemble* one another without having a single defining feature (Wittgenstein). Think of your own family – you might look a bit like your parents and your siblings, but there is probably not a single characteristic that you all have in common.

This might be a more fruitful way of defining 'Indigenous'. There might be common characteristics which *generally* capture what we think the term should mean. Starting with the acceptance that there are communities of people around the world (the UN has counted them!) to whom we think the term 'Indigenous' applies, we may then explore ways in which they resemble one another, even if we accept that each may have unique characteristics which are related to their unique circumstances and histories. Trying to fit all of these communities into a single definition could never show an adequate appreciation of those circumstances and histories, but it might be possible to identify elements that suggest they are *distinct* from other ways of knowing the world.

Cultural assumptions

In addition to the attempt to find a working definition of 'Indigenous' described here, there are further questions about the politics of making such a distinction. You may have already recognized the problem we're facing when reading about Pratt's goals for the Carlisle School. It's pretty clear in his quotations on pages 148 and 149 that, while we might recognize that, from his point of view, he was trying to help the Indigenous students at his school, he nevertheless saw them and their culture as 'primitive', even calling them 'savage'. Perhaps it can be argued that Pratt was a product of his time and that his own cultural assumptions made it impossible for him to accept that a culture so different from his own (and one that that had been happily living on its own for thousands of years). However, his cultural assumptions about the Native Americans nevertheless pose a real problem and are likely to render anything Pratt says or does as irretrievably prejudiced and bigoted. The question of how to *responsibly* define and then *responsibly* reflect on Indigenous knowledge systems in the context of a wider dominating society is contentious and explored more fully in the Ethics section of this chapter. We as writers are aware of this problem, conscious as we are that we are not part of any Indigenous community. We make an attempt to define and reflect on Indigenous knowledge systems, though, in the hopes that we can learn about these communities and reflect on our own cultural perspectives.

TOK trap

One of the key points of the Theory of Knowledge course is that each of us views the world from a perspective or through the lens of the beliefs and culture we are part of. It is a bit like viewing the world through a set of spectacles, but not realizing that you're wearing them.

Recognizing the impact of these background beliefs, expectations and paradigms is a challenge. This often impacts TOK students' work in two ways. Firstly, students very quickly think that they understand or can speak about another culture to which they do not belong. More often than not, it is obvious to a reader of the student's work (your teachers and your examiners will spot it a mile away). Secondly, students (but not just students!) can too easily *judge* the world from their own perspective (and unconsciously believe that perspective to be the 'right' perspective). It is very easy and all too natural to judge other cultures negatively, especially when they present ideas and behaviours which are not part of your own culture.

This is *not* to suggest that a genuine critical reflection on another culture's behaviour is not appropriate and sometimes needed. However, take care not to assume from the outset that just because you are unfamiliar with a practice or belief from another culture it is therefore not as good as your own, or that it is in some way 'wrong'. To conclude that some other culture's behaviour is mistaken or wrong takes a fair bit of charitable understanding and argument. To 'pre-judge' another culture's behaviours or beliefs is just a sign of prejudice.

None of this is to suggest that a working definition of 'Indigenous' isn't possible or important to construct. Identifying what we mean by Indigenous will help us to both understand the perspective of these communities as well as understand and help to combat the challenges they might face.

Accepting that such definitions are contentious, the UN has avoided adopting any 'official' definition, but it has offered a number of concepts which might serve as distinguishing features of these communities. Some distinguishing features include:

- Having historical and pre-colonial or pre-settler connections to a specific geographical region and having distinct linguistic, social, economic or political systems from the more dominant culture surrounding them. Being a 'non-dominant' community is meant to bring out the fact that in many cases Indigenous cultures are those cultures who have suffered the worst consequences of colonial expansion: it was generally *their* lands which were colonized by more economically and militarily powerful cultures and it is Indigenous cultures which have found their way of life threatened.
- Self-identification of members into that community and the acceptance by the community of that individual. In other words, the community itself decides who are members of that community.
- The resolve to maintain the traditions and culture of that community in the face of a dominant society which would otherwise easily subsume the community.

The UN accepts that trying to find definitions in this context is sometimes not helpful or even possible. It therefore suggests that we should be trying to *identify* rather than *define* Indigenous communities, in the hopes that both Indigenous and non-Indigenous communities can work together to maintain the traditions, culture and history which would otherwise be lost (United Nations Permanent Forum on Indigenous Issues).

Indigenous knowledge systems

If it is possible and right to develop a working definition of 'Indigenous societies' in order to better understand them and better understand their relation to other types of communities of knowers, we must now get a handle on what we mean by 'Indigenous knowledge systems'.

Indigenous communities often have unique ways of knowing about the world around them which are often quite different to those systems of knowledge that are studied elsewhere in the Theory of Knowledge course.

In TOK, the phrase 'knowledge systems' is a title reserved only for Indigenous knowledge and religious knowledge. How is this sort of knowledge different from other forms of knowledge, particularly those forms captured in the areas of knowledge (AOK)? One difference is that the knowledge systems of Indigenous cultures and religions are *informal* in opposition to the AOKs, which tend to have more formal structures. Science and history both have a reasonably well-defined *method*; they have 'rules' or established general principles which govern how knowledge *ought* to be constructed. The informality of Indigenous and religious systems, however, suggests that the methods used by these communities is varied and might incorporate methods that are unique and one-off events. For example, some of these methods might incorporate visions, a loyalty to a shared history and a set of traditions or even centuries of simple trial and error. Some of these methods will be explored in the Methods and tools section of this chapter.

KNOWLEDGE QUESTION

In what ways do different AOKs and communities of knowers create structures which make their knowledge different from others?

One of the features of knowledge systems we are considering here, as opposed to the AOKs, is that both Indigenous knowledge and religious knowledge are far more absolute than the knowledge of the AOKs and they impose a far greater influence on the individual. Knowledge in the areas of knowledge might be seen as in a state of flux, with knowledge changing over time with new evidence and discoveries, whereas one of the features of Indigenous and religious systems is that they are relatively closed. This is because in many respects they hold and confer *cultural* knowledge which people identify with, so an individual's relationship to that knowledge is different. The intellectual tradition from which the International Baccalaureate has emerged, for example, starts with the assumption that knowledge is a sort of commodity that we gain, trade, construct and sometimes overturn. But knowledge in Indigenous cultures is intimately related to an individual's sense of identity. Being part of an Indigenous community means holding on to knowledge as part of your core. This is the tragedy of the decline of Indigenous knowledge: peoples' identities are being lost as well. We will consider this more in terms of language later.

Characteristics of Indigenous knowledge systems

What follows here is an attempt to outline a few of the interesting characteristics that seem to be familiar across different Indigenous knowledge systems wherever they are in the world. These characteristics might serve as relevant comparison points with what is normally considered 'western' or **Enlightenment** scientific knowledge systems. Chapter 9 (The Natural Sciences) and Chapter 10 (The Human Sciences) are more firmly rooted in this tradition, so while reading this chapter you might like to refer to those chapters to look for connections and contrasts.

By way of developing a contrast, we might consider some of the fundamental starting points of what we might call Enlightenment science. Prior to the seventeenth century, much of the European tradition of knowledge construction was what we might consider *deductive*. This means it began with what tradition and authority said was the case and then worked to develop theories which aligned what was seen in the world with those accepted principles and authorities. The advent of 'modern' science was different in that it prioritized observation and placed the development of theories which explained the observations later.

One of the hallmarks of modern science might be called **scientific reductionism**. This was the idea that any problem or explanation should start with the breakdown of problems into smaller parts, then the development of an understanding of the objects and mechanisms at this smaller level, then an explanation of the larger problems on what was discovered at the lower level. This is why, when you study life sciences, you are often working hard to understand the smallest units of life – cells – and even lower down you might be investigating chemical reactions in those cells at the molecular level. The assumption is that if you really want to know what's going on, you look at the fundamental entities and forces at work. Another basic assumption in this process is that the observer and what is being observed are distinct: observers are meant to distance themselves

◆ **Enlightenment**: A historical period from the late seventeenth to the early nineteenth centuries. It was characterized by significant shifts in the role of individual reason and inquiry in the formation of knowledge, and the breakdown of authority. The natural sciences stepped out from the realm of philosophy and became a discipline in its own right.

◆ **Scientific reductionism**: The belief that all phenomena can be broken down and investigated at the level of fundamental entities and forces. Thunderstorms, for instance, are *best* and *fully* explained when explained with accepted scientific concepts like humidity, air currents and electrostatic discharges.

mentally from what is being studied. Being 'objective' means trying to understand the world without imposing our own values on it; it seems that one's own perspective is in fact damaging to the knowledge gained. Moreover, a truly scientific view of the world disqualifies any explanations that reference or utilize any spiritual or religious component; if it's not directly observable in some way then it is not scientific.

Indigenous knowledge systems are significantly different in three ways, which we will briefly mention here and then spend more time unpacking in the Perspectives section. They are illustrated in the cases studies we present.

- Indigenous knowledge systems generally prioritize a deeply *relational* approach to explaining the world around us, building a belief that we are all related to one another (especially those in a particular community) and that we are deeply related to the natural world around us. These relationships bring about *interdependencies*: the awareness both that our actions have direct consequences and that the events and processes around us have a direct effect on our own actions and circumstances. These relationships and interdependencies often extend beyond the natural world and into the ancestral and spiritual realm.
- This brings us to the second element characteristic of an Indigenous knowledge system, namely the *collapse of the sacred and secular* dimensions of the world. Indigenous explanations of the world incorporate both elements of the world around us, and so are considered 'dualistic', and reference spirits and personal beings beyond the here and now, including deities and ancestors. Often, physical objects in the world (mountains, rivers, forests) are the manifestations of spirits, so engaging with these objects (climbing mountains, navigating rivers, walking through a forest) are direct engagements with these spirits.
- Finally, Indigenous systems investigate the world using a *holistic* perspective that often investigates and explores the connections between all outward elements of the world but also the internal and spiritual. Our physical and emotional well-being is directly related to the well-being and interactions of the world around us and the interconnections of the spirits and people living within it. This holistic view of the world, however, often prioritizes *local* interactions and connections between specific places and people. What this means is that the way that this knowledge is discovered, discussed and transmitted, requires an appreciation of far more than unbiased observation and cold rationality. It requires the individual to engage with a local culture and a particular time and a particular place. Knowing about one's world is to know about a wider process, and again, underscores the deep connections and relationships between individuals, their communities and the world.

What this suggests, then, is that Indigenous knowledge systems are attempting something *different*; they seek to explain the relationships that we have to our place and our histories. They therefore don't break down the world into smaller parts, but rather explain the world at a far broader level, and try to explain different elements.

Table 5.1 summarizes these differences between Indigenous and Enlightenment knowledge systems.

Table 5.1 Differences between Indigenous and Enlightenment knowledge systems

Characteristics of Indigenous knowledge systems	**Characteristics of Enlightenment knowledge systems**
Holistic: the belief that the particular must be understood in terms of the whole	Reductionist: the belief that to understand the whole, one must understand the smallest elements
Relational: emphasis is on how human beings and the world *relate* to one another	Objective: often understands the 'natural' world and the human world to be distinct, that the natural world is a *resource* for human beings to use for their own needs
Secular and the sacred are unified: natural and supernatural forces are both real elements of the world around us	The natural world is the only world: a full understanding of the world includes *only* the secular or natural world. No reference to the supernatural is needed or desired

CONCEPT CONNECTION

Explanation

We saw in Chapter 1 that an explanation is a description of some thing, system or phenomenon. But beyond simply describing, an explanation accounts for why the thing is the way it is or what it does or what it's good for. What concepts and language are used in those explanations, however, isn't immediately obvious and may be different depending on the communities of knowers giving the explanation. In the case of Indigenous knowledge systems, the sorts of phenomena being explained will incorporate the types of objects these communities experience in the world, which we will see can incorporate spirits like myths, visions or rituals that science wouldn't accept as real. The methods used to explain such spirits and their interaction with the world will require different methods than those used in scientific explanation.

Perspectives

If it makes sense to say that there is an 'Indigenous' perspective on the world, we must take care not to assume that this is in anyway set in stone, or that there won't be significant differences across cultures in relation to the details of each. However, we might continue to develop the ideas and implications of the characteristics set out above using genuine Indigenous cultural beliefs and practices to unpack them.

IA prompt

32 What makes a good explanation?

Understanding the natural world

From the characteristics above, it is clear that one major theme for Indigenous culture and knowledge is the natural world. As we will see, Indigenous knowledge systems rarely make a clear break between the natural and spiritual forces in the world. This means that an Indigenous individual's understanding of the natural world and their relationship to it will strike some as significantly different from what non-Indigenous cultures say about it.

The Enlightenment scientific perspective

Explanations of the natural world from the Enlightenment scientific perspective assume that the Universe is like a big, incredibly complex machine. Everything we see happening in the world is the result of natural 'laws' which describe the events we see. There is no personal aspect to these laws; they are simply rules that the Universe follows with no intent or purpose. While there might be mysterious forces at work which we don't currently understand, a genuinely scientific view will never expect those mysterious forces to be anything other than non-personal, non-conscious mechanical forces. One prevalent belief since the Enlightenment has been to use the objective distinction between observer and observed to suggest that this is the hallmark of modern science: to do science properly one must step back and observe and reflect on the world as if it were entirely separate from us. Even when we try to understand ourselves (in the human sciences) we consider ourselves as *objects* and try to find 'laws' which describe our behaviours. From this perspective, a method of understanding the world which describes spirits at work in the natural forces is the essence of a 'primitive' worldview (Kidwell).

KNOWLEDGE QUESTION

Does our culture determine what we know?

The ultimate goal of this paradigm is to control those forces or put them to our use; once we understand the workings of the natural world, we can then exploit those workings for our own desired ends. Harnessing the power of steam, the development of the combustion engine and the production of nuclear power plants are the result of a scientific understanding of those forces (constructing knowledge about them), all in the service of the desire and exercise of control of those forces.

The natural world perspective

Many Indigenous cultures start from the assumption that the natural world surrounding us is infused with the purposeful actions of forces working within nature or working at the direct command of some unseeing being.

The Subanen people of the Philippines is one example. Their beliefs are characterized as a sort of **animism**, something common in Indigenous knowledge systems. They believe that the world is the creation of *Sha'po Magbabya*, the supreme creator of all things and that other spirits live in the world, particularly in unique features like uncommonly large trees, isolated caves and tall mountain peaks. Because of this belief, they perform rituals before using natural resources (Quilo 119). Similarly, the experience and explanation of natural disasters become an interaction between people and these spirits:

> Earthquake is caused by the movement of the pig owned by a spirit named Baebolan. It is believed that the world rests on the back of pig Baebolan. And when it moves, an earthquake occurs. To make the earthquake stop, the pig has to be made to stop moving through the shouts of the people saying, 'Bwaaa! Bwaaa!' (Quilo 120)

Another example of this comes from the study of Indigenous women in northwestern Canada, who tell many stories of the spirits living in the glaciers around their community:

> Glaciers in these stories listen: a thoughtless remark promoted by human hubris may trigger an unexpected surge. Glaciers also see and have 'eyes like the moon'. They resent humans looking directly at them, so in the past people darkened their faces and more recently began to wear dark glasses to conceal their gaze. Glaciers have a sense of smell: their olfactory abilities are especially astute and they are particularly offended by odours arising from 'cooking with grease'. (Quilo 121)

◆ **Animism**: The belief that unseen spirits exist in objects, places and creatures in the environment and often form part of the explanation of natural forces. The word is derived from the Latin word *anima*, which means 'life' or 'spirit'. Often religious leaders will try to communicate and influence the behaviour of these spirits though ritual, prayer or visions.

KNOWLEDGE QUESTION

Does it matter if one culture describes natural phenomena one way, while another describes them another way?

Native houses of the Subanen tribe

Understanding our relationship with the natural world

One question which arises from this fundamental difference in paradigm is how best to *know* or to understand the natural world. From the perspective of the scientific paradigm, we must observe and reflect on the world; our understanding of ourselves as social beings is not relevant. An objective rationality takes over and we remove ourselves as human beings from the attempt to understand. In the Indigenous paradigm, however, any attempt to understand the world is an attempt to understand the desires, beliefs and purpose of the beings at work in the world. In other words, to understand the world we must understand *our relationship* to it. Acting on our understanding of the world, then, is not about exerting control over the world, but about *establishing personal relationships* with the forces at work in the world. We do not manipulate or command the world, rather we engage through communication with the world, asking, requesting and listening, approaching the world with humility, sacrifice and patience. In many cases, these interpersonal relationships are understood through the use of myth and are developed and maintained through ritual. These two methods of developing knowledge in Indigenous systems are discussed in later sections.

KNOWLEDGE QUESTION

How might our approach to understanding the natural world influence the way we engage with it?

This approach emphasizes the Indigenous belief shared by many communities that we human beings are fully embedded in the world we are trying to describe; but we are not simply an *object* to study, we are part of an interrelated social environment. Describing how the world is, is partly describing the desires, motives and purpose of the beings *in* the natural forces we see (Kidwell 212).

What then are we to say about these two perspectives? One in which the world is fully explained through a description of the natural laws and impersonal forces as if the world is a big and complex machine, the other in which we describe the world in terms of spirits and unseen beings (or beings 'seen' through the wind and the seasons changing and in the movement of rivers)? EA Burtt, a philosopher of science writing in 1932, suggested that perhaps there's nothing *in* the world which will make this decision for us, but rather something in us which compels us to choose one over another (Kidwell 212).

Some might argue that the paradigm in which we are separate from the world, where understanding the world requires us to step back from it and construct knowledge of the natural forces so we can harness and exploit those forces and resources, has led us to the brink of disaster. Our track record in maintaining a healthy respect of the limited resources of the world and promoting a healthy environment is not very good. Might this be because our paradigm ignores our *personal relationships* to the world?

One interesting practical outcome is to think about the differences on how we characterize the threat of climate change.

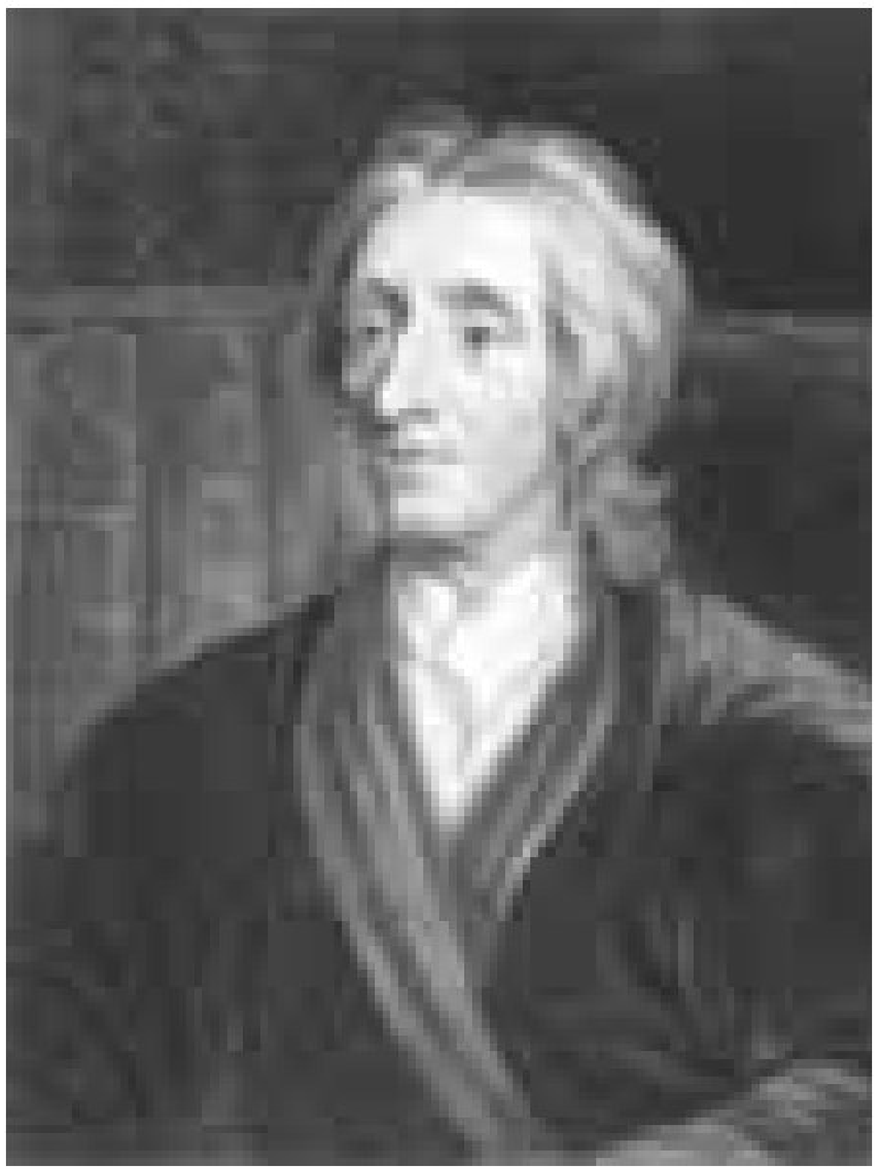
KNOWLEDGE QUESTION

Do the natural sciences provide a more effective way to understand and engage with climate change than Indigenous traditions? Are Indigenous traditions incompatible with an understanding of the natural world provided by the natural sciences?

The way that many Indigenous cultures relate to the land itself has come into conflict with other notions of 'ownership'. In the eighteenth century, philosopher John Locke emerged as one of the heroes of the Enlightenment because he wrote convincingly about the basic human rights individuals have in relation to their government.

Locke argued specifically for an understanding of 'ownership' that placed the emphasis on the *labour* of individuals. If a person worked the land, this would be the basis of his or her claim to 'own' it. 'Working the land' meant things like farming, mining, building or otherwise transforming the land into something that the owner desired. Having put that work into the land, kings and queens therefore, could not morally take that land away. When the Europeans transported this view of land ownership to the New World of the Americas (and we can see the same thing happening wherever the Europeans sailed to) they found land devoid of any recognizable 'labour'. They found virgin forests, untilled land and pristine empty lands wherever they looked. In many cases, the people they did find (the great cities and civilizations of Meso-America excluded of course) were mobile, following game and the seasons.

> … tis labour indeed that puts the difference of value on every thing; and let any one consider, what the difference is between an acre of land planted with tobacco, or sugar, sown with wheat or barley; and an acre of the same land lying in common, without husbandry upon it, and he will find, that the improvement of labour makes the far greater part of the value. (John Locke, *Second Treatise on Government* Book II, Chapter 5, section 40)



John Locke

In this quote, Locke is suggesting that what makes land *valuable* is the transforming of it to produce something, that land in its 'natural' state is land that has not yet become *valuable*. From their European perspective, therefore, the lands in the New World were un-owned, and just waiting to belong to someone, to be transformed and exploited. It was to be made 'productive'.

However, Indigenous cultures often relate to the land quite differently. The Lakota idea of 'homeland', for instance, was built around a notion of 'care' rather than 'labour', and care in this sense meant looking after what was already there rather than transforming it. The natural environment is already home to unseen spirits, gods and ancestors in many Indigenous knowledge systems and one outcome of this is that the land is already what it *should* be. Care for the land meant caring for the spirits all around them and protecting that land as it was (Martinez 87). Many of the myths and rituals of Indigenous peoples are aimed at reminding individuals of the need for this care.

CASE STUDY

Marovo Lagoon

The Solomon Islands are found about 2000 km north of Brisbane, Australia, and are so named because when Spanish explorers found gold there in the sixteenth century, they believed it to be home to the fabled King Solomon's mines. (King Solomon was said to be an exceedingly rich king of Israel who reigned in the tenth century BCE. The source of his wealth was a matter of mystery and explorers, motivated by greed, did their best to find it.)

The Solomon Islands have been the focus of colonizing attempts by Spain, The Netherlands, France and Britain. The islands gained independence in 1976. Marovo Lagoon, one of the world's largest coral lagoons at over 700 square kilometres is located there. The Marovo peoples have lived there for thousands of years and are seeing their natural landscapes on the islands exploited by transnational organizations who extract and export the rich natural resources of the islands. From 2005, a new UNESCO resource for schools was created called *Reef and Rainforest: An Environmental Encyclopedia of Marovo Lagoon*. Local teachers and researchers have been encouraged to conduct local research and generate content relevant to the local communities (Hviding). Accompanying the text is a teacher's resource and lesson plan booklet, which delivers a scientific curriculum focused on the local environment and, when appropriate, using the local languages for instruction and for assignments. One of the key aspects of the curriculum is the 'Home assignment sheet for teachers and schools in the Marovo area: village level documentation and transmission of local environmental knowledge', which explicitly uses elders and people native to the area in the education of the children. One lesson plan asks teachers to:

take a group walk from the seashore up into the forest. Ask a man or woman who knows about this to come with you as resource person. Find and talk about some of the useful plants listed below. Bring back to the village leaves, flowers or fruit of the plants you find. Then find the plants in the book and talk about them. If you speak Hoava or Vanunu, use the book's name lists in those languages. (Hviding 48)

ACTIVITY

Use the QR code to view the UNESCO study guide *Reef and Rainforest: An Environmental Encyclopedia of Marovo Lagoon*.

1 What do you think is the effect of the students learning science through direct reference to the local environment, engaging with the local villagers (who may not be teachers) and communicating and writing assignments in the local language?
2 How might this benefit the Indigenous population and contribute to the Marovo Indigenous knowledge system?
3 Are there ways that this might be limiting?
4 Are there benefits of learning science in this way that could not be achieved were the instruction to be given entirely in the dominant language of English?

CONCEPT CONNECTION

Responsibility

In Chapter 1 we discussed the relationship between knowledge and responsibility. This responsibility can be thought of as being written into the very understanding of the world. In many Indigenous knowledge systems, the individual's place in the environment is characterized as a relationship between conscious beings. This immediately creates an ethical commitment between the individual and the world around them, which is analogous to our ethical commitments to people around us. In some cases, we are directly responsible for promoting the well-being of people (like our friends and family) and in other cases we are minimally responsible for not damaging others' well-being (like strangers around us).

Methods and tools

Earlier, we explored common features of Indigenous knowledge systems as being relational, holistic and incorporating both the sacred and secular. These characteristics of the nature of Indigenous knowledge mean that the methods of constructing and developing knowledge are different as well. Knowledge that assumes direct connections to a world populated by spirits and ancestors requires a different approach than that which we find in Enlightenment science.

Like all knowledge, Indigenous knowledge is developed *within* a culture and is heavily influenced by that culture. In contrast to the 'universal' aspirations of Enlightenment science, Indigenous knowledge is generally very much connected to a specific people or place, and this is reflected in the methods by which it is produced.

Look, for example, at the poster on the next page, which has been published by the First Nations Education Steering Committee (FNESC) in British Columbia, Canada, in order to help educators in British Columbia approach Indigenous knowledge in their classrooms.

ACTIVITY

Consider the various 'Principles of Learning' listed on the poster and discuss what you think this tells you about the nature of Indigenous knowledge systems.

First Peoples Principles of Learning poster

Language

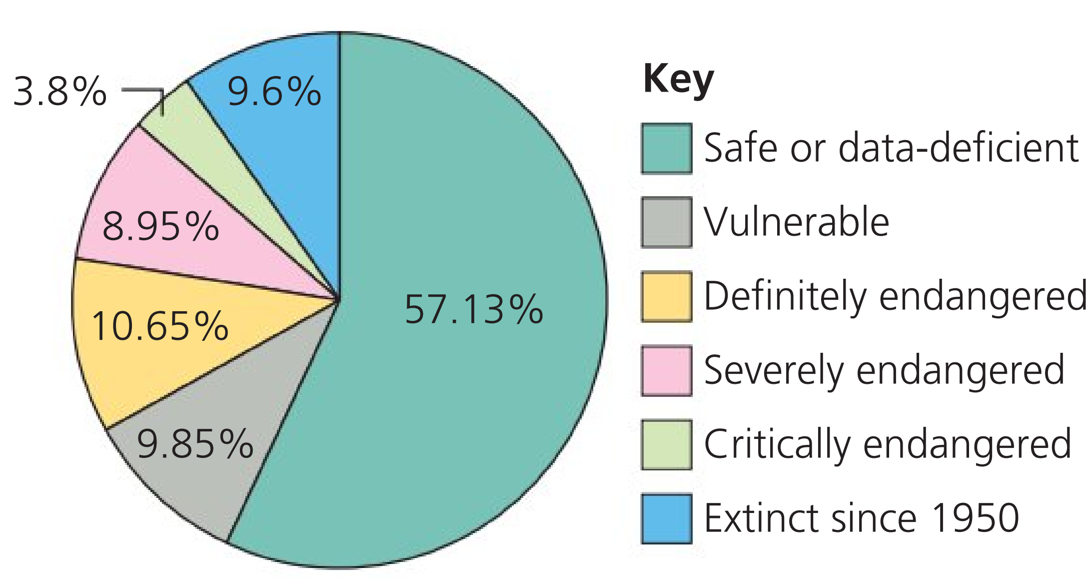
One of the clearest ways of differentiating between cultures is through language. In your own IB Programme (if you are a full DP candidate), you are expected to take two languages: your 'mother tongue' (in Group 1) and an acquired language (in Group 2). Generally, for your acquired language, part of the knowledge you gain, in addition to learning both propositional knowledge about the language (eg, 'fromage' in French and 'cheese' in English mean the same thing), and ability knowledge about the language (ie, you know how to conjugate regular French verbs), you'll also learn about the culture of the peoples that speak that language. There is, in other words, a very close link between knowing a culture and knowing a language; knowing how to speak your own language binds you to your cultural community in a deep and significant way.

Imagine, however, if your government officially mandated that you should not speak your mother tongue or follow your cultural traditions. Indigenous peoples all over the world have suffered this fate. Under the belief that Indigenous cultures were doomed to fade away, many governments, in a supposed attempt to look after the welfare of Indigenous people, forced a programme of 'assimilation' on members of Indigenous communities.

The United States Civilization Fund Act of 1819 and the Japanese Former Natives Protection Law of 1899 are two examples where it was assumed that the native populations were destined to disappear, so to help the remaining members of the communities, their children were forced into boarding schools, their land was taken and distributed to the wider community and their cultural traditions outlawed. The goal was to remove any distinction between Indigenous and non-Indigenous peoples, except that the only ones to lose out were the Indigenous peoples.

Even while many of these laws have been repealed and countries all over the world are now trying to foster the languages of their native populations, many are still destined to die out. In this section we look at the unique role that Indigenous language plays in the Indigenous knowledge systems and how conserving Indigenous languages maintains a whole system of values and environmental knowledge that otherwise would be lost.

The UN estimates that there are 2680 Indigenous languages at danger of being lost, and declared 2019 the international year of Indigenous languages, to bring this to the attention of the world. The potential loss of a community's language represents the loss of that community's identity.



According to UNESCO, about a third of the languages used in the world today are vulnerable or endangered

For example, look at this quotation from Minnie Degawan, Director of the Indigenous and Traditional Peoples Program at Conservation International:

> In my community, the Kankanaey Igorot [an Indigenous group living in the Cordillera region of the Philippines], we have the concept of **inayan**, which basically prescribes the proper behaviour in various circumstances. It encapsulates the relationship of the individual to the community and to the ancestors. It goes beyond simply saying 'be good'; it carries the admonition that 'the spirits/ancestors will not approve'. Because many of the young people now no longer speak the local language and use English or the national language instead, this notion and value is being lost. The lack of dialogue between elders and the youth is exacting a toll, not just in terms of language but in ancestral ethical principles. (Degawan)

In cases where the culture's language is spoken at home but the dominant language is taught as the only language at school, the dominant language and its culture comes to be seen as the culture that students *should* be learning, that in the public world the 'right' language is the language of the dominant culture. This message, then, reinforces the belief that their own native culture is not as important.

KNOWLEDGE QUESTION

In what ways does the loss of Indigenous languages signify a loss of knowledge and cultural diversity?

CASE STUDY

The Mayangna, Nicaragua

Francisco Miguel Castro, a bilingual language teacher in Nicaragua and member of the Indigenous Mayangna people, says that learning their own community's language is important because students 'have more freedom to express their knowledge, what they observe, their reality, and moreover, they have a greater sense of pride – that they are part of a language that is their own language, and they now feel they have the same rights as other nations' (UNESCO 2017a). For example, the Mayangna people have been living in the forests of Nicaragua for centuries and have developed a thorough knowledge of the plants and animals in the area and of how to live harmoniously with those plants and animals. The gold mining and cattle industry is now threatening their homeland forests, but the education system (which was conducted entirely in Spanish) didn't engage directly with this threat. The Spanish language instruction was not related to them at all and didn't have any connection to the perils of their local forests.

In 2010, a new initiative was launched to teach the students primarily in their native language with Spanish taught as a *second* language, meaning that the language was taught through the lens of the immediate needs of the community. Students were able to learn the knowledge of their community *first*, including the local fish and turtle species which traditionally have been a major food source, but which have been threatened by the loss of local habitat. Learning in their own language has given them access to the relevant knowledge and concepts which will empower them to use that knowledge to protect their land and their culture.

ACTIVITY

Consider your own school's curricula – or the choices that your school makes in terms of IB options.

1. What are the messages being sent?
2. What values are demonstrated by those choices?
3. What *other* choices are available and how might they have suggested different values?

Critically reflecting on your curriculum in other contexts provides good TOK insights: we will do this in relation to history in Chapter 11.

As a TOK student, you will be aware of how different languages pose genuine problems for translation. It is not always the case that a concept which is captured by a word in one language can easily be translated into another language. This issue also comes up when working with Indigenous cultures whose background and linguistic evolution might be entirely different to any of the 'modern' languages used by the non-Indigenous populations of the world. Sometimes this unique linguistic evolution has interesting consequences which illustrates on one hand the biological, similarities between all humans, and the deep cultural differences between us on the other. These cultural differences in language seem to have a deep effect on how we perceive the world, how we actually *see* the world.

For instance, the colour terms available to different cultures in their respective languages show how important language is when describing what we normally consider objective facts. Comparisons between the use of colour terms between cultures show that toddlers who do not yet speak their culture's language are equally good at distinguishing between the whole range of colours, suggesting that biologically, human beings are born equally skilled at perceiving colour. Once children learn their language, however, an interesting phenomenon occurs; we seem to lose the ability to make certain colour distinctions that speakers from other linguistic traditions can easily make.

Research has shown that the ability to distinguish certain colours varies between English speakers and those in the Berinmo culture of Papua New Guinea and the Himba culture of northern Namibia. Whereas English speakers use many colour terms, the Himba and Berinmo cultures use only five, which means that English speakers will categorize the colours they see under very different headings to members of these Indigenous cultures. The effect of this is that when one language doesn't discriminate between subtle differences in the hues of colour, that is, when the same colour term is used for different hues, the speaker of that language struggles to identify the difference.

Learner profile

Communicators

How does knowing about another's culture help you communicate with them more effectively?

■ The Himba people of northern Namibia are easily able to distinguish between hues of colours that English speakers struggle to tell apart

Use the QR code to have a go at a test that was used as part of a study comparing the ability of English speakers and members of the Himba culture to differentiate between different colours. Were you able to identify the different shade of green? Probably not easily. A member of the Himba tribe would likely have little problem. The website also contains full colour charts showing the different ways that English speakers and the Himba people categorize colours. You might like to create similar tests for your classmates. Would you, for instance, reliably see the difference between the colours 'dumbu' (at 5YR/7) and 'serandu' (at 10R/7) when they are not directly next to one another?

Berinmo speakers similarly struggled to see the difference between certain shades of blue-green that English speakers have no problems with at all, because English uses different words to capture the difference: 'blue' and 'green'. In the Berinmo language the same word applies to both colours. However, the inverse is also true; despite having more colour categories, English speakers struggled to distinguish between what the Berinmo easily distinguish and use different terms for: 'nol' and 'wor'. With these colour terms they are able to spot differences immediately where English speakers cannot (Davidov, *et al* and Bornstein).

What this suggests is that the influence of culture and language on how we describe and articulate what we can see has huge ramifications for what we claim to be real features of the world. The Himba people cannot deny that they see a clear difference between a 'dumbu' square and a 'serandu' square, even if English speakers simply cannot see it.

This example also emphasizes the point that to genuinely understand the world from another culture's perspective we would need to have a thorough understanding of that culture's language. Learning the Himba or Berinmo colour words, however, might not be enough if we cannot apply them meaningfully, and *this* might not be possible without actually *living with* or even growing up in that culture. They have spent their whole life applying their colour concepts in a way that someone stepping into that language might not be able to do.

IA prompt

10 What challenges are raised by the dissemination and/or communication of knowledge?

CASE STUDY

Rapa Nui

Rapa Nui – also known as Isla de Pascua or Easter Island – is an island in the South Pacific, 3600 km west of Chile. It was annexed by Chile in 1888. It is believed that the first inhabitants arrived there in the thirteenth century from the surrounding Polynesian islands (although the nearest island is still over 2000 km away). The Rapa Nui culture is famous for producing the nearly 1000 *moai* statues. UNESCO designated the entire island a World Heritage site in 2015. Today, nearly 8000 people live on the island, of whom 3512 consider themselves part of the Indigenous Rapa Nui community.

In 2016, the Chilean government and UNESCO surveyed the status of the native Rapa Nui language speakers, finding that over 70 per cent of people over 60 speak the native language, but this drops to half of all speakers over the age of 40, and it drops again to barely one third of the population in the 20–39 age range (UNESCO 2017b). The vast majority of these young adults do not pass on the native language to their children, instead opting for the dominant culture's language, Spanish.

Only 10 per cent of school children today speak their culture's native language, down from 23 per cent in 1997 (Sopova and Ortega). The language is dying:

> 'If there are no children who speak our language, and we as adults die, when these children are adults and become parents, they won't speak the language and will not be able to teach it to their children', laments Vicky Haoa, member of the Rapa Nui Language Academy. She dreams 'that my language will not disappear, because language is part of our way of being, of our thoughts, our feelings, our joys and much more. If our language disappears, one cannot speak of the existence of a culture called Rapa Nui. We show who we are through our language'. (UNESCO 2017b)

Ritual

KNOWLEDGE QUESTION

What is the role of rituals in acquiring and sharing knowledge?

Much of the learning that you are used to takes place sitting in a classroom and listening to teachers, or reading books, articles and textbooks. Within the context of the classroom, your teachers develop and implement any number of different activities and processes which they hope will provide you opportunities to perform well in exams and ultimately to lead you towards mastery in the subject. This type of 'formal education' is common across the world, and is an example of instances of genuine *instruction* in all cultures – instances where an expert takes the time to focus on consciously deciding what needs to be known, thinks about how best to pass it on and then actually engages with learners.

'Knowledge' in this very familiar picture takes the form of ideas and beliefs which we examine, consider, test and then ultimately accept or not. If accepted, we store this knowledge in our minds and use it to help make sense of other ideas later. Many of the *methods* we employ in our areas of knowledge suggest then that we should remain open to testing those beliefs to make sure they are still justified according to the evidence we continue to gather.

Our exploration of Indigenous knowledge systems opens up new ways of thinking about how knowledge is conveyed and how we relate to that knowledge once we've accepted it. One method by which communities ensure that knowledge is passed on to individuals is through *ritual*. Rituals are used in all sorts of societies and communities as a way of passing on knowledge and an exploration of this method highlights two important elements of knowledge in these communities.

- Firstly, the knowledge and beliefs conveyed through ritual are *embedded* in a way that is different from the way knowledge is 'held' when it is passed on through books and teachers. Often, the knowledge gained through rituals becomes part of the non-conscious, pre-reflective attitudes and dispositions of the knower, rather than being something that the knower has considered and tested and accepted. Very often, the beliefs gained through ritual are far *stronger* than beliefs we accept and sometimes we are not fully aware that we have these embedded beliefs. This sort of knowledge can of course be developed in ways other than ritual, but one of the *points* of ritual is to change the knower in a far deeper way than what can be characterized as 'teaching' or 'learning'.
- Secondly, we might suggest that there are certain *types* of knowledge that might *need* to be conveyed in other, more subtle, ways than the traditional learning occurring in classrooms and libraries. Some knowledge helps bind communities together, individuals to individuals, and Indigenous societies are often bound together in a way that is far more interdependent and communal than thinking about these communities merely as 'cultures' might suggest. We might, for instance, suggest that there is a North American or European 'culture', a way of living which has broad similarities across the region, but those similarities don't bind individuals to each other or to the local community in a way that is nearly as strong as what is often seen in Indigenous cultures.

Being part of an Indigenous culture is to be, to exist, in the world in a certain way. A way which sometimes is not learned through books and lectures, but through other avenues such as participating in rituals or exploring myths. Rituals are things people *do* but they are also a way of aligning one's personal knowledge and experience to the community's. Some of the knowledge which binds those communal communities is not something learned in the classroom or through books; it needs to be far stronger than that and ritual might be the best way for an individual to accept and embed that knowledge.

What is a ritual?

Ritual is *not* habitual behaviour. You might have a morning ritual in which you do things the same way and in the same order. You might brush your teeth in a particular way, then lay out your clothes for the day in a certain way, then set up and eat your breakfast in a particular way and even make your way to school in a particular way. Repetitive behaviour is often called 'ritual', but there is a more profound meaning related to knowing.

One way to understand this difference is to think about something which *looks* like a ritual but isn't. Suppose, for instance, that you are acting in a school play in which you are expected to take part in a wedding. This is *not* a real wedding. You might undergo exactly the same actions and you might even say exactly the same things, but taking part in the genuine *ritual* imposes a new status upon you; you end up in quite a different situation than when you started or you have, through the ritual, *renewed* the status that you're aiming for. The *difference* between play-acting and a genuine ritual, then, is that the individuals involved (both those participating in the ritual and those attending the ritual), *change* during the process. Getting married, for instance, obviously means that the participants have entered into a new relationship, but also that the community recognizes that new relationship. Everyone, in effect, has changed.

CASE STUDY

Sateré-Mawé initiation rites

One example of such a ritual in the context of an Indigenous community comes from the Sateré-Mawé initiation rites. This Amazonian rainforest tribe uses a ritual designed to initiate young men into adulthood in which the men place their hands into specially designed gloves which hold hundreds of bullet ants. The stings of these ants are thought to be the most painful sting in the animal kingdom. Having undergone this ritual successfully, the young man is thus entitled to the rights and privileges of adulthood, including marriage and joining warriors and hunters. For the Sateré-Mawé men, however, it seems that once is not enough: the men will undergo this ritual a number of times throughout their life, each time renewing their status as a warrior in the group. The first QR code below will enable you to watch a National Geographic video of this ritual. The second QR code provides more information about the ritual.

■ The bullet ant is thought to have the most powerful sting in the animal kingdom

How is this particular ritual related to knowledge? In Singapore, children become 'adults' at the age of 21, and we know this because of a law ('Children and Young Persons Act'). All countries will have these legal definitions of adults and when the conditions relate to age, the individual *becomes* a legal adult at the stroke of midnight.

People in the Sateré-Mawé community, however, use the ritual mentioned above not simply as a way of *telling* others that these men have become adults but as a means also of *justifying* that knowledge. Undergoing that ritual creates the conditions on which the knowledge that the child has become an adult can be established. While an individual might undergo all sorts of painful and frightening experiences during their adolescence, these experiences are not what 'turns' the boy into the adult. The community has established a *particular* event and it is *this* event, not any other, by which the truth of the claim, 'you are an adult' is established.

One definition of ritual highlights the fact that rituals are a form of *communication*. Ritual scholar Roy Rappaport defines ritual as 'the performance of more or less invariant sequences of formal acts and utterances not encoded by the performers' (Rappaport 175). The idea here is that through ritual, *messages* or knowledge are communicated *from* the culture to the performers of the ritual. When he says 'utterances not encoded by the performers', Rappaport is pointing out that rituals are one way that the shared knowledge and cultural information of the community is passed on to individuals in that community. The performers do not themselves determine the meaning (encode) of the ritual, they *participate* in that meaning. He says that 'participants transmit information concerning their own current physical, psychic, or sometimes social status to themselves and to other participants' (Rappaport 179). This information is meaningful only in the context of the shared beliefs and knowledge of the wider community. This is why sometimes when we watch the behaviour of people from other cultures, particularly when watching rituals, we find it difficult to make sense of what they are doing. Without being part of the culture and understanding the context, the rituals might not make sense, but *participating* in the ritual over and over again is one way for an individual to come to understand that culture.

Rappaport describes several key characteristics of ritual, including:

- formality – actions which are abstract and divorced from everyday activity
- repetitiveness – they happen again and again, the same way each time without alteration
- effectiveness – participating in a ritual creates a change in you and your status in society and among other people
- earnestness – participating in ritual is far more than just 'going through the motions'.

A ritual's formality refers to the processes and actions involved. They are purposefully *not* part of the normal everyday range of behaviours. This 'formality' is meant to indicate that something special is happening and the formality of the event underscores an important point: that the events of the ritual are each important and any deviation from the ritual will mean that it is not effective. If the Sateré-Mawé boys, for instance, show too much emotion or throw the gloves off before the time is up, then the ritual has not been effective, and they are not considered 'men'. Similarly, in the wedding ceremony, if the people getting married don't, for example, exchange their vows in the presence of someone who has been given the responsibility of officiating, then all the vowing in the world won't necessarily mean that they have been successful in getting married.

The formal actions of a ritual can change over time and in different contexts. There are as many different wedding ceremonies as there are cultures, but this is part of the point of ritual. That the participants and observers have chosen a particular set of formal actions is partly what binds them together.

The effectiveness and earnestness of rituals underscores the idea that rituals are designed to create new states for the individuals or to maintain the normal state of things. Rituals are effective in that they initiate and implement change (often an individual moving from one stage of life to another) but they also *maintain the status quo* – how things need to be.

Rituals *protect* communities and their cultural knowledge in that they unite the communities under a single unchanging vision and single framework to understand the world. Each of the elements listed above is crucial in maintaining a ritual's effectiveness: in maintaining a clear statement of that shared knowledge, for passing that knowledge on to individuals and perhaps most importantly, for individuals to communicate to themselves and to others that they *accept* this cultural knowledge. Participating in that ritual, time and time again, and

CASE STUDY

The Island of the Sun, Lake Titicaca

Lake Titicaca on the border of modern-day Bolivia and Peru was the site of such a ritual. In the middle of the lake is an island called Isla del Sol (Island of the Sun). Standing at a particular point on the island during the summer solstice, the observer will see the Sun rise from the horizon directly above the island. The Colla peoples and the Inca both developed a narrative or myth surrounding this in which the island becomes the birthplace of the Sun (Dearborn, *et al*).

A Spanish priest recorded the Inca tale in 1575:

> They say that it was at night and that there he [the creator] made the Sun and Moon and Stars, and that he ordered the Sun and Moon and Stars to go to the Island of Titicaca that is near there, and from there they rose to the sky. And at that time, the Sun who wanted to rise in the figure of a very flamboyant man called to the Inca and to Manco Capac, as their superior and said: You and your descendants will be Lords and will subjugate many nations; take me as your father . . . and at that point he ordered the Sun, Moon, and Stars to rise to the sky and put each one in their place. (Dearborn, *et al*)

The island subsequently became the site of shrines dedicated to these spirits and yearly rituals called *Inti Raymi* were performed there in order to worship and to guarantee the Sun's continued regularity.

knowing that others in the culture, including your ancestors, have participated in the ritual embeds the knowledge being communicated 'into' the individual. In this case, *seeing* the Sun rise from the island at the solstice, and being part of a ritual where that observation is given a meaning in the context of the whole-world view of the culture, will make that knowledge *true* in a significant way.

For this reason, participants take rituals very seriously because they recognize that their actions are what is important to maintain how things need to be. The Sateré-Mawé boys take their initiation rites seriously, not just because it is horrifically painful, but because without it they cannot consider themselves or be considered full adult members of the society. One can imagine a boy allowing himself to be stung beforehand to test how painful it will be, but this practice would never be thought of as the ritual itself. Rehearsing the ritual is not the same as undergoing it. Similarly, the Inca priesthood on the Island of the Sun must also take their job seriously as it is partly the rituals and the worship that *cause* the regularity of the Sun's procession through the sky.

Rituals are also generally repetitive, in the sense that different individuals will undergo the same ritual repeated each time it's needed, or that individuals will undergo the same ritual again and again when it is needed. This is one of the most important elements of how rituals embed knowledge more deeply than perhaps simply learning some fact would.

Rituals are essentially about the messages and perspectives shared by communities being renewed in the minds of individuals. They *embed* knowledge in a way that is hard to drive out. Consider the following quote from a member of the Yup'ik tribe in western Alaska:

> There is a very close connection between the animal world and human world. We believe that humans and animals communicate through Ellam Yua, and that these relationships are governed by rules. For each different type of food, there are rules that men and women

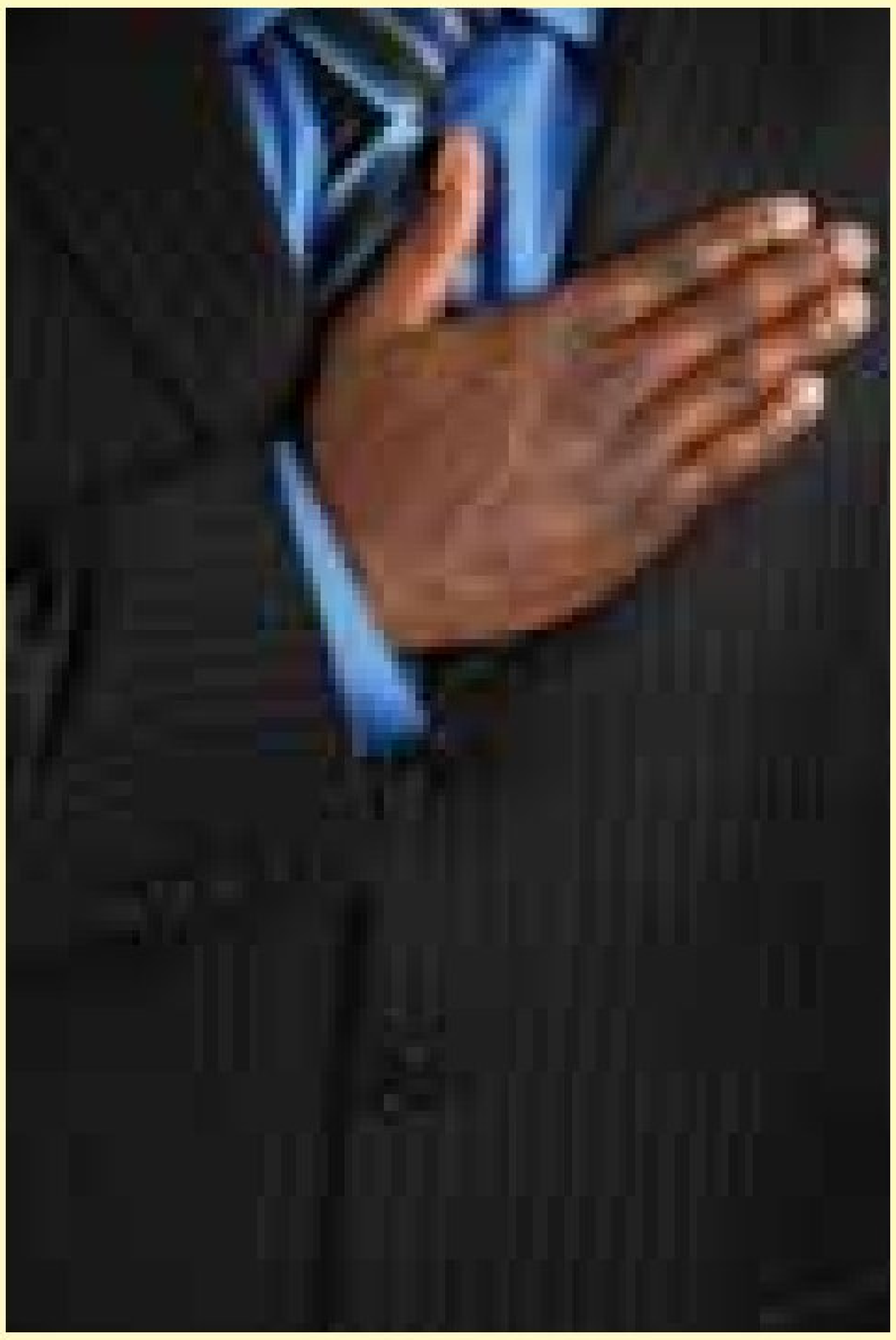
> must follow to take care of it. If the rule is not followed for that particular animal, then that food source will either become scarce or disappear entirely, depending on the intensity of the violation. If the rules were followed carefully and the animal spirit was pleased for example, with the way that the weapons were handled after it was caught, or the way that it was cared for and eaten, then the food source would multiply and the hunter would be blessed with more to catch. Subsistence required good relationships between humans and animals and maintaining this relationship was the only way people survived long ago. Respect for the land as well as the sea ensure the seasonal provision of food given to us through Ellam Yua ['Spirit of the Universe' or 'the Unseen One']. (Ayunerak, *et al*)

These rules are part of the Yup'ik people's *yuuyaraq*, which was a system of right action which helped to maintain important interrelationships between members of the Yup'ik community and the natural world around them. Like many Indigenous cultures, the Yup'ik believe the natural world to be infused with spirits, and maintaining harmony with these spirits is essential to the health of the community. Undoubtedly the adults in the community *teach* the youth that the human world is interrelated with the natural spirits and *teach* them how to follow rituals and maintain harmony with the natural world, but physically enacting the rituals *embeds* this knowledge. One simply cannot treat the environment or animals with disrespect if one has been engaged since childhood in actions which *show* genuine respect to the environment and harmony with it. The rituals, in other words, embed an *attitude* or a *disposition* onto an individual which might be characterized as a knowledge claim – 'I know that the spirits will appreciate this action' – but is more profoundly *known* than 'normal' knowledge is. These dispositions and attitudes bind an individual to the natural landscape in a way that knowledge produced from books or classrooms might not.

CONNECTION TO THE CORE THEME

Rituals and shared beliefs

One of the authors of this book had an experience which brought this point about the power of belief given to us by ritual into sharp relief. While living in England during the 2012 Olympics (when it was held in London) and after the Olympics were over, he noticed that many of the little plastic United Kingdom flags that only days earlier had been displayed in shop windows, in front of houses and other places, had suddenly found their way into rubbish bins and sometimes just lay on the pavement. As a US citizen who, for his entire school education, said the Pledge of Allegiance every morning and been deeply impressed by the reverence given to the flag, he suddenly noticed that he felt if he were to come across a US flag, plastic or otherwise, he simply *could not* leave it lying there. The ritualized pledging he participated in every morning had inculcated a belief that the flag was of special significance. Other flag-related rituals, like the proper folding of it, the lowering of it to half-mast or the proper disposal of it are natural outcomes of the belief that it is a genuine symbol of great importance,



■ Can you think of any rituals that you have taken part in that have shaped your values or beliefs?

all encoded through daily rituals in which he verbally and physically showed its importance. That ritual was utterly successful; that belief remains even 30 years after he last pledged allegiance to any flag.

There are other examples of ritual all around us. In some schools, students stand when teachers walk into the room to inculcate the belief that respect to teachers is due (a crucial belief in education). Militaries have intense initiation periods ('boot camps') in which a soldier's beliefs about individuality are reconstructed to prioritize the group (a crucial belief in battle). This sort of knowledge is deeply personal, and it has a unique relation to the shared knowledge of the community.

ACTIVITY

Think about rituals that have impacted your life. They may be religious, cultural, political or social.

1. Can you identify the beliefs that are encoded in that ritual?
2. How has that belief impacted your life?
3. Could that belief, or the knowing of it or having of it, be given in some other way? Why or why not?
4. Research a ritual in an Indigenous culture (it might be your own).
5. Present the elements of the ritual and explain the beliefs that are passed on by participating.
6. Discuss whether you think that this knowledge or these beliefs can be passed on through other means.

Myths

Another common and sometimes *primary* feature of Indigenous cultures and their knowledge systems is the use of mythology. When thinking about myths, we often think of stories (fictions) which were popular in the past and which were used to explain how things were, prior to a 'real' understanding of nature. The concept of 'myth' is still used today in this sense; they are commonly understood to be a story that somehow misleads or is a claim that is simply not true. Begin an internet search with '5 myths of …' and see what you find: generally, these are lists of ideas and beliefs which are not true and which hold people back from success in some task.

This is not the only way to understand myths, however. No culture on Earth has been entirely without myth, and, in most non-Indigenous cultures, myths no longer form part of how people think about, learn about or explain the world. As we described above, a common feature in Indigenous knowledge systems is to describe the natural world as a world filled with purposeful beings – spirits and beings who act through the natural world. Whereas scientific descriptions make attempts to explain the world through impersonal natural laws, a genuine *explanation* of some event from an Indigenous perspective would naturally include the motives and desires of the beings at work in the natural world and the relationships that people have with these spirits. Narratives, stories and myths, then, are far better suited to describing and explaining these relationships than a science report.

Myths not only describe the way the world is, and why it is like that, but they *establish* the relationship with that world by creating a framework in which people can *see themselves* in that natural world. Scholars have suggested that 'encoded in myth is a kind of implicit knowledge' (Lawson 507–23) about some of the deepest truths in human experience, and the use of myth, in both explaining these insights into the nature of the world, and disseminating this knowledge to individuals in the community, is an important part of many Indigenous cultures.

A pretty universal example of the use of myth is in developing an understanding of why things have come to be the way that they are. These 'creation myths' are narratives about the origins of the world as we see it and create an understanding of the world which helps bind communities and individuals together in a shared vision of the world.

CASE STUDY

Kaluli creation myth

The creation myth of the Kaluli people of central Papua New Guinea (who are generally non-literate) starts with a completely formless land, populated with people, who quickly become cold and hungry. From within the ranks comes one person who gathers the people together and begins assigning them various roles in the natural world, from streams and rivers, to plants, trees and animals. The people left over after this dividing are the ancestors of the humans living today.

This myth, which may be considered 'true' by the individuals in the community, teaches an important point, that the human beings of the tribe are no different than anything around them, as everything is essentially the same, just taking on a different form.

Thus, the myth teaches that humans are not 'other' than the world around them (Schieffelin 93–94).

Interestingly, the fact that the Kaluli people are non-literate underscores the importance of myths in the community – without the intuitive and relatable myths, the knowledge of their relationship to the world would disappear.

CASE STUDY

Sámi people, Finland

In the Sámi culture of northern Finland, another sort of myth is told, this time underscoring how sometimes myths give us a way of understanding particular events. In this instance, it is the return of the Sun, and how, things *might not* end up working the same as they've worked before (thereby emphasizing the role of ritual in maintaining how things are).

In this account, based on a fragment of a poem called 'The Death of Sun's Daughter', the title character lies close to death yet yearns to see her father one last time. He has gone beyond the horizon and has yet to rise again. She laments that 'the herd shrinks, the pest rages, insects torment, Children grope about in the dark' (Kárrái/Thomas). With her final breath she begs her father to rise again and return the world to light.

Here we see an understanding of the world that is deeply dangerous and frightening. In the homelands of the far north, where the Sámi live, the Sun can disappear for months on end (depending on how far north you live). The understanding captured in this myth provides a personal connection to the darkness of the winter but doesn't hide the fact that the Sun's

■ The Sámi people live in northern Europe, where the Sun may not rise for months during the winter

disappearance is a genuine threat and needs to be taken seriously. The Sun *might not return* so one must take care to work to maintain the safety of the community in light of this fact. So, whether or not people genuinely believe this story to describe what happens every winter, it provides the knowledge needed to act accordingly.

Not all Indigenous myths are aimed at telling the origins of the cosmos or cosmological events; some are more limited, but these do not have any less impact on *teaching* the individual about his relationship to the world. Like many Indigenous cultures, the Sámi understand the natural landscape to be full of magical spirits who govern all sorts of aspects of their lives, from the migration of reindeer, to the success of hunters and fishermen. They have identified *seidas* in the landscape (natural formations which stood out from their surroundings, like rocky outcrops in a flat landscape or a grove of trees in an otherwise barren plain) and believe them to hold these spirits. The people used *ritual* to engage with these spirits and would reward the spirits with offerings if they helped the people, perhaps through a successful hunt. Interestingly the spirits would sometimes be punished or abandoned if the Sámi felt that the spirits didn't help *enough*. One story told is as follows:

> A man from Teno caught some trout by his dam and gave some to the seida. But, as it happened, there was no bounty for the next few days. The man got mad and went to beat his god with birch twigs, jeering:
>
> 'You are no god!
>
> I've anointed you with oils,
>
> but you will not give me fish.'
>
> When the fisherman went back to his fishing dam, a gust of wind threw his boat over and he nearly drowned. Frightened, he crawled back to the rock to ask that it not be angry anymore. ('The Sámi World View and Mythology')

In non-Indigenous cultures this might be seen as simply a story with meaning, but in the mythological language this is a story which underscores a number of important truths:

- Firstly, that the Sámi people and the spirits of the land live in a close harmony, where the resources of the land are not simply assumed to be had for the taking. Scarcity is a real feature of living in a harsh climate and the world's resources and goods should not be taken for granted.
- Secondly, the myth teaches that human beings work in harmony with these spirits; humans are tied to the natural world in a deep and interrelated way. Finally, these spirits must be respected even when they do not provide.

Sámi do accept that sometimes the spirits do not or cannot provide and their *seidas* are sometimes abandoned for new ones, but even in these cases the Sámi learn through these stories that respect must nevertheless be shown.

CONCEPT CONNECTION

Explanation

As discussed previously, explanations both describe events *and* try to offer reasons why those events are the way that they are. The role of myths in Indigenous knowledge systems are no different; they provide a description of events and of *reasons* why things are the way that they are. However, those reasons are not characterized by impersonal physical forces, but by personal motives and intentions that can be engaged with by the community through ritual.

One difference with myths as explanations, however, is that we have to keep in mind what is actually being explained. Like when we discussed maps and their explanatory power, we must understand what sort of phenomenon or event is being explained. The story about the death of the Sun's daughter doesn't explain the physics behind the Sun's yearly movement through the sky; rather, it explains the *motives* and intentions of the forces at work. The explanation thus provided creates a relation to that event; it turns the listener into a participant in the movement of the Sun rather than simply a far-off and unconnected observer.

DEEPER THINKING

Myth and climate change

Consider the current climate crisis.

- How do you think an explanation of the natural features of the world, which incorporates personal spirits and beings within the landscape, might alter how you characterize the crisis?
- How do you think describing the resources of the world as impersonal objects to be exploited, or how an explanation of the world which actively attempts to break the connection between our personal views and our descriptions of the world, might have contributed to the crisis in the first place?
- If an explanation of the crisis using mythological language provides the motive to change our behaviour in relation to the environment, does it *matter* whether a scientific perspective might disagree with it?
- What role could a scientific view of the environment and the facts about climate change play in relation to such a mythological explanation?

ACTIVITY

Find a 'creation myth' or 'creation account' prominent in an Indigenous culture. Get into small groups and read about it. Discuss what you found out and answer the following questions:

1 What knowledge is being conveyed?
2 Is it simply historical or scientific, or does it contain beliefs and knowledge about how individuals in that community relate to the world?
3 How do you think this knowledge would aid a person from that community?
4 In what ways do the non-literal elements of the myths help in developing understanding?
5 Does the notion of truth take on a different aspect here?

Now compare your ideas with another group's responses:

6 How are they different?
7 What about the students in the group – do you think the cultural background of the group might account for these differences?
8 Does it make sense to suggest that some interpretations are better than others?
9 How do you think a person from that culture would approach the myth?
10 What other cultural elements are needed for the myth to 'make sense'?

KNOWLEDGE QUESTION

What methods have Indigenous peoples developed to support the recording, preservation and protection of their traditional knowledge?

What is the status of myth as knowledge?

Let us return briefly then to a central concern with understanding the role of mythological explanations. How are we meant to understand them? Can they be thought of as true? And if they are then in what sense? We often discuss certain types of literature or art as being 'true' but certainly not in the sense that we would consider mathematics or science to be 'true'.

We need to differentiate the truth of art and literature from mythological 'truth' in a number of ways:

- People in Indigenous communities will often accept myth as a genuine description of the world around them, even while accepting the truth of what science tells us about that same world. As we've discussed above, myths (unlike literature) are not generally considered *metaphorical* of some general truth, they *actually* tell us what is true. The Sámi genuinely accept that there are spirits in the *seidas* and that some reverence needs to be paid to them.
- The myths do more to bind individuals and communities together than either literature or science. To accept a mythological explanation, one must accept a *way of living* or a perspective on the world that is needed to find the value and importance of what the myth offers. Furthermore, that perspective or way of living is often very local to a particular community. Because acceptance and a genuine understanding of the myth is local to a community, the myths themselves, like the rituals in that community, generally are unchanging. They are not open to deep revision because it is the acceptance of the myth as 'ours' which binds the community together. Scientific explanations are always up for amendment and alteration depending on new evidence, so cannot serve as a binding element to a community in the same way. Literature, while often designed to speak to a particular community, doesn't require the same sort of *loyalty* or acceptance of it.

An implication of this discussion then leads us to a fundamental worry in discussing myths and Indigenous cultures more widely: can we genuinely understand the *value* and function of mythological explanations from outside the culture in which, and for which, they have been designed? If one doesn't identify as a member of an Indigenous community, is there any hope of fully understanding the role of visions, myth, ritual or authority when thinking about Indigenous knowledge systems?

Extended Essay

If you're interested in the nature or function of myths, you might consider exploring this in the context of an extended essay. The World Studies essay asks students to combine the approach of two disciplines in the attempt to answer a single research question. In this case you could use World Religions, Social and Cultural Anthropology, Philosophy or even Group 1 Literature to explore the nature, use and function of myths and mythology.

Vision

Given that the worldview assumed by many Indigenous cultures incorporates both the sacred and the secular, how knowledge is obtained about that relationship poses problems if you are prioritizing only direct verifiable observation. A common way around this is by seeking direct knowledge through visions. These are altered states of consciousness sought after by individuals in the hopes that they might gain some new insight into whatever it is they want to know about.

◆ **Dogma**: Refers to the core beliefs in a religion which all individuals are expected to hold.

CASE STUDY

The Lakota people and Sitting Bull

In the Lakota people's traditions, visions are an integral part of the life of an individual. The culture is not set up around a set number of beliefs which all people have to believe, so the life of the individual and his or her understanding of the world is largely left up to them.

Visions, for the Lakota men, were a generally accepted part of life, and young men would seek out visions hoping to see something significant which might shed light on how to live their life (Martínez 82). Because there was no specified set of religious **dogma** in Native American spirituality, each man would formulate his own system and individuals would accept others at their word that they had been told what they said they had been told. Lakota 'medicine-men', the spiritual leaders, would have visions which helped them cure the sick, locate hidden articles, predict future events, or assist hunters by coaxing buffalo near (Martínez 83).

'Fundamental to the visionary experience is crossing a critical threshold from the explicit world of the everyday to the implicit reality of the visionary world' (Martínez 90). As discussed, one of the main characteristics of many Indigenous knowledge systems is the connection between the secular (or 'everyday') and the sacred (or 'visionary world'). Visions, then, are a full breakdown of this distinction, where the sacred becomes a genuine experience to the individual. They were often accompanied by long and arduous rituals beforehand, which could include self-inflicted physical wounds, fasting, incredibly exhausting and dangerous physical exertions and exposure to the elements. The lucky few, however, would be given a vision, which was not always comfortable.

> Sounds came to me through the darkness; the cries of the wind, the whisper of the trees, the voices of nature, animal sounds, the hooting of an owl. Suddenly I felt an overwhelming presence. Down there with me in my cramped hole was a big bird. The pit was only as wide as myself, and I was a skinny boy, but that huge bird was flying around me as if he had the whole sky to himself. I could hear his cries, sometimes near and sometimes far, far away. I felt feathers or a wing touching my back and head. This feeling was so overwhelming that it was just too much for me. I trembled and my bones turned to ice. I grasped the rattle and with the forty pieces of my grandmother's flesh . . . I shook the rattle and it made a soothing sound, like rain falling on rock. It was talking to me, but it did not calm my fears. I took the sacred pipe in the other hand and began to sing and pray… But this did not help. I don't know what got into me, but I was no longer myself. I started to cry. (Martínez 91)

■ Sitting Bull

It was this individualism at the heart of the Sioux nation which historian Stephen E Ambrose suggests is the root of the relative ease that the European descendants in the young United States were able to remove the Indigenous populations from their lands. Whereas in the US military, soldiers were commanded as a unit and were obliged to do what their chain of command told them to, the Sioux warriors were each free to do what they wished. Building an effective 'Native Army', then, could only have been achieved through the strength, reputation and charisma of its leaders. These leaders did exist and one was named Sitting Bull.

Sitting Bull was a Hunkpapa Sioux medicine-man (the Sioux are within the same family of tribes as the Lakota). He was not a warrior but was nevertheless considered one of the bravest the Sioux had to offer. For example, in 1872, during a standoff with US Cavalry troops, Sitting Bull wanted to raise the spirits of his warriors, so he calmly took his pipe and wandered out into the no-man's land between the lines and in range of the soldiers rifles. He lit his pipe, took a seat and called out to his warriors, 'Any Indians* who wish to smoke with me, come on!' Four other warriors joined him, including a fellow Sioux warrior named White Bull. White Bull reported that the others smoked as fast as they could while the bullets whined over their heads and hit the ground all around them, but 'Sitting Bull was not afraid. He just sat there quietly, looking around as if he were at home in his tent, and smoked peacefully' (Ambrose 355).

(*Note that the term 'Indian' is used here because this is the term used in Ambrose's text. It is, of course, not the term we would use for Native Americans today – who were named this because of Christopher Columbus' mistaken belief that he had found a westward route to the trade rich areas of India.)

In 1876, tensions between the warriors of the Sioux and the United States government had come to a boiling point. During that summer, the US sent a whole army into the lands of the Sioux to drive them all on to reservations so the US could take full control of the whole continent. Sitting Bull's Sioux, along with 2000–4000 other warriors, were camped at Rosebud Valley near the Little Bighorn River in what is now Montana. In an attempt to find out how to proceed and what would happen in the coming

A Native American painting on buffalo hide depicting the Battle of Little Bighorn

battles, Sitting Bull held a Sun Dance. Surrounded by hundreds of chanting and singing warriors, Sitting Bull followed a sacred ritual designed to bring on a vision. It required a torturous cutting of his arms and chest, and then, bleeding profusely, he began a dance, which lasted for 18 hours. When he would faint, others would splash him with cold water so he could dance some more. Finally, he had his vision: he heard a voice from above saying, 'I give you these because they have no ears', accompanied by a vision of soldiers and Indian warriors falling from the sky, with their heads down and their hats falling off. 'They were falling right into our camp' (Ambrose 417). This vision was the rallying call that Sitting Bull's group needed, after having been chased around the northern plains for months.

Within three weeks, on 25 June 1876, while camped on the Little Bighorn River, General George Armstrong Custer of the 7th US Cavalry caught up with Sitting Bull's group. They stormed out of the surrounding hills and into the camp in an attempt to annihilate them, just as Sitting Bull's vision said they would. But the Sioux were motivated and ready and in a final stand that lasted no more than 20 minutes, Custer and over 200 of his men were dead.

The victory was short-lived and the last for the Native Americans. After Little Bighorn, new resources were given to the Army and within 20 years the battles were over, with all the Indigenous Native Americans living on reservations, kept from their lands and living a life that was not their own, dependent on US government handouts. In 1890, Sitting Bull was killed while resisting arrest on one such reservation.

ACTIVITY

1 Describe how you think Sitting Bull's vision, or any other vision, would be treated by Enlightenment science.
2 How would the science you learn in IB describe such an experience as Sitting Bull's, its causes and its content?
3 Knowing what you know about the Indigenous worldview, how do you think someone from the Indigenous perspective would describe visions? What is their *authority* in a knowledge system?
4 What function would visions play in the culture?

A 'scientific' view of the situation would presumably note Sitting Bull's vision as simply the result of dehydration, blood-loss, incredible stress and physical exhaustion. Anyone in that situation, were they strong enough to remain conscious, would be hallucinating. In terms of content, the psychologists might point out that *of course* his visions would be populated with people and events that were on his mind, in a way that our frequent dreams often are about the events in our lives. These were the objects and ideas that Sitting Bull was most familiar with and had on his mind, so it comes as no surprise that they are in his visions.

The Indigenous perspective, however, would focus on the *authority* of such a vision in a description of the world. Given the basic assumption common to many Indigenous knowledge systems that there is a deep connection between sacred and secular, a full explanation of the world from such a perspective would require some sort of access to this sacred realm and visions are ideally suited to this purpose. Furthermore, of course, the visions are of immediate events and people and this again would be expected in a knowledge system so focused on the immediate context. The point of Indigenous knowledge is not to know 'objective' universal truths but to know about the immediate world and how to navigate it.

Knowledge is in the service of the immediate here and now; it serves to orientate an individual in his or her world and explain how the individual relates to their immediate surroundings. As with mythological language, those of us outside an Indigenous community or those of us who have never had a vision are at something of a disadvantage when trying to understand them. Sitting Bull's vision, then, held the authority, reliability and credibility others might give to expert scientists.

Ethics

We hope that this chapter on Indigenous knowledge systems has given you some opportunities to reflect on some of the general characteristics of these sometimes quite unique knowledge systems. Many of you will be unfamiliar with Indigenous ways of understanding the world and they will therefore seem foreign and quite different from what you are perhaps used to when constructing knowledge in your school or cultural setting.

Does 'knowledge' of Indigenous societies perpetuate colonial thinking?

The question of ethics, when discussing the optional themes or areas of knowledge discussed in this book, often encompasses the responsible use of, or responsible creation of, knowledge. As indicated early in this chapter, when reflecting on or studying Indigenous knowledge systems or cultures, there is another layer of ethical concern which is tied directly to the dynamics of power in history and which cannot be ignored. Thinking back to the issue of *defining* 'Indigenous', we must avoid a definition based on some opposition to what they are not and where communities are seen as somehow 'less' because of this difference. Were you to

KNOWLEDGE QUESTION

As an 'outsider', can we know and speak about the knowledge held by a different cultural group?

accept your own western culture as superior, you might be tempted to see anything not like it as somehow less advanced. This is where the definition of the term 'Indigenous' becomes particularly contentious, because however one defines 'Indigenous', any use of the term, given the histories of the communities being considered, will be embedded in and informed by the history of colonialism. This history often has treated Indigenous communities as if they were 'primitive', as is clearly and explicitly illustrated with Richard Henry Pratt's comments in relation to the aims of the Carlisle School.

A genuine and honest exploration of Indigenous knowledge systems cannot be achieved if the investigation *starts* with the assumption that Indigenous communities are less advanced than the colonizing group. If they are looked down upon as the 'lesser other' then they again fall prey to another form of colonization, this time based on describing them in a certain way, a way which might lead to individuals seeing their own Indigenous communities as somehow deficient.

If you come from a non-Indigenous culture, then these historical facts must be foremost in your mind as you consider the TOK issues related to Indigenous knowledge systems. Mischaracterizing them as 'primitive' or 'not scientific' is simply to further denigrate them by reapplying the colonial attitudes that Indigenous cultures have tried to break free from:

> The powerful colonial institutions, whether educational, social or economic, have also colonized people's minds which has led to internalized colonialism and the acquisitions of … western values, ways of thinking and world views. In this way, these subtle forms of colonialism have made many Indigenous individuals devalue their own culture and anything that is connected to it. (Kuokkanen)

ACTIVITY

Consider the quotation from Kuokkanen.

1 What does this say about the dangers of trying to develop knowledge of a different culture?
2 Is it possible to fully understand and appreciate the fundamental assumptions and ideas of another culture?

IA prompt

14 Does some knowledge belong only to particular communities of knowers?

DEEPER THINKING

What makes knowledge valuable?

While we might accept that there are many different ways of understanding the world, *assuming* from the outset that one way is simply better might not make it possible to truly understand the other form. Have you ever been in a situation where someone has tried to tell you that something you know or value is not important? What made the other person so sure that their view was the better view? How has *authority* or *power* played a role in their claim that your approach or view was not important or valuable?

Think back to the map metaphor we've been developing. Do you think that there are *inherently* better maps than others? We might imagine utterly useless maps, ones that are random or purposefully have no relation to any real feature of our world. These would be inherently bad maps and designed to be such. But if some map has been developed in the context of the shared understanding of a community and this map (or way of understanding of the world) *works* for the people using it and perhaps has worked for thousands of years, doesn't this mean that it is, *in some ways,* valuable? You might not accept it, but might it be 'true' to some degree? What would you have to establish to genuinely show that another's view of the world is not 'accurate'? What do you and another have to have *in common* to agree that one map is better than another?

The politics of making a definition

Essentially the issue is about whether one group can adequately investigate, in a way that is fair and equitable, some *other* group, especially when the two groups are significantly different in many ways. How can we characterize those differences without non-consciously holding that 'other' culture to standards that they don't hold themselves to? It is entirely conceivable that using categories that are central to one system of belief (like 'scientific reductionism') in a system where those categories are simply *not* part of the set of assumptions used, will create a view of that system that is unwarranted or simply *misses the point*.

You might think of this dynamic in your language classes. It seems obvious that it is not possible to fully understand another community if you cannot speak their language (just try walking down the street in a country where you don't speak the language). However, you might also push this point and ask whether you can truly understand a community without having *grown up in* that community. It's a real challenge, even for people living in new community for many years, to both feel 'at home' in that community and to be accepted by others in that community.

Any examination of an 'Indigenous' knowledge system, then, must take seriously this dynamic of insider and outsider, and an outside community must take care to avoid using a paradigm or 'map' during an analysis which will necessarily result in an outcome which implies devaluation or judgment. This is not to say that in some instances the analysis won't result in a judgment (we might, for instance, devalue an Indigenous system of knowledge if its understanding of medical illness unnecessarily places individuals at risk), but even in those circumstances, the questions being asked and the answers must be quite clear. If I wonder how best to synthesize vitamin K to help the blood in newborn infants coagulate, then I might turn to modern chemistry. Modern chemistry is pretty good at that sort of thing. However, if I want to better understand how a community might live in harmony with the natural environment to create more sustainable living, I might turn to Indigenous understandings of the natural world and the place of human beings within it.

How to study a community

The Enlightenment paradigm, when trying to develop a 'scientific' explanation of something, is to remove the observer as much as possible and simply observe what happens or to develop experiments where variables are controlled. Applying this method to investigating cultures, however, is less appropriate because when studying human beings we know that there are internal motives and perspectives at work in the way people are acting. Simply observing another culture might tell you about the sorts of objects they surround themselves with and the sorts of actions they make, but *culture* includes beliefs, motives, ideas and reasons which might not be observable.

This is a problem in the discipline of anthropology and more generally in the area of knowledge of the human sciences. What, then, is the best way of learning about *culture*?

Assessment advice

When you choose objects to exhibit in your TOK exhibition assessment, you'll be looking for items which are the manifestations of some belief or set of beliefs over and above just what the object *is*. Many Indigenous communities create art or artefacts which have a particular meaning to them, one which is unknowable to others unless they take the time to learn. Even then the *significance* might not be understood without being deeply embedded in that community. An object from an Indigenous culture could be used to explore these issues in the context of one of the TOK IA prompts.

CASE STUDY

Frank Hamilton Cushing and the Zuni People

In 1879, when he was 22 years old, Frank Hamilton Cushing, Curator of the **Ethnological** Department of the US National Museum in Washington DC was invited to join an expedition to the southwest of the United States to study the Zuni People, a group of people who had been living along the Zuni river for 3000–4000 years. Cushing, born and educated on the US east coast, was an expert on Native American artefacts and had joined the Smithsonian Institute at age 19.

Cushing was so impressed with the Zuni people they had been studying that, once the team of anthropologists decided to leave, he received permission to remain. He moved in with the residents and was accepted into their secret religious group, the 'Priesthood of the Bow'. He was ultimately recalled to Washington by the US government, seemingly because of his involvement in a series of inter-tribal clashes at a time when the US was trying to smooth over tribal divisions ('Frank Hamilton Cushing'). His work in the community, however, was the first of its kind in that he observed the culture *from within*, thereby giving a more authentic account of the culture and its beliefs and practices. Cushing's approach provided a deeper awareness of the inner workings of the culture and an awareness of its strengths. This provided further reflection on the nature of 'culture' in general, in particular the assumption that it was something that dominant cultures have and Indigenous cultures do not.

ACTIVITY

Consider any travelling you might have done to countries, places or even into other communities unfamiliar to you.

1. What were your initial experiences like? Often these experiences can be quite challenging because they are so different, and your normal beliefs, reasons and explanations don't fully apply. However, the longer you spend in a culture, the more you know about the activities and worldview of that community, the more you might find that your comfort level changes as well.
2. What knowledge do you have or not have at the beginning of the process?
3. What knowledge do you gain in the process of learning more about the community?
4. Is that *propositional* or *ability* knowledge?
5. How does your knowledge of or thoughts about your own culture change as a result of being part of another culture?

◆ **Ethnology**: A branch of anthropology (the study of human cultures) focusing on the different characteristics between human populations and cultures and the historical relationships between these populations.

CAS links

If you are part of or live near an Indigenous community, you might consider developing a CAS project exploring links between your own culture and the nearby dominant or Indigenous culture. Perhaps children in the non-Indigenous community would benefit from regular links with elders or children in Indigenous cultures to learn about and help preserve the customs and practices in that Indigenous community. Students in the non-Indigenous community might report back to their own community about their experience and encourage mutual understanding.

Conclusion

Thinking about a whole culture and a 'knowledge system' and trying to say something about it which is informative and charitable is a challenge. It is doubly challenging when the knowledge system is significantly different from our own. Here we have tried to offer a framework to understand 'Indigenous knowledge systems', but we accept that speaking from *outside* any such knowledge system raises particular challenges.

We hope we have achieved a way of opening up a series of ideas and concepts which could create the possibility for further research and thinking about these intriguing systems of knowledge. We think this is important, as Indigenous knowledge systems are, and have been, under threat of disappearing. Many individuals *identify* with these systems; the systems of knowledge and the ways of living associated with them provide individuals with a sense of self-awareness, self-definition and self-confidence. Losing them would be losing many people's sense of who they are, so discussing them here and exploring them in your classroom provides further awareness and witness to their value.

As a conclusion and a way to wrap up many of the themes in this chapter, we'd like to finish with a reply from Canassatego, an Onondaga nation leader and spokesperson for the Iroquois Confederacy to the Virginia State Legislature, who had offered the Iroquois a chance to send a number of their young men to the college of William and Mary in Williamsburg, Virginia, in 1744.

> We know you highly esteem the kind of Learning taught in these Colleges, and the maintenance of our young Men, while with you, would be very expensive to you. We're convinced, therefore, that you mean to do us Good by your Proposal, and we thank you heartily. But you who are so wise must know that different Nations have different Conceptions of things. And you will not, therefore, take it amiss if our Ideas of this kind of Education happens not to be the same with yours. We have had some experience of it. Several of our young People were formerly brought up in the Colleges of the Northern Provinces; they were instructed in all your Sciences; but when they came back to us, they were bad Runners, ignorant of every means of living in the Woods, unable to bear either cold or Hunger, knew neither how to build a Cabin, take a deer, or kill an enemy, spoke our language imperfectly, and therefore were neither fit for Hunters, Warriors, nor Counsellors; they were totally good for nothing. We are, however, not the less obliged for your kind Offer, tho' we decline accepting it; and to show our grateful Sense of it, if the Gentlemen of Virginia shall send us a Dozen of their Sons, we would take great care in their Education, instruct them in all we know, and make Men of them. (O'Brien 239)

IA prompt

21 What is the relationship between knowledge and culture?

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6 Knowledge and Religion

OBJECTIVES

After reading this chapter, students will:

- know what a religious knowledge system is and how it might differ from other forms of knowing the world
- understand key concepts in the discussion of religious knowledge systems that might not be part of other knowledge systems
- understand arguments about how religious knowledge systems are *distinct* from scientific knowledge systems
- be able to reflect on the extent to which knowers *outside* religious knowledge systems can offer legitimate critiques of religious content
- recognize some of the key methods of developing and accepting religious knowledge
- understand the role religious knowledge systems play in the development of ethical systems.

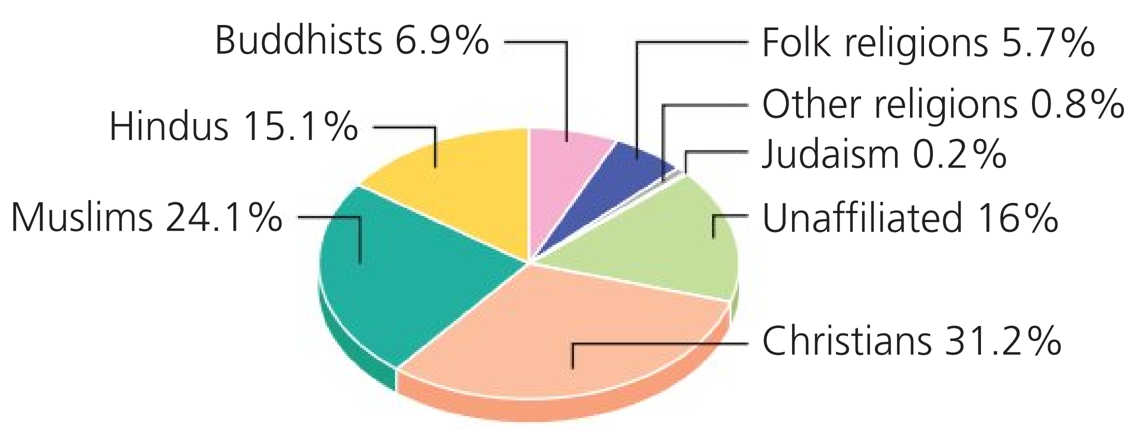
Learner profile

Balanced

How can we align our religious beliefs with what we learn in other areas of knowledge?

Introduction

In all societies across the planet we find religions, and roughly 80 per cent of the world's population, or nearly 5.8 billion people, consider themselves religious (The Global Religious Landscape). However, as was the case with 'Indigenous societies', it might be a challenge to define 'religion', since there are things that we would call 'religions' that might not fit any particular definition perfectly. The pie chart on the right shows the population of the world broken down by the most common religious beliefs.



The population of the world broken down by religious belief

The pie chart does not do justice to the diversity of religious beliefs held by people around the world, however. Most religions can be divided and subdivided into different branches, denominations or sects, such as Sunni Islam, Orthodox Judaism or Roman Catholicism. And within these, there will be differing opinions about the interpretations of sacred texts or the best way to practise religion.

To what extent can we talk of religious knowledge systems when there is such a variety of religious perspectives?

In Theory of Knowledge, however, rather than investigating individual religions' perspectives, we are exploring more broadly religious knowledge systems. This means that we're looking at a type of knowledge and a type of knowing that is shared among the various religions. This would be a little like considering scientific knowledge systems as opposed to thinking only of biologists, astronomers, psychologists and geographers; we are looking for similarities rather than focusing on differences. One way of analysing this idea of religious knowledge systems, then, is to explore what these 'religions' might have in common.

ACTIVITY

1. Working with a partner, write a list of characteristics shared by different religions. Share your ideas with the rest of your class.
2. Do these shared characteristics help us to define what we mean by religion? What do they tell us about the relationship between religion and knowledge?

Thinking through these common approaches to religious knowledge is the main goal of this chapter. First, we'll be exploring just what the scope of religious knowledge systems is, then exploring some perspectives about the relationship between religion and knowledge. Then we will be looking at the methods and tools used by religious knowledge systems and how they differ from non-religious systems of knowledge. Finally, we'll explore the ethical dimension of religious knowledge systems.

Scope

What is religion?

Religions each contain a set of core beliefs which treats the world we can see, hear, touch, taste and smell as somehow *incomplete*; these systems of knowledge suggest that there is *more* to understanding reality than just appealing to what we find around us. This already suggests that religious knowledge systems and the view of the world provided by the natural sciences are quite different. Natural science accepts that metaphysical questions about what cannot be seen are beyond the scope of scientific description, which depends on observation for evidence. If something, by definition, exists beyond the physical world around us and therefore cannot be seen or measured in some way, then it cannot be the subject of science. Many natural scientists think what is physical is all that there is, suggesting that any claims about what lies outside the observable world is not genuine knowledge or worse, is simply meaningless. Other natural scientists are perfectly happy to use the scientific method to explain how things work in this world but believe that religious claims about what happens *outside* the observable world are not in direct conflict therewith.

Most religious knowledge systems, however, don't accept that the two worlds are independent or separate. The claims about the world beyond what we can immediately see and experience (the 'religious realm') has a direct impact on the way we live in *this* world. In the Abrahamic faiths of Judaism, Christianity and Islam (which share a historical connection to the God of Abraham) our actions and behaviour in *this* world are directly connected with the desires and command of God. Fulfilling those wishes of God is essential to our happiness in the afterlife, over which God presides. The eastern religious systems tend to move away from a single divine being, and often are focused on a number of spirits and beings, some malevolent, some **benevolent**, who are far more integrated or infused into the world around us. Both western and eastern religious knowledge systems have many rituals and practices that believers participate in, in order to guarantee that the relationship between the divine beings is a healthy one.

A religious knowledge system might, therefore, be defined as a set of practices and beliefs and traditions which assume a worldview made up of two distinct worlds: one world populated by the objects we see, feel and directly interact with (the **secular** world), and another world which is not directly seen, and is populated with gods or a god, or other unseen beings (the **sacred** world). These worlds, however, are deeply connected. This idea of a relationship or connection in religious knowledge is evident in the Latin root of the word 'religion' (Oxford English Dictionary). *Religare* is the Latin word meaning 'to bind again' or 'constrain'. The idea is that a religion *binds* the believer to a particular set of obligations or duties that are derived from the belief in this supernatural world or deity, rather than from the world around them.

The two worlds are intimately related, and our existence in *this* world is often seen as a preparation or a test for acceptance into the sacred world. The acceptance or transitioning into this sacred world represents the ultimate goal for humans; in a sense the sacred world is the more real, or at least the final goal of our actions and behaviour in this world. Many religions focus on a successful transition from this world to the next, and the rules of acceptance into the divine world depend entirely on our actions and beliefs in this world. If these sorts of beliefs are common to religious knowledge systems, then a religion is one particular version of such a system, like Islam, Hinduism or Shintoism.

◆ **Benevolent**: Wishing good things. It is the opposite of malevolent which means 'wishing bad things'. *Volare* is Latin for 'wanting or desiring', *bene* is 'good' or 'well' while 'male' (mah-lay) is 'evil' or 'bad'.

◆ **Secular**: Describes beliefs which have nothing to do with religion.

◆ **Sacred**: Refers to an inherent 'holiness', something which is connected to the divine and therefore deserves special respect. Here it is used in opposition to secular.

◆ **Sinful**: Evil or improper behaviour. The word 'sin' is derived from a Greek word meaning 'to miss the mark'. In other words, a sinful act is an act which 'misses the mark' or goal set out by God.

Not all systems of belief that we would call religions necessarily place a divine being or beings at the centre of the system, but most do. A more common starting point in terms of most religious knowledge systems is that human *agency* or human action is paramount in the way the Universe works. It matters what we do, and how we behave, but not in the sense that our actions simply have consequences, like billiard balls have an effect on other billiard balls, or how a breeze has an effect on the leaves of trees. A full description of this sort of effect need only to refer to scientific laws governing how objects interact. Rather, religious knowledge systems tend to start from the belief that there is some being or process which stands outside the world and its natural processes, but that governs them from afar. So, while physics might give an adequate explanation of the interaction among the breeze and leaves or billiard balls, *religious* systems would place those natural laws in the context of the desires and actions of a being or process which stands *outside* physics and is not affected by them.

■ The Psalter world map. This medieval map depicts the spiritual domain as well as the physical world

We call these sets of beliefs and knowledge 'systems' to bring out the internal connections between the individual beliefs: each belief in a religious system will form coherent and consistent connections with the other beliefs in that system. Buddhist beliefs about the nature of the individual self, for instance (namely that there is no self at the root of our existence), will be consistent with Buddhist beliefs about the nature of suffering and the solutions to suffering in the world. Similarly, the Christian belief in humanity's **sinful** nature helps makes sense of the Christian ideas surrounding salvation.

◆ **Theology**: An academic discipline which focuses on applying a philosophical analysis of the nature of God or of the divine and the nature of religious beliefs and practices. A theologian is someone trained in this discipline.

Another way of saying this is that religious systems often have made conscious and explicit attempts at creating a formal **theology**, meaning religions often produce philosophically rigorous and systematic theories about God and nearly every other aspect of human life. If you are a Catholic Christian, for instance, then you are part of a long tradition of Catholic academics and philosophers who have considered nearly every aspect of life and have tried to develop a Catholic perspective on it. The Catechism of the Catholic Church is a summary of the official Catholic perspective on all sorts of issues in the world today, from understanding just what the term 'God' means (section 34), to the role of children in a family (sections 2214–2220), the nature of human passions (section 1763), rules around self-defence (section 2264) and abortion (section 2270ff), and the relationship between private ownership and the belief that all things belong ultimately to God (section 2403). You can explore the Catechism in more depth by using the QR code on the right.

While religious systems are often focused on the fulfilment of the individual, the religious traditions take great pains to explore just what that individual *should* believe in order to be worthy of the rewards promised by that religion.

DEEPER THINKING

Religion and reason

Many TOK students will mistakenly think of religious knowledge systems as being primarily grounded in something they call 'faith', by which they mean something like an uncritical, or unreflective acceptance of claims where there is no evidence for them, and thereby downplay the role of *reason* in religious belief. While for many the starting point of an *individual* belief in God is not explicitly a rational process, religious traditions, however, are conscious attempts at critically reflecting on this shared belief. The history and practice of religion shows that the suggestion that religion is merely uncritical acceptance of non-rational beliefs is simply untrue. The Catholic Catechism (indeed the last 2000 years of Christian theology) is one example of how reason is used to develop consistent, coherent and integrated systems of beliefs.

One thing TOK students should always remember is that **reason is a *process*, not an outcome**.

Reason is a process by which ideas are related to one another, not one which tells us whether the ideas are 'true'. There are any number of false beliefs (eg, that the Earth is flat), supported by 'rational' arguments. That the arguments are called rational doesn't mean that you should think that they are true. Many students who are not religious, think that because *they* think religious beliefs are 'false' they cannot be rational, or that they cannot be rationally defended. This is simply not true. What these students might find more fruitful is to explore the *premises* of the competing arguments in order to think about how different premises might lead, through entirely rational development or analysis, to quite different conclusions. Identifying where two arguments differ is far more complex and challenging to students, which is why some will simply try to derail arguments they don't like by claiming that they are 'irrational'.

The Jewish Talmud is another good example of the role of reasoned interpretation and analysis of religious texts as central to religious knowledge systems. While Jewish people hold the Torah as sacred (containing the direct commandments of God), these texts are sometimes hard to interpret in light of modern development. Would the commandment 'Thou shalt not steal' cover using an uncited image from the internet in a presentation in class? Jewish people, however, also

Students studying the Talmud

look to the Talmud, texts which contain commentaries of the Torah along with the teachings of thousands of rabbis who analysed and reflected on those texts (Shurpin). The idea is that the original Torah is complex and *general*, so working out how to apply it in a *particular* everyday modern context (like whether using uncredited images breaks the commandment prohibiting stealing) needs analysis by people with the experience and knowledge to do this responsibly. This further underscores the role of reasoned interpretation in the development of Jewish religious belief.

Religions or religious traditions might have different perspectives within them, for example, the Hindu traditions have a number of approaches to questions about how the world was created. However, even in these situations there are enough internal consistencies and common concepts that we can still recognize them as the same 'system'. The various religions, in other words, share an approach to the knowledge they construct about the world in ways that are quite similar – similar enough for us to step back from any particular 'religion' and think about the *type* of knowledge (both propositional and ability) used in religions.

Can religious claims be considered knowledge?

Since the Enlightenment, the ability to *test* knowledge through observation of the world or close analysis of the ideas themselves has become central to how we generally construct knowledge. One of the outcomes of this intellectual period was a de-emphasis on accepting knowledge simply because the religious authorities told you so. However, religious knowledge systems continue to influence the vast majority of people on the planet, so how do their claims about the world stand up to scrutiny?

Some would consider the ability to be tested as non-negotiable when it comes to whether a claim is actually something that can be *known* or something that can be 'reliable'. An argument from this perspective which concludes that religious knowledge cannot be called

IA prompt

1 What counts as knowledge?

'knowledge' looks something like this parable, originally offered by John Wisdom and later developed by Antony Flew (this is the author's own retelling).

> Imagine you and a friend happen across a clearing in a forest. Your friend, taken by the beauty of the spot declares, 'What a beautiful garden! The gardener is very talented.' You see no obvious signs of purpose or intent in the clearing, just a seemingly random collection of bushes, rocks and flowers. You say, 'There is no gardener here.' It appears that the two of you disagree quite fundamentally about the truth of the matter; you both accept the evidence before you, but you disagree on what exactly it is evidence of.
>
> You propose a series of tests to determine which is correct. You suggest that you wait to see if a gardener arrives, but one does not. Your friend says, 'But the gardener is invisible.' You suggest that you set up some infrared devices, but nothing is detected. Your friend says, 'But the gardener is utterly undetectable.' You suggest that you wait to see if any changes in the garden itself occur that are not simply how things naturally happen. The plants and bushes grow normally, the rocks do nothing out of the ordinary. Your friend says, 'But the gardener is working with and coordinating the natural processes.'
>
> After many such interactions, you both come to realize that nothing that could ever be observed could count against your friend's claim that 'there is a gardener'. Your friend will add to the definition of the gardener some quality which would explain why nothing counts definitively against his claim. You will each use all observations as evidence for your separate claims. Both of the claims 'there is no gardener' and 'there is a gardener, who is undetectable' are consistent with the agreed-upon evidence.

KNOWLEDGE QUESTION

What is the value of thinking about questions to which there are no definite answers?

■ Does the parable represent an adequate analogy for religious belief?

What are we to do in this situation? The case here is that two claims:

1 There is a gardener
2 There is no gardener

are both being used to describe the *same set of facts in the world*. Every time the non-believer uses the facts in front of them as evidence to argue for claim 2, the believer then re-defines, or

ACTIVITY

Carry on this conversation with a partner. One partner should offer an experiment which should detect the gardener; the other should reply with an additional reason why that won't work in this case. How far can you get? What do you think this suggests about the reliability of the claim, 'There is a gardener'?

‘qualifies’ the concept of gardener in order to show how that fact is still consistent with claim 1. It seems then that all conceivable observational facts are consistent with both of these mutually exclusive claims, given the continually more complex definition of the gardener. Either there is a gardener or there is not, but the situation suggests that there is no way we can appeal to observations about the world to tell which is true. What each of two people *see* can be counted as *verification* of their claim, but they cannot both be true. Conversely, neither of the claims can be *falsified*, they each end up true in relation to all the available evidence.

In this case, Antony Flew argues that the two claims are *meaningless* because they both make claims about the world, neither of which can be shown to be definitively true through appeal to observed facts. In this case, then, no claims about divine beings (either for or against) should be counted as ‘knowledge’.

Flew suggests that this is different from scientific knowledge about the world. Consider the following claims:

1 The MMR vaccine causes autism.
2 The MMR vaccine does not cause autism.

One of these claims *might* be true, but they cannot both be, so we need to look to the world, apply the scientific method and decide which of these claims is *justified* by appealing to facts in the world. So far, all the available scientific evidence (that evidence gained through the rigorous application of the scientific method, not evidence gained through misapplication of the method or based on mere anecdote), shows that there is no evidence for claim 1 and that all the available data suggests claim 2 is true. The opposite might have been true, but this has not happened.

So, by looking at the world around us, it is possible to say that in *this world*, claim 1 is false and claim 2 is true. This suggests that both 1 and 2 are both *meaningful* because they describe a situation which we are able to test. Furthermore, we have made the tests and discovered that, in fact, claim 2 is false. This ability to use facts to show something is false means that the claims are indeed ‘scientific’ (because they describe this world) and can therefore be ‘scientific knowledge’.

Flew uses this notion (and the parable about the gardener on the previous page) to suggest that religious claims cannot be thought of as knowledge. Now consider a common claim in the western traditions such as ‘God loves me’.

ACTIVITY

1 Play the dialogue game from the last activity but now with the claim ‘God loves me’. The first partner should offer reasons *not* to believe it – based on real facts in the world. The second partner should reply, explaining why those reasons don’t really contradict the claim. How far can you get?
2 Consider what other sources of knowledge, other than sensory observation of the world, a religious believer might appeal to in order to justify their claim. Do the second partner’s reasons draw from facts in the world, or redefinitions of the notion of ‘God’ or ‘love’?
3 What conclusions about the *reliability* of the claim can you draw?

There seems to be a lot of counter-evidence against the claim that ‘God loves us’: people are subject to grave political and social injustice and violence, people lose their jobs for unjust reasons, people get sick and die. These would seem to count against the claim that there is a loving God looking after people, but often religious people will suggest that God *still* loves us, but then *qualify* their understanding of God to allow what appears to be evidence counter to the claim. They might say that God is testing us, helping us be stronger, or giving us the freedom to respond and help others, developing charity and kindness which are traits God wants us to have. In other words, it seems that no matter how bad things are, all these things are *still* compatible with the claim that God loves us.

What questions does religion seek to answer?

We have established that there are genuine problems conceiving religious claims as scientific knowledge. In various ways, religious claims don't really stand up to the challenges posed by the scientific method and some might argue that this means that religious claims can't even be considered 'knowledge'. What, then, is the status of 'religious knowledge systems'?

KNOWLEDGE QUESTION

Does religion try to resolve problems that other areas can't resolve?

For many, a religious belief is simply a belief in some supernatural being. There are more and less sophisticated versions of this type of belief, but belief in some supernatural being or beings is central. As we saw above, however, one of the ways of understanding the context of religion is in terms of its etymology: *religare*, the Latin for 'binding'. This brings out the notion that religious knowledge systems are about linking people with supernatural beings, not just in terms of belief, but in terms of behaviour or living your life. Paul Tillich, a twentieth-century theologian defines religion as:

> the state of being grasped by an ultimate concern, a concern which qualifies all other concerns as preliminary and which itself contains the answer to the question of the meaning of our life. Therefore this concern is unconditionally serious and shows a willingness to sacrifice any finite concern which is in conflict with it. The predominant religious name for the content of such concern is God. (Tillich)

Rather than focusing on supernatural beings, Tillich's definition is helpful in that it focuses instead on the notion of the *meaning* or *significance* of religious knowledge systems. By 'ultimate concern', Tillich is pointing out that religious belief tends to focus on what people believe to be the most *important* element of their lives, that element which all activity should be aimed at. Indeed, this concern is 'infinite' in that it is that which is greater than all other 'finite' concerns, even our own personal interests. Religion deals with that which is more important than any other thing, our own lives included. For many religious people their notion of 'God' represents that which they *should* be most 'concerned' by. ('Concern' here doesn't necessarily mean 'worried by' but more like, 'most interested in'.) God, in other words, is that which is the most important, the most significant thing we could possibly concern ourselves with.

In this definition of religion we encounter the notion of a supreme, supernatural being, but we also encounter the notion that we are *committed* to this being, drawn to this being, obligated to it in a way that is more profound than any other commitment we could have. In fact, as the quote above suggests, all other concerns are necessarily less crucial than our ultimate concern. We may be 'concerned' or interested in money, friends or an excellent job, we might devote our lives to helping others or to simply aiming to be the best we can be, but a religious believer might say that these activities are done in the service of something greater. On their own these goals fall short of being 'ultimate'. A Hindu might say, 'Sure, aim for that good job and happy life, but if you are not trying to build good **karma**, then you're not worried about the right things.' A Jew might say, 'Sure, working hard to gain a promotion at work is good, but if you are violating the Torah to do it, then you're not worried about the right things.' The idea is that our own individual or immediate concerns and needs will never outweigh the ultimate concerns and needs, which is nothing less than our eternal well-being. The limited concerns which occupy our secular, everyday lives only impact us 'locally', rather than 'absolutely'. We might even devote our lives to helping others, but here again the impact is limited to those we help.

◆ **Karma**: Hindus and Buddhists believe that our actions in this world have consequences for our future well-being. This is the Law of Karma. If we commit bad deeds, we will suffer the bad consequences of that behaviour later (perhaps in the next life).

The idea of God, or our gods, however, for Tillich reaches far beyond that. *Whatever* happens to those we help, there is still the *larger* question of God and our relationship to God and our obligations to God.

What religious knowledge systems are meant to engage with, then, are those things which give our lives meaning and significance. Whereas scientific or historical claims describe what happened and why and where, religious knowledge systems try to make sense of what is eternally meaningful. In focusing on those things about which we should be most concerned, religious beliefs orientate us toward how we *should* be, rather than simply how we are. Religious knowledge systems give us goals and priorities and codes of behaviour.

IA prompt

2 Are some types of knowledge more useful than others?

CONCEPT CONNECTION

Values

Values is one of the key concepts of the TOK course and here we see that religious knowledge systems provide many people their *ultimate* values. This means that for religious believers there can be nothing more important than their religious devotions and all other values are part of this ultimate value. As we saw on page 185 with the Catholic Catechism, the 'system' of religious knowledge is all about exploring those things that we do value in life (family, job, friends, health), in order to understand them in relation to God. For many Catholics, every aspect of their lives – everything that they value – is related to and directed towards God, which is the most valued thing.

Enlightenment, salvation, redemption

As we have seen, one of the central aspects of religious knowledge systems, an aspect that clearly differentiates it from historical or scientific knowledge systems, explores what we should be 'ultimately concerned by' and is the main *goal* of religious practice and faith. There are many of these concepts and they vary across traditions, but they all have the same sort of importance or significance. A full list would need to encompass all religions and is therefore impossible for this book, but a selection of a few will make the point. While different, they all point to something like 'salvation' or 'enlightenment', meaning that religious knowledge systems aim to bring individuals from a state of imperfections towards one of perfection.

A common dynamic in religious knowledge systems is that *our relationship to the ultimate reality has gone wrong and needs to be put right again*. That relationship is the ultimate value of our lives (consider Tillich's definition on the previous page) and our number one priority is to try to make that right again. A good job won't make it right; a beautiful spouse won't make it right. Religious knowledge systems challenge us to change how we relate to the world at a very deep level and challenge us to return to our *proper* relationship to the world. This is something well beyond the realm of a scientific description of the world.

'Redemption' captures this idea nicely. It is a common concept in Judaism but is applicable more broadly across most religions. To be 'redeemed' in a non-religious context means to be cleared of a debt. In the religious context, it means to be freed from the state of imperfection (eg, sin, evil, illusion) in which we find ourselves and to be again in the proper relationship with the divine being. We can see this dynamic between finding ourselves in a state of imperfection and striving for a state of perfection in the religious systems in Table 6.1.

Table 6.1 Religions and their goals

Religion	Goal	Meaning	Relationship to a divine being
Judaism	Redemption	Jews hope to live in perfect coordination with the will of God as expressed in the Torah (commandments). These commandments provide a framework in which to carry out every aspect of their lives	'Western' faiths, (Judaism, Christianity and Islam) all profess to follow the same divine being, the God of Abraham, and the idea of salvation or redemption means roughly that the perfect and proper relationship to God (Yahweh, God, Allah) is re-established, after having been broken by human selfishness and greed
Christianity	'Salvation' or Heaven	To be 'saved' is to be in the direct presence of the eternal God, earned through accepting God's actions (the death and resurrection of Jesus Christ) to free us from our sinful state	
Islam	*al-Qadr*	Submission to Allah's all-encompassing plan (*al-Qadr*) is the goal for Muslims. 'Islam' and 'Muslim' are both words related to the word for 'submission.' In all things, Allah's own desire is paramount, and Heaven is reserved for those who have submitted their own desires to Allah's	
Hinduism	*Moksha*	Ceasing to be tied to the never-ending cycle of birth, life and death known as 'reincarnation'. Once we have reached *moksha* our individual identities are reunited with the ultimate divine reality known as 'Brahman'	In 'eastern' faiths, which often do not have a single divine *being*, the aim of life is to live in proper relationship with the divine reality that exists all around us, but which we cannot recognize because we are trapped in our human value systems and our tendency towards greed and selfishness
Buddhism	Enlightenment and Nirvana	Being 'enlightened' means to be aware of the nature of life as suffering and the non-existence of a 'self'. Nirvana then is existing with an eternally still mind free from all desire	
Taoism	The Tao	Living perfectly coordinated with the Tao or 'the Way', the natural order and process of the Universe in which all human categories of right, wrong, good, bad are transcended	
Confucianism	The Way of the Sages	Human beings are tied to a natural moral order, but we cannot easily follow this due to a propensity towards selfishness and greed. The Way of the Sages (also called the Tao) is the proper and natural moral behaviours of human beings, which can be fostered through adherence to the '*li*' or rites, ritual behaviour which provides a framework for proper behaviour	

One clear way of distinguishing religious knowledge systems is at the level of the final aim or goal of such knowledge. Whereas science and history seek to describe the features of this world, religious knowledge systems point us beyond the everyday physical world and encourage us to think about our ultimate state of human perfection, how best to live a human life or what should be most significant in that life. Whatever claims religious knowledge systems make about *this* world (claims which often come into direct conflict with scientific or historical claims) should be understood as preliminary concerns, because the ultimate aim of religion is far greater than anything which can be said of this world.

What this amounts to is that the types of questions answered by religious knowledge systems might be quite different from the types of questions answered by other AOKs. Human beings have a natural tendency to want to live well – to live in the right way – and although there are deep and genuine differences in what people think the 'right' way to live is, the answers are generally *not* found in a purely scientific approach. The fact that people have developed religious knowledge systems since we have *been* human (these systems pre-date what we would now consider scientific knowledge by tens of thousands of years) suggests that these attempts to make sense of our lives, to give them meaning and significance, is a deep feature of our human psychology. Science's best answer when it comes to the problem of the meaning of human existence seems at best to be, there is none, which is not really an answer at all and, for something like 5.8 billion of us, is not adequate.

More than any other AOK, then, the scope of a religious knowledge system is human beings and what our place is in the Universe. Religious systems ask:

- Who are we?
- How do we relate to the forces that govern the Universe?
- What is our *place* or significance in the history of existence?
- What meaning or purpose do our individual lives have?

These questions are unique among the AOKs and therefore require a different approach to constructing and developing the knowledge claims that are central to religious belief. The various approaches, of course, result in dramatically different religions, each with its unique rituals, practices, methods and perspectives.

Perspectives

Religious knowledge systems are interesting in that, ultimately, for the 'religious believer' all questions can be subsumed into a single religious worldview. In a sense, therefore, all questions can be considered religious because religious knowledge systems seek to understand the ultimate questions of the Universe and the place of human beings within it. In this section, we will address several perspectives on the status of religious beliefs and practices in relation to other forms of knowledge.

KNOWLEDGE QUESTION

If knowledge is a map, what is the territory that religion represents?

Gould and 'non-overlapping magisteria'

An illustration of one counter position to the idea that religion is an all-pervasive knowledge system comes from Stephen Jay Gould's notion of 'non-overlapping magisteria' or NOMA. In a 1997 article, Gould, a Harvard professor of Biology and a member of the National Academy of Sciences, addressed the question of the scope and application of science and religion, arguing that they are indeed not in conflict, precisely because they each are out to construct quite different *types* of knowledge. If they were trying to do the same thing they would be in conflict, but because they seek to ask and answer different types of questions, they are not in conflict. Gould writes:

> The lack of conflict between science and religion arises from a lack of overlap between their respective domains of professional expertise – science in the empirical constitution of the universe, and religion in the search for proper ethical values and the spiritual meaning of our lives. (Gould)

In other words, the 'respective domains' or what the knowledge framework would call the scope and application of science and religion are quite different. The word 'magisteria' comes from the Latin 'magister', meaning to teach, and the suggestion is that science and religion have the authority to teach us different things about our experience in the world: science can teach us the answers to questions of empirical facts and theories about why these observable facts are the way they are, and religion offers answers when we ask about moral meaning and value. As Gould puts it, scientists 'study how the heavens go, and [theologians] determine how to go to heaven' (Gould).

As we suggested above, however, not all scientists or theologians would agree with Gould; religious knowledge systems often do make empirical claims about the world and the things within it. Much of the content in many sacred texts are historical in nature, so therefore make historical claims. Likewise, the human and natural sciences do make more and more claims about the natural basis of meaning and value in human life, but Gould's point is important to keep in mind. In trying to answer questions about how the world works, scientific inquiry follows a method rooted in observation. As we will see in the Methods and tools section, a religious claim is often justified according to other non-observation-based evidence, like scriptural authority, or revelation. Too often religious thinkers side-step this necessary element in the construction of *scientific* knowledge and suggest that their own *religious* claims are somehow justifiable in the same way as science. However, claims about the observable world based on unverifiable evidence, claims made in sacred texts or based on personal revelation, will simply be seen as non-scientific. In other words, using a sacred text to justify a scientific or historical knowledge claim is not science in any traditional sense.

One area in which this overlap between religious knowledge systems and the natural sciences can be seen, is in the discussion of intelligent design. The discussion has to do with just what a complete explanation of the features of life would look like. The common position held in the scientific community is that a 'Darwinian' explanation is sufficient and best in keeping with the evidence. Some in the religious community, however, wish to consider alternative theories to the Darwinian perspective.

The religious view suggests that there are some features which need an explanation that Darwinian evolutionary theory does not provide, namely the appearance of *design*. One such scholar, Michael Behe of Lehigh University, argues that the complex functions we find in the world cannot adequately be explained through reference to Darwinian evolution by natural selection as it is currently understood. He suggests that the flagella of certain bacteria (the little tails that, when shaken, propel a bacterium along) display such an intricately fine-tuned structure, one that would cease to be functional if even one element was missing, that he believes this to be *irreducibly complex*. This means that there could have been no *previous* state from which the current state had evolved. This example of irreducible complexity, then, needs a new concept to be explained – one not provided by Darwinian evolution – namely a designer.

The idea is that because the world is designed, there must be a designer (DeWolf, *et al*). Behe is not the first to consider this argument. It was famously put forward in 1802 by William Paley, who likened the complexity we see in the natural world to the complexity we see in a pocket watch. He argued that to suggest that the pocket watch was the result of natural, undesigned process is inconceivable, so an appeal to a designer is necessary for a full explanation.

Whether Behe's claim is correct is beyond the remit of a TOK discussion, but the question does serve as an opportunity to consider just what a 'religious' view and what a 'scientific' view is. Behe, unlike Gould, is suggesting that a genuine and honest exploration of the natural world leads us to claims about a divine being. Gould would say the two are essentially distinct. The question matters because there are many people who believe that intelligent design should be taught alongside Darwinian evolution in the context of a Biology class. Exactly where the divisions between religious knowledge systems and the natural sciences lie have real-world consequences.

One way for a TOK student to approach this is to question just what sorts of concepts are available to religious systems and science as traditionally conceived. We have seen already that part of the core beliefs in most religious systems is the acceptance of a higher power or divine being who stands outside and beyond the world we see around us. This concept then is available when

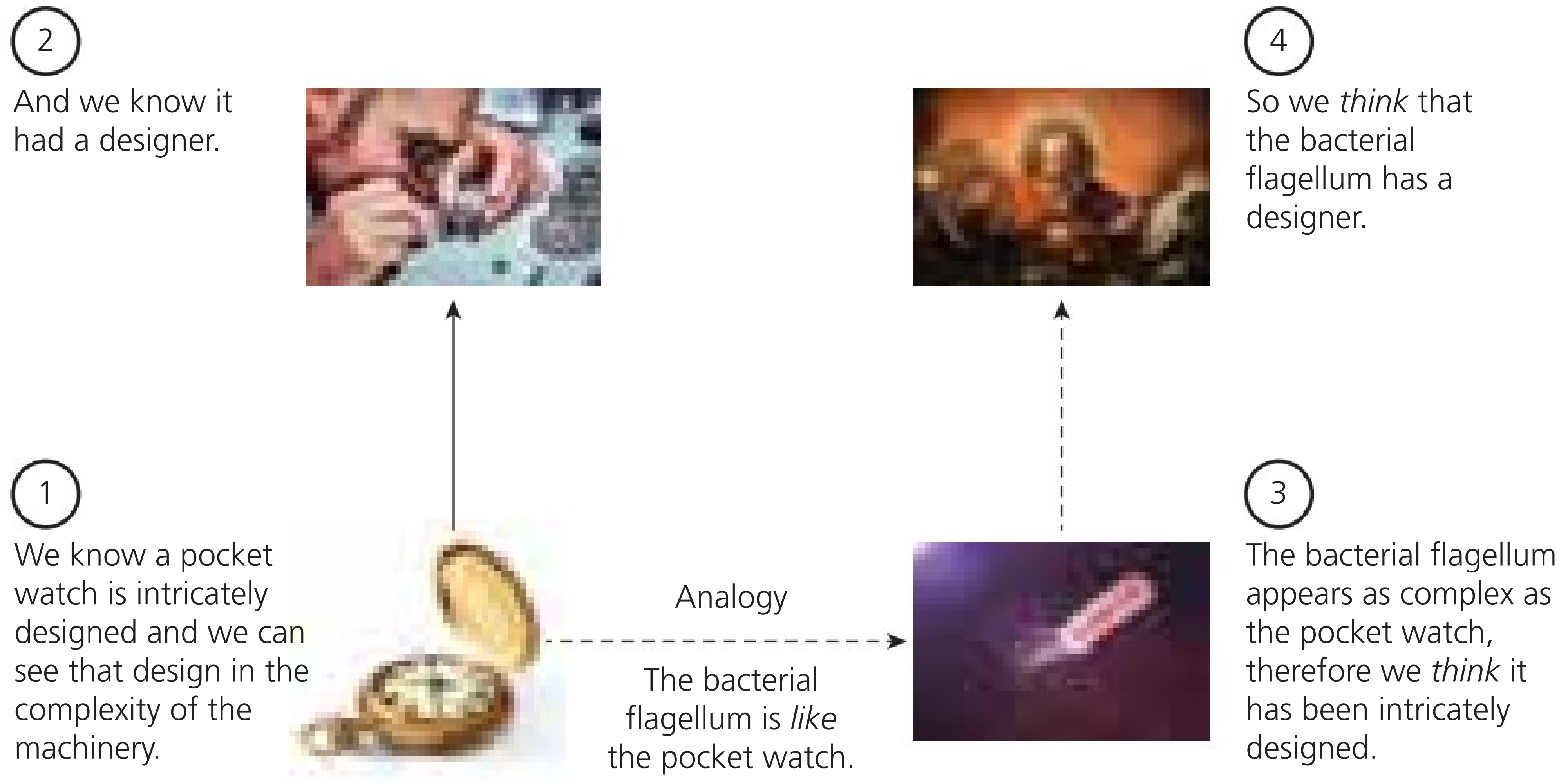
Is the bacterial flagellum evidence of the kind of complex intelligent design found in a pocket watch?

applying a religious explanation, and this is clearly being applied when using a 'designer' as part of the explanation. A non-religious position cannot appeal to this concept, since any explanation it provides must use the concepts that have been developed from *within* the system and have been verified or confirmed by the logic and tools of that system. The claim 'there is a designer who exists outside the natural world but has designed elements of the natural world' is itself a claim which extends beyond the available evidence. Much of the intelligent design argument rests on the claim that certain parts of the natural world (like a bacterium's flagellum) are *like* objects which we know are designed and therefore have a designer. Paley's pocket watch is an example. We already know the watch's complexity is designed, and we already know that the watch has a designer. For some scientists like Behe, it is a short step then to apply that logic in an **analogy** to the natural world – because the world also seems so extremely complex (such that if even one part was absent the whole mechanism would fail to work) that it must *also* be the product of design (and so there must be an intelligent designer). The diagram below seeks to explain this analogy. We discuss the nature of 'analogies' and their use in Chapter 10.

◆ **Analogy**: A way of explaining or clarifying something by comparing it with something else that has similar characteristics.

We will spend more time thinking about the methods of the natural sciences in Chapter 9, but one of the ways in which scientific claims are evaluated is to consider whether or not they are consistent with other accepted facts and whether or not the claim helps make sense of other facts. The non-religious scientist would claim that while it is perfectly reasonable to believe the bacterial flagellum is incredibly complex, one would need independent verification that such a designer exists. If, however, there is no independent way to establish the existence of such a being, then the claim is, merely, an *unconfirmed hypothesis*. However, if there is no *possible* way of verifying the designer from within the system (ie, nothing in the natural world can count as direct evidence for something outside the natural world), then the claim that this designer exists is an *unfalsifiable hypothesis*, one that cannot even in principle be shown to be true or false.

Using unfalsifiable claims to explain a natural phenomenon is the hallmark of 'pseudoscience'. In the vast majority of other cases, there has never been a need to use the hypothesis of a supernatural designer – the concepts of natural science have worked or been discovered – so for there to be a need in this *one* case is unconvincing. The responsible scientist would probably



■ The analogical argument for design. We think the world is like an intricately designed mechanism. Therefore, if the mechanism had a designer, so too did the world conclude something like, *we don't know how this particular object has evolved, but with more evidence we might find out*. The scientist might claim that to reject the whole scientific method and use a being for whom there could be no other scientific evidence to explain some phenomenon or event in this world is unnecessary and not in keeping with the scientific method. In fact, Michael Behe's own departmental colleagues at Lehigh University, express a position like this on their own departmental website:

> While we respect Prof. Behe's right to express his views, they are his alone and are in no way endorsed by the department. It is our collective position that intelligent design has no basis in science, has not been tested experimentally, and should not be regarded as scientific. (Department of Biological Sciences, Lehigh University)

Many scientists believe there to be no conflict between 'religious' belief in a supernatural designer of the world and a complete 'scientific' explanation of that world, but they generally accept that when they shift from thinking about the natural world to thinking about what stands *outside* of and in control of that natural world, they are no longer *doing* science. This is why there is no conflict: science is great for working out the mechanisms of this world, but it is an entirely different question (ie, not a question science can ask or answer) when asking about what happens *outside* the world of scientific observation.

So how useful is Gould's initial claim that science and religion offer 'non-overlapping' explanations? On the one hand, Gould's division is too simplistic, because many believers in religious knowledge systems believe their religious knowledge to *include* claims about the world; it is their religious conviction that, for example, what the Book of Genesis in the Hebrew Torah (the Christian Old Testament) says about the creation of the world *really is how it happened*. On the other hand, Gould's division is useful when thinking about what constitutes good evidence in the context of an AOK (especially in the natural sciences) and useful when thinking about what religious knowledge systems are best suited at doing. Thinking about the scope and application of natural science and religious knowledge systems gives you the opportunity to compare the two and suggests that when doing science, one cannot appeal to an ancient text as part of that 'scientific' process.

IA prompt

5 What counts as good evidence for a claim?

Wittgenstein and 'language-games'

There is another perspective on the nature of religious belief which in some ways is similar to Gould's (and actually came first). Ludwig Wittgenstein considers language and our understanding and treatment of concepts more broadly, and applies it to religious use of language. Language, he suggests, gains its meaning through its *use* in everyday interactions. When, for example, we utter 'Water!' the meaning of that word in that moment depends on the context we are in. If we are speaking to a waiter in a restaurant, it might be a request. If we are lost in the desert and say it to the rescuer who finds us, it is still a request, but rather more urgent. If we are an electrician, it might be a warning to colleagues. The point is that words often *do* something other than just name objects. Wittgenstein extends this to include what we might think as claims about the world and calls them 'language-games', suggesting that 'the *speaking* of language is part of an activity, or a form of life' (Wittgenstein section 23). What he means is that the meaning of terms and sentences should be linked to what the speaker and listener are *doing* with those words. Suppose at their next wedding anniversary a husband wrote the following note to his wife: 'Dearest, my brain over time has continued to release more and more of the hormones oxytocin and vasopressin when I am in your presence.'

Ludwig Wittgenstein

It is unlikely his wife would be impressed, even if she were a neurologist, because that is an inappropriate use of that sort of language in that context. She would probably prefer it if her husband were to say something like, 'I love you more every day' instead. Similarly, a teacher might get fired were they to see the head teacher at morning assembly and shout from across the room 'What's up, Steve-O?' If the teacher addressed the head teacher in that manner, they would be acting as if the two of them were close friends. They might be, but in the context of the workplace that would be inappropriate. That particular way of using language is appropriate in the language-game of 'greeting close friends', whereas the teacher really should be playing the language-game, 'addressing my work colleague and superior'. The use of language in the anniversary card mistook the game the husband *should* have been playing: 'telling his partner how much he loved and valued her', instead of using language that was more appropriate for the language-game 'describing scientifically the neurological and hormonal foundations of psychological attachment'. In other words, the context of our use of language impacts how we should *use* the language and what that particular use of the language means.

◆ **Resurrection**: To be raised from the dead. It is a central dogma in traditional Christianity that after the Romans crucified Jesus in Jerusalem in about 33 CE, God raised him from the dead. This is different from the Hindu and Buddhist belief in reincarnation, which is the belief that after death your spirit or soul moves on to live a life in a different body.

This might not seem like a ground-breaking insight, but we can find its significance in terms of how differently religious knowledge systems use language. Earlier, I mentioned that sometimes religious knowledge systems extend into other AOKs. One such claim would be 'Jesus was **resurrected**', a central belief in Christianity. Most Christians consider that a historical claim, meaning that they believe it to refer to a genuine historical fact: at one point Jesus was dead, having been crucified by the Romans, then at a later point he was biologically *alive* and engaging with his followers. However, Wittgenstein suggests that the language-game being played by a religious believer who makes this claim is nevertheless quite different than if a historian were to say it. He says:

> Christianity is not based on a historical truth; rather, it offers us a (historical) narrative and says: now believe! But not, believe this narrative with the belief appropriate to a historical narrative, rather: believe through thick and thin, which you can only do as a result of a life. *Here you have a narrative, don't take the same attitude to it as you take to other historical narratives!* Make a quite different place in your life for it. (Wittgenstein, *et al* 32 [emphasis in original])

■ What do Christians mean when they say Jesus was resurrected from the dead?

There is a lot to unpack here. Primarily, Wittgenstein is suggesting that the *type of belief* is different for the religious person than for the historian, or that the form of belief is quite different. He says that the 'historical proof game' (the way that expert historians will use language when developing historical narratives) is irrelevant to religious belief. The language-game played by the historian towards the claim 'Jesus was resurrected' would be governed by the historical method; the historian would take it as a hypothesis that *might* be true, and then try to find sources to support it, consider biases in those sources and consider what other facts about the time or place or people are accepted, to test for consistency. Accepting the belief for the historian would be a question of *probability*, meaning that the historian would accept it only insofar as it is *likely, given the evidence*. A natural scientist would have a similar attitude towards the claim, insisting on evidence and accepting the claim only if the evidence was strong enough (and it would have to be pretty strong).

Wittgenstein suggests that this is not the approach or use a religious believer would take towards the claim. Whereas a historian would *evaluate* the claim, the religious person (in this case a Christian), *believes* the claim. They still accept it as a historical truth (they believe it did happen), but they might hold it in their mind (as Wittgenstein says) 'lovingly' or 'believingly' as a believer. In relation to religious belief he says that 'what I [the Christian] need is *certainty* … and this certainty is faith' (Wittgenstein, *et al* 33). Certainty is not really an option in the methodology or language-game of science or history, it is generally a matter of 'more or less confirmed'. The *certainty* provided by a religious acceptance of the claim provides the believer a picture or understanding of the world that is used to provide guidance and direction and their *identity*, which isn't part of the attitude a historian would take towards the claim.

Wittgenstein references a debate he was having with a Catholic priest, Father O'Hara, who was attempting to ground religious claims in science and argue that belief in the resurrection is a good historical or scientific belief, one that is strong enough for a historian or scientist to accept on the grounds of the historical or scientific method. Wittgenstein suggests that when the priest reduces religious claims to *merely* scientific claims, he lowers the value of religious belief to 'superstition', by which he means that, if the priest is taking a scientific attitude towards a religious claim then all he has accomplished is to make poorly justified scientific claims (Wittgenstein and Barrett 59). To maintain the power and *certainty* of the religious claims, the believer must treat it differently.

One might argue that this approach of Father O'Hara (that religious claims should be evaluated in terms of the historical or scientific methods) is precisely the attitude taken by some of the popular modern critics of religious belief, but in the critics' view the religious claims *never* muster the strength to be accepted on historical or scientific terms. The 'New Atheism' movement takes a similar approach in their highly critical view of religious faith, first suggesting that religious claims are *always* meant to be evaluated against scientific or historical criteria and then suggesting that these claims are worse than simply being untrue, they are genuinely dangerous (Poole).

Whatever you make of the moral judgment that religious belief is dangerous, the movement seems based on an acceptance of religious belief as simply scientific or historical claims, similar to the way Wittgenstein sees Father O'Hara's use of religious claims. As we've seen, though, when a believer makes a religious claim, there might be 'entirely different connections' being made (Wittgenstein and Barrett 58), such that if a Christian were to claim 'Jesus has been resurrected' and a scientist were to say 'Jesus was not resurrected', they might mean such different things that they don't even genuinely contradict one another.

These types of *religious* connections need to be understood before the whole form of knowing is dismissed. If the new atheists' claims are that religious claims are not scientific claims, we might accept this: they represent different forms and different areas of knowledge, each with its own methods. To characterize all religious belief as bad science, however, and then dismiss it for being

IA prompt

14 Does some knowledge only belong to particular communities of knowers?

KNOWLEDGE QUESTION

Is certainty any more or less attainable in religion than it is in the arts or human sciences?

bad science is to wilfully misread the scope and application of what religious knowledge systems are generally trying to do.

Of course, the issue is rather more complex than this, as Wittgenstein's use of Father O'Hara's scientific defence of Christian belief in the resurrection suggests. In many cases, religious believers *are making historical and scientific claims* about the world when making religious claims. Most traditional Christians *do believe* that 'Jesus was resurrected' is literally true. It describes an event which *really happened*.

Whether religious claims are meant to be evaluated using the criteria from other areas of knowledge for establishing reliable claims is a difficult question. Perhaps we can consider what religious knowledge systems are trying to describe? If religions are 'maps' to guide us through and help us understand our human experience in the world, just what is the landscape being described?

Methods and tools

While religious knowledge systems might be *internally* consistent, they might not appear consistent with other facts which we construct *outside* the realm of religion. One Hindu explanation of the Universe suggests that the world was born from a great egg; the traditional western creation story suggests God (Yahweh or Allah) is the sole creator of all existence. Scientific systems will not accept these approaches. Similarly, religious knowledge systems often use historical narrative as ways of explaining the world and our place within it. Here again, these religious claims about history might conflict with what secular historians might agree has happened. Historians generally accept that there was a popular Jewish teacher in first century Palestine, known as Jesus, who preached the coming resurrection of the dead and the ultimate victory of the Jewish God. But these historians will stop short of claiming to have historical knowledge of exactly what he said or what he did day to day, although the Christian New Testament is full of such stories.

In many cases, these conflicts can be analysed through an examination of the methods and tools used by religious knowledge systems. This is often a point of real conflict between various AOKs and religious knowledge systems. Historians and scientists, for instance, will insist on a particular method and accept only certain types of *evidence*, whereas religious knowledge might be happy to accept other forms of evidence as justification for its claims. The extent to which an individual finds those restrictions and opportunities convincing might govern whether they are religious or not; if you believe that knowledge *must* be grounded in the scientific method, then you might be less likely to accept any religious claim, whereas if you accept the authority of church leaders, revelation or experience, faith or sacred texts, then you might be more likely to accept religious claims.

The following section seeks to unpack a few of the methods and tools of religious knowledge systems. It will focus largely on the western religious traditions, both because of the authors' own experiences and knowledge, and also because the western religious tradition has been far more concerned with developing rational arguments for faith, particularly since the Enlightenment period in the seventeenth and eighteenth centuries.

The methods and tools we will explore are:

- faith
- reason and argument
- authority
- sacred texts
- dogma
- religious experience.

Faith

Although we've argued above that faith is not the *only* method by which religious knowledge systems are accepted by individuals, the role of faith in such systems cannot be underestimated. However, just what faith means or amounts to when thinking about religious claims is not clear. Faith can mean an unwarranted belief or believing something to be true when there is no evidence to suggest it is. This might more properly be called 'blind faith'. This sort of faith is generally *not* the sort of faith that religious people appeal to when discussing their beliefs, although, ironically, this is the sort of faith that critics of religious belief say religious people have.

Augustine of Hippo

Augustine of Hippo, a Bishop in north Africa in the fifth century, suggested that reason and faith are compatible and necessary to genuinely understand Christian **doctrine**. He says:

> Heaven forbid, I say, that we should believe in such a way that we do not accept or seek a rational account, since we could not even believe if we did not have rational souls. In certain matters, therefore, pertaining to the teaching of salvation, which we cannot yet grasp by reason, but which we will be able to at some point, faith precedes reason so that the heart may be purified in order that it may receive and sustain the light of the great reason. (Augustine, *et al*)

So, Augustine's position is that we are, by nature, rational beings, and we must use that reason to help us understand our faith. He quotes the Old Testament: *Unless you believe you will not understand* (Isaiah 7:9) to suggest how faith and reason work together. While there are certain elements of Christian doctrine (Salvation and the **Trinity** in this case) that are to be accepted by faith, this acceptance by faith is nevertheless able to be explored through reason to aim at *understanding*.

◆ **Doctrine**: Official teachings of a theory or perspective which are at the core of the system.

◆ **Trinity**: The Christian idea that God has three forms, though is only one being – God as transcendent creator, God as the human Jesus Christ and God as the 'Holy Spirit' which exists in the hearts of all human beings.

IA prompt

18 Are some things unknowable?

DEEPER THINKING

Acceptance and understanding

This distinction between acceptance and understanding is an interesting one in the world of TOK and can be used to explore knowledge claims across all the areas of knowledge. You might, for example, accept that your teacher's claim that some mathematical theorem is true or that the chemical structure for some molecule is a certain shape, even if you don't understand for yourself just what that means. Consider how much of your own knowledge gained over your entire school career is *accepted* in this manner, through the authority of your teacher. However, accepting claims like this and for these reasons is not unreasonable; you *should* consider your teacher a reliable source of knowledge and so should 'have faith' in their claims. This, however, does not mean that reason has no part to play in your developing a full *understanding* of those claims. Having accepted that mathematical theorems and chemical structures are knowledge and accepting the way and methods they use to describe certain features of the world, then you can develop your understanding of the phenomenon by applying your reason to further study the claims.

Augustine is suggesting that religious knowledge systems can follow a similar pattern. If you are a Christian, you might accept the central doctrines of the faith, but then use your reason to *make sense* of it. Indeed, in other writings, Augustine suggests that when the literal meaning of biblical texts (in this case the creation story in Genesis) contradicts what reason tells us, then we should treat the biblical texts as metaphorical (Augustine of Hippo).

■ Many people accept that the Genesis creation account is literal, even though others argue it is metaphorical

We fully accept that there are many religious people who take quite a different view and will always prioritize the literal meaning of the texts as they stand, and that the attitudes towards the texts might differ between religions. However, we offer Augustine's view as a way to underscore that there are many ways of understanding the relationship between faith and reason and that they do not necessarily contradict one another. In fact, they can work together to develop a deep *understanding* of the knowledge provided by religious knowledge systems.

ACTIVITY

We've suggested that faith *before* understanding is one traditional approach of religious knowledge systems.

1. Do you think this is a reliable method?
2. Can you think of other examples in other AOKs where you might be asked to accept something *before* you can truly understand it?
3. Do you think those situations are different or similar to the religious context?

Why would anyone *start* with the acceptance through faith suggested by Augustine on the previous page? In the secular examples we used earlier, a student would have good reasons to accept what their teacher said in the first place; as an authority in their subject, it makes good sense initially to take what the teacher says as reliable even if the student is going to apply reason to more deeply understand it later. In the case of religious claims, though, what impetus is there to accept the ideas to begin with?

We will discuss 'religious experience' later, but we might start the discussion here. In many cases, the initial acceptance of religious claims might be based on a deeply personal and powerful experience. Blaise Pascal was a seventeenth-century scientist and mathematician who, in 1654, had a religious experience which changed the course of his life. He had been born and raised in France as a Catholic but hadn't written much on religious matters until after this particular experience, after which he seemed to have devalued mathematics and science as the most powerful knowledge available (O'Connell). So powerful was the experience that, after he frantically wrote it down, he sewed it into the lining of his coat so it would never be far from him for the rest of his life. This *Memorial* was found after his death:

> The year of grace 1654.
>
> Monday, 23 November, feast of St. Clement,
>
> pope and martyr and others in the martyrology.
>
> The eve of Saint Chrysogonus martyr and others.
>
> From about half-past ten in the evening
> until about half-past midnight.
>
> Fire.
>
> The God of Abraham, the God of Isaac, the God of Jacob.
>
> Not of the philosophers and intellectuals.
>
> Certitude, certitude, feeling, joy, peace.
>
> The God of Jesus Christ.
>
> My God and your God [in Latin, accusative case].
>
> Your God will be my God.
>
> Forgetfulness of the world and of everything except God.
>
> One finds oneself only by way of the directions taught
> in the gospel.
>
> The grandeur of the human soul.

Oh just Father, the world has not known you,
but I have known you.

Joy, joy, joy, tears of joy.

I have separated myself from him.

They have abandoned me, the fountain of living water [in Latin].

My God, will you leave me?

May I not be separated from him eternally.

This is eternal life, that they know you the one true God
and J.C. whom you have sent.

Jesus Christ.

Jesus Christ.

I have separated myself from him. I have run away from him,
renounced him, crucified him.

May I never be separated from him.

One preserves oneself only by way of the lessons taught
in the gospel.

Renunciation total and sweet.

And so forth. (O'Connell 96)

It is clear that for Pascal this was a remarkably powerful experience, one that is clearly difficult to put into words. Despite not having any such experience ourselves, we can fully understand how such an experience would create a massive impact on an individual and would stand as 'enough' justification for their belief in God. For Pascal, then, to *rationalize* his religious faith or construct a logical argument based on reason that would be strong enough to make *us* believe in God strikes us as implausible. It would be like someone asking a father to prove that his love for his children is real. What arguments could he offer that would convince them that his love was genuine? He could just as easily say, 'If you think love is the sort of thing that needs a rational argument, then you don't understand the love I have for my son.' Likewise, to a critic who says: 'prove to me this God of Abraham exists', Pascal might simply appeal to the power of the experience and say, 'no argument I can offer will be as *convincing* as the experience I've had. All I can say is that my experience is real, take it or leave it.' In this case, the *experience* provides the grounding for his faith rather than a rational argument.

CONCEPT CONNECTION

Justification

The idea here is that Pascal's justification for his belief in God is clearly drawn from a different source, than a traditional argument that uses premises and arguments. This sort of justification by experience is certainly *not* the sort of thing that scientists would accept either. While scientific experiments certainly *start* with the personal experience of a scientist (they observe the results of an experience), those observations must be able to be recreated in further experiments and by other scientists. Pascal's experience, of course, is not repeatable, nor could any other person experience it. Perhaps what 'justification' looks like is different in the contexts of different AOKs.

Reason and argument

It is interesting to learn that Pascal himself does offer a sort of argument, the conclusion of which is that it is rationally a better choice to believe in God than to not. In what has become known as 'Pascal's Wager', he points out that our belief or non-belief in God might have pretty serious consequences if it turns out that God does exist (Pascal 67). The punishment for denying God's existence if God does exist are drastic and eternal, and the rewards for believing in God are infinitely rewarding if God does exist. In the case of God not existing then your belief or non-belief has no real consequences. On this logic (an early instance of a type of reasoning called 'decision theory'), the most rational option is to believe in God's existence.

KNOWLEDGE QUESTION

Are faith and reason interdependent?

Table 6.2 Pascal's Wager

	God exists	**God doesn't exist**
You believe in God	Infinite reward in Heaven	No consequences: finite loss of having lived with a false belief
You do not believe in God	Infinite punishment in Hell	No consequences: finite reward of having lived with a true belief

Pascal would never accept this as anything like an 'argument' for believing in God. A genuine argument for God's existence would mean that there'd be no *wager* involved at all since an argument would offer something like a 'proof'. Rather, Pascal merely wants to point out that, in those instances where you have a choice (where, in other words your reason, faith or experience are not compelling you in one way or another), belief is a reasonable position to choose. However, this again points to what we've said before about the nature of religious knowledge systems: you must commit to this belief in a way that alters your life and your relationship to the world. *Choosing* to believe in God as a result of this argument won't immediately change your life, but Pascal believes that if you do choose to believe, *and then act like you believe it as a 'genuine' religious believer believes it*, you may come to the sort of certainty that seems to accompany true religious faith.

Arguments for the existence of God

In the absence of the sort of religious experience that might convince you God is real, what might otherwise convince you? In the western tradition (particularly in Christianity), there have been a number of arguments for the existence of God which believers suggest show that not only does belief in God have rational backing, but that God's existence can be demonstrated to be true through argument. There are many types of argument and some are more convincing than others. Rather than going through them all, we shall summarize four basic types to suggest that reason can be used as a foundation for religious belief.

ACTIVITY

Begin by first reading each of the argument summaries, which start on page 204.

Try your best to understand the arguments in the most charitable way you can (you don't want your evaluation to be based on a misunderstanding of the argument). Then see if you can identify any weaknesses in the arguments and try to articulate them.

1. What do you think of the four types of arguments presented here?
2. How might you develop them to make them *stronger*?
3. How might a critic offer challenges to the arguments?
4. Do you think that finding a weakness in each of the arguments necessarily means that God does not exist?

These four basic argument types are:

- Ontological arguments
- Teleological arguments
- Cosmological arguments
- Moral arguments.

As with any argument, each begins with a series of claims, or premises, that both the believer and non-believer are meant to accept. The believer then tries to show how belief in God is in fact consistent with those starting points and disbelief is not consistent. We shall take each in turn.

ACTIVITY

For each of the arguments that follow, see if you can create a *formal* version of them. By 'formal' version we mean a version in the form *premise, premise … conclusion*, where the conclusion in each case is 'God exists'.

Ontological arguments

'Ontological' arguments offer an analysis of the concept of 'God' ('ontological' means 'the study of being') to show that this concept must refer to something which actually does exist in the world. The starting point is a definition or understanding of God as something like 'a supremely perfect being'. This means that God must have all the perfections (things that make one great, like knowledge, power, goodness) and must have them in the highest capacity.

The argument assumes that even the non-believer would accept this as a definition, even if the non-believer thinks this definition doesn't apply to anything *in reality*. As the argument progresses, it suggests that it is *better* or *more perfect* to exist in reality rather than *only* existing in the mind as an idea. If this is the case, then even the non-believer must accept that the *supremely perfect being* (a being that is as perfect as perfect can be) must also exist in reality, because, if God were only to exist as an idea (as the non-believer suggests) then God cannot be defined as 'supremely perfect'. So, having accepted the definition of God, the non-believer seems committed to accepting that that thing (the supremely perfect being) must exist in both our minds as an idea, but *also* as a real object in the world. Therefore 'God exists' is true.

Analysis: One common approach a TOK student can take when evaluating knowledge claims is to uncover any hidden assumptions in arguments. In this argument there is an assumption that many critics have suggested show that this argument is *unsound* – in other words, there is a premise which is unacceptable. The unacceptable premise here is the suggestion that something can be more or less perfect depending on whether or not it 'has' existence. This does sound plausible, however. Suppose we asked someone which was better, ie, which would they rather have: an idea of a shoebox containing £100 or an *actual* shoebox *actually* containing £100. They would definitely say the latter is better. But to say that existing in the world is *better* than to exist only as an idea is to suggest we can take one thing (a shoebox full of money in this case) and say that *that thing* can either have or not have the property of 'existence'. What sense does it make to say that there is an object on the table in front of us, but we cannot see, touch, feel, hear, taste or smell it because it lacks 'existence'? In that case we would more properly say there is nothing at all on the table. It makes no sense to say, 'I have a *shoebox full of money but unfortunately it doesn't have existence*'. As a result, saying that there is a God in our mind which has everything which makes it perfect, except existence, means we simply don't have anything at all. The ontological argument asks us to accept that *having existence* is better, but the critic can simply say, if something lacks existence, it isn't less perfect, it is nothing.

Another important critique has to do with the general strategy of the argument. It hopes to convince us that by analysing the *concept of God* we can discover truths about a God that is meant to exist in *this world*. However, the best way to establish claims about an object in this world is not through analysing the *definition* of things, but to actually investigate the things themselves to see if they are true. For example, it might be true that the King Arthur of mythology has a wife named Guinevere, but this fact has no bearing on whether the *historical* King Arthur also had a wife named Guinevere. No amount of reading the King Arthur legends will give me any legitimate

Learner profile

Thinkers

Is reason just as important to religious belief as faith?

evidence for historical claims about the real King Arthur. Genuine evidence from the world is needed to make claims about the King Arthur in this world. Similarly, then, no amount of simply *thinking* about God will provide any evidence for believing those same things about a real God. Just because the *concept* of God suggests that God must exist in the real world, does not mean that there actually *is* a God in the real world! We would need real-world evidence to make that claim (Alston 1960).

The other three types of arguments do try to offer evidence taken from the world for the existence of God.

Teleological arguments

Telos is a Greek term meaning something's *endpoint* or *goal* or *ultimate aim*. Teleological arguments for the existence of God start by arguing that the features *in* the world are so complex or finely tuned that the best explanation for them is that there has been a *goal* in mind from the start. The argument from design (ie, intelligent design, as discussed earlier) is an example of this type of argument. The world is awesomely complex and works together too well for it to have been the result of a random, unorganized process. It must have been *designed* with some goal (*telos*) in mind. That designer, then, is God. Another related argument makes use of the anthropic principle, which argues that the world's processes have created conditions that are *just right* for the existence of human beings. Had any of the conditions been even slightly off, the conditions for life would never have existed and the Universe would be a cold, dark place devoid of even basic life forms, let alone a wonderous place containing human beings, with the consciousness sufficient for understanding the truths of the Universe. These arguments consider the scientific explanation of the phenomenon under consideration to be inadequate and so add another type of explanation to account for the complex features of the world.

CONCEPT CONNECTION

Explanation

Here again we see a disagreement about what makes a better explanation. The facts being described here are perceived quite differently by the theist (one who claims God does exist) and the atheist (one who claims God doesn't exist). The theist believes that the world is designed, the other does not. Given these different descriptions of the world, different explanations then are needed. The theist suggests that scientific explanations may tell us how the world *works* but cannot tell us why the world is the way that it is. Another 'level' of explanation is required, one that steps beyond the world as we experience it and uses concepts like 'design', 'designer', 'creation' and 'God'. These concepts are not available to the scientist (nor are they even desired).

Analysis: These arguments rest on a couple of assumptions. Firstly, that the complexity that is actually present in the world (something even non-believers would agree exists) *cannot be adequately explained by appeal only to scientific principles*. Secondly, they assume that the only plausible explanation must be the existence of some supernatural, divine process guiding the world towards a final goal. Together these assumptions amount to the position that the world is obviously *designed* and so obviously needs a *designer*. This argument can be quite compelling – it is hard, for example, to understand what the human eye evolved from, because every element of human vision must be precisely what it is now for it to work and any 'previous version' wouldn't have worked so wouldn't have been an eye at all.

However, both assumptions are highly contentious, and an atheist might respond in two ways. Firstly, the theory of evolution by natural selection *is* an adequate explanation; the complexity of the world and the existence of human beings (with all their incredibly complex systems) can be explained in terms of the concepts within evolutionary theory, whether evolution deniers like it or not. There might be unanswered questions in the application of the theory, but nothing suggests that the theory of evolution is wholly inappropriate or wholly inadequate. Secondly, that even in those instances where science doesn't fully know or understand some phenomena, that this only means that science is *incomplete*, not that an entirely different set of principles based in a supernatural perspective is necessary. No one thinks that science has discovered everything we *can* know, and the historical development of science shows that more knowledge is always on the horizon, not that we have necessarily reached the limits. While there might be some questions about what stands outside the scope of science (perhaps questions about how we should live the life we have, or what the most important things in this world should be), these questions are not the sort of things science would investigate anyway. A full TOK analysis of this debate could explore the nature, limits and overlapping of these two perspectives.

Cosmological arguments

A third form of argument for the existence of God starts from a question about the various processes within the world, 'Why is the world the way it is at all?' We might, for instance, wonder why all events have a cause, and accept that continuing a search for a further cause will result in an *infinite regress* (there will always be another cause). Rather than finding the 'starting point', we might instead ask, 'why is there a cause-and-effect process at all?' As an example, consider this analogy: Suppose we find a path in the woods and ask, 'where does it begin?' We follow it but can't find a beginning. Shouldn't we be instead asking about why there is a path at all? Finding the beginning answers a question about the path, but 'why is there a path at all' then makes us think about whatever created the path. Many arguments for God follow a similar structure, rather than asking about why the world is the way it is, we might ask why is there any world at all?

The Islamic scholars Al-Kindi (ninth century) and Al-Ghazli (eleventh century) popularized one version of this argument. Al-Kindi writes, 'Every being which begins has a cause for its beginning; now the world is a being which begins; therefore, it possesses a cause for its beginning' (Craig 80). The point here is that things are the way they are for a reason, and God is at the core of that reason. Physics suggests that there was a 'beginning', but the cosmological argument will then ask what caused this beginning?

Analysis: Again, this argument sounds quite plausible, but it does rest on an inductive *leap,* one that might be unacceptable to a non-believer. We might fully accept that the events that we see around us do, in fact, need a cause, but the 'thing' that the argument suggests *also* needs a cause (ie, the whole process of cause and effect) is a significantly different *kind* of thing. Why should the thing that is 'the Universe' need a beginning? Just because everything *within* the Universe needs a cause, the Universe itself might not need one. Bertrand Russell, a philosopher in the early twentieth century, suggested that the existence of the Universe (the 'cosmos') might simply be a *brute fact*, which means it doesn't *need* an explanation for its existence, it just exists. Furthermore, any explanation about the Universe would have been developed from concepts which made sense only *within* the Universe, so to use those concepts to try to make sense of the Universe itself is to misapply those concepts. Again, what we see here is a discussion of the *scope and limits* of the scientific explanation. If science is a language and a set of concepts designed to explain the world as we find it, it makes no sense to then try to use that set of concepts to explain what is *outside* that context. The believer will exploit this and say that God is what is outside that process, and this might be convincing, but it certainly doesn't seem to be a *scientific* claim, so the non-believers need not comment.

Moral arguments

This type of argument begins from a point we developed earlier, namely, that science doesn't seem well-equipped to make sense of our ethical values. The argument suggests that when we examine the world around us through the perspective of science, we cannot observe ethical principles or observe the cause of ethical beliefs. We might, for instance, evaluate capital punishment by looking at the process, laws and outcomes, but we won't *see* anything like 'wrong' or 'right' nestled in among those facts. Yet we definitely have ethical beliefs and attitudes towards it. Furthermore, we find that different people have different views on capital punishment, and we also find that people's beliefs change over time. In some cases, those beliefs move between more contentious and less contentious. Slavery, for instance, is universally looked upon as 'wrong' and that we are 'more right' than those who don't think this way. The first question is, 'Where do those ethical attitudes come from if they don't appear to exist in the same way as physical objects and events?' The second question is, 'Why do we have an intuition that ethical beliefs can *improve* over time? If beliefs improve, they must improve *towards* an objective truth about the ethics of certain actions.'

The moral argument for the existence of God suggests that the origin and standards for ethical beliefs are to be found in God, not in the world. It accepts that ethical intuitions and beliefs are real features of our world but that these ethical facts are different *in nature* from anything else we find in the world of observed facts and events, so they cannot have their origin in that world. Similarly, the intuition that our ethical beliefs can be better and worse suggests that there is an *objective* truth to ethical claims. God is used as a way of grounding that objective truth.

Analysis: One route of critique here is to question whether or not our ethical beliefs or intuitions really are the sorts of things that *cannot* be explained using relatively straightforward scientific principles. We might, for example, suggest that our ethical intuitions are the result of prevailing social attitudes. Psychological and sociological methods and processes might be used to explain why people believe the way they do without appealing to anything *other* than what we can see and measure. A psychological theory based on stages of moral development for instance, suggests that we progress through various stages of morality, beginning from the self-interest of avoiding punishment, through adherence to traditional social conventions, to formulation or acceptance of rationally justified ethical principles. A modern view called Moral Foundations Theory suggests that our ethical values are the result of 'several innate and universally available psychological systems [that] are the foundations of "intuitive ethics" (like notions of care and harm, fairness and cheating, sanctity and degradation) rather than anything supernatural' (Moral Foundations).

In terms of the presumed objectivity of ethics, this too, needn't rely upon a supernatural foundation either. As an example, Sam Harris, a philosopher and neuroscientist, suggests that we can use the concept of 'human flourishing' and neuroscience to make claims about what is considered 'good' or 'bad' or 'right' or 'wrong'. He argues that we can make pretty clear distinctions between the *sorts* of things which promote human flourishing (like having the freedom to participate in the political environment through voting, or having access to an education), which can then form the basis for ethical claims like 'Women should have the right to vote' or 'Children should have the right to an education'. We might also identify things which *tend to make flourishing impossible*, like separating vulnerable children from loving parents or not allowing children to learn their native language, and build ethical prohibitions against those practices. This might not create a list of things *everyone* would agree to, but it certainly accepts the importance of creating conditions in which people might live genuinely happy lives, however they wish to live them. While this might not solve *every* ethical dilemma, these methods might go some way in providing a 'scientific' framework through which to explore our ethical intuitions, rather than importing methods and concepts from the religious dimension.

Use the QR code on the right to watch Sam Harris's TED talk.

What does this all imply regarding religious knowledge systems?

What these arguments suggest is that *reason* can play a huge role in an individual's or a community's belief in the existence of God. Very often people suggest that religious belief is something that *cannot* be thoughtful, rational or well justified, but this is simply not the case. While non-believers might not accept that these arguments are *convincing*, they would be desperately uncharitable to suggest that they were 'irrational'. Theologian Richard Swinburne accepts that no one of these arguments will ever carry the weight of a scientific proof, meaning it is unlikely that any argument would, on purely rational grounds, move someone from disbelief to belief. However, he argues, the weight of all the various arguments combined provide a good and perfectly rational justification for the belief in God's existence (Swinburne).

As we've seen throughout this chapter, reason plays a huge part in developing religious beliefs, understanding and analysing those beliefs, and applying those beliefs to the business of living a human life.

Authority

Pope Francis

IA prompt

22 What role do experts play in influencing our consumption or acquisition of knowledge?

The concept of authority is an important one for religious knowledge systems and must be considered as a primary *tool* used to construct religious knowledge. In nearly all the religious traditions there are individuals who are considered to be authorities and whose opinions and proclamations are accepted as 'truth' by the followers of that religion. The clearest example in the world of a religious authority is perhaps the Catholic Pope.

The Pope's position as being in authority here is derived from his *apostolic succession* from the *first* Roman head of the church, St Peter, whom Christian tradition claims was the person who Jesus Christ left in charge of his church. The man who takes on the role of Pope, however, is also *an* authority on Catholic doctrine. Indeed, all bishops must 'hold a doctorate or at least a licentiate in sacred scripture, theology or canon law, from an institute of higher studies approved by the Apostolic See, or at least be well versed in these disciplines' ('Code of Canon Law' 378).

KNOWLEDGE QUESTION

Do different AOKs treat the authority of individuals differently?

Are religious leaders 'in' authority or 'an' authority?

Many religions have individuals whose word counts as authoritative, however. Their authority is established in a number of ways, from education and experience, in the case of the Pope, and the same is often true for other priests (Catholicism), ministers and pastors (Christianity), rabbis (Judaism), monks (Christianity and Buddhism), gurus (Hinduism) or Shinto priests. These men and women have, in many cases, devoted their lives to learning about their religions and to passing their knowledge on to others; this makes them *reliable* sources of knowledge about that religion's doctrines and practices. In other cases, an individual's authority is established through their having some sort of experience which has revealed to them some truth which hasn't been available to others (see the section on Religious experience beginning on page 213).

KNOWLEDGE QUESTION

What role do authority and testimony play in the pursuit of knowledge?

Sacred texts

Can human languages effectively represent the word of God?

The 'world religions' are often focused on a sacred text which articulates the core beliefs of the religion. For instance, the primary sacred text of Judaism is the Torah (a Hebrew word meaning 'instruction'), which Christians recognize as the Old Testament. The Torah tells the history of the Jewish people from the creation of the world (Genesis) through the revelations of the Prophets and the early history of the Jewish kingdoms in what is modern Israel. The first five books of the Torah are the most **foundational** because they contain the basic moral codes which are meant to be followed by Jews, known as the 'Ten Commandments'. The Torah actually contains 613 *mitzvot* (commandments) which an adult Jew might use to govern nearly every aspect of their life. These commandments are thought to have been delivered by God directly to Moses, an early leader of the Jewish people.

Islam also reveres its sacred text, the Qur'an. Believers in Islam generally accept a direct connection to what they call 'the People of the Book', meaning Jews and Christians, because they accept the Jewish prophets and leaders as followers of the same God. Islam differs however, in the view that God or 'Allah' last spoke directly to a sixth century man living in Mecca (now Saudia Arabia) named Muhammad, and that these new revelations replace all others. Muhammad ensured that everything Allah told him was written down exactly as Allah said it. These writings are the Qur'an, which became the foundational text upon which all Muslim beliefs are based.

The attitude towards sacred texts in religious knowledge systems is another distinguishing feature between this form of knowing and others. In many of the AOKs, knowledge claims are based on observable *evidence*; a claim is *justified* if the evidence for it is adequate. In the sciences and history this evidence is generally publicly observable and can be evaluated by **disinterested** observers.

◆ **Foundational**: A text (or belief) that serves as the most basic justification for all other beliefs. In this case, the Torah (and the Qur'an) are the starting point for all other beliefs. Nothing can justify the authority of the foundational texts, but everything else should be justified through what is said in these texts.

◆ **Disinterested**: Refers to an observer who has no particular goal in mind when evaluating evidence. They are willing to accept whatever the evidence suggests and are not manipulating their interpretation of the evidence in favour of a desired outcome.

Religious knowledge systems, in contrast, often refer to their texts as the primary evidence for, and the definitive authority on, certain claims. This is generally more characteristic of the western religious traditions. For many Christians and Muslims their texts are the ultimate foundations upon which the rest of their religious beliefs rest; if a belief or action is inconsistent with what is written in those texts then it is the belief or behaviour which must change. In both religious traditions, concepts like '**infallibility**' and '**inerrancy**' are used to describe the nature of the texts. The degree to which people hold the texts as infallible or inerrant could be used to describe the extent to which the believer is a '**fundamentalist**'.

◆ **Infallible**: Something that *cannot* be wrong.

◆ **Inerrant**: Something that is not contrary to facts. It is very close in meaning to infallible but is slightly different.

◆ **Fundamentalism**: A form of belief where the basic fundamentals of a faith, generally expressed in the sacred texts, are held as the most crucial elements of that faith.

Interpreting sacred texts

The challenge with any sacred text is just how to interpret it. Texts are the product of a particular person, or group, at a particular time and written under particular circumstances. Take a look at the last few texts exchanged with your friends in your texting app. Do you think someone a hundred years ago could make any sense of it at all? Imagine some future civilization trying to decode your texts in 10 000 years' time. Even in a non-religious context, historians sometimes struggle trying to make sense of texts from the past.

In a religious context, where different interpretations might create fault lines between different denominations, or where the texts might not say anything about modern worries or concerns, the problems of interpretation are multiplied. We saw earlier that in the Christian and Jewish traditions there is a long history of struggling with exactly what the sacred texts mean and how to interpret them.

The *Tao te Ching*, one of the primary texts of Taoism, raises a particularly challenging problem on the status of the text as a source of knowledge in its first section:

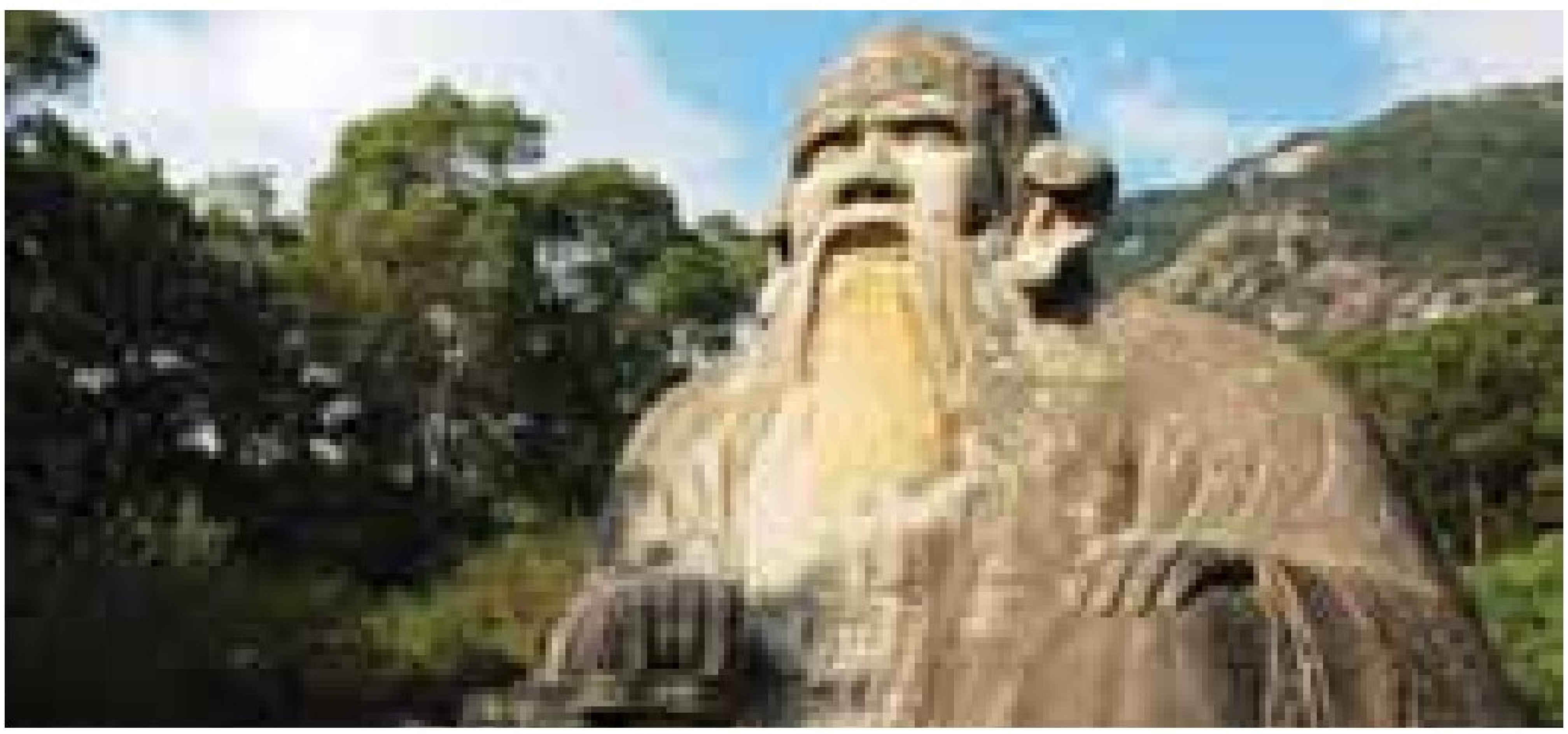
> The tao that can be told
> is not the eternal Tao.
> The name that can be named
> is not the eternal Name.
>
> The unnamable is the eternally real.
> Naming is the origin
> of all particular things. (Laozi (trans. Mitchell))

KNOWLEDGE QUESTION

How do the different AOKs manage the role of individual interpretations in the construction of knowledge?

IA prompt

9 Are some types of knowledge less open to interpretation than others?



■ The *Tao te Ching* is ascribed to the ancient Chinese philosopher Laozi

The worry here is that if one is attempting to understand the Tao, the unnamable force and natural processes at the root of existence, then *applying* a name (or using language to describe it) will necessarily miss the mark. Language is a human convention which is created in a particular time and place and in a particular community. Applying it to something which is instead the *root* of all time and space will mean that nothing you say will ever capture the essence of what you're trying to describe. Taoism is a religious knowledge system which prioritizes personal experience, perhaps even *special revelation* (see section on Religious experience, page 213) to truly understand the nature of the Tao.

In the western religious traditions (Judaism, Christianity and Islam) this is less of a worry, because their central focus is on a divine being which reveals itself to human individuals, often in the form of words meant to be written down. Both Moses (in Judaism) and Muhammad (in Islam) received revelations from God which were in the form of language. Moses was *given* the Jewish commandments (all 613 of them) by God on Mount Sinai sometime in the second millennium BCE and these became the Jewish Torah. Muhammad received his revelations from Allah beginning in AD 610. In each of these cases, the texts are understood to be faithful representations of God's own words.

Even in these cases, however, just how to interpret individual phrases in relation to all the *other* elements of the text is not always clear. The Christian sacred text, the New Testament, contains the Gospels – the life story of Jesus Christ (whom Christians believe was God in human form) – and other texts written by early followers of Christ and early church leaders. Although Jesus didn't command things to be written down, his life's example and his words were chronicled by his early followers. At one point, Jesus is asked what the greatest commandments are. He replies, 'Love the Lord your God with all your heart and with all your soul and with all your mind.' This is the first and greatest commandment. And the second is like it: 'Love your neighbour as yourself.' The law and the word of the prophets should be read as being consistent with these two commandments (The Bible, Matthew 22:37–40). It seems that Jesus then has pulled *two* of the Jewish commandments and prioritized them over all the others. But some of the other laws, particularly those having to do with the punishment of those who have transgressed the laws, seem to directly contradict the second of Jesus' main commandments. Homosexual behaviour, for instance, is meant to be punished by death (The Bible, Leviticus 20:13), which is also the penalty for adultery (The Bible, Leviticus 20:10, Deuteronomy 22:22) and not being a virgin at the time of marriage (The Bible, Deuteronomy 22:23–24). On the face of it these seem to be precisely how *not* to love your neighbour as yourself.

The worry, if we are to use them to construct or justify religious knowledge, is just how to interpret these texts, particularly when there is a perceived conflict. One answer is not to simply accept the decontextualized verses or individual phrases as they are, but *as they illustrate the overall message of the piece*. Religious texts are like other non-sacred texts in that they are meant to hang together as a whole, even if individual elements are in tension with one another. These texts might have a beginning, middle and end, where each element feeds into the next, culminating in final message. Some texts don't have a succession of ideas, but nevertheless each element contributes to a whole. Again, from the *Tao*:

> If you want to become straight,
> let yourself be crooked.
> If you want to become full,
> let yourself be empty.
> If you want to be reborn,
> let yourself die.
> If you want to be given everything,
> give everything up. (Laozi (trans. Mitchell))

This list of direct contradictions seems utterly unhelpful as a guide for how to live. However, the text *as a whole* helps make sense of this passage. It is like a puzzle: while each individual piece might have an image on it, the fact that they are designed to fit together suggests that, whatever the image on the piece, it is incomplete by itself, but adds to the whole. You might have seen people using snippets of a sacred text to bolster whatever point they wish to make, but it is important to remember that whatever the individual element of the text says, that is not the message of the text as a whole. This is why scholars will devote their academic careers or even their lives to studying the texts, hoping to uncover and understand the message as a whole.

Only once the pieces of a puzzle are fitted together do they seem to make sense

ACTIVITY

Have you ever had your words taken out of context and used against you? Consider the sentence or phrase that was taken out of context:

1. Was it strictly untrue or false? Or would you say that it was incomplete?
2. What further knowledge or context was needed to make it possible to understand your intended message?
3. What do you think this says about the nature of how narratives work?
4. Can various elements be properly understood without understanding the whole?
5. You might consider rereading the opening chapters of one of the texts you are reading in the literature element of your Group 1 course. How has your understanding of these opening elements changed, now that you know the whole text?

Dogma

Closely related to the value placed on the claims contained in sacred texts and perhaps ultimately more important is the notion of *dogma* in religious knowledge systems. 'Dogma' is a term that comes to us from the Greek word for 'opinion', which is derived from *dokein*, meaning 'to seem good, think' (Lexico). Dogma refers to those beliefs and opinions which are the right ones to have. Beliefs that are 'dogmatic' refer to those non-negotiable beliefs which are held to be *incontrovertibly* true and must be accepted in order to be part of a religious tradition.

There are dogmatic beliefs outside the realm of religious knowledge systems as well. Some political beliefs might be considered dogmatic. One dogma in a politically conservative knowledge system might be that the role of government is to remain largely out of the everyday decisions and freedoms of individuals, while a more liberal dogma might be that government should play a larger role in guaranteeing that social goods are distributed equally among the populace.

One difference with religious dogma, however, might be a consequence of the different scope of religious knowledge systems in relation to other AOKs. Because religious knowledge systems are generally about the individual's relationship to the *ultimate* reality, and because religious knowledge systems are about the ultimate values, happiness and meaning in the world, people will hold on to dogmatic beliefs in a way that is less like how a mathematician might accept assumptions

ACTIVITY

The terms 'religious dogma' and 'dogmatic' are often used in negative terms to mean ideas or beliefs that are held for the wrong reasons. Someone who is dogmatic might be unwilling to change their beliefs or accept alternatives, and may even be actively trying to impose those beliefs on others.

1. Can you identify and articulate the principle upon which this negative connotation rests? What is the principle that, if true, would make someone calling someone 'dogmatic' a negative term?
2. You might think about how *other* AOKs might treat someone who held certain beliefs as unchangeable. Would this be acceptable in other AOKs?
3. How might the community of knowers in that AOK treat such a person who held faithfully onto a particular claim without changing?

about the properties of triangles or an economist might accept assumptions about how people make decisions. For a religious believer, their adherence to a set of beliefs *matters* in a way that these other beliefs do not. Sure, it is important to get the maths right or to be able to understand how economies work to avoid financial ruin, but one's *soul* is not at stake, as religious believers think theirs is.

Religious experience

One of the main sources of religious knowledge is through what is known as 'religious experience'. This is a type of experience that seems to be fundamentally different from any other 'normal' experience, in that during such an experience many religious believers claim to have *gained knowledge* through them, but often this knowledge is accessible *only* to the person having the experience and not others. The concept of 'revelation' is very important in this context and refers to knowledge that is uncovered or revealed through the religious experience. However, the fact that this knowledge is often quite individual and personal raises issues of how the knowledge gained is meant to be accommodated by the shared community.

There are two general forms of religious experience, and the knowledge provided by these two forms are quite different.

General revelation

Have you ever felt inspired by the beauty of a sunrise or become emotional when considering the kindness of a stranger, feeling perhaps that there's something *greater* going on than simply the rising of the Sun or someone doing something kind? These events are relatively straightforward and (literally) everyday occurrences and can be witnessed by anyone. However, sometimes these events make us feel particularly emotional and might bring to mind thoughts and ideas about the world or its people that are far more profound than those you would normally have.

These types of experiences in the context of religious knowledge systems might be called 'general revelation', which means that knowledge about the divine or about divine action in the world is pulled from what otherwise might be thought of as a perfectly natural phenomenon. Many religious believers, having experiences which are not private to them (like sunrises or interactions with strangers) will interpret or explain them in terms specific to their religious beliefs. The beauty of a sunrise becomes for them a reminder of God's presence in the world and God's promises to them. The kindness of strangers becomes God's own kindness in the world.

IA prompt

20 What is the relationship between personal experience and knowledge?

Learner profile

Communicators

How can we share knowledge gained from personal experiences, like religious revelation?

Many religious people find evidence for their beliefs in the beauty of the natural world

The 'knowledge' gained here, of course, depends on already having a certain set of beliefs before the experience, which are brought to mind when having the experience. As we saw in the example of the invisible gardener before, whatever knowledge one gains from this type of revelation is the direct product of what is already there. The arguments from *design* which we explored earlier would fall under this category. Where we might see a complex system and provide a naturalistic explanation (one not drawing on supernatural beings or actions), others might 'see' in that complexity genuine 'design' and therefore see evidence of a 'designer'.

From outside the religious perspective this sort of knowledge, then, is not very reliable, in the sense that pointing to a sunrise as evidence of God's action won't be very convincing to someone who doesn't already believe in God – one might say it is simply *applying* knowledge already present. However, general revelation plays a big part in the believer's own knowledge system in terms of *reconfirming* beliefs that they have. They carry a map with them which helps them 'see' God's action. For them, this may be real evidence.

Special revelation

Another form of 'revelation' is often referred to as 'special' revelation, and this can be more contentious. 'Special' revelation refers to an experience which happens to an individual, but which is *private* to the individual. Whereas in general revelation the experience itself (for instance, seeing a sunrise) is a public event – everyone can experience it – in special revelations, people report having experiences which are private to them. The knowledge conferred is often new and this gaining new knowledge is often the essence of the experience, not something which is interpreted.

CASE STUDY

Muhammad and the revelation of the Qur'an

One very famous example of this sort of revelation is that of Muhammad's, the Prophet of Islam. Muhammad was born into a distinguished merchant family who were prominent in the city of Mecca, in what is now Saudi Arabia. Muhammad made a yearly retreat to the Cave of Hira on the mountain Jabal al-Nour for meditation and solitary prayer. It was here, in about the year 610, he had the first of a series of experiences which would last for the rest of his lifetime, and which, once written down would become the Qur'an, the sacred text of Islam. These experiences, however, were often quite harrowing for the Prophet. The first revelation was given to him after a powerful presence burst in on his solitude and squeezed him in an overpowering embrace, one which nearly squeezed the life from him. So frightening was the experience that he initially thought it was caused by a *jinni* or desert spirit. He was later persuaded, however, that he had become the final Prophet of the God of Abraham, the same divine being worshipped by the Jews and Christians (Armstrong). For the rest of his life, Muhammad received (directly from God according to Islam) a series of recitations which provided direct and immediate guidance on how Muhammad and his people should live.

Pilgrims visit the Cave of Hira on Jabal al-Nour

While Muhammad's revelations took the form of immediate knowledge, not all special revelations are as clear and unambiguous, although they nevertheless carry clear knowledge content.

CASE STUDY

Julian of Norwich

Julian of Norwich was a Christian **mystic** who lived in England in the fourteenth century. In her *Revelations of Divine Love*, which incidentally is the oldest text in the English language written by a woman, she describes a series of revelations or 'shewings' which she had while seriously ill and near death. Over the course of two nights she had a number of visions which she later wrote about. What is interesting about these special revelations is that they are largely based on imagery, but the interpretation of those images are also revealed to her. She doesn't add her own interpretation later, she experiences the knowledge directly. Here's one example:

> Also in this He shewed me a little thing, the quantity of an hazel-nut, in the palm of my hand; and it was as round as a ball. I looked thereupon with eye of my understanding, and thought: What may this be? And it was answered generally thus: it is all that is made. I marvelled how it might last, for methought it might suddenly have fallen to naught for little[ness]. And I was answered in my understanding: It lasteth, and ever shall [last] for that God loveth it. And so All-thing hath the Being by the love of God. In this Little Thing I saw three properties. The first is that God made it, the second is that God loveth it, the third, that God keepeth it. But what is to me verily the Maker, the Keeper, and the Lover,—I cannot tell; for till I am Substantially oned to Him, I may never have full rest nor very bliss: that is to say, till I be so fastened to Him, that there is right nought that is made betwixt my God and me. (Julian of Norwich, Project Gutenberg)

The knowledge revealed in special revelation poses a challenge to those trying to decide how reliable or 'true' the knowledge is. Here again, there are no ways we can apply anything like the scientific method to the claims, the source of the knowledge itself was entirely private to Julian. On these grounds we may be sceptical and dismiss them. However, religious knowledge systems around the world take these types of experiences very seriously, just as we saw how Indigenous people also accept these types of visions and experiences as genuine sources of knowledge.

ACTIVITY

Consider the two broad types of revelation that we've discussed here – general and special.

1 How would you rate them in relation to their reliability or certainty?
2 Do you think that revelation is more or less certain for the person *having* the experience?

◆ **Mystic**: Someone who claims to receive various visions and special revelations.

When considering the status of claims based on revelation, it would be very easy to dismiss them on the grounds that they were either private, or simply expressions of illusions or dreams, but this might be to apply an unfair criterion for what makes something believable, one that is based on a prejudice (pre-judgment) against religious experience. If you are an atheist, for instance, you will very likely find no claims about religious experience believable, because you *already* believe that such experiences cannot be experiences of anything real. However, why should we automatically not accept claims about religious experience as at least *possibly true*, even if we might not, on later reflection and analysis accept them to be true.

Richard Swinburne argues that *generally* speaking, when listening to other people talk about their experiences we apply (not necessarily consciously) two principles. The first he calls the *principle of credulity*, by which he means that in most cases we will accept that what our senses tell us is a good reason to believe that that is how things really are. If we hear a voice, for instance, we tend to accept that there is a speaker. If we see a person before us, this gives us good reason to believe there is actually a person before us. Swinburne accepts that our senses sometimes deceive us (especially when it is dark, for instance, or in the case of optical illusions), but generally speaking, our senses are pretty reliable. This, therefore, is a good rule of thumb to live by, except when there are other good reasons for thinking that the senses might not be truthful in some particular instance.

The other principle relevant here is the *principle of testimony*, which suggests that *generally speaking*, believing what others tell you is a good way of gaining knowledge. People, by and large, tend *not* to lie to us, so as another good rule of thumb, we should believe that what they tell us happened to them, really did happen to them, unless we have other good reasons to think they are lying.

These two principles, Swinburne suggests, are at the root of how we create knowledge every day and in all sorts of circumstances. The testimony of an eyewitness, for instance, is used by historians as reliable evidence that what the witness says happened, really did happen. Scientists rely very heavily on the principle that their senses are very good indicators of what actually happened. No one, Swinburne included, would suggest that scientists always get their observations right, or that all eyewitnesses should be believed 100 per cent, but the point is that the testimony of others about what they experienced should not be immediately dismissed as impossible. Applied to the testimony of religious experiences, then, Swinburne argues that they should not be *immediately* dismissed as impossible. When we hear the testimony from Julian of Norwich about what she experienced, we should not dismiss it simply because of our own pre-judgments about what sorts of experiences are possible. We should not *assume* that they must be false.

The historical and scientific methods, however, have processes by which the claims of individuals can be tested, including their predictive power, their repeatability and their consistency with other facts which have been established. Often, claims of religious experience, especially special revelations, cannot be tested in this way, so their credibility as *historical* claims or *scientific* claims might not be very strong. However, in reply, we might bring to mind Gould's non-overlapping magisteria or Wittgenstein's language-games and question whether the testimony was *meant* to make a historical or scientific claim. If they were not meant to be reliable claims in these AOKs, then using the rules from those AOKs to judge them might be considered irrelevant.

ACTIVITY

It is rare for people to have religious experiences from a religious tradition outside their own experience. You wouldn't expect, for instance, a Hindu living in India to have a vision involving Mary, the mother of Jesus, an experience which many Christians report.

1. Why do you think this might be?
2. What do you think the consequences are for the *reliability* of the knowledge gained through such experiences?

TOK trap

It would be a mistake to *assume* that religious knowledge is not genuine knowledge. You might think this (and many do), but you would have to offer *reasons* for this belief, since people have throughout the centuries felt that religious knowledge is a legitimate sort of knowledge. Here we have tried to start from a charitable position but have also tried to use the TOK concepts and framework to explore challenges to this view.

IA prompt

1 What counts as knowledge?

KNOWLEDGE QUESTION

Can there be religious knowledge that is independent from the culture that produces it?

IA prompt

14 Does some knowledge belong only to particular communities of knowers?

While both general and special revelation might have a huge appeal *within* religious communities and might be the source of much of the knowledge of those communities, those who stand outside of them might find very little reason to accept these revelations. In many cases, of course, this should not pose a problem. If an individual is not part of a religious community, we wouldn't expect them to understand or even *want* to understand the content of another's revelations, even if we thought it would be *good* for them to understand it. However, religious belief more often than not spills out into wider communities; rarely is it entirely limited to its own community of knowers.

Recently in the United States, there have been a number of laws passed restricting women's rights to abortion. In the US, there are strict rules *against* the publicly elected government promoting or imposing any particular faith tradition. However, being a representational democracy, where the people elect officials to create, debate and pass laws on their behalf, many of those representatives are themselves parts of religious communities and will therefore draw on those traditions and knowledge to guide their own decisions. The Alabama laws restricting abortion were passed by lawmakers who all profess to be Christians, but who claim not to have written laws based on those beliefs. (Burke).

While knowledge gained through personal experience, perhaps including revelation through religious experience or prayer, might be limited in terms of meaning and significance to the particular community of knowers *in* that religious tradition, often that knowledge finds its way into other communities who have no connection to that particular religious tradition. The reliability and credibility of that knowledge gained through religious methods, then, might find itself being challenged and tested through criteria not accepted within that community. This clash of knowledge communities creates real challenges for individuals and societies.

Ethics

If what we have been arguing about the nature of religious knowledge systems is true, then it means that for many people their religious traditions provide very important guidelines for how to behave. If religions are attempting to make sense of questions about what it means to be human, or to live a meaningful and significant human existence, it is no wonder that one of the outcomes of this sort of knowledge system is the development of rules to live by. These ethical rules become the rules that must be followed to guarantee that the promise of fulfillment (Heaven, Nirvana, Moksha, etc) is attained.

KNOWLEDGE QUESTIONS

Does religion provide a way to systematize concepts of right and wrong?

If religion is intimately connected with ethics, should we expect those with religious knowledge to act more ethically than those without religious knowledge?

Divine command theory

There is a well-known ethical theory called 'divine command theory', which states that God's own commandments are what provide us with ethical guidelines. If God says you should do it, then it is 'good'; if God says *not* to do it, then it is 'bad'. This theory provides a pretty clear framework for understanding how we should behave and can take away much of the worrying and hand-wringing that comes with trying to work out for ourselves just what sorts of behaviours are good and bad.

It also provides two other benefits. First, it avoids what we might call a 'grounding' problem; that is, it avoids worries about how to ground our ethical principles. As is the case with the three theories discussed in the 'Introduction to Ethical Theory' (which you can access by using the QR code), we might try to 'ground' our ethical principles in either the amount of happiness produced by an action or an appeal to logical consistency or human autonomy or perhaps an appeal to what we think might be a 'good' human character. However, these elements might be subjective, or relative to a particular society or time or place. Divine command theory avoids this by grounding what a good action is by simply appealing to the commands of God. God, being the creator and sustainer of the Universe would also, presumably, have a pretty clear

■ The Ten Commandments. Are the concepts of right and wrong set in stone?

idea about just what actions are 'good' or 'bad' for all people all of the time. Secondly, divine command theory provides a very clear reason to be motivated to follow the moral laws. Again, in relation to the ethical theories we looked at before, we simply might not want to 'be good', especially when being good might actually mean that my own desires and wishes are thwarted by concern for others. In the case of divine command theory, we are naturally motivated to follow the rules, knowing that following the rules will promote the chances that we ultimately receive the rewards promised by the religious tradition.

Natural law theory

One worry about the divine command theory comes from the question about *which* commands to follow. The Jewish Torah has 613 commandments, some of which are obviously important and obviously *moral*, like some of the Ten Commandments (eg, 'You shall not murder' (Exodus 20:13)). Other commandments, however, don't strike us as obviously moral or ethical in nature, like those about what a priest should do when mould is found on fabric (Leviticus 13: 47–59); should they be held in the same esteem as the Ten Commandments? Divine command theory would seem to suggest this. Another question is what to do if people have not heard of these commandments, so don't have a choice to follow them, or perhaps they are following the *wrong* commandments.

Another theory about the relationship between religious knowledge systems and ethical principles might be an answer to these questions. Thomas Aquinas, a thirteenth-century priest and philosopher developed a theory called natural law theory. The idea here is that God has created a world which follows regular process and rationally decipherable laws. Some of these laws are *ethical* in nature, meaning we as living, breathing, human beings have certain basic motives and desires that are natural to us. Aquinas identified six 'basic goods' which he argued all human beings were naturally inclined towards. These include a number of biologically based inclinations like the desire to protect our life, to procreate and to be social, some social inclinations like being kind to one another, educating our children and ourselves and a more religious inclination to seek an awareness of the divine (Aquinas).

Aquinas' point is that our natural human instincts are designed to drive us towards living a 'good' life, in that we naturally seek out the six things that lead to a good life. Our motivation to live an ethical life is the same as living a *natural* life; we just have to use our God-given rational faculties to identify what is the most natural course of action. Evil in this view is *unnatural*; it is what happens when we turn away from the natural inclinations which are written into the structure of our being, both biological and psychological. What makes this a *religious* view is Aquinas' belief that God is the creator of all we see. One advantage over divine command theory might be that one need not know about or even *want* to follow some set of rules; rather you just want to live your best life, one that promotes a well-lived human life.

Conclusion

Religious knowledge systems are probably the most well-known and longest-living types of knowledge systems humans have developed. There is no culture currently, and probably no culture *ever*, that has not been heavily impacted by religious knowledge systems. If you count up those of us who are historians, scientists, artists or mathematicians, you won't get anywhere near the estimated 5.8 billion of us who consider ourselves religious. A religious perspective, therefore, is one that is ever present, even if you are not religious yourself or don't know many people who are religious. Often, you'll find people who consider themselves religious are unaware of other types of religious knowledge and so develop quite uncharitable attitudes towards others.

This chapter is not meant to advocate for religious knowledge systems, but it is meant to take an open-minded approach. We have done our best to think about religious knowledge following the concepts and framework offered by the TOK specification. We hope that doing this will provide the foundation upon which a comparison between this form of human knowledge and the other AOKs which you'll also find in this textbook can be made. These other forms of knowledge do not have the same sort of impact on people's lives as religion does, and not everyone considers religion a beneficial force.

Some consider the notion that *this* life is not as important as some promised afterlife as the root of much arrogance, hatred and bigotry, given that all too often people will act in violent ways, thinking that in the *next* life they will somehow be rewarded for this behaviour. The vast majority of religious people, however, live their lives promoting charity and kindness for others. We hope that this chapter has provided some awareness and understanding of how such religious knowledge systems approach the world.

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7 Knowledge and Politics

OBJECTIVES

After reading this chapter, students will:

- understand the scope of politics as reflected in governmental processes
- understand the positive and negative connotations of the term 'politics'
- recognize the relationship between politics and culture
- understand the relationship between politics and laws
- appreciate the relationship between politics and ethics
- understand how the individual knower develops knowledge of politics.

Learner profile

Knowledgeable

What types of knowledge are valued by society? How do political factors affect the value of different types of knowledge?

Introduction

The theme of politics and knowledge has two separate but related dimensions:

- questions about how we develop knowledge of politics and political issues in our respective cultures
- questions about how the politics of knowledge shapes what we can and do know.

In order to understand the difference between those two perspectives on politics and knowledge, we first need to have a good idea of what the word 'politics' means.

The technical meaning of 'politics,' the meaning with which you are probably most familiar, is the processes by which a society develops the rules by which the members will be governed (Heywood). People who take on official roles in these processes are known as politicians. The methods by which they are assigned to official roles vary depending on the particular system in place in the society. We will investigate some of the different kinds of political systems and how they are structured later in the chapter when we consider scope and methods.

KNOWLEDGE QUESTION

What kinds of knowledge inform our political opinions?

Beyond the strictly technical use of the term 'politics' to refer to processes of government, the term is used to describe decision-making **hierarchies** in other kinds of systems such as businesses, educational systems and sometimes even organized religions. We can speak of the politics of school administration or the politics of a club or a sports team.

◆ **Hierarchy**: A structure in which some things are higher up than others. There is a natural progression from bottom to top in a hierarchy, and in general, those at any given level have power over those below them.

We can also speak of the politics of knowledge, by which we mean that people in positions of political power, who have the authority to make decisions, often control what knowledge gets made and disseminated. Politicians, for example, very often decide what kinds of scientific research gets funded and what does not. As we shall see, those political forces have a considerable influence on what questions are pursued and answered – and what kinds of answers are developed and disseminated – and which ones are not.

Because political systems determine rules by which people must live – whether in a greater society or in a smaller institution – they necessarily wield a great deal of power, and we therefore entrust politicians with that power. Some people wield their power wisely and benevolently, but history gives us many examples of people who used their power for their own benefit, ensuring their own wealth and success by exploiting the weaker and poorer.

Because of the potential for the misuse of power by politicians, we very often hear the word 'politics' referred to with a strongly negative connotation. Someone discussing why one person got a promotion while another person with more experience did not might say 'that was just politics!'

■ In what ways do political decisions and systems affect what we know?

ACTIVITY

Look at the images on the left and think about the political systems and forces that affect what and how you know. The effects could be positive or negative. Work with your classmates to make a list. You do not have to limit yourselves to the elements depicted in the images. How much influence do you have over these aspects of your life?

The suggestion in such a case is that the decision about who got the promotion didn't have anything to do with ability or suitability for the position, but instead was to do with some kind of **subversive** manipulation of the system – a case of someone in a position of power promoting a friend or ally, regardless of qualifications. Used in situations such as this, the word 'politics' suggests an unethical action taken for the individual good of someone in power.

◆ **Subversive**: The adjective form of the verb 'to subvert.' To subvert something is to undermine its function or purpose. In this case, when we say that the promotion was a subversive manipulation, we are saying that it undermined the goals of the company, ie, to put the best person forward for each job so that the company would function effectively.

Political correctness

Another common reference to politics can be found in the use of the phrase 'politically correct'. That phrase was used as early as 1793, when it appeared in a US Supreme Court ruling about what would be appropriate behaviour by politicians – it was, in other words, a literal description (Florence) – that which is correct for politicians. Over the ensuing two centuries, the phrase has taken on several different meanings, but in the twenty-first century it refers to the way people use words. This meaning arose largely out of an attempt in the 1960s by people who wanted to eliminate the inherent bias in everyday words and phrases and to try to create better understanding and greater inclusiveness for a wider diversity of people.

Today, this phrase is more commonly used by people who are critical of such an attitude. The use of the adjective 'politically', in this context, performs the same function that we saw in the example of the person who said that someone's promotion was political, implying that it was not deserved. In the case of 'politically correct' or 'political correctness', the implication is that the scrupulous attempt to remove racial and gender bias from language is not necessary or genuine – it's just an effort to appear, in public, to care about equality by people who really don't.

Those in favour of the idea of racial and gender equality, however, see the effort as being an important one in paying due respect to all people, and they do not use the term 'politically correct' to describe their efforts. One could argue that it is not 'politically correct' to be inoffensive, it is just unacceptable (and indeed a crime in some cases) in the present day to use sexist, racist or homophobic language.

KNOWLEDGE QUESTION

How do our values and assumptions influence the language in which we express our ideas?

As part of this effort, there was a push to halt the common practice of using the pronoun 'he' or 'his' whenever the antecedent noun was a generic word which referred to an unidentified person. Instead, people were encouraged to use 'his or her' or 'him or her'. So instead of writing or saying something like 'a politician has a lot of power at his disposal', there was a shift to 'a politician has a lot of power at his or her disposal'. That grammatical construction can get quite unwieldy, however, and there has been a subsequent shift to using 'their', the plural pronoun, even when the antecedent noun is singular.

In the twenty-first century, moreover, language, along with other cultural practices, has been shifting to try to accommodate people who do not see themselves as being gendered either male or female. In many cases, those people prefer 'their' as the pronoun to be used to refer to them. Hodder Education has adopted this practice as editorial policy, and so throughout this book, you will see 'their' used as the pronoun for any singular human subject for which the gender – or gender preference – is not known. The developing use of pronouns in English is an excellent example of how culture influences language and how language influences what we know.

We can see, then, that the idea of politics is a **loaded** one. Politics does, however, play an essential role in human experience. We could not get along together without a group of people in leadership positions to help us organize ourselves, make decisions and mediate conflicts. We will, therefore, investigate the neutral idea of politics as well as the more controversial one. We shall explore, later in this chapter, the means by which people develop their political beliefs and values and how those beliefs and values lead to sometimes dramatically different political perspectives. We will also explore questions about how different political perspectives shape our communal and individual knowledge.

◆ **Loaded**: To say that a word or idea is 'loaded' is to say that it has a lot of emotional associations and tends, therefore, to be controversial.

Scope

Politics of a society or a nation

As with many other topics that you will consider in your TOK class, politics is a complicated idea and one which is difficult to differentiate among other related ideas. Ideally, we would like to be able to draw clear lines between politics, society, religion and ethics, but trying to do so poses a great deal of difficulty. This is because politics – both at the societal and the individual levels – depends on all of those other features of human experience. Andrew Heywood, a British educator and political scientist, suggests that the best definition of politics is 'the making, preserving and amending of general social rules', because it encompasses a lot of different elements of social governance such as the exercise of power, the allocation of resources, and the means by which we make collective decisions (Heywood).

Throughout history, different societies have developed different political systems, and even today, we can find a wide variety of political systems in place in different countries. In Theory of Knowledge, we are not concerned with trying to determine whether any given political system is 'better' than any other; we are concerned with trying to understand how different societies come to believe that the political system they have is the best one for them.

DEEPER THINKING

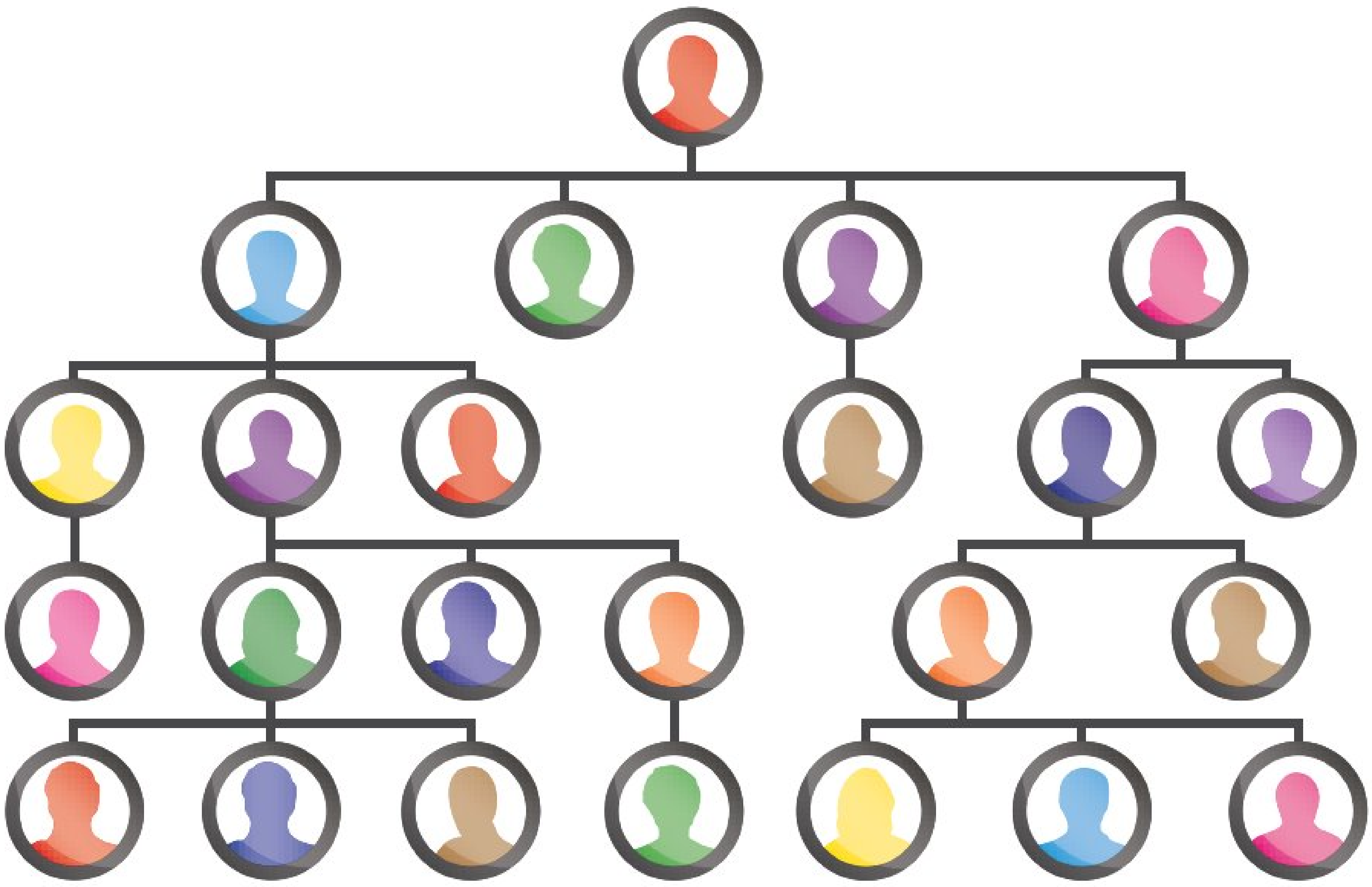
Political beliefs vs knowledge

When we talk about knowledge in relation to politics, we can talk about knowledge of political systems, such as knowing the difference between a democracy, a theocracy, a monarchy and a dictatorship. We can also talk about knowledge of what actions politicians have taken and what issues are of concern in a particular society. The study of the facts of political systems and political actions is called political science. When we want to talk about the 'knowledge' that an individual has about what a political system *should* be like and what actions politicians *should* take, we must instead talk about political beliefs.

The determination of what makes for the best political system is fundamentally a matter of opinion. Because different people have different *values* (see Concept connection, page 226), they have different ideas about what the role of government is and what rules should be in place for all people. Because politics are based on people's opinions and values, knowledge of politics is not a matter of trying to discover a reality that exists outside of people. There is no objectively 'right' or 'wrong' system, although there are systems which have, over the course of history, come to be widely seen as prone to abuse and, therefore, not in the best interest of many people. We will explore this process in more detail in the section on methods that follows.

The scope of the politics of a society or a nation is wide and varied. Political decisions must be made about such things as health care, education, the economy, international relations, national security (including the military), infrastructure such as roads, bridges, wireless capacity, water, electricity and human rights. Laws are the expression of the decisions which politicians make on these matters and all others which affect the members of the community or nation, so politics is related to the legal system of that community or nation. Political decisions are made for communities as a whole, but they affect each individual living in that community. The scope of politics therefore includes everyone and many aspects of everyone's daily life.

Politics of an institution



An organization's hierarchy will often be represented in an organizational chart, like this one

Any institution large enough that decisions cannot be made from direct input of all stakeholders has a hierarchy of decision makers which functions essentially as politics. Community boards, schools and school systems, churches and religions, military forces and large businesses all require some sort of decision-making hierarchy. The politics of an institution are essentially the same as the politics of a nation, except that their scope and power are limited to that institution. We don't call the decision makers within various non-governmental institutions 'politicians': that is a term that we reserve for the decision makers in governments. The decision makers in other kinds of institutions have a variety of titles depending upon the institution itself. Titles include Chief Executive Officer, Chair of the Board, President and Vice-President of companies, Superintendent, Principal, Head of School, Chair of Department, Priest, Rabbi, Imam, Pujari, Financial Officer, Technology Officer, and so on. Military forces have many titles for their leadership positions: Commander, Admiral, General, Colonel, Lieutenant, Captain, Major and so on.

ACTIVITY

Think about an organization you belong to – it could be your school, a club or your employer. Answer the following questions:

1. What political systems are in place within the organization?
2. Could those systems be improved?
3. Where do you feature in the hierarchy?
4. Does understanding the political system in place affect your opinion about the way decisions are made?
5. How does your personal experience with the politics of an institution help you to understand the scope of politics?

The kinds of decisions that the 'politicians' must make within any given institution, such as a business or an educational or religious institution, differ considerably from the decisions that a politician makes for a nation. The scope of the politics of an institution is directly related to the overall function of that institution, though there are some kinds of decisions which are common to most, if not all, such institutions. Common functions have to do with hiring practices, financial practices, policies for promotion, hiring and firing and the establishment of the goals and formal values of the institution. Specific decisions have to do with the specific function of the institution: educational institutions must make decisions about what constitutes effective educational practice. Religious institutions must make decisions about how best to embody the teachings of the holy texts and religious traditions. Military institutions must make decisions about how to protect their nations and allies, what weaponry is necessary and so on. The scope of institutional politics is shaped, then, by the nature of each individual institution. Decisions made within one institution do not have any power to control or direct other institutions or people outside of that institution.

ACTIVITY

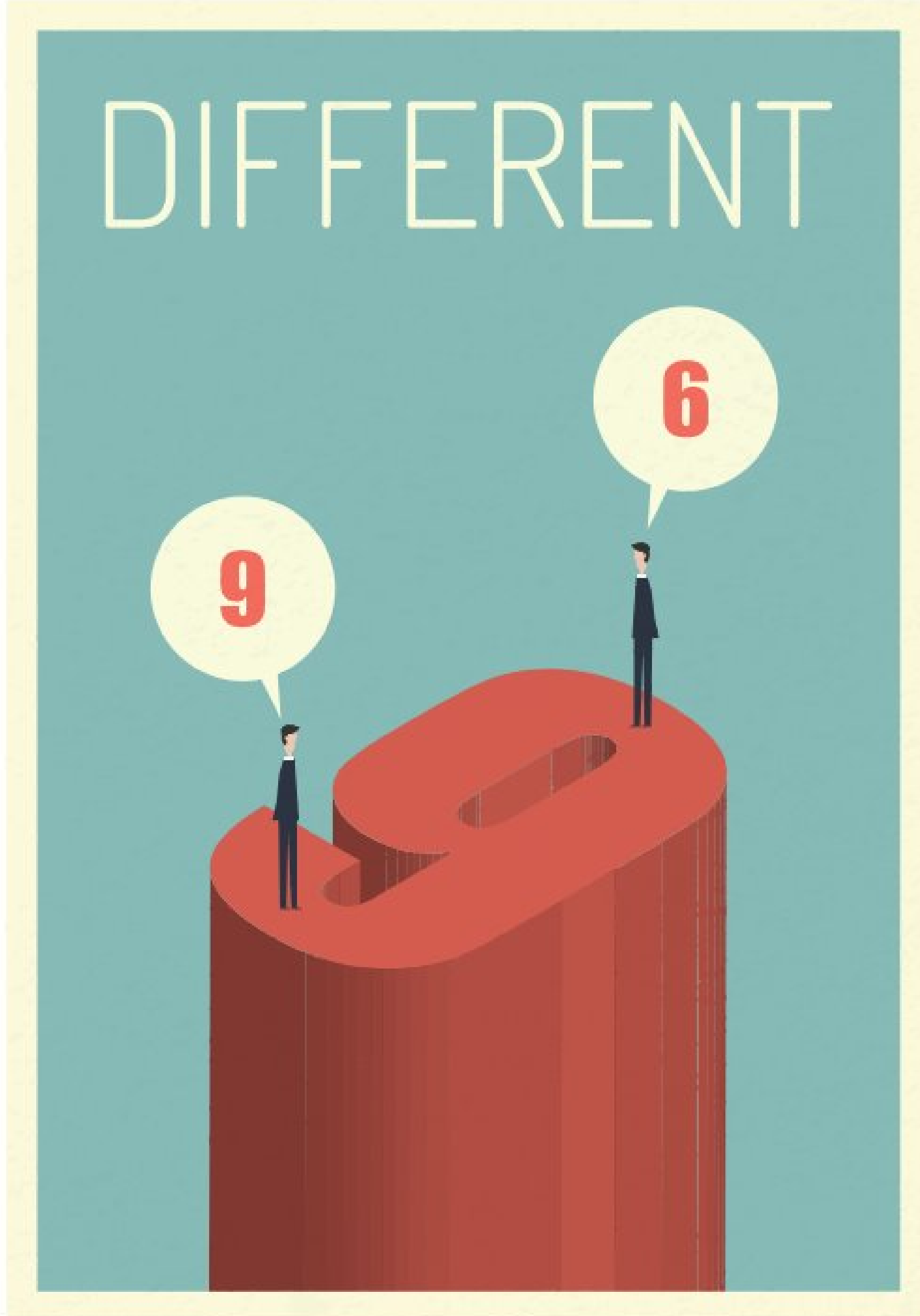
Discuss with your classmates: What is the scope of politics? Is there any part of our lives which is unaffected by political forces?

Politics of knowledge

When we talk about the politics of knowledge, we are talking about the ways in which political considerations influence the development and dissemination of knowledge. Since knowledge is developed formally through institutions like the government and universities, as well as by businesses, and since the development of knowledge through these formal structures costs money, political influence is inevitable. One of the things you will explore in TOK is the ways in which politics can shape what we know and how we share and use that knowledge, both positively and negatively.

Perspectives

As we have already seen, the perspective of the knower inevitably shapes what we know. In the realm of politics, differing perspectives are responsible both for the difficulty of making good decisions and for the conflict which very often arises out of the decision-making process. In trying to make knowledge about what is the best or right thing to do for any group of people, the decision makers will ideally take into account the perspectives of all those who will be affected by the decision. Trying to account for everyone's needs and wishes is always a problem, however, and different political systems deal with that problem in different ways.

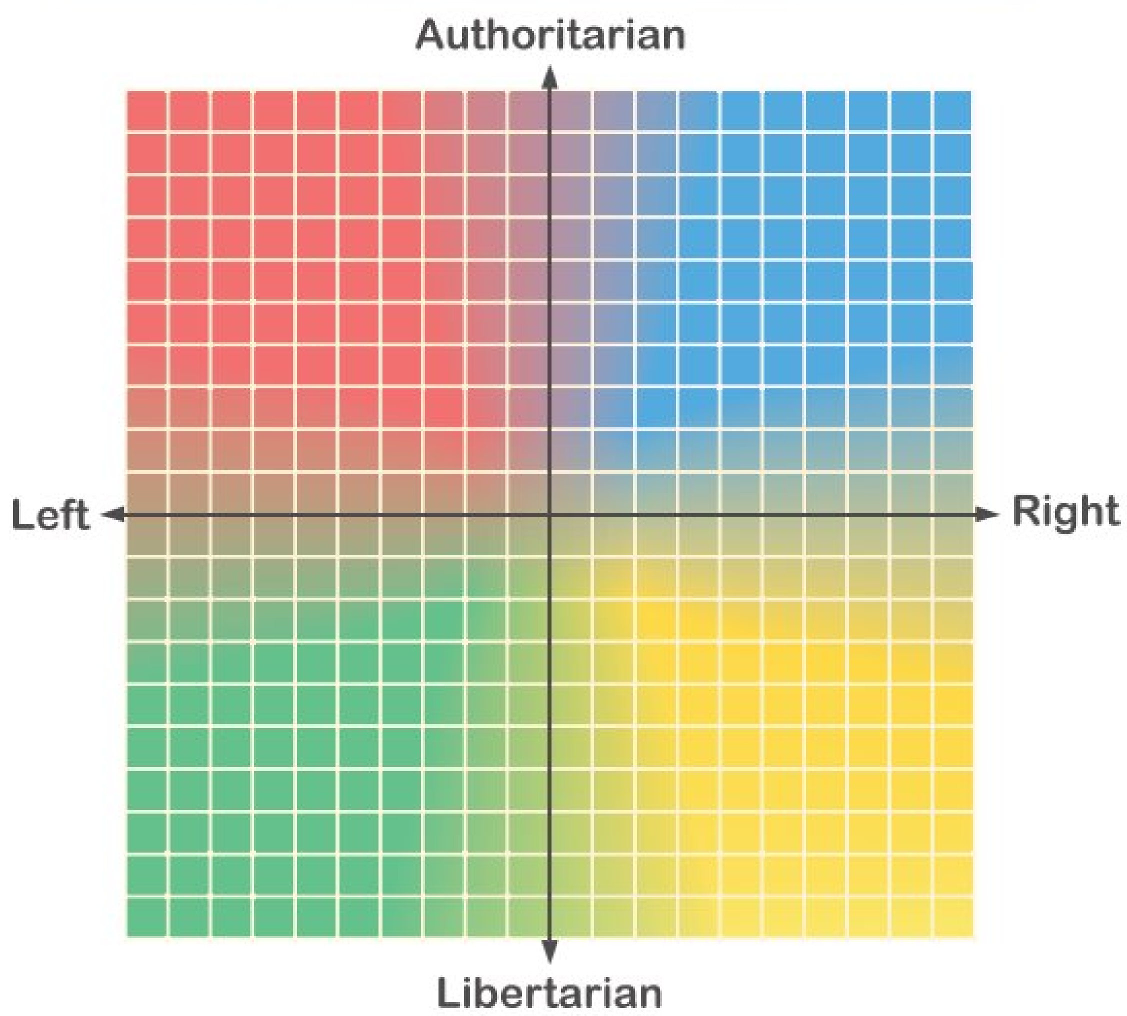


Perspectives in national politics

Some political perspectives are formalized in political parties that represent themselves as supporting particular values (see below). In political systems which include parties, the parties tend to divide along the spectrum of conservative (or right-wing) ideas to liberal (or left-wing) ideas.

In the United Kingdom, for example, nine different parties were represented in the House of Commons following the 2017 general election ('Political Parties in Parliament'). Three of those parties have historically held the bulk of the available seats: Labour, the Conservative Party and the Liberal Democrats. Two of those parties identify their position in the party name. Labour is a party which identifies itself as being 'centre left', which is slightly more liberal leaning than the Liberal Democrats, who describe themselves as 'centre/centre-left'. In the United States, there are two dominant political parties: the Democrats, who are the more liberal party, and the Republicans who describe themselves as conservative. Naturally, within those parties, there are people with a range of views, with some people expressing more extremely liberal or conservative values, and some who hold more moderate beliefs.

At the heart of the difference between liberal and conservative perspectives is a fundamental difference in values.



Is the traditional linear left–right axis an adequate model for political differences? Where would you place yourself on this spectrum?

CONCEPT CONNECTION

Values

Values, as we saw in Chapter 1, are those beliefs around which we shape our lives. Values, therefore, play an extremely important role in our lives, and our attachment to them is deeply emotional. We feel that the things we value are essential to a good life. We invest the same emotional attachment to our political values as we do to any other value. It can become very difficult, then, for people to listen to other political viewpoints with an open mind. For many people, political values other than their own represent not just different thinking, but wrong thinking. Their 'knowledge' of other people's political beliefs is shaped by their own perspective, and the deeper their commitment to their own beliefs, the harder it is to accept, or even listen to, different beliefs with any degree of *objectivity* (see Chapter 1, page 21).

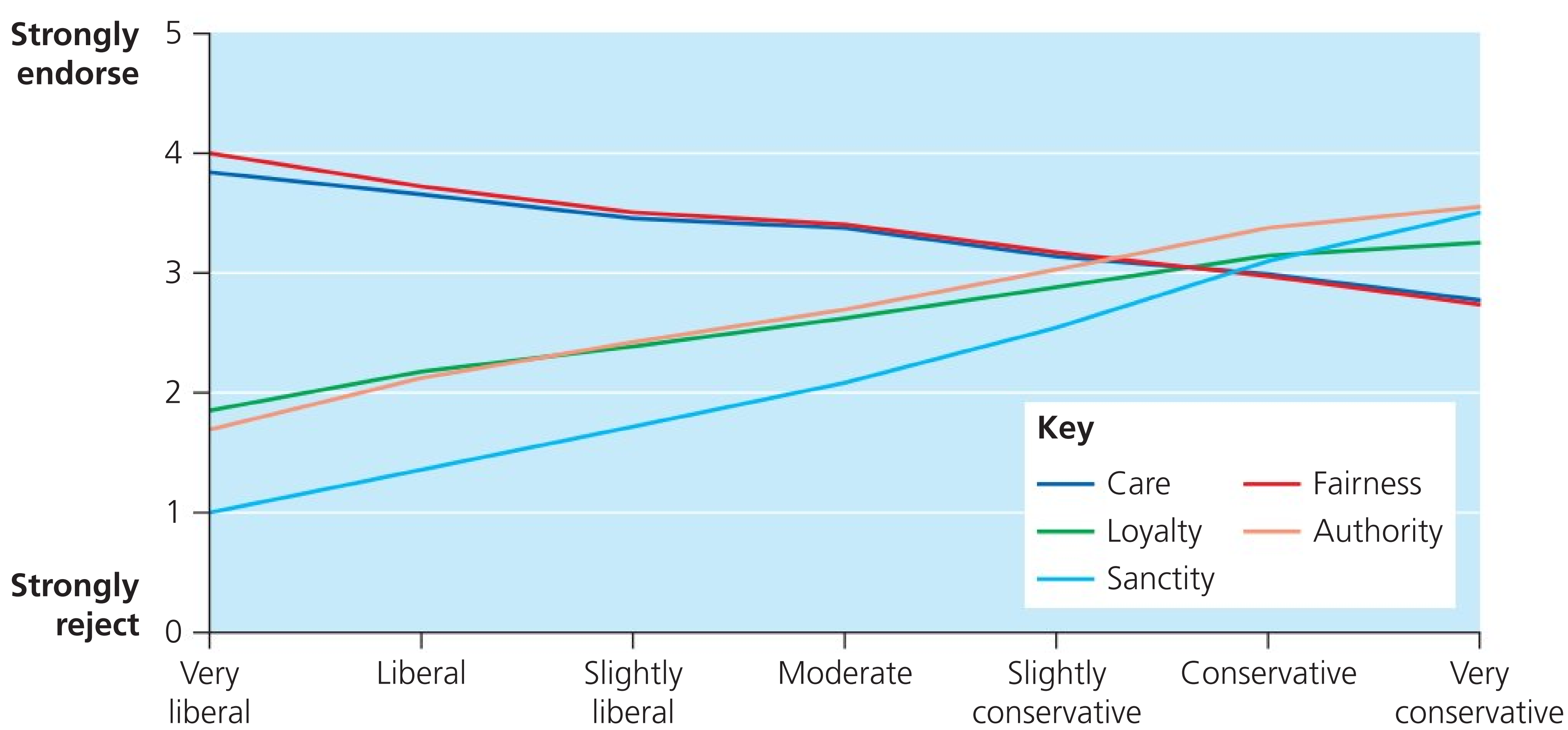
Jonathan Haidt, Professor of Ethical Leadership at New York University's Stern School of Business, has investigated the values which are at the basis of the difference between conservative and liberal beliefs. He helped to develop a theory called the Moral Foundations Theory. The theory proposes five values as being foundational to our political beliefs. The values are presented as pairs of opposites on a spectrum (Haidt, *et al*). Those foundational values are:

1 Care/harm
2 Fairness/cheating
3 Loyalty/betrayal
4 Authority/subversion
5 Sanctity/degradation.

Haidt and his colleagues do not suggest that any people – whether liberal or conservative – think that some of those values are not important. Rather, that different people value some more than others. In his book, *The Righteous Mind: Why Good People are Divided by Politics and Religion,* Haidt argues that we are born with an innate disposition to value these things (Haidt 152). Those predispositions are then shaped by our experience as we grow up. Haidt and his colleagues have developed a profile which shows that conservatives and liberals value these five things to differing degrees, and that some are more important for people who identify themselves as conservative, while others are more important for people who identify themselves as liberal: 'liberals try to create a morality relying primarily on the Care/harm foundation, with additional support from the fairness/cheating and liberty/oppression foundations. Conservatives, especially religious conservatives, use all six foundations, including loyalty/betrayal, authority/subversion, and sanctity/degradation' (Haidt).

The following graph shows the differences in the way that conservative and liberal people value five of these aspects of human relations. (In later work, Haidt added a sixth value: liberty vs oppression):

The data on the graph is from data accumulated between 2007 and 2011, involving more than 130 000 subjects (Haidt 160–1). You can see that people who identify themselves as being liberal or very liberal identify care and fairness as being extremely important, while people who identify as conservative or very conservative identify loyalty, authority and sanctity as being very important. In general, liberal people are more tolerant of changes that allow for more people to have more rights, while conservative people value traditions, security and loyalty to their group. We can see that no one could reasonably fault anyone for holding these values – they are all positive features of human experience. The difficulty arises because people care about them to differing degrees, and people make their political judgments based on what they believe is most important to living a good life. People's beliefs about what kinds of decisions politicians should make, in other words, depend on the underlying values that they hold.



Differing values of conservative and liberal people according to Moral Foundations Theory
(Source: *The Righteous Mind: Why Good People are Divided by Politics and Religion by Jonathan Haidt*)

KNOWLEDGE QUESTION

To what extent are our political views shaped by society, family backgrounds, education or social class?

In addition to the perspectives of various degrees of conservativism or liberalism, people have many other perspectives which bear on their understanding of politics. People of different genders, races, sexual orientations and nationalities have differing ideas about what is important in terms of ensuring a good life. People with different kinds of education see things differently. Immigrants very often have different needs than people who were born in a particular country. Young people might see the world differently from the way older people see the world. And so on. All of these perspectives are informed by the personal experiences and values of the people who hold them.

Let's consider an example using the question of taxation. Many countries, including Belgium, Turkey, Denmark, The Netherlands, Germany, the United States and the United Kingdom (Fontinelle) have an income tax that all members of the society must pay to help fund the cost of running the government and providing services which the government delivers to everyone. Politicians are the ones who determine how much tax people will have to pay. If we want to determine what an acceptable amount of tax is, we look at it from the perspective of what we value.

If we value caring and equality, then we want to fund services for people who might not be able, for whatever reason, to take care of themselves as well as others. We might want to fund universal health care, free public education and job training services.

If, however, we value loyalty and fairness, we might see these things quite differently. It might not seem fair to us that we have to pay high income taxes to fund health care and education for people who don't hold down jobs or who have many children or who have only been in the country for a few years, while we have been working hard for many years to educate ourselves and to get jobs with good salaries. Our sense of unfairness might be aggravated if we perceive that the reason some people can't hold down jobs is due to their own choices – maybe someone was a drug addict or had a high-paying job and quit and now can't find another one. We want to be loyal first to our families, before we fund services for other people.

If we value caring and the reduction of harm, we might be willing to pay more from our personal income to help others, but on the other hand, it might seem very unfair that we have to pay for foreign aid or welfare for people who have not earned their own money. This would be the more conservative viewpoint.

A person with a more liberal viewpoint might argue that it is fair to help people who cannot help themselves, because they began from a position of innate unfairness – maybe poverty or lack of effective parenting, or the consequences of problems like Fetal Alcohol Syndrome – all problems which make it much more difficult for people to achieve a high-quality education and a well-paid job. Neither viewpoint can be said to be 'correct'; both are matters for interpretation.

We can see that in many political situations, there is no 'right' or 'wrong' answer. In the best-case scenario, politicians, and those who contribute to political decision-making in any capacity, are trying to determine the right thing to do based on human beliefs and opinions, which are not subject to a factual determination of accuracy. My personal perspective is going to shape my understanding of any decision that politicians make – as well as determining whether I approve of the decision or not.

When we think about how our perspective affects our knowledge of political values, then, we can see that we are influenced to see six important elements of human experience in certain ways based on the experiences we have in our lives. We develop emotional attachments to those values in differing degrees. We also form our beliefs about which values ought to be considered to be the most important when it comes to making decisions about how the whole group should be treated and how all members of that group should be required to act. It is not easy to get people to change their fundamental values, which is why so many political decisions are contentious.

Use the QR code to read more about these foundational values on the Moral Foundations Theory website.

ACTIVITY

Investigate how taxes are spent in your country or local area. Are you surprised by your findings? Do you agree with the way money is distributed?

How does this research help you to understand the values and governmental processes in your country?

ACTIVITY

To learn more about Haidt's work on Moral Foundations Theory, use the QR code to take a survey to map your own moral values.

1 Do you think that the result of the survey accurately represents your personal political beliefs? Why or why not?
2 What does this study help you understand about the basic differences between essentially conservative and essentially liberal political beliefs?

Perspectives in institutional politics

Perspective is going to be similarly important in institutional politics. Our view of what policies a company should have, and what actions it should take, will depend on our role in the company, as well as on any number of other factors, such as our education, our total income, the number of children we might have and so on. Our understanding of whether the leadership of a company or institution is making good decisions will likely be based in large part on the goals of that institution. If, for example, someone is a teacher in a school, we might judge their decisions to be effective or not effective based on our perception of whether they have a positive effect on the ability to help students learn or not. If we perceive that decisions about who is assigned to teach particular classes are being made in order to ensure that people in power positions have the most desirable schedules, rather than in order to ensure that the most qualified teachers are teaching each course, we are going to believe that the decisions being made are a matter of 'politics' in the negative sense, rather than a matter of trying to achieve the goals of the institution. If you are a member of a church, and you perceive that decisions about how to allocate funds are being made in order to best help people in the community who are in need, you are likely to believe that the decisions are being made wisely.

CASE STUDY

The Challenger disaster

Sometimes poor decisions are made within an institution because of pressure that is applied by people who have power, but who lack real knowledge.

In 1986, NASA's space shuttle Challenger lifted off from Cape Canaveral in Florida and 73 seconds later, it exploded, killing all seven of the astronauts on board. The night before the scheduled launch, five engineers who worked for the NASA contractor Morton Thiakol, and who helped design and build the Shuttle, tried to stop the launch, warning the decision makers that it was not safe to fly the Shuttle in cold temperatures because the rubber gaskets on the booster rockets wouldn't seal properly (Berkes).

No one is absolutely certain as to the reasons why the decision makers decided to ignore the warnings from the people who built the craft, but political pressure seems to have played a significant role: 'The space shuttle programme had an ambitious launch schedule that year and NASA wanted to show it could launch regularly and reliably. President Ronald Reagan was also set to deliver the State of the Union address that evening and reportedly planned to tout the Challenger launch' (Berkes).

In the case of the Shuttle Challenger, the politicians had one perspective and the engineers had another.

NASA Space Shuttle Challenger

It turned out to be an example in which the two perspectives were not equal; clearly the engineers' warnings should have been heeded. Although they did not have the power of decision making, they did have the knowledge that should have formed the basis of the decision. The failure in that case was catastrophic.

CONCEPT CONNECTION

Culture

In Chapter 1, we considered the definition of 'culture' primarily from the perspective of the culture of a whole country or a whole community. Culture, however, is a concept that can apply in smaller groups as well. We can talk about the culture of a business, a club or a family. In the Space Shuttle example on the previous page, we might consider how the culture of NASA as an organization, which is part of the US government, contributed to the decision-making process. We might consider that the culture of that organization at that time was one which featured competitiveness with space agencies in other countries, as well as a culture which featured significant pressure on people doing the actual work to get the job done quickly. We can, therefore, consider that the politics of an organization can reflect the culture of the organization.

We can also consider how our individual and group politics are reflections of our culture. Some nations have democratic systems of government, and the people who grow up in those countries are likely to have the perspective that a **democracy** is the best form of politics for a government to have. Other people live in countries where religion plays a very prominent role in both daily lives and in government, and those people might have the perspective that a **theocracy** is the best form of government. Some examples of theocracies are Saudi Arabia and the Vatican.

Our culture also plays a powerful and **integral** role in shaping our political beliefs. If you think for a moment about your own beliefs about what is important in terms of contributing to a quality life, you will be able to see right away that those beliefs came from your parents, your peers, your religious institution and your community. When you took Dr Haidt's survey earlier in this chapter, which of the values did you think were most important? Probably you felt that all were important to some degree, but if you were forced to choose, you would pick some over the others. Where did you get those values? Note that 'values' are also a TOK course concept, and now you can probably see the relationship between your cultural experience, what you value, and your political beliefs.

◆ **Democracy**: People in a country can vote for the representatives, the politicians, who will make most of the decisions. In a true democracy, the citizens of the country would vote on all issues that needed to be decided. Most democracies in the modern world are too big for direct input of all citizens, and so most modern democracies, including those in the UK, Canada, the United States and Australia, are representative democracies.

◆ **Theocracy**: A form of government in which the leaders of government are also leaders of the predominant religion, and they are considered to be led in their decision making by divine guidance.

◆ **Integral**: Something that is essential that cannot be separated from the other thing. In this case, to say that our culture is integral to our political beliefs is to say that the two cannot be separated.

EE links

If you are interested in the relationship between culture and politics, you might want to pursue this topic further and investigate the question of how the cultural history of a nation has shaped its political system. You could, for example, choose to write an extended essay about how, historically, cultural attitudes have kept women from rising to the top political roles in many countries. By 2019, Australia has had only one female prime minister, the UK has had two, New Zealand has had three female prime ministers and Canada has had one female prime minister, while the United States has never had a female president or vice president.

The politics of knowledge and the shaping of perspectives

So far, we have looked primarily at our knowledge of politics – the system of decision making for a community or country. We must now also consider the politics of knowledge: the ways in which political decisions and political power affect our ability to make knowledge.

Learner profile

Reflective

How does reflecting on the politics of knowledge help us to understand what it is possible to know?

History

"Who controls the past controls the future; who controls the present controls the past."

George Orwell, Nineteen Eighty-Four

■ George Orwell

Politics generally affects knowledge-making on an institutional level, but it is also possible to see how politics can affect the knowledge that you, personally, can make and how you make it. In his 1949 novel *Nineteen Eighty-Four,* George Orwell depicted a futuristic society in which the government exerted rigid control over all information that was accessible to any member of the society. The government slogan was 'Who controls the past controls the future; who controls the present controls the past' (Orwell 313). In the novel, the Party (the political machine) controlled the past by altering news reports and photographs so that individual people couldn't learn anything about the past that the government didn't want them to learn. One important reason to know the real past is that it helps us understand how we came to be what we are today, both individually and as a nation, and so when a past is constructed deliberately to suit the wishes of the politicians in control, so is the understanding it is possible to have of the present. Orwell's vision might seem to be excessive – even **apocalyptic**; however, attempts to control information on this scale have occurred in relatively recent history.

◆ **Apocalyptic**: As described in the book of Revelation in the Christian Bible, the apocalypse refers to the complete destruction of the world. The idea of an apocalypse has come to refer metaphorically to any catastrophic event which would destroy civilization as we know it.

Josef Stalin's efforts to control the knowledge of history that it was possible for citizens of the Soviet Union to have are widely known. His revisions to historical documents included the doctoring of numerous photographs in order to remove people who had once been his allies but who had become his enemies: 'Sometimes, official censors had to retouch photos over and over again as the list of political enemies grew longer. In one photograph, Stalin is shown with a group of three of his deputies. As each deputy fell out of his favour, they were snipped out of the photo until only Stalin remained' (Blakemore). The original photo is shown below; Stalin is the second from the left. The second image is of the revised photo, with no one but Stalin left.

Changing historical documents such as photographs results in people who try to learn history from those documents taking away a completely wrong understanding of historical events. We know now what Stalin tried to do, because in the years following the fall of the Soviet Union in 1991, Stalin's secrets became known to the rest of the world and original documents were recovered. Many people, however, lived their entire lives during Stalin's rule, and those who lived beyond it had to relearn the history of their country.

■ Josef Stalin famously had photos doctored to remove allies that had become adversaries

Education

The deliberate rewriting of history is an extreme example of how politics can shape people's knowledge. As we have already seen, politics very often determines what knowledge is pursued because of the allocation of funding. That process also naturally affects what individuals can know. If knowledge doesn't get developed, it isn't available to be learned.

One of the most significant ways that politics can help or hinder individuals' knowledge is by the control over who has access to education. The provision of education is a significant decision that must be made in virtually every modern society. If education is an entirely private venture, for which individual people have to pay, then only the wealthy can afford to educate their children. If the government is going to provide education for everyone, then the problem becomes how to pay for it and whether the same education can be provided to everyone. In trying to make that decision, politicians must take into account many different perspectives.

KNOWLEDGE QUESTIONS

With regards to politics, do we know as much as we think we know?

How can we know whether we have sufficient knowledge before voting in an election?

Schools

In the United States, for example, the goal is to provide publicly funded education for everyone. A portion of the funding comes from the federal government, and a portion comes from the state governments. Trying to determine how much money will be spent requires a consideration of how many school-aged children there are in any given state, how much money each state can afford to provide (some states being poorer than others) and so on. A very common problem is that areas with a high percentage of low-income families end up with school systems which are underfunded. If one school can provide all the students with access to laptop computers, fully-stocked science labs and up-to-date equipment for health and physical education, and another school in another city or state can only provide five computers in the library (or none), a science lab with only four microscopes and no access to lab specimens for dissection, and jumping ropes and balls for physical education but no weight machines or monitors for heart rate and counting steps, then the kind of education that the students will get is very different.

In many countries, such as the United States, Canada and the UK, families who can afford to do so can send their children to schools which are privately funded, which means that they are not funded by the government. In some cases, private primary and secondary schools are very well funded, and, because parents pay high fees, can provide many more resources than public schools can. It is sometimes the case, therefore, that people who can afford these schools can get a better education than people who must rely on state-funded schools for their education. At any rate, in any system where there are both publicly and privately funded schools, the systems are inherently different, and which one you attend shapes what you can learn.

Learner profile

Caring

How might knowledge of inequalities in a country's educational system contribute to our ability to take action in the world?

Historically, inequalities in school systems have sometimes been based in an overtly racist political situation. Official government policies, such as the Jim Crow era 'separate but equal' laws in the United States and apartheid in South Africa, meant that white children had access to much better funded schools than black children had access to. During the Jim Crow era, the races were certainly separated, but they were not, despite the claim in the slogan, by any means provided with equal facilities or resources. Black schools were often housed in old, run-down buildings and lacked books and other materials. Carter G. Woodson, one of the first scholars to study African American history '… told how some black children in southern schools were not allowed to use books that included the Declaration of Independence or the US Constitution' (Brooker). Although in both of those countries the laws have been changed, the inequalities are often still reflected in the poverty of some cities and neighbourhoods.

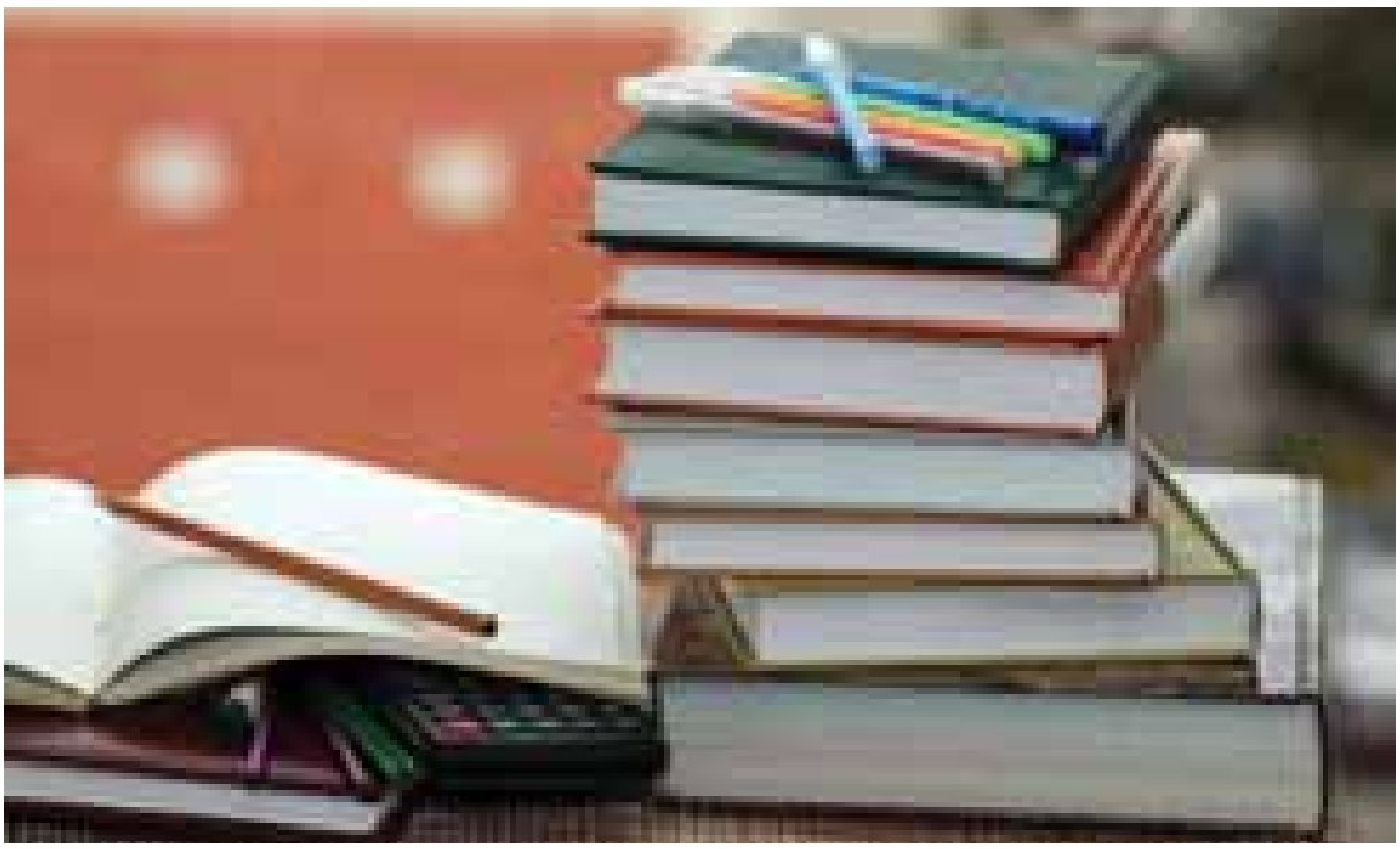
One more important political factor that shapes what young people can learn in schools has to do with the fact that every school system must decide what content should be taught. One decision to be made is which subjects will be offered. If you go to a school where, say, Chinese is not taught, then you won't be able to gain knowledge of Chinese, unless you take it upon yourself to find a private Chinese language school. Perhaps your IB Programme offers philosophy but not psychology, or biology and chemistry but not physics. All of these choices, which can be seen as political at least to the degree that there are decision makers who have the power of choice for everyone, and to the degree that money is involved in the decision, shape what it is possible for you to study.

A second, less obvious decision that must be made is what content will be taught within the courses that have been chosen. No secondary school in Canada could, for example, teach everything there is to know about Canadian history. High school calculus can only cover so many topics over the course of a year. What are the most important topics to be taught in physics? Someone has to make choices, and each system has a different means of determining course content.

One powerful influence on what will be taught in any given class is the production of textbooks. Textbook publishers cannot afford to publish many different textbooks for many different situations, schools or states, so each publisher usually has only one textbook for each level of each subject. Depending on how many textbook publishers there are in any country, school systems are limited to a very few choices of which book to buy.

For the last Theory of Knowledge curriculum, for instance, there were several choices of textbooks for the TOK course, including the Hodder book which preceded this edition, a book published by Oxford University Press, a book published by Cambridge University Press and a book published by Pearson. All the books were written for the published IB curriculum, but the authors of each one determined what aspects of the curriculum should be featured prominently and how to explain each of the ideas that would be included in the course. Each book was, therefore, different from all the others. Different schools chose different books, and some schools chose no books. Students at those different schools, therefore, had access to different ideas about what was important knowledge in Theory of Knowledge.

In the case of Theory of Knowledge, the differences in the books seemed to be relatively minor. No large political interest group got involved in trying to determine what could or could not be

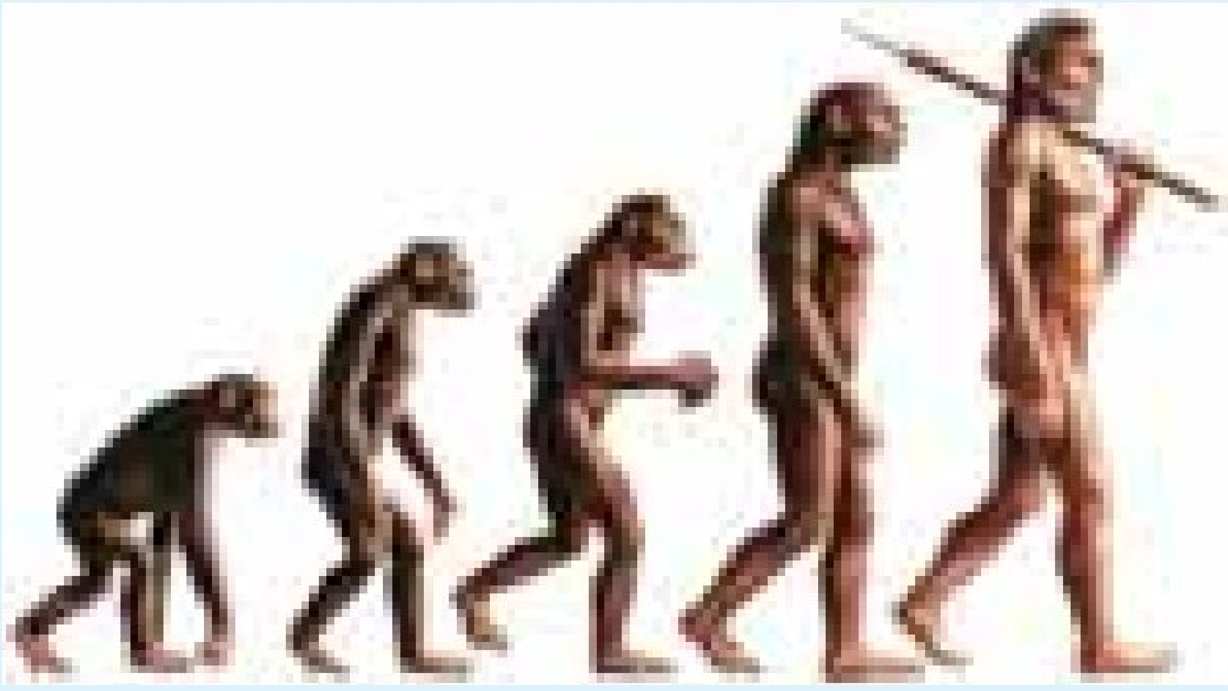


■ To what extent do textbooks, such as the one you are reading, affect what you know or think?

included in the TOK books. For many textbooks, however, different groups of people have very strong opinions about what should and should not be taught. These groups sometimes get involved in lobbying textbook companies to have certain information included or excluded from student textbooks. If they are successful, then those textbooks are what are available to everyone, even in places where the community and the school officials wish to teach the excluded information.

CASE STUDY

Evolution in schools



One topic which is often the target of special-interest groups is the teaching of evolution. In 2016, Biology textbooks in Alabama schools in the US were still required to include a sticker with a message to students which claimed that evolution is a 'controversial theory' supported by 'some scientists' (Schlanger). You can use the QR code to read the entire statement which is presented to students in that state who take biology.

Opponents of the use of such stickers are concerned that they harm students' understanding of both science and of religion (Glaze).

Anti-evolution sentiment, in fact, extends well beyond the political pressure put on textbooks. In India, in 2018, the Minister for Higher Education, Satyapal Singh, called for the removal of evolution from schools, claiming that Darwin's work is 'scientifically wrong' (Dixon). In Turkey, claims have been made that evolution cannot be taught because it is beyond the ability of secondary students to understand, while in Israel teachers were claiming that there is pressure from the education ministry to teach subjects other than evolution in biology (Dixon). All of these examples demonstrate the effects of political decision-making on the personal knowledge of individuals through the influence those decisions have on the educational process in any given country.

ACTIVITY

Consider the political decision-making in your country. How does it affect what people can learn in schools and can, therefore, know?

1. Do you think that people of all races are treated the same way in terms of their education?
2. Do you think that immigrants have access to the same kind of education that native-born citizens do?
3. Do you think that young women get the same kind of education as young men?
4. Is there a different educational path for students who wish to go to college and students who wish to go into a trade or into the military?
5. Can all students at your school choose to study the IB curriculum? Are all students at your school required to study the IB curriculum?
6. Do you think that such differences are always necessarily negative? Why or why not?

Learner profile

Principled

What principles should underlie the creation and implementation of an educational system?

CAS links

If you are interested in finding out more about how educational decision making takes place in your community, you could organize a field trip to the nearest state-run education office. You could arrange for an official to make a presentation to you and your classmates about the process that is used in your area for determining what curriculum is to be taught in your schools.

Higher education

Access to higher education is also often influenced by political factors. In China, access to higher education is determined by the *gaokao*, an examination which students must pass to be eligible for university. When it was first developed in 1952, under the rule of Mao, only students who were seen to be sufficiently communist could apply to take the exam (Qin and Hernández). In the twenty-first century, the test is available to many more people and is perceived as offering opportunity to anyone who is willing to work hard enough; however, it can also be seen as a 'tool of social control' (Qin and Hernández), which happens because those who benefit from the education are expected to **acquiesce** with government policies. One mother, who dropped out of school herself, has big dreams for her son, who will, she thinks, raise the family out of poverty.

> To achieve all this, Ms Gong and millions of other Chinese like her have an unspoken bargain with the ruling Communist Party. The government promises a good life to anyone who works hard, even the children of peasants. In exchange, they stay out of politics, look away when protesters climb onto rooftops to denounce the forced demolition of their homes, and accept the propaganda posters plastered across the city. (Qin and Hernandez)

Interestingly, in terms of how politics influences knowledge, because the *gaokao* is now seen as offering pretty fair opportunities for anyone who wants to take it, even those students who fail the exam do not complain about the politics of their country. The blame for failure rests on the students who, as they see it, simply did not work hard enough.

Information sharing

Another example of how politics can influence knowledge reveals how, depending on the political goals of a government, knowledge can be deliberately kept from the public, even when the public has paid, through taxes, for that knowledge to be gathered or developed.

◆ **Acquiesce**: To go along with. It has the connotation of allowing someone else to do something that you might not entirely approve of, but you let it pass for some reason or another. In this case, whether the parents and students like the government or not, they have decided to go along with the political decisions without complaining because they will get an education out of keeping quiet.

◆ **Innocuous**: Something that is of virtually no importance and which has no meaningful consequences. In this case, a change from allowing scientific models to project change to the end of the century to allowing them only to project change for the next 20 years doesn't seem very significant; however, the appearance is deceiving.

CASE STUDY

Climate change

Global climate change has been a politically contentious topic for some years, because the cost of engaging in a dedicated effort to combat climate change is quite high. Those costs include the money that would have to be expended to develop new technologies as well as the costs to businesses and industries of modifying their factories and changing their practices for things like disposing of waste. Some political groups place the value of caring for the environment higher than the value of promoting business profits, while others believe that free enterprise and capitalism are of greater value.

In recent years, this clash of beliefs has led to dramatic changes in policies regarding the sharing of information about global climate change with the public. In September 2016, for example, under President Barack Obama's administration, the United States joined the Paris Accord, a multi-national agreement to commit to an effort to keeping global warming below 2°C in this century, as well as participating in other efforts to cope with the effects of climate change ('The Paris Agreement'). You can read the text of the Paris Agreement using the QR code.

In signing the accord and committing the US to meeting the standards it lays out, Obama said this:

> One of the reasons I ran for this office was to make sure that America does its part to protect this planet for future generations. Over the past seven and a half years, we've transformed the United States into a global leader in the fight against climate change. (Somanader)

Obama states directly that protecting the planet was a political goal under his administration. Just a few months later, however, after Donald Trump's election in November 2016, there was a dramatic change to the political values guiding the decision making in Washington. Under the new administration, significant changes were made to the Environmental Protection Agency. Environmental protections passed by previous administrations were rolled back, and Trump's White House withdrew the United States from the Paris Accord (Davenport and Landler). The Trump administration has also put into place regulations about what information about climate change can and cannot be released to the public:

> the White House-appointed director of the United States Geological Survey, James Reilly, a former astronaut and petroleum geologist, has ordered that scientific assessments produced by that office use only computer-generated climate models that project the impact of climate change through 2040, rather than through the end of the century, as had been done previously. (Davenport and Landler)

While this limitation on what knowledge can be disseminated seems, at first glance, to be fairly **innocuous**, the implications are actually pretty significant, as the models show that the greatest effects of climate change will occur after the year 2040 (Davenport and Landler). By limiting the models to the years in which the effects of climate change are likely to be the least problematic, the government is ensuring that people do not hear about the most devastating consequences.

The United States is not the only country with a government which has taken active steps to stop the spread of knowledge about global climate change. In Canada, when Prime Minister Stephen Harper consolidated power in 2011 with the election of more members of the Conservative Party to Parliament, his administration set in place specific new rules denying government scientists the right to speak directly to the press. All requests for information about climate change had to go through a special media centre which dealt with those communications. Often responses were stalled until the reporters' deadlines were past (Learn). Other times, they were simply tied up in a long back-and-forth of emails. In one case, a request by a reporter from *The Canadian Press* to speak with Max Bothwell, a government scientist with Environment Canada, an environmental watchdog, was bogged down in what ultimately turned out to be 110 pages of emails involving 16 different government agencies (Learn). The reasons for the change to regulations in Canada were based on the fact that Harper's administration opposed spending money to fight climate change and favoured developing energy resources:

> Early on in his administration, Harper boasted that Canada would become an 'energy superpower' built on the growth of the Athabasca oil sands in the western part of the country. This oil-rich region would subsequently become a driving economic force for the country, until low global oil prices caused the loonie (the Canadian dollar) to crash. Climate change science – and environmental regulations – posed a hindrance to that ambitious vision. (Learn)

Harper's political goals were different from the goals of the government which preceded him, and the decisions that he and his administration made resulted in a change to the knowledge readily available to the Canadian public.

Both of these examples show how the values which underlie political decision making influence the kind and amount of knowledge which is available to the public.

This kind of influence of politics on knowledge is not, of course, particular only to the United States and Canada. Politicians must make choices between options – indeed, that is their function in a government. Whichever choice they make will have consequences in terms of what knowledge does get made and disseminated and what does not. Therefore, all countries in which politicians make decisions for the populace at large will experience the fact that those political decisions affect the way that knowledge gets made and distributed within that country.

Funding

A final way in which politics influences knowledge has to do with funding. Much of our knowledge is developed by professionals – biologists, psychologists, mathematicians and so on. These people are almost without exception employed either by the government, by universities or by private industries. As employees, they are not free to do whatever work they want to do. Rather, they do the work that their employer is willing to pay for.

ACTIVITY

Can you think of examples in your country of how political decision making has resulted in your having access to either more or less knowledge of a particular subject?

CASE STUDY

Alan Turing

An example of the way that funding determines what knowledge gets made can be found in British history. During the Second World War, the Germans developed a cyphering system that they could change every day, and which the British and their allies could not crack. They were able to pick up messages, but they could not understand them. Breaking the enigma code, as the cypher was known as, became a top priority for the British military, and the government set up a department at Bletchley Park, in Buckinghamshire, devoted to finding a way to crack the code (IWM Staff).

Alan Turing, a brilliant mathematician, was instrumental in helping to crack the code, which he did by inventing a machine he called 'Bomba'. In the post-war years, Turing continued to work on his computing machines, using what he had learned during the war. It wasn't until long after he died that Turing's contribution to modern computing was recognized, but his work is now seen as foundational to the development of computers and computer science, and the highest award in computer science is named after him (IWM Staff).

The example of the high value to the British of being able to intercept German messages during the war and their subsequent funding of a very expensive project to develop the necessary knowledge shows how powerful the allocation of money is in the effort to generate knowledge. We might imagine that had the British government not funded Turing's work, he would not have learned what he needed to learn in order to advance the invention of computers as far as he did. Had he not done his work, the development of modern computer science might have been delayed or it might have taken a very different path from the one that it did. Knowledge is often power, but so is money.

Methods and tools

Making knowledge about politics

The history of politics reveals how a society came to have the political system that it has now. In England, for example, the political system began as a monarchy in the ninth century. Parliament was formally convened in the thirteenth century with the signing of the Magna Carta, which established a body of wealthy landowners who were chosen by the King and who served as advisers to him (History.com Editors). Parliament gradually gained more power over the next several centuries, and in 1688 the Glorious Revolution led to the formation of a constitutional monarchy (British Monarchist League). The system has gradually evolved further in the intervening centuries so that today the monarch holds a largely ceremonial position and the governing of the nation is done by the prime minister and parliament. The history of politics in England reveals a change from early beliefs that the monarch was God's representative on Earth, and so infallible, to a contemporary belief that all people in a society have rights to be protected, one of which is to have a say in how they are to be governed.

This description is, of course, very simplified; 13 centuries of history cannot be represented adequately in a paragraph. You can get an idea, though, of how the history of politics in England would reveal all the gradual changes and how they came about. Perhaps more importantly, from a TOK perspective, it also reveals the changing values which drove those changes. The history of politics reveals the history of people's knowledge and their beliefs about how the country should be governed.

Different countries' political systems have undergone different kinds of political change, and so reflect different beliefs and values about how a country is to be governed. There are still, in the twenty-first century, a number of countries whose political system is an absolute monarchy, one in which there is no parliament or other governing body, and in which the king's or queen's word is law.

ACTIVITY

Identify one time in your country's history when there was a change in the political system. This change might be a dramatic one, such as the adoption of a constitution, or it might be a simpler one, such as a shift from a more conservative government to a more liberal one. Identify the events and values that led to that change in the political system.

CASE STUDY

Saudi Arabia

Saudi Arabia is an absolute monarchy. During the twentieth century, there was considerable talk about moving the country toward a constitutional monarchy, and several documents were drafted over the years which could have formed the basis for such an arrangement. However, none of these plans came to anything, and the current monarch, Crown Prince Mohammed bin Salman (commonly known as MBS) has firmly denounced any such plans. Saudi Arabian Abdullah Alaoudh, writing for *The Washington Post* in July 2018, had this to say:

> The change of mind-set with MBS toward embracing eternal absolute power marks a dramatic shift from past democratic promises that offered some hope for the future, even though none of them were ever fulfilled. The new Saudi administration has gained positive press for its futuristic rhetoric, including talk of a robotically manned city, and for allowing women to drive. But make no mistake: We are witnessing a return to Saudi Arabia's past. In abandoning the promise of democracy, the crown prince may actually be on his way to making Saudi Arabia more medieval than ever. (Alaoudh)

The history of the politics of Saudi Arabia reveals the fact that when a nation has a leader with absolute power, it requires the cooperation, and possibly the active leadership of that monarch, to move the country toward something more democratic, regardless of what the political beliefs of the people of that society may be.

History is full of examples, however, of people rising up in revolution to overthrow an absolute ruler who refused to make any such changes. The American Revolution which began in 1776 is one such example and resulted in a new nation being formed when the 13 British colonies broke away from the rule of King George III of England. The French Revolution of 1789 removed the monarchy in that country, and in 1917, the Bolshevik Revolution removed the Emperor of Russia from power and ultimately established, in its place, the Union of Soviet Socialist Republics – the USSR (The Learning Network). The USSR, in turn, fell in the late twentieth century when President Mikhail Gorbechev instituted a series of reforms during his time as leader of the Soviet Union. Each one of these revolutions arose out of changing beliefs and values.

Knowledge about the history of politics is made by historians, using the methods of history, which you will read about in Chapter 11.

IA prompt

33 How is current knowledge shaped by its historical development?

Political facts and laws

Politics has a close relationship to the legal system in any government, because the decisions that politicians make are disseminated to the public in the form of laws. Laws are, of course, creations particular to a given society, and they are the formal statements of what people living in that society can and cannot do. One way to think about the laws of the country, then, is that they are the knowledge claims about what is politically acceptable in the country as a whole.

In general, federal laws (those passed by a country's national government) apply to all places and all citizens of that country. Smaller governmental entities, such as states or provinces, also pass laws, but those laws may not contradict any federal law. Many issues, however, are not addressed by federal law, and so there may be actions which are legal in some places within a given country, but which are not legal in others. In the United States for instance, the age at which it is legal to marry without parental consent is set by the individual states. In almost all states, the age is 18. However, in two states, people must be older: in Nebraska, you must be 19 to marry without parental consent, and in Mississippi, you must be 21 (Free Advice Staff). As with federal laws, state or provincial and local laws are, in effect, knowledge claims about the political decisions of that geographical area. So how is this knowledge made?

Laws are initially written by people, and they can be changed by people, using the processes allowed in that particular society. In December 2017, for instance, 245 laws were formally repealed by two acts of the Indian Parliament. Among the laws which were repealed was one which regulated hackney carriages, vehicles which were in common use in the nineteenth century (PTI).

An Indian hackney carriage

The repeal of this law doesn't have much significance in terms of day-to-day life in India, as no one uses hackney carriages anymore. Another law which was repealed in these acts, however, has more interesting ramifications. The bill repealed the 'Dramatic Performance Act' of 1876, which outlawed theatrical performances because they were being used as protests against British rule (PTI). Since theatrical performances are certainly being given in India in the twenty-first century, some or all of these performances may be technically in violation of the law. Formally repealing the law means that no one can try to challenge a theatrical performance they don't like using that 1876 law as the basis for the suit. The process in this case was the normal process for passing laws in the Indian Parliament. This process is typical of countries in which there is a representative government.

In the case of governments with absolute monarchies or dictatorships, the process of knowledge-making is quite different. In those cases, the leader determines what is to be permissible and what is not, and their decree is sufficient to establish law. The common term for 'laws' in these nations is 'edict'. There are no procedures for repealing edicts. In North Korea, for example, an edict was issued in 1972 which is called the 'Three Generations of Punishment' rule. Under this edict, if a person is convicted of a crime which results in his being sent to a prison camp, his entire family and all members of the next two generations can be sent to the prison camp as well (Wright and Urban). As of 2017, this rule was still in place.

The laws and edicts of any country function as the embodiment of beliefs about what is right and what is wrong and about how things should be. This fact accounts for the controversy that often surrounds the proposal and passage of laws. Consider, for example, the emotional debate over gun control laws, particularly in the United States. The fight stems from disagreements such as whether it is right for individuals to be able to own even military-grade weaponry, as well as being about what kind of society should exist.

One very familiar role that the legal system of a government plays at any level is to determine (ie, to make knowledge of) whether or not a person has broken a law. How this process works differs somewhat from country to country, but it generally involves lawyers, witnesses, evidence, a judge and, often, a jury. The decision is very often communally made.

Another very significant function of the legal system, however, is to hear challenges to laws which someone or some people feel violate the higher law of the constitution of the state, province or nation. As we saw, in the case of dictatorships or absolute monarchies, there is no process for launching this sort of appeal. In other countries, however, where the governmental structure includes a system of checks and balances, courts do take up the question of whether some laws are legal according to the higher authority, and ought, therefore to be allowed to stand, or whether those laws violate the constitution, and must therefore be struck down. Knowledge of whether a law is fair or not, in other words, lies with the court system in many instances.

Sometimes the process of challenging a law on legal grounds can be quite tricky for the courts, because situations and facts that did not exist previously now require new thinking about the implications of the constitution. In the United States, for example, a group of young people filed a suit in 2015 to require the government to combat human-caused climate change on the grounds that such change violates young people's 'constitutional right to a clean environment'. By early 2019, the courts had been denying government challenges requesting that the suit be dropped, but in June 2019, a new challenge from the government claimed that there is no constitutional right to a stable environment and that the lawsuit brought by the young people is an effort to get around the separation of powers that is a fundamental aspect of US government. The latest challenge claims that the students are asking the courts to take on the job which normally belongs to the legislature by asking it to make new law (Dennis).

This particular case gives us a very interesting example of trying to make knowledge in politics, because the fundamental question in this latest challenge is about where the line is between applying existing law to new facts and creating new law. In the US, it is not the job of the courts to make new law. It is the job of the courts to perform the check of new situations against existing law. In this example, the government is claiming that the student suit requires new law to be made, while the lawyer for the students says, specifically, 'We're asking the court to apply bedrock constitutional law and principles to a wholly new set of facts' (Dennis). The first question which needs to be decided is who actually has the right to make the knowledge needed in this instance: the legislature or the courts.

ACTIVITY

1. Working with several of your classmates, each of you choose a country and do some research about how laws are made in that country and then compare notes.
2. Remember that the process of making laws is a process of making knowledge, since the resulting laws are knowledge claims. How do these processes shape the kind of knowledge that is possible in each country?

DEEPER THINKING

The foundations of present-day law making

Notice that the entire system of making, testing and repealing laws rests on the honesty and integrity of those responsible for applying the procedures. The constitution, or other underlying document of any country, was written, at some point in history, by people who committed to trying to establish the guidelines by which all future decisions would be made. The constitution was then ratified, or approved, by some significant portion of the people who were alive at that time. A constitution is, therefore, an agreement made by specific people and by which all ensuing people have agreed to abide, unless formal amendment is made to it. All laws written and tested since the adoption of a constitution are required to comply with the constitution, and the legal system is the means by which the constitutionality of any given law can be tested.

We depend, in a very fundamental way, on politicians, lawyers and judges to act in accordance with their vows to uphold the constitution or other foundational document. The power, in other words, of a constitution to express what we know about what can and cannot be done in any given nation, depends on people abiding by it. If people in the present day simply decide that they are not going to operate within the rules as set out in a constitution, and if the people who are responsible for legal decisions decide that they are not going to hold others to the rules as set out in the constitution, a constitution has no power at all. Since we must put great faith in those we choose to represent us, we might argue that all individuals have a responsibility both to educate themselves about the people who would represent them and to participate in the electoral process of choosing those representatives.

How politicians make knowledge about the problems that must be addressed

Professional politicians require a great deal of knowledge on a wide range of topics. Local politicians must know about the kinds of people who live in their constituencies, the problems that those people face, and which come under the scope of the politicians' work: education, health care, **infrastructure**, crime, water supply, management of sewage and garbage and so on. A database search for the bills under consideration in the first half of 2019 in just one state in the United States, Virginia, turned up 6085 bills (Virginia Legislative Information System).

◆ **Infrastructure**: Refers to the physical structures which people in a given city or country need in order to be able to carry out the regular business of their lives. This includes things such as bridges, roads, power supply and communication networks.

ACTIVITY

Do some research and find out how many bills have been considered by your local legislature so far this year. You can choose to investigate either for your city or town or for your state or province. If you cannot find the information on the internet, you can probably telephone your local legislator's office to find out how you can gain access to that information. Make a list of general topics that the politicians have been considering recently.

1. How many different bills have been considered?
2. How many different topics have come before the legislature for your local politicians to make decisions about?
3. How would you characterize the knowledge that your local politicians must have in order to perform their jobs well?
4. Which of the topics under consideration would you have sufficient knowledge about to be able to make responsible decisions for your community? How did you acquire that knowledge?
5. If you wanted to know more about the topics you don't have a lot of knowledge about, how would you go about learning what you need to know?

KNOWLEDGE QUESTION

Is being knowledgeable an important quality in a political leader?

Depending on their role, politicians who have responsibility over larger geographical regions need to have knowledge about all these topics for that larger region and many more. At national levels, politicians have to be concerned about the need for such larger issues as military services, diplomacy with other nations, immigration policy, global warming and human rights. They may have to concern themselves with problems faced by other countries, because those problems have consequences which affect the home country. Peace in the Middle East, for instance, becomes a significant issue for many other nations in the world, because if the severely troubled relationship between Israel and Palestine cannot be resolved, many other nations may find themselves ultimately drawn into, or at least significantly concerned with the dangers of, a war between those two groups.

Just as worldwide concerns can expand to draw in individual nations who would not appear to be immediately affected by them, national and international concerns can become significant local problems as well. In nations where immigration has come to be a vital national concern, places in those nations in which immigrants settle must deal with immigration questions locally, such as how to provide for the education and health care of immigrants. If there is a large body of illegal immigrants in a city, state or province, how will that locality address that issue? Will the local authority offer the immigrants asylum in their area? What are the effects on the economy of a number of immigrants settling in a particular place? Similarly, in localities in which the effects of global warming are likely to be extensive or even catastrophic, politicians in those localities must learn about the issue and must involve themselves in trying to solve the problem.

In addition to needing to know facts about all these various topics, politicians at all levels must have a set of coherent political beliefs (more on this in the Ethics section below), upon which they can base their decisions. All of this knowledge is ultimately made by each individual. The methods that they use are the same methods that you, or any other individual, can use to make political knowledge, and we will investigate these in the next section.

KNOWLEDGE QUESTIONS

With regards to politics, do we know as much as we think we know?

Why do facts sometimes not change our minds?

How individual knowers make knowledge about politics

As we have seen from previous chapters, much of what we learn is learned directly from other people. We listen to what people have to say, and we believe what we hear, particularly when the people who are telling us things are people we know well and trust – parents, teachers, peers and people in authority, such as news broadcasters and politicians. We gain much of our political knowledge in this way.

CONNECTION TO THE CORE THEME

The formation of a general political stance

Earlier in this chapter, we learned that we form our political beliefs based on more fundamental beliefs about what things matter in a human life. Some of those deeper values, as Jonathan Haidt has shown (see page 227) are caring, loyalty, authority, fairness and sanctity. You can imagine other important values such as safety and economic security which might form the basis for your personal definition of the things that are required for a successful and happy life. You are going to develop your personal values – your personal beliefs about which of these you care about and which you care about the most – from your life experience. You will be influenced by family, friends, religion and culture. Initially, you will likely accept the viewpoints of those people you respect without questioning them.

As you live your own life, however, you may find that your initial views are solidified by your personal experience interacting with the world, or that your views may change, and that your beliefs may eventually differ in greater or lesser degree from those of your parents. You may have experiences that they did not have. Perhaps you go to school with many people from different countries, and you, therefore, have experience seeing the world from different perspectives. Perhaps you get a summer job working for a company which is dedicated to cleaning up beaches in your area, and you learn to develop an appreciation for preserving the environment, while your friends, who worked in the city, did not necessarily develop the same perspective. As you meet people you respect, your beliefs are likely to be influenced by their beliefs. If people you respect let you down in some way, you may come to question the attitudes that they hold and which you formerly accepted without question.

All of your experiences together help shape your basic values. These values in turn form your worldview, your understanding of what it means to be human and what it means to have a good and successful life. That worldview shapes your knowledge in all areas of your experience. Since politics are a direct expression of what we believe is the right way for people to live together, our political beliefs are necessarily a direct expression of our worldview.

Professional politicians develop their general political stance the same way that you develop yours: based on their personal experience throughout their lives.

ACTIVITY

Use the QR code to visit the website for the Political Compass. You can take a survey on that site, and it will produce for you a profile of your political views based on your answers to a number of questions. After you take the survey, answer these questions:

1. Do you think that the questions you were asked were relevant to revealing your political views?
2. Do you agree with the result of the analysis of your answers? Why or why not?
3. Do you think that categorizing people's political views in this way is useful? Why or why not?

IA prompt

6 How does the way that we organize or classify knowledge affect what we know?

Developing knowledge about current political events

Political scientists

Political scientists study the nature of political systems at all levels from the local to the national and international. They study all different types of political systems – monarchical, totalitarian, democratic, theocratic and so on. Political scientists also study political theory, examining the basis for the political beliefs that people hold as well as the historical trends that lead to a country's having a particular sort of government. The history of political thought includes the study of theory dating back to Aristotle and Plato, so you can see that the nature and mechanisms of politics has been a human concern for many centuries.

After university, political scientists work in a variety of careers related to politics, including serving as policy analysts, legislative assistants, consultants working on political campaigns and so on. Some political scientists work on administering polls to gather information about people's political beliefs and concerns as well as on analysing the data gathered in these polls. Results of the polls – knowledge of public opinion – can be used by politicians to shape their policies and it can be used by news media to convey to the public information about how a campaign is progressing.

KNOWLEDGE QUESTION

To what extent can polls provide reliable knowledge and accurate predictions?

Individual citizens

People who live in societies with governmental systems that require the participation of the citizenry need to keep themselves informed about current political events so that they can make good decisions when they vote. Voters need to be aware of which political issues play a central role at any given time, and they need to know what is involved in those issues. In some communities, for example, immigration might be of concern. In others, the need to improve education might be of pressing importance, while in still others, the problem of ensuring that all community members have clean water might be the most important issue of the day. Of course, all communities will have multiple needs, and decisions about which politicians to vote for will be based on those politicians' stances on multiple issues.

In order to find out what politicians intend to do, once in office, about the various problems that concern a community, individuals need to educate themselves. Often communities will provide for formal means by which that education can take place: groups or organizations will arrange forums in which politicians can answer questions from members of the public or engage in debates. Politicians have organizations working on their behalf which will publish formal statements of policy. In the present day, these policy platforms are often published on the internet. People who desire to learn more about any given politician's policies can seek out that information on those websites.

A lot of political knowledge-making, however, takes place in less formal ways. In most places, the news media is the primary source of information about current political events. News media in the twenty-first century takes myriad forms: newspapers, radio and television are still active sources of political news. There are also many websites which are dedicated to producing commentary on political topics. Some of these are written by political experts – people who have studied politics formally. Some are written by statisticians – political scientists who work with polls. Other websites publish politicians' voting records. Use the QR codes in the margin to look at some examples from the UK, the US and Canada.

Some sites track the votes of individual politicians and some track the votes of individual bills. There are many others besides the ones we have offered here; if you want to know more about how politicians vote in your country, you should have no trouble finding many online resources.

However, social media increasingly has become a forum in which people exchange ideas about politics. Twitter and Facebook have been popular forums in the past few years on which people post their personal political views. Politicians, too, have taken to posting on social media, which has the power to reach many people in a very short amount of time.

People who are interested in learning about contemporary political issues, therefore, have many resources at their disposal in order to be able to do so. The problem is that these social media platforms are available for people to post to with little or no restraint. This means that not only can people post whatever they want (which may be true or not), but they can also do so while hiding their true selves behind a fake identity. The reader of the posts has no way of determining whether the person posting the message has an ulterior motive. You saw, in Chapter 3, how algorithms are used to determine what appears on your Facebook and Twitter feeds, which results in people having little or no exposure to ideas other than those they already have. If you have a particular political belief, then, and you post a few things that express that belief, the technology will begin funnelling your way other posts which are like the ones you posted. Included in those posts are likely to be some statements which are not true – either because the person posting them didn't bother to check and passed on what they just assumed was accurate – or because the person posting them deliberately lied. If you do not check the accuracy of the posts that you read, you will likely begin believing things which are not true.

Political knowledge and technology

One problem for people trying to make political knowledge by using what they read on the internet is that our modern technology has outstripped evolution. We have evolved, as a species, to depend on each other.

Humans' biggest advantage over other species is our ability to cooperate. Cooperation is difficult to establish and almost as difficult to sustain. For any individual, **freeloading** is always the best course of action. Reason developed not to enable us to solve abstract, logical problems or even to help us draw conclusions from unfamiliar data; rather, it developed to resolve the problems posed by living in collaborative groups (Kolbert).

In other words, we couldn't have survived as individuals living alone among wild animals and the many other dangerous forces of nature half a million years ago, so we developed into a species which cooperates with each other. Once we depend on cooperation, then we have a system in which some people are responsible for some knowledge and other people are responsible for different knowledge. We survive when everyone delivers the necessary knowledge at the right moment.

Modern society absolutely depends on our being able to believe much of what we are told, and to believe that other people, who have jobs that create things we use – like cars, bridges, cell phones, computers, hot water heaters, refrigerators and so on – know what they are doing, even though we don't know or understand what that is. You probably know how to operate your computer. You can boot it up, run programs, write papers. Maybe you can create spreadsheets. You can access the internet to do research. Most students, however, have no idea how the computer actually works. They cannot program it, and they cannot explain why, when they push 'send' on an email message, the message actually shows up on someone else's computer, no matter how far away that person is physically located. (Try it. Can you explain how that works?) Both historically and in terms of our personal, individual experience, we have learned to count on other people.

The problem for knowledge and the internet, and especially for social media, however, is that we are no longer dealing just with experts. If someone who is not an expert in building a computer tries to build one, and someone else who is not an expert in programming that computer tries to program it, it simply will not work. We are not, therefore, in any real danger of being misled by the lack of expertise. If someone who is not an expert in politics – or any other subject – posts a claim on the internet, however, it looks just like a post by an expert would look. Finding out whether posts on social media are like broken computers requires a completely different kind of mental work from what we have been used to, and most of us have not been alerted to the need for the work, nor have we been given the tools to do that work. Thus, people who have been used to trusting what they hear, go right on trusting it, and false information spreads rapidly on the internet.

ACTIVITY

Evaluate your own personal use of social media.

1. Which platforms do you rely on the most?
2. Are there people whose posts you just believe without checking their validity?
3. Why are those people trustworthy?
4. Have you seen a post on social media that was clearly untrue? How often does this happen?
5. How often do you take steps to find out whether what you are seeing online is true? What steps do you take?

In recent years, another problem has arisen, particularly with regard to political 'information' on social media: bots. Bots are automated programs that run on the internet and they can act like people. They can post things to Facebook accounts, for example, and they can be programmed to post whatever the person who programs them wants. They are, therefore, a particularly powerful tool for manipulating people with false information.

◆ **Freeloading:** People who are freeloaders are those who take advantage of other people's work so they don't have to work themselves. They get benefit for 'free' and they are themselves a 'load' on others around them.

IA prompt

24 How might the context in which knowledge is presented influence whether it is accepted or rejected?

CAS links

You could organize a survey of classmates or a school-wide survey to collect information about how much students rely on social media and how often they check the validity of the information that they see online. You could then organize an event at which you share the findings and provide the audience with some tools for how to make better judgments about claims which have been posted online generally and on social media in particular.

Bots were unleashed on consumers in the United States through Twitter and Facebook during the 2016 election to spread false information, in an effort, apparently, to influence the election. Studies have been ongoing in an effort to try to figure out just how much false information was spread and whether it did actually have an impact on the outcome of the election. The extent of the problem is still not known, but in early 2018, Twitter admitted that more than 50 000 Russian-linked accounts were used to post automated material to Twitter (Swaine).

KNOWLEDGE QUESTION

What impact has social media had on how we acquire and share political knowledge?

CONCEPT CONNECTION

Power

We can see from this situation that technology gives unscrupulous people power to persuade people who are unaware of the ways in which technology can be manipulated, especially because of the human tendency to believe what we hear. Anyone who tries to learn about politicians and politics from social media, and who does not take the extra step of checking what they read against other sources to see if they support each other, runs the risk of being manipulated by someone who has a particular interest in one certain outcome. The same is true of anyone who doesn't analyse what they read carefully and thoughtfully in order to determine whether it is plausible and logical. The people using the technology in such an unscrupulous way wield it to gain power over others, and they don't care whether that outcome is good for the readers of those posts or not.

Consumers can take the power back, but they have to do it consciously, by taking the extra step of checking the accuracy of what they read. This is one of the important aims of Theory of Knowledge: to arm you with the tools to do that so that you have the power of your own opinions, and you do not cede it to someone else.

ACTIVITY

Choose a politician in your community, state, province or country. Work with some classmates to locate some good resources for finding out what politicians claim and what they actually do. Use the QR code to see one example of many.

Many politicians also have an individual webpage on which they publish their platform and beliefs. Look up the policy claims that that politician made when they were running for election. Compare those claims with the actual voting record of that politician. Do their actions reflect the early promises?

We have been looking at ways in which individuals can try to educate themselves about contemporary political issues. For a more extensive and more formal understanding of politics, however, students at university can make political science the subject for their degree.

Problems of knowledge in politics

The methods of making knowledge in politics are similar to the methods of human scientists, which you will study in more detail in Chapter 10. When the person making knowledge is a political scientist administering a poll, for example, they are functioning as a human scientist. When the person is not a trained political scientist, but is, rather, a person such as yourself, a member of a society who simply wants to know more about the politics of the region and the day, the methods are much less formal. Both methods, however, pose significant problems for trying to develop certain knowledge.

You will learn more about the problems of the methodology of the human sciences in Chapter 10; however, we will look at one example here in order to demonstrate the kind of difficulty that political scientists face in trying to make knowledge.

Polling

Polling is an important means of collecting information about people's political beliefs and priorities. Ideally, when a poll is administered, the people who respond to it are a perfect representation of the whole range of people in the society in which they live, in terms of race, age, gender, economic status, profession and so on.

Statisticians can determine how many people are needed for a poll to be considered representative of the larger community. Ideally too, the questions used in the poll are constructed carefully so that they are perfectly unbiased and do not lead people to provide particular answers. The accuracy of the polling results depend on the statistical reliability, but they also depend on whether or not the people responding to the poll have told the truth.

In the United States, the polling leading to the 2016 presidential election was notoriously misleading. Virtually all the polling before election day showed with a high degree of certainty that Hillary Clinton would win, but, of course, she did not. No one knows for certain why the polling was so far off; however, the Pew Research Center, a non-partisan 'fact tank' that develops and provides information on a variety of public issues, has suggested a number of possible reasons for the fact that the polls failed to give the public an accurate picture of people's opinions. These include (Mercer, *et al*):

- 'Nonresponse bias': the failure of certain kinds of people to respond to polls. In the case of the 2016 presidential race, people may not have wanted to admit to supporting a man who was seen by so many people as being anti-social.
- Dishonesty on the part of people responding to the polls.
- Problems identifying 'likely voters' – the polls try to target people who will actually vote, and problems in the models of how to identify those people might have slanted the results.

The problem of inaccurate polls has not been limited to the United States. Polls also failed to accurately predict the outcome of the British general election in 2015 (Mercer, *et al*). Pollsters are aware of the significant problems that can arise from the false representation of people's attitudes during elections, since the polling can, itself, cause people to decide that there is no need to vote (if they think that their candidate is 'safely ahead' or 'impossibly behind). The Pew Research Center has this to say on the matter:

> Pollsters are well aware that the profession faces serious challenges that this election has only served to highlight. But this is also a time of extensive experimentation and innovation in the field. The role of polling in a democracy goes far beyond simply predicting the horse race. At its best, polling provides an equal voice to everyone and helps to give expression to the public's needs and wants in ways that elections may be too blunt to do. That is why restoring polling's credibility is so important, and why we are committed to helping in the effort to do so. (Mercer, *et al*)

IA prompt

10 What challenges are raised by the dissemination and/or communication of knowledge?

Lying politicians

Whether or not people are telling the truth is a question which poses another problem for anyone trying to learn about the beliefs and attitudes of politicians. Politicians themselves do not necessarily tell the truth. Sometimes the desire to win a seat or to keep a seat drives politicians and their campaigns to say what they think their followers want to hear, or to dodge questions with vague answers, rather than to take the risk of telling an unpleasant truth and alienating their would-be supporters. Non-partisan organizations have been created in order to keep track of the accuracy of the statements that various politicians make.

In Canada, one such organization is FactsCan. You can scan the QR code to visit their webpage to see the latest facts they have been checking.

In the US, the main fact-checking organization is PolitiFact. Scan the top QR code on the right to visit their site.

In Britain, FullFact, whose website can be seen by scanning the second QR code, is a non-partisan fact-checking charity.

The kinds of falsehoods we have seen in recent years have taken a variety of forms. One problem is that politicians sometimes say different things to different audiences. President Donald Trump, for example, regularly changes his claims about global warming. In 2012, Mr Trump famously tweeted that global warming is a hoax created by the Chinese. You can read his tweet by scanning the third QR code on the right.

Once he became president, however, his story tended to change. On some occasions, particularly when addressing his 'base' – his strongest supporters – he claims that there is no such thing as global warning, or even claims that we need more global warming. In December 2018, he tweeted, 'Perhaps we could use a little bit of that good old Global Warming that our Country, but not other countries, was going to pay TRILLIONS OF DOLLARS to protect against'. In other situations, while speaking to people who accept the fact that science has definitively tied global climate change to human activity, Mr Trump changes his claims. In an interview with the *New York Times* in 2016, Trump said that he did believe there was some relationship between human activity and climate change (Meyer).

This kind of misrepresentation of facts is not, of course, limited to US politics. In the run up to the Brexit vote in 2016, a now-notorious advertisement was painted on the side of a bus:

The Brexit bus

The figure of £350 million was, according to Full Fact, misleading, as was the implication that leaving the European Union would essentially give Britain control over that money to spend as it wished.

> £350 million is roughly what we would send to the EU budget if it wasn't for the UK's budget rebate. The rebate is effectively a discount on what we would otherwise be liable for. This rebate was negotiated by Margaret Thatcher in 1984 and the way it is calculated can't be changed in future without the UK's agreement. (Full Fact)

As late as 2018, Boris Johnson, then Foreign Secretary, claimed that the number was actually much higher, and that it would rise as high as £438 million a week ('£350m Brexit claim was "too low"' – BBC News). The promotion of misleading information in this case was seen by some as being so damaging that Mr Johnson was deserving of legal punishment, and in May of 2019, an attempt was made to prosecute him for misusing his office. The suit was thrown out of court, however. The incident does, nevertheless, indicate the importance of accurate political knowledge and the wide-ranging effects of having bad information.

IA prompt

4 On what grounds might we doubt a claim?

Fake news

The examples we have been looking at are instances of what has come to be known as 'fake news'. In both of these cases, the claims being made were actually false. In other cases, however, real claims have been labelled as 'fake news' by people who don't like the claims and wish to convince others to ignore them. For the purposes of Theory of Knowledge, the fact that the term 'fake news' has arisen makes the important point that enough false information is now being spread through various news media to require the development of a term to name the phenomenon. If you are trying to develop your knowledge of politics, you must be alert to the fact that some of what you are getting is, indeed, fake news, and you must develop strategies for trying to tell the difference between fake news and real news.

IA prompt

23 How important are material tools in the production or acquisition of knowledge?

Confirmation bias

The problem of the existence of fake news is further aggravated by the problem of confirmation bias, which is the tendency we have to listen to and believe reports that back up what we already believe to be true, rather than being open to having our minds changed. This tendency, in fact, contributes to the problem of fake news, because if the fake report tells us what we already believe or want to believe, we are very unlikely to check the facts. Even if the facts are given to us, it is easier to discount the facts than to change our minds.

Many studies have demonstrated how difficult it is to get people to change their minds, and one explanation for this fact is that we have evolved to live in communities. Living and working in communities means that we rely on each other to get things done: *I* don't have to know how my computer works, because *you* designed it and *someone else* built it. I have learned to trust you and the others who built the computer – or my car or the roads or the airplane in which I took my trip to Madagascar last summer. I have become used to relying on the knowledge of others.

This kind of trust, however, becomes a problem when it comes to dealing with politics, social media and fake news. Cognitive scientists Steven Sloman, at Brown University, and Philip Fernbach, at the University of Colorado, have described the problem:

> 'This is how a community of knowledge can become dangerous', Sloman and Fernbach observe … In a study conducted in 2012, they asked people for their stance on questions like: Should there be a single-payer health-care system? Or merit-based pay for teachers? Participants were asked to rate their positions depending on how strongly they agreed or disagreed with the proposals. Next, they were instructed

> to explain, in as much detail as they could, the impacts of implementing each one. Most people at this point ran into trouble. Asked once again to rate their views, they ratcheted down the intensity, so that they either agreed or disagreed less vehemently.
>
> Sloman and Fernbach see in this result a little candle for a dark world. If we – or our friends or the pundits on CNN – spent less time pontificating and more trying to work through the implications of policy proposals, we'd realize how clueless we are and moderate our views. This, they write, 'may be the only form of thinking that will shatter the illusion of explanatory depth and change people's attitudes'. (Kolbert)

Consider the following scenario: If I trust you when you tell me that global warming is not a real problem, and your knowledge of global warming is not well-founded, then my opinion of global warming is now also not well-founded. If I tell my friend that global warming is not a problem, and my friend believes me, then my friend's opinion is also not well-founded. Thus, badly formed political opinions can spread rapidly. No one checked the facts, because everyone trusted their source. Actual facts, if they are subsequently presented, don't carry any weight, because if I were to believe the facts, I would have to accept that my friend didn't tell me the truth.

We have seen that humans are genetically engineered to cooperate and to trust the knowledge of others. We have not developed a capacity to reason that works against our deeply ingrained trust of the people we depend upon to make our lives run smoothly.

If you want to ensure that your political knowledge is accurate, you will have to take conscious and conscientious steps to check the claims that are made to you.

IA prompt

12 Is bias inevitable in the production of knowledge?

Ethics

In the section about Jonathan Haidt's work earlier (page 227) we saw that political knowledge is, essentially, ethical knowledge. Politics is about making choices about what the right way to govern a country is, and about which rules are good rules for people to live by in order to get along together. Differing political beliefs arise from differing moral and ethical values. The belief that people ought to be rewarded when they *earn* rewards and punished when they have done wrong is a belief that is very widespread, if not virtually universal. The question of *when* someone has done something to earn a reward and *when* someone has done something that deserves to be punished is a more difficult question, the answer to which becomes the basis for a certain kind of political decision.

KNOWLEDGE QUESTION

Can knowledge be divorced from the values embedded in the process of creating it?

Some people might believe that those who do not have jobs have failed to do their part in preparing themselves for the workplace, and, therefore, they might believe that those people do not deserve any help from the government. The political belief that the government ought not to provide extensive services to the poor in the form of assistance for housing, food and health care, rests in the ethical belief that the poor did not do what they should have done to take care of themselves, and are not, therefore, deserving of rewards they did not earn.

Others might believe, however, that the poor did not simply fail to take care of themselves out of a failure of character, but that many poor people are poor because they lacked the opportunities that others had to prepare themselves to take care of themselves and their families. The belief that government ought to provide assistance in the form of housing, food and health care arises from the ethical belief that everyone deserves the chance to help themselves and that where opportunity was not fair, the role of a government is to help to balance the scales.

Virtually all political beliefs can be traced back to this kind of ethical belief. Table 7.1, on the next page, provides some examples.

Table 7.1 Justifications which can be used to support different ethical stances

Belief	Ethical justification
Taxes are too high	• All people ought to be able to keep what they earned • It is wrong for government to take my money in order to help people I don't know • It is wrong for government to take my money to pay for services I cannot use
Taxes ought to be raised	• We live in a community together, so we are obligated to help others in the community, even if we have to pay for services I cannot use myself
Military spending is too low	• The safety of our country and all its citizens is the most important service a government can provide
Military spending is too high	• War is essentially wrong, and governments ought not to contribute to a culture of war-like aggression
The government should be helping to protect the environment	• The role of humans in the Universe ought not to be destructive • We should be helping to preserve the Earth for future generations • We should be helping to preserve the Earth for its own sake
The government ought not to spend money to preserve the environment	• The Earth is here for the use of human beings • The government ought not to be making decisions for individuals and businesses which ultimately affect the amount of income that those people and companies can earn

CONCEPT CONNECTION

Justification

All knowledge must be justified. In fields such as politics, where we are seldom able to make knowledge claims which we can confidently assert are 'certain', the justification takes on a particular importance. Neither politicians nor individuals can expect to make political claims and have them just be believed on their face value. Those claims must be justified, and, as we saw in Chapter 1, an effective justification is one which convinces others. That in turn means that the justification is rational, balanced and based on accurate information. In TOK, then, when we evaluate the effectiveness of political claims, we will want to look for accuracy, balance and rationality.

IA prompt

19 What counts as a good justification for a claim?

ACTIVITY

Think of at least three political decisions that have been made in your country or in your state or local community recently.

1. Identify the ethical values which underlie those decisions. Did you agree with those decisions? If so, then do you share the ethical values that you just identified?
2. If you do not agree with those decisions, what are the differences in your ethical values which lead you to hold a different political belief?

We have seen that our political judgments are based on our values, and our values are reflections of what we believe is necessary for us to be able to maximize the quality of human life. Political judgments, in other words, are essentially ethical judgments. Politicians decide what is the right way for a society to function, and the decisions that politicians make draw from and contribute to the legal system of that society. The problem is made more difficult by the fact that neither ethics nor politics has a clear external basis against which we can make those judgments.

In many of the contexts in which we try to make knowledge, we have a solid basis for determining whether something is true or not. In the natural sciences, for example, we have nature itself: we are trying to describe nature as it is, independent of us. In history, we are trying to ascertain what actually happened in the past. In mathematics, we are trying to figure out implications of existing mathematics based on the inevitable character of numbers and other mathematical concepts and their relationships to each other. When it comes to ethical judgments, however, it is difficult to pinpoint the thing in which ethics are grounded – the thing that we can point to as the basis for all of our claims about what is right and what is wrong. That is why, historically, we have developed proposals for ethical systems, such as consequentialism, deontology and virtue ethics. You can read more about these three ethical theories by using the QR code to access an 'Introduction to Ethical Theory'.

KNOWLEDGE QUESTIONS

When exposed to numerous competing ideologies and explanations, what makes an individual settle on a particular framework?

Is there ever a neutral position from which to write about politics or from which to judge political opinions?

Even so, questions of what constitutes good and evil have to be negotiated among us. Some principles are widely agreed upon while others are subject to widespread disagreement. Since our political judgments are ethical judgments, then, we find ourselves in the same position: we are creating and negotiating the rules as we go along. What is politically correct, or good, is a matter of what we can agree upon. The methods section earlier detailed the means by which we try to come to those agreements. Essential to those methods is the use of reasoned justifications, based in evidence, in order to convince others to see things our way. In Theory of Knowledge, then, as you examine claims made about politics, you will be looking for patterns of consistency or contradiction in the ethical principles which underlie those political beliefs on the part of any one individual or group.

Ethics as the foundation for political knowledge

The 'Introduction to Ethical Theory' (linked to by the QR code on the right) examines several different systems for forming ethical principles, and shows that each one is problematic in its own way. Nevertheless, in trying to make political knowledge, we ideally try to hold beliefs which are part of a series of consistent ethical principles. It is not logical, for example, to claim that you value all human lives, and therefore you believe that it is politically wrong to allow abortions if, at the same time, you believe that it is politically correct for the government to support taking away health care services for people with mental illnesses. Believing that the government has an obligation to protect people who haven't been born yet is not consistent with believing that the government has no obligation to protect those who have been born, but who cannot take care of themselves for reasons which are no fault of their own.

KNOWLEDGE QUESTION

Are political judgments a type of moral judgment?

The 'Introduction to Ethical Theory' looks at systems of ethical principles based on consequentialism, deontology and virtue ethics. When trying to consider whether political beliefs are good ones or not, we can consider whether they are soundly based on the consistent application of one of these ethical principles. Let's consider belief 1 – that government should ban most or all abortions. Table 7.2 shows possible arguments for each position based on those three ethical principles.

Table 7.2 Political belief 1 viewed from three different systems of ethical principles

Political belief	Consequentialism: an act is ethical if it results in a good outcome	Deontology: an act is ethical if it follows a good rule, regardless of outcome	Virtue ethics: an act is ethical if the person's character is good
Government should limit access to abortion	Keeping unborn babies alive is a good outcome	The rule is that all human life is sacred and must be protected	A good person would protect those who need protecting

We can see from Table 7.2 that a person with this political belief could justify that belief based on any of the three types of ethical principles. Now we will examine political belief 2 and see if the same principles apply.

Table 7.3 Political belief 2 viewed from three different systems of ethical principles

Political belief	Consequentialism: an act is ethical if it results in a good outcome	Deontology: an act is ethical if it follows a good rule, regardless of outcome	Virtue ethics: an act is ethical if the person's character is good
Government should not provide aid to mentally ill people	Keeping taxes low so that people who earn their own money get to keep more of it is a good outcome	The rule is that government should not take money away from some people in order to give it to other people	A good person does not take money away from someone who earned it

We can see that political belief 2 can also be justified using any of the three types of ethical principles. However, the ethical principles for this second set of justifications is fundamentally different from the ethical principles offered in the first set of justifications in Table 7.2. The first set is based on an underlying principle that we ought to look out for others. All three of the principles are based in an attitude that it is good to help others. The second set (Table 7.3), however, is based on a completely opposite value, the belief that one should look after oneself first. There is no valuing in this second set of principles for helping others.

When we think of virtue ethics, the character traits that we generally consider to be virtuous are things such as charity, mercy, kindness, supportiveness, unselfishness, courageousness and trustworthiness, among others. Those virtues all require an underlying belief that good people help others, so the reasons given in Table 7.3 would seem to be essentially unvirtuous. We have tried to make the case that it is a virtue not to take away someone else's money, but when we're talking about members of a society paying taxes in order to help sustain the society for everyone, we are not talking about theft. It might be easier to argue that a good person is willing to contribute to the society in which they live, rather than to argue that a good person should not have to contribute to that society.

Even if we do accept that the idea that a good person doesn't take money away from someone who earned it, even for the purposes of maintaining a community, is a virtue, we are left with the problem that the two arguments above are not consistent. If the same person holds both political beliefs, they cannot justify them using a coherent system of ethical principles.

One difficulty, therefore, for individuals trying to form strong political beliefs, is the difficulty of being consistent. Another difficulty related to the ethical aspect of political beliefs applies to groups of people who hold differing political beliefs. This is because different people justify their positions based on different, and potentially irreconcilable, ethical principles. The fact that our political beliefs are tied to our ethical principles is one reason that politics can be quite contentious. We naturally have a very strong emotional attachment to our ethical beliefs. We do not easily abandon our beliefs about what is morally right and what is morally wrong.

Deliberate untruths

Finally, as we saw from the discussion about social media, technology and politics, some people – politicians and others – set out to deliberately mislead voters about what is true. This behaviour is clearly unethical, as it violates that underlying principle of knowledge-making that we learned about in the introduction to this book: we must make every effort to ensure that the knowledge claims we make are true. That doesn't mean that we expect politicians – and everyone who has an interest in spreading political knowledge – to be right at all times. It does, however, mean that we expect people to try to be right, and then we expect them to admit when they are wrong. In a 'fake news' world, where, apparently, some people have come to believe that they need not worry about telling the truth, individuals who want to know what is real must take it upon themselves to counter the unethical behaviour through careful checking of facts and denouncing whatever lies they encounter.

ACTIVITY

Choose a controversial issue, such as global warming. Do some research about what politicians in your community are saying about this issue. This is the knowledge that they are intending to disseminate to their constituents.

1 Do you think that politicians in your region are, in general, providing accurate information about this issue? How can you know?
2 Do you think politicians themselves have accurate knowledge? How can you know?
3 What kinds of forces work on politicians to cause them to provide misleading information to the public on this, or other political issues?
4 What can you, as an individual living in your society, do to ensure that your knowledge both of the issue and of what the politicians are doing about the issue is accurate?

IA prompt

7 What are the implications of having, or not having, knowledge?

Conclusion

Over the course of this chapter, we have seen how fundamental politics are to the smooth running of any society. We have also seen how important our politics are to us, being, as they are, based in our ethical principles. We have also seen how difficult it is to develop an accurate understanding of politics and political issues. Finally, we saw in the last section how difficult it is for us to change our beliefs and how easy it is to believe the first thing we hear and then to hang on to that belief.

CONCEPT CONNECTION

Responsibility

The decisions that politicians make affect people's lives – our own and others' – in very deep and significant ways. If we live in a society in which the participation of the populace contributes to the decision-making process (if only by the selection of representatives who will make the decisions), each one of us has a responsibility to do everything we can to make sure that our political knowledge is as accurate as we can make it. We also have a responsibility to keep an open mind and to be willing to change our opinions when the facts reveal that our opinions and beliefs are not well-founded. The responsibility arises from the fact that political knowledge has such wide-ranging and long-lasting effects on people's lives. The consequences are, well, extremely consequential, and any failure to take seriously the knowledge that determines the decisions which get made may result in people suffering.

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Areas of knowledge

8 Mathematics

OBJECTIVES

After reading this chapter, students will:

- understand the wide and varied scope and applications of mathematics
- recognize the differences between students of mathematics, pure mathematicians and applied mathematicians
- appreciate the different perspectives of those who believe that mathematics is invented and those who believe it is discovered
- understand the importance of the rigorous proof as a method for making mathematical knowledge
- recognize how some of the fundamental methods of mathematics are changing due to developing technologies
- appreciate the varied ways in which ethical values shape knowledge-making in mathematics.

Learner profile

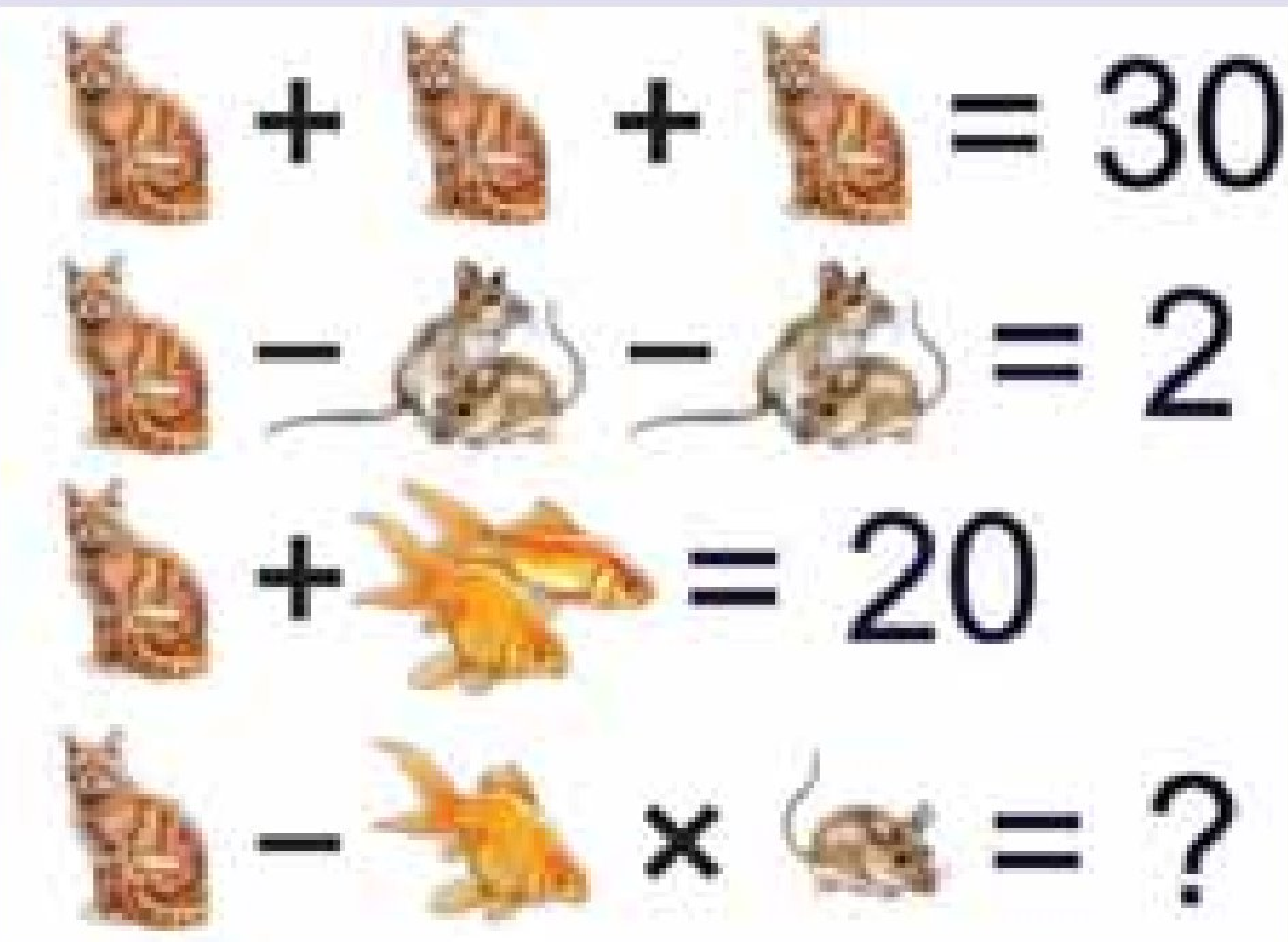
Thinkers

How do we use critical and creative thinking to solve mathematical problems and apply mathematical knowledge in the real world?

Introduction

ACTIVITY

What number should replace the question mark?



The activity above presents a rather strange mathematical problem. There are some very familiar elements of mathematics – the addition signs, equal signs and some numbers, for example, but there are also cats and fish and mice – not things we normally associate with mathematics problems. Still, you can probably solve this problem. Take a moment to do so, if you haven't already, before you read on to the next paragraph.

What answer did you get? Some possible answers are 10, 0 and –30. Some people might come up with other responses, depending upon how they approached the problem. In mathematics, however, there can be only one answer to a problem – or, at least, there must be one clearly defined set of answers to a problem (the square root of 4, for example, is either 2 or –2 because of the properties of multiplication). If we are to have more than one correct answer, it must be because of the properties of numbers, not because different procedures generate different answers.

Check your answer again, and, when you are confident that you have the correct response, rewrite the problem and the steps you used to solve it using regular mathematical language.

There is, in fact, one correct answer to this problem: 0. If you got a different answer, it may be because you neglected to notice that in the final statement there is only one fish and one mouse, whereas in the earlier statements, mice and fish were always presented in pairs. Each mouse, therefore, is worth 2, not 4, and each fish is worth 5, not 10. The other easily made mistake is to overlook the required order of operations: you must multiply first, before you add. The final statement can be correctly rewritten as:

$$10 - (5 \times 2) = 10 - 10 = 0$$

Possibly you have seen problems similar to this one circulating on the internet in recent years. They are very popular, perhaps because this relatively simple problem reveals at least two significant features of mathematics.

First, the problem reveals the inherently symbolic nature of mathematics as an endeavour. We have seen problems laid out in numbers, and often with some letters as well, as in an algebraic expression such as:

$$6a - 3b = 4$$

We have encountered word problems, such as this one:

> Imagine that two trains are approaching each other (on separate tracks), from stations 100 miles apart, and both leave at the same time, each heading for the other station. The train heading west is moving at 50 miles an hour, while the train heading east is moving at 60 miles an hour. How many minutes will pass before the two trains pass each other?

We don't, however, really expect to encounter maths problems with pictures of animals (or anything else) in them. Nevertheless, you had no difficulty converting those animals in your mind into numbers. Mathematics is – or has – a language, and, as we saw in Chapter 4, one feature of language is that it is symbolic. '10' is a symbol which results from the combining of the symbols '1' and '0', and which stands for a very particular quantity, but so, in this case, is a cat a symbol. The problem isn't about cats, it's about quantities which can be manipulated in mathematical statements. '10' doesn't have any presence in the real world; we have just learned how to read it. Once we understand the basic principle of addition, we have no trouble adding tens, and to swap in the cat for '10' is so simple as to be automatic. We see that there are three identical things that add up to 30, and the only possible meaning for each of those three things then, is 10. Cats, mice and fish are not part of the normal language of mathematics, but it's quite simple to replace numbers with pictures – much easier than swapping, say, Swahili words for English words, unless we are speakers of Swahili. We can easily read:

> ten plus ten plus ten equals thirty

but we cannot so easily read:

> kumi pamoja na kumi pamoja na kumi sawa na thelathini.

KNOWLEDGE QUESTION

Should mathematics be defined as a language?

KNOWLEDGE QUESTION

Do any other areas of knowledge have a language or function as a language in the way that mathematics does?

We probably can, however, figure out that:

kumi plus kumi plus kumi equals thelathini

means that 'kumi' is a number, three of which added together, equals another number, 'thelathini'. The recognizable mathematical language ('plus' and 'equals') directs us to understand whatever comes in between those mathematical signifiers must be a symbol for some number. If we know that all of these statements are identical:

- ten plus ten plus ten = thirty
- 10 + 10 + 10 = 30
-  +  +  = 30
- kumi plus kumi plus kumi equals thelathini

then we know that 'ten', '10', a picture of a cat and 'kumi' all stand for the same thing. The fact that so many different things can stand in for the quantity we call, in English, 'ten', reveals the fundamental nature of symbols: a symbol is not the thing itself. It stands for something, and once we agree on a system, then we can swap out the symbols quite easily.

This problem with cats and fish raises another quite interesting question about the nature of mathematics: why must we multiply first in the last statement? What's wrong with reading the statement left to right, as, in English, we read all other language-based texts? The answer to that question, of course, is that in mathematics, there is a rule which stipulates the order in which operations must be done in order to correctly solve a maths problem – regardless of where the operations appear in a mathematical statement. You probably learned to remember this rule using a **mnemonic**. You may have learned PEMDAS, BEMDAS or BODMAS, or maybe you learned the sentence 'Please excuse my dear aunt Sally', which works as a mnemonic because the first letter of each word spells out PEMDAS.

P (or B):	Parentheses (or Brackets)
E (or O):	Exponents (or Orders)
M/D:	Divide and Multiply
A/S:	Add and Subtract

The existence of this rule is quite revealing in terms of the nature of mathematics as an area of knowledge as opposed to other areas of knowledge. There is no reason for this order. It is arbitrary. The order does not represent any feature or process which occurs in the physical world; we have no external standard – no real standard – to tell us why we should work out anything in parentheses before we work out exponents, why we should work out exponents before multiplying or dividing, or why we should multiply and divide before adding and subtracting. PEMDAS (or BEMDAS) is a **convention**. The order of operations is the result of agreements that have arisen among mathematicians about how the notation of mathematical statements ought to work. The order of operations, in other words, is an invention, not the result of a discovery. We will explore the question of the order of operations later in the chapter when we consider the role of ethics in mathematics. For now, it is important for you

KNOWLEDGE QUESTION

How does the use of symbols in mathematics to convey meaning differ from the use of symbols in the arts to convey meaning? Are there similarities?

◆ **Mnemonic**: A word or phrase used as an aid to memory. Mnemonics are not limited to mathematics; you will find them in other areas of knowledge. A very common form of mnemonics is to use the first letters of words to form a new word or phrase.

◆ **Convention**: A procedure which is done because people have agreed to do it that way. Something which is conventional is something which is done the way people expect it to be done. Conventions, like mnemonics, are not individual to mathematics. The order of operations is a mathematical convention, but all the rules of grammar are also conventions. Conventions can change from situation to situation; the conventions of grammar are not the same, for example, in all languages.

to recognize that an important feature of mathematics is that much (or possibly all!) of it is invented, rather than discovered. In this way, mathematics is more like the arts than it is like natural science.

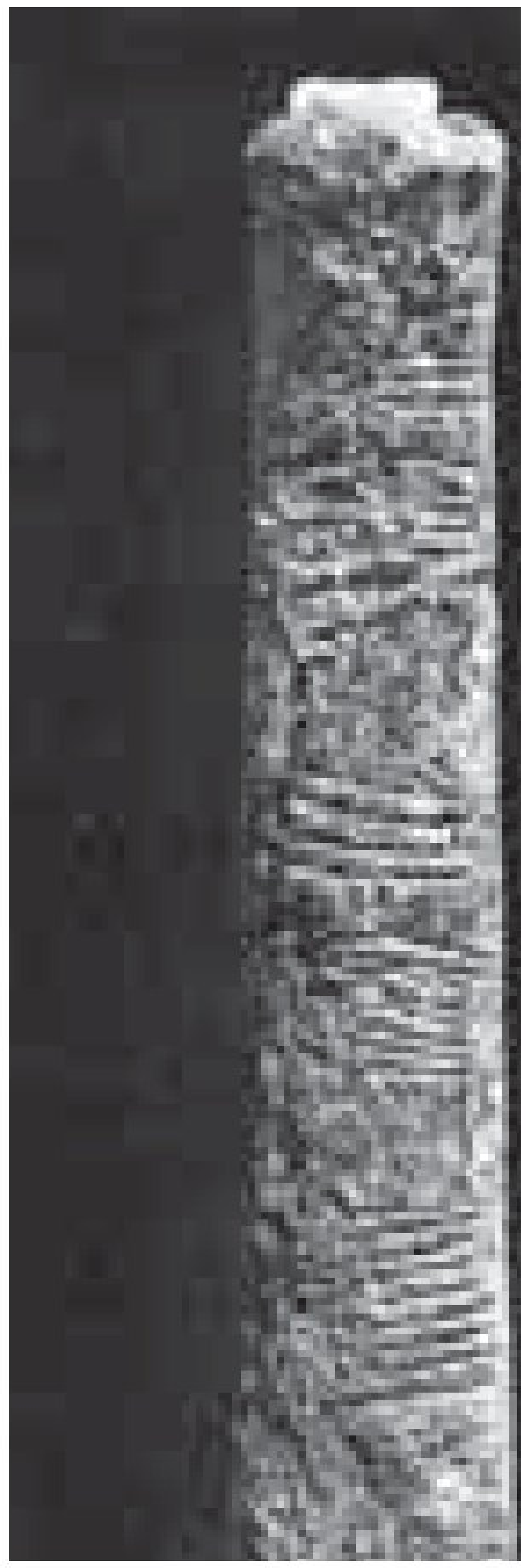
Scope

The origins of mathematics

So far, we have looked at two important characteristics of mathematics: its symbolic nature and its nature as something invented by humans. But what is it, exactly?

The first thing most people think of when they think of defining mathematics is that it is a system of numbers which we use for expressing ideas about quantity. We can easily expand that idea because those numbers – that language – can be used to express ideas about many other things: size, dimension, space, motion, properties of objects and so on. This is certainly an extremely important and useful function of mathematics. But mathematics is also, interestingly, the study of itself. Mathematicians spend a lot of time looking at existing mathematics and then working out the implications of that knowledge. The essential procedures can be thought of this way: if X is true, then what else must also be true? This basic question has brought us from the earliest known mathematical activity to today.

The oldest known mathematical object is the Lebombo Bone, a 35 000-year-old fibula of a baboon carved with 29 notches (Williams), which was discovered in the 1970s during an exploration of a cave in the Lebombo Mountains between Swaziland and South Africa (Gerdes). A similar object, the Ishango Bone, was discovered in the Democratic Republic of the Congo (then the Belgian Congo) in 1960 by Belgian explorer Jean de Heinzelin de Braucourt (originalpeople.org). Both of these bones have been identified as tally sticks – objects used in order to keep track of objects in the real world. The actual purpose is not known – some historians have suggested that the sticks are calendars, some specify lunar calendars, some think it was used in a mathematical game involving units of ten (Gerdes) and some think that the sticks have a more sophisticated mathematical purpose than simply counting (originalpeople.org).



The Ishango bone

CONCEPT CONNECTION

Evidence

These very early mathematical objects serve as evidence for the existence of mathematics as a human endeavour much earlier than the work of the mathematicians in ancient Greece. Historians and mathematicians have no way of knowing with a high degree of certainty what these objects were used for. They base their suggestions on the grouping of the notches into regular units and on the role of similar objects in other, later societies. Note that the evidence alone is not sufficient for knowledge; the evidence has been interpreted, and hypotheses have been developed and explained on the basis of the evidence. In Chapter 2, you learned about the coherence theory of truth (see page 45); the interpretation of these tally sticks as mathematical objects coheres with other known facts about mathematical objects from other places and times.

What are the advantages and disadvantages of these different systems of counting?

We can imagine how the development of basic mathematics evolved from the original starting place of tally sticks. It is pretty easy to count a small number of things by using notches in bones or sticks, but as the number gets higher, the job gets more difficult. So long as each notch stands for one object being counted, we can only usefully use a tally stick for small numbers of things – days in a month, or bushels of corn, perhaps. But if what we need to get is a very large quantity, we need a system which does not rely on a one-to-one correspondence between object and tally. We can see how a sign might have developed to indicate ten or a hundred. Still, very large numbers cannot easily be indicated with notches – what would 1 million look like, for example? Over time, a variety of systems arose for indicating quantity, including Roman numerals, Egyptian hieroglyphics and the abacus, among others.

KNOWLEDGE QUESTIONS

How significant have notable individuals been in shaping the nature and development of mathematics as an area of knowledge?

Is mathematical knowledge embedded in particular cultures or traditions?

The system that we are used to today arose in India in the sixth century ('Indian Numerals'), and consists of only ten numbers: 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. This system is capable of generating an infinite number of quantities, with the vast majority consisting of a very manageable number of digits. The development of zero came later than the development of the other symbols, and the system evolved over several hundred years as it was disseminated throughout the Arab world and, eventually, to Europe. If you are interested in a more detailed explanation of how the Hindu-Arabic system which we use today arose, use the QR code here on the right to watch a video lecture on the history of the system.

The Roman numerals system seems like a pretty simple number system using a relatively small number of symbols. In fact, there are even fewer symbols in Roman numerals than there are in the Hindu-Arabic system:

I	V	X	L	C	D	M
1	5	10	50	100	500	1000

To read and write Roman numerals, you need to remember a few rules:

- In order to write the numbers in between those that we have symbols for, you must indicate lower numbers by subtraction and higher numbers by addition. If you want to indicate nine, you show 10 – 1 = 9 or IX. If you want to show 54, then you have to show 50 + 5 – 1 = 54 or LIV.
- You can only use three of the same symbols in a row before you have to shift to the symbol with the next higher value. So, you can write XXX for 30 but not XXXX for 40. For 40, you write 50 – 10 or XL.

If you need a refresher on how to use Roman numerals, you can use the QR code here on the right to watch a video about how they work.

ACTIVITY

1 Try writing out this number in Roman numerals: 3682. Give it a try before you read on. How did you do? If you broke the number down into its parts, you might have come up with something like this:

MMM = 3000

D = 500

C = 100

L = 50

XXX = 30

II = 2

Add them all up, and you get MMMDCLXXXII.

To write 3682 in Roman numerals, then, requires 11 symbols, as opposed to the four we can do it with using the Hindu-Arabic system.

2 Imagine that the Roman numeral system had been the one which had taken hold and was disseminated worldwide for use in mathematical and scientific study. How might that system have changed what it was possible for us to learn?

KNOWLEDGE QUESTION

The language used to express mathematical concepts can be seen to constrain the pursuit of knowledge. Are there similar constraints in other areas of knowledge?

Studying the implications of existing mathematics

Once we have a number system, then, we can see that that system has inherent properties that we can discover. One implication of being able to generate numbers from a small set (remember the productivity property of language from Chapter 4, page 116) is that we can generate an unlimited number of numbers. All we have to do is add one to the current number. There is nothing either in the real Universe or in the invented system of numbers to stop us doing that indefinitely, and so the concept of infinity is developed. Infinity, in other words, is an implication of the nature of integers. Another implication of the nature of the integers and how they relate to each other is the concept of even and odd numbers, and the fact that if we add one to any odd number, we will get an even number and vice versa. We can start noticing other inherent characteristics of this system: some numbers are prime; that is, they can only be divided by themselves and 1. All of these discoveries arise naturally from the invented system.

All of mathematics, since that humble beginning, has been derived in the same way. Once we know about prime numbers, we can start asking ourselves what the implications of prime numbers are – how many are there? Are there an infinite number of prime numbers? We can start developing ideas about what happens when we multiply numbers by themselves, and we have squares and square roots to learn more about. And so on. The mathematics that professional mathematicians work on today is a lot more complicated than ideas about the existence of even and odd numbers, but the process in which they engage is the same: pure mathematics is the study of the mathematics which inevitably arises from existing mathematics. We will investigate this process in more detail in the section on Methods and tools, but for now, we can see that when we try to define what mathematics is, there are two critical features:

- it is a language for expressing knowledge about space, quantity and motion
- it is the ongoing development of new mathematical principles based in the mathematical knowledge that we already have.

So, when we think about the scope of mathematics, one big part of that is mathematics itself. New mathematics is developed out of any and all existing mathematics.

Learner profile

Inquirers

How does the study of pure mathematics rely on the skill of inquiry?

KNOWLEDGE QUESTION

Part of the scope of mathematics is mathematics itself. Are there any other AOKs with a goal of studying existing knowledge in that AOK?

Another big part of the scope of mathematics, however, can be defined by the aspects of the world and our lives to which it can be applied. The scope of applied mathematics is huge – maybe encompassing all of human experience.

Most people use mathematics quite frequently in their everyday lives, for working out a budget, or figuring out how long it will take to get from home to a friend's house 100 miles away. A lot of this kind of everyday mathematics is done for us, of course, by the technological gadgets that we have: financial records software and GPS, for instance. Some people use basic mathematics more frequently.

ACTIVITY

Consider an alpaca farmer who owns, say, 25 acres of land and 40 alpaca. She wants to breed and raise her alpaca and sell some of them, while shearing others for the wool, which can be sold, or made into knitted goods which can be sold. Here are some of the activities for which she might use mathematics on a regular basis:

- Calculating the quantity of food she needs to feed her alpaca through the winter.
- Calculating the amount of pasture she needs vs the amount of land she needs for growing food to store for winter.
- Determining the best shape to make her alpaca enclosures and her crop fields in order to reduce the amount of fencing material needed.
- Calculating the amount of fencing she needs in order to keep the alpaca out of the grain crop.
- Calculating how many alpaca she needs to sell after the alpaca young are born if she wants to increase her herd by 10 per cent each year.
- Calculating the price of the alpaca, the wool and the knitted goods she needs to sell in order to maintain her farm, pay her workers, cover all her household expenses and make a reasonable profit.
- Determining the best proportion of her wool to sell and how much to keep in order to have knitted goods made.
- Calculating the cost of employee salaries and insurance.

1. Can you think of other uses a small farmer might have for mathematics in order to run her business efficiently and profitably?
2. Do you think that the average person needs to use this much mathematics?
3. What about the average business owner?
4. How are these uses different from the ways in which you use mathematics on a regular basis?

KNOWLEDGE QUESTIONS

Why is mathematics so important in other AOKs, particularly the natural sciences?

Does mathematics only yield knowledge about the real world when it is combined with other AOKs?

Mathematics is used for a wide variety of other purposes beyond what the average person would use it for. It can be used, for example, to determine the identity of the creator of a work of art. In 2013, Patrick Juola, a professor of computer science at Duquesne University in Pittsburgh, used a computer program that he developed to create an extensive and detailed statistical analysis of a crime novel called *The Cuckoo's Calling*, by Robert Galbraith. The program was able to determine that it had, as a tip given to a London newspaper had suggested, actually been written by JK Rowling, the famed author of the *Harry Potter* novels (Juola). If you want to read in detail about how the statistical analysis was done, use the QR code on the right.

Mathematics can also be used in order to determine whether a painting is the creation of a famous painter, or whether it is a forgery. A Princeton mathematician, Ingrid Daubechies, developed a software program using a mathematical function called wavelet analysis, in order to analyse the brushstrokes in paintings. The mathematical function breaks the image down into many layers of features. By analysing those layers in digital images of a large number of paintings by Van Gogh, the algorithm was able to establish a sort of digital fingerprint of Van Gogh's brushwork (Greenwood). When challenged by the Public Broadcasting System (NOVA) to see if they could use the mathematical tool to correctly identify a copy among six Van Gogh paintings, three different teams were all able to do so. The fake turned out to have many more wavelets than the real Van Gogh work. The team think that the explanation for this is that the copier had to work more slowly in order to try to copy precisely, and that more hesitant work results in more wavelets, which cannot be seen by the naked eye, but which can be detected through a mathematical analysis of the digital image (Greenwood).

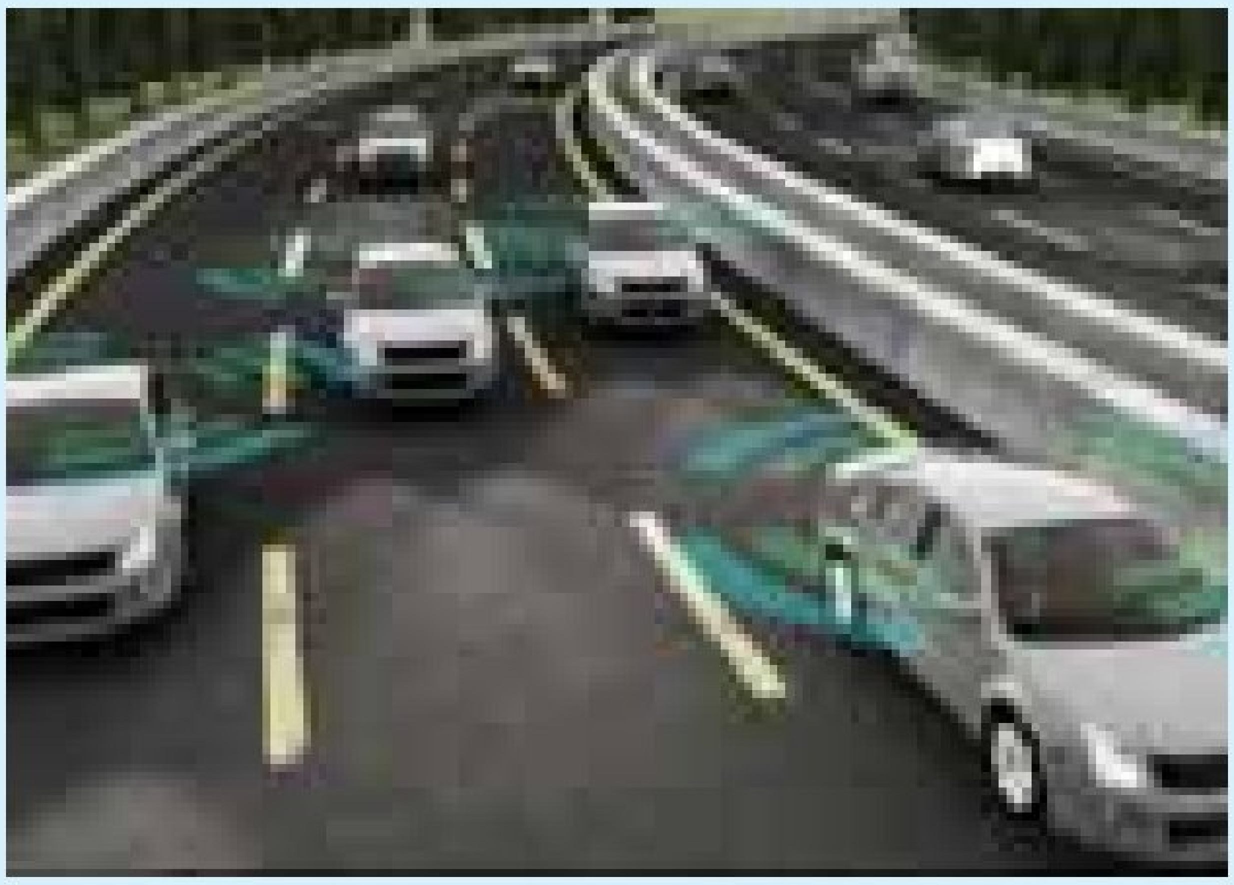
The use of mathematics to analyse identify the creator of artworks might be a surprising one, but mathematics is, of course, used for many much more familiar purposes. Engineers use mathematics in building bridges, architects use mathematics in designing buildings. Mathematical models are used as a means of determining the effectiveness of projects. In Chapter 3, you read about the problem of building the ability to solve ethical dilemmas into a self-driving car, but we can also consider that the design of the self-driving car is an example of a project which is based in mathematical analysis. Mathematicians with Intel Corporation in the United States have developed a model for designing self-driving cars in such a way as to reduce the number of road fatalities in the US from the approximately 40 000 there were in 2016 to approximately 40 per year (Shashua and Shalev-Shwartz).

KNOWLEDGE QUESTION

Does mathematical knowledge have more power in the world than other AOKs? Is the power of mathematical knowledge different from the power of other kinds of knowledge?

DEEPER THINKING

Driverless cars



The mathematical modelling related to autonomous cars all suggests that self-driving cars are dramatically safer than human-driven cars. Self-driving cars can 'see' in 360°, they never get distracted by passengers or cell phones, and they never get sleepy or otherwise stop paying careful attention to what goes on around them. Yet surveys about self-driving cars given to the consumers who would have to buy into the concept suggest that people aren't convinced. A March 2019 survey in the United States showed that 71 per cent of consumers who responded to the survey fear self-driving cars (Naughton). Another, more global, survey in May of 2019 revealed that about a quarter of drivers would be willing to ride in a self-driving car a year from now, but that that number increased to 67 per cent when the consumers were asked how they would feel 10 years from now (Martin). The highest rate of acceptance came among Chinese respondents, with the highest anxiety reported by consumers in the UK and the US (Martin). If you would like to read about the survey in more detail, use the QR code here.

What do you think accounts for the fact that people's attitudes toward this technology are so dramatically out of line with the mathematical facts? Do you think that if people were given the mathematical facts they would change their minds? Why or why not? How reliable do you think a person's claim about how they will feel in 10 years' time is? Why?

EE links

An exploration into the kind of mathematics needed in order to design a safe autonomous car, as well as to model the functionality of that car, could make for an interesting extended essay project. What role does mathematics play in the development of technology intended to reduce risk by functioning more efficiently than humans can?

KNOWLEDGE QUESTION

Do other areas of knowledge, such as the natural sciences, have the ability to change people's values and beliefs differently or better than mathematics?

Scientists rely heavily on mathematics, and this has made many technological developments possible. Houses, cell phones, dams, airplanes and computers, for example, all need extensive mathematics in their creation.

CASE STUDY

Katherine Johnson

The 2016 book by Margot Lee Shetterly, called *Hidden Figures* explores the role of women mathematicians working for NASA in the early days of the race to the Moon in the wake of Russia's launch of Sputnik. The movie of the same name was pretty heavily fictionalized, but it did correctly convey the fact that Katherine Johnson worked on the calculations which allowed the module to orbit the Earth and to re-enter safely.

Her work, done by hand, was more accurate than the work done by early computers which were too new to be reliable, and sometimes gave out contradictory answers. The re-entry calculations in particular were critical because if the capsule were to come in too steeply it could break up or burn up. If it were to come in at too shallow an angle, there might be insufficient braking and the ship could continue its orbit, heading back out of the atmosphere and then re-entering at some later point, well out of range of where it was supposed to be (Scuka).

Johnson is most famous for her work making the calculations for John Glenn's Freedom 7 mission. He did not trust the computers and he asked for Johnson specifically, saying that he would trust the numbers she came up with (Shetterly).

CONCEPT CONNECTION

Power

Buzz Aldrin's footstep on the Moon

The space race in the 1960s provides a good example of one of the ways in which power influences knowledge. The space race began when the Soviet Union launched Sputnik, the world's first satellite, in 1957. At that point, the United States stepped up an effort to get ahead in what had suddenly become a space race (Garber 2007). But after Soviet astronaut Yuri Gagarin became the first man in space on 12 April 1961, the pressure to catch up and pass the Soviets intensified. The US sent Alan Shepard into space three weeks later, but Shepard flew a short suborbital flight, where Gagarin had orbited the Earth. On 25 May, 20 days after Shepard's flight, President John F Kennedy made a speech before congress announcing the US goal of putting a man on the Moon before the end of the decade (Garber 2013).

The goal was achieved on 20 July 1969 when Neil Armstrong took the now-famous 'giant leap for mankind'. Three men went to the Moon in Apollo 11, but the scale of the programme which made that possible was almost unimaginably large. Taking into account all of the different problems that had to be solved – engineering, physics, maths, design of clothing, development of food, and many more – 400 000 people worked on the project (Riley). Many of these people worked on solving problems that had never been solved before – making, in other words, brand new knowledge in many fields, but in particular, science, mathematics and technology. The cost of the project was $28 billion, or the equivalent of $288 billion in 2019 money (Planetary Society).

Such a massive knowledge-making endeavour could never be organized or carried out without the power of a government behind it. No private individual or organization could fund or organize such a project. The reason that this knowledge was developed at the time it was developed and in the relatively short amount of time that it took, was that the power structure of the United States was brought to bear. Possibly all the same knowledge would have been developed eventually, but without the call to action from the US president and the financial commitment authorized by Congress, it would almost certainly have taken much longer, and all the technology which has developed in the 50 years since then would have been delayed as well. Some of the technologies with civilian uses that arose as part of (or in the aftermath of) the space race are artificial limbs, the handheld vacuum, the world's fastest swimsuit and a water purifier, among others (Kolbe).

The space race, then, provides an excellent example of how systemic power shapes the knowledge that is developed and which becomes, inevitably, the foundation for later knowledge development.

The scope of mathematics, then, is wide-ranging. It can be used to complete an almost unimaginable number of tasks ranging from counting change to bringing a man safely back from outer space. Mathematics is not just useful, then; it is, in many cases, critical to the point of being the difference between life and death.

ACTIVITY

Can you think of any human activity or physical object in the Universe to which some mathematical description could not be developed or applied?

Concepts that underlie mathematical knowledge

A final consideration in trying to define the scope of mathematics is that the ability to do mathematics relies on having knowledge of a good many significant concepts about how the world is organized. The Texas School for the Blind and Visually Impaired has identified a number of these concepts, which sighted people mostly begin to learn automatically by interacting with their environment, but which must be deliberately taught to blind students. Table 8.1 is a summary of their list ('Teaching Mathematical Concepts'):

Table 8.1 Teaching basic mathematical concepts

Concept	Definition	Example from mathematics
Classification	Grouping, matching and categorizing based on certain shared characteristics	Odd numbers and even numbers
Seriation	Being able to put things in a particular order based on certain characteristics	Fibonacci sequence
Conservation	The understanding that a quantity of something remains the same even if it appears to change in some ways	$7 + 3 = 10$ $2 + 8 = 10$ $20 - 10 = 10$ $2^2 + 6 = 10$
Spatial and positional concepts	The ability to recognize the shapes of things as well as their relationship to each other in space, such as 'next to', 'under', 'over' and 'curved'	Right angles and perpendicular lines

KNOWLEDGE QUESTION

Are these same mental skills which are needed for success in mathematics necessary in other areas of knowledge? Which ones? Why?

In being able to manipulate objects (physical and then symbolic) using these concepts, children and then students can use such characteristics as shape, size, weight, length, width and height. As understanding of how to use those characteristics develops, students also learn about quantities such as many, few, fewer, more and none. They must learn how to discriminate between things which are the same and things which are different, how to match and group, and how to categorize based on multiple characteristics. All of these cognitive skills must be mastered in order for a person to make progress in mathematics.

ACTIVITY

1. Take a regular deck of 52 playing cards and begin by organizing them in order by suit from highest to lowest. Which of the concepts in Table 8.1 did you have to use to do that?
2. Next, put them into categories. Make sure that when you create your categories, you do not have any cards left over. Do this in three different ways, using three different systems of categorization. Which of the concepts in Table 8.1 did you have to use to do that?
3. Finally, hold the deck loosely and drop it onto the table from a height of a couple of feet. Identify all the ways in which they are now physically related to each other (such as 'next to'). Which of the concepts in Table 8.1 did you have to use to do that?

Probably you had no difficulty doing any of these tasks. How did you learn to perceive the world in those various ways?

4. Repeat steps 1–3 using the following collection of numbers:

   2, 5, 9, 45, 63, 12, 1004, 0, 28, 190, 199, 54245, 6, 3, 77, 2117, 8 and 555
5. Why can't you do something like step number 3 with these numbers?
6. Now think about how you learned to make the shift from being able to recognize these relationships in physical objects to being able to see them in symbolic objects, such as numbers. How did you learn to do that?

KNOWLEDGE QUESTION

Does the kind of thinking required to solve the problem in the activity below compare to the kind of thinking used to solve problems in history or the arts?

Concepts that we learn from learning mathematics

As you learn mathematics, you learn many concepts which themselves are about mathematics: numbers, addition, multiplication, exponents and so on. But from solving mathematical problems and developing mathematical skills, you also develop an understanding of real-world concepts which you use more often than you probably realize, and the mathematical driverless skills themselves are applicable in the real world in ways you might not ordinarily think about.

ACTIVITY

Use the QR code to access a mathematical problem called 'Route to Infinity'.

Go ahead and take your time solving the problem. Discuss it with your friends. There are several different ways it can be done, so there is not a right or wrong method. The most important thing for you to attend to is how you go about solving the problem.

1. What kind of thinking skills do you have to use?
2. If you had to help someone else solve this problem, how would you describe to that person what they will need to do without telling them step-by-step?
3. After you have solved the problem your way, you can go back to the website and click on the solutions tab and see how other people solved it. Choose two and discuss what those students did differently from what you did. Were the thinking skills similar or different to your approach to the problem?
4. Identify two ways in which you have used or might have to use these same thinking skills in another situation in your life.

The IB guides for Mathematics, from the Primary Years Programme through the Diploma Programme, identify the following skills (among others) as goals for students to achieve as they study mathematics throughout their school years:

- Count, sort, match and compare objects, shapes and numbers.
- Recognize and continue patterns (and relationships) to make reasonable estimates.
- Analyse, make predictions and infer from data.
- Describe patterns as general rules consistent with findings.
- Organize information using a logical structure.
- Justify the degree of accuracy of a solution.
- Justify whether a solution makes sense in the context of the authentic real-life situation.
- Approximation.
- Generalization.
- Modelling.

Did you identify any of these skills as being needed in order to solve the problem on page 268?

We can see, as we start to consider the fundamental nature of these mathematical skills and concepts, how integrally connected mathematics is to the nature of physical objects in the world and their relationships to each other. We can also see how the kinds of thinking skills that we develop through mathematics are skills that can help us function in a wide range of situations in our daily lives. That should not really surprise us at this point, as we have now seen how mathematics functions to describe much of the physical universe.

One final point about the scope of mathematics: because advanced mathematics relies on symbols, rather than on real objects, and because the development of new mathematics so often occurs as a result of the effort to extend existing mathematics, mathematics is capable of dealing with things that do not exist in the real world or which might exist, but whose existence has not yet been absolutely established. A simple example of this is negative numbers. The number –12 does not represent a quantity which can be represented by real-world objects such as oranges. The concept of negative numbers had appeared in China by 200BC (Rogers) but remained controversial until the nineteenth century. The need for negative numbers was illustrated by an Alexandrian mathematician named Diophantus, who offered this problem:

$$4x + 20 = 4$$

If we solve for x, we find that x has to equal a negative number:

$$4x + 20 - 20 = 4 - 20$$
$$4x = -16$$
$$x = -4$$

Diophantus called that result 'absurd' (Rogers). Certainly it is absurd if we want to restrict ourselves to mathematics that reflects things that can and do exist in the real world; however, if we consider that pure mathematics explores the implications of mathematics, even this early example reveals the inevitable need for negative numbers. The nature of mathematics certainly allows for the creation of such problems as $4x + 20 = 4$, and so the 'absurd' answer is an answer to a real, though abstract, problem.

KNOWLEDGE QUESTION

What is it about mathematics that enables mathematical results to remain unchanged over time?

KNOWLEDGE QUESTION

The scope of mathematics includes material that does not exist in the real world. How does that compare and contrast to religious knowledge, for example?

ACTIVITY

In some situations, we do use negative numbers to describe a real-world phenomenon, such as temperature. Use the QR code to read the story about a lottery game in the UK that had to be withdrawn because people did not understand it.

1. What was the fundamental misunderstanding?
2. How might you demonstrate the concept to people who did not understand so that they could understand it?
3. Since negative temperatures are a real-world phenomenon, does that mean that negative numbers do, after all, represent 'things' that exist in the physical world? Why or why not?
4. How is it that we can use a negative number to describe temperatures? Why is zero not the lowest possible temperature?

Some other mathematical elements with which you may be familiar but which do not describe things that exist as physical objects in the real world are imaginary numbers, parallel lines (which, we imagine in maths, extend into infinity), and the concept of infinity itself. We know that there are an infinite number of numbers, but there is not an infinite number of any object in the Universe – not even atoms. The estimated number of atoms in the Universe is very large: between 10^{78} and 10^{82} (Helminstine) – but the idea of an infinite number of things is infinitely bigger than that.

We have seen, now, that mathematics has a very broad scope indeed. Physicist Richard Feynman said that mathematics is the language of nature, and if we are to understand the beauty of nature, we must learn her language (TalkReelTV). Such a statement brings all of the natural world into the scope of mathematics. Use the QR code to listen to Feynman's lecture. His comments about the relationship between mathematics and nature begin at about 50.00. If that were not enough of a job for mathematics to do, we have also seen how it encompasses the study of all the logical ramifications of all existing mathematics. That study increases all the time as new mathematics are developed, because then mathematicians will study the implications of the new mathematics as well. The scope of mathematics also includes our ability to apply mathematics in an enormous range of situations to help provide solutions to an enormous number of problems that we encounter in the real world. Finally, the scope of mathematics includes all of our cognitive abilities to recognize and organize relationships between physical objects and between objects which are strictly imagined. As you continue through your TOK course, compare the scope of mathematics to the scope of other areas of knowledge and note the difference in type and scale. Few, if any, will cover so much territory!

In the next section, we will consider how different approaches to and beliefs about mathematics might change our understanding of mathematics as an area of knowledge and our knowledge of the nature of mathematics itself.

KNOWLEDGE QUESTION

Does the knowledge we can develop about nature from mathematics differ in significant ways from the knowledge that we can gain about nature from the natural sciences or the arts?

CONCEPT CONNECTION

Truth

Truth takes on different significance depending on what aspect of mathematics we are looking at. If we are talking about pure mathematics, the truth that is revealed is truth about the nature of mathematics itself. If we are talking about applied mathematics, we can gauge the truth of mathematical statements by how functional they are. If the mathematics works, as it did in the effort to send men to the Moon, then we can say that it is true, or at least that it successfully depicts truths in the world.

Perspectives

Students of mathematics

One important perspective on mathematics is the perspective of the student. Students of mathematics, especially students in primary and secondary school, have a perspective which is significantly different from the perspective of professional mathematicians, because students of mathematics aren't breaking new ground in the field. Students of mathematics are following in the footsteps of mathematicians who developed the concepts and procedures which now make up the mathematical knowledge that someone who wishes to pursue mathematics as a career must have as a foundation.

ACTIVITY

Which of the following activities are familiar to you as part of your study of mathematics in school? Which do you not engage in?

1. Memorizing formulas.
2. Solving problems from a textbook.
3. Getting 'right' or 'wrong' answers.
4. Following established procedures.
5. Demonstrating that you know what the proper procedures are.
6. Applying known formulas to practice situations.
7. Creating an original proof.
8. Studying the nature of modular forms.
9. Analysing existing mathematical conjectures in an effort to see if they can be proven.
10. Submitting mathematical papers for publication in maths journals.
11. Making presentations at conferences to present new conjectures or new proofs.
12. Collaborating with mathematicians at universities or even from other countries.

Probably most students will identify the first six as being familiar activities, while the last six are not. How might you characterize the difference between what you do as a student and the kinds of activities described in numbers 7–12? What is the difference between the kind of mathematical knowledge you are developing and the kind of mathematical knowledge that professional mathematicians develop?

The experience of learning mathematics is not, of course, the same for all students. Some students struggle with it much more than others. In the Methods and tools section, we will investigate the kind of thinking skills needed to learn mathematics, which may differ among students and professional mathematicians.

Toward the end of the previous section, we looked at some concepts developed by the Texas School for the Blind and Visually Impaired. The school delved into those concepts in detail, because the experience of learning them is, for blind students, quite different from the experience that sighted students have of learning those concepts and, therefore, of learning mathematics.

CAS links

If there is a school for the visually impaired in or near to your community, you might organize a trip to speak with the students and teachers about how they go about learning mathematics. You could also volunteer as a tutor, which could help the younger students and expand your understanding of what is required in order to develop strong skills in mathematics.

Pure mathematics

In addition to the student perspective, mathematics can be seen from two other perspectives: the perspective of the pure mathematician and the perspective of the applied mathematician. You were introduced to both perspectives in the Scope section. The pure mathematician is the one who considers mathematics from the perspective of exploring the implications of existing mathematics. This is the approach to mathematics that does not concern itself directly with the ways in which maths describes the real world. This approach consists purely of extending existing mathematical knowledge by following logical pathways. In 1964, Richard Feynman gave a series of lectures at Cornell University. In one of those, he described the difference between the mathematician and the physicist, and he described pure mathematics this way:

> Mathematicians only are dealing with the structure of the reasoning and they do not really care what they are talking about. They don't even need to know what they are talking about … or whether what they say is true. Now I will explain that. If you state the axioms, you say such and such is so and such and such is so and such and such is so, what then? Then the logic can be carried out without knowing what the such and such words mean … if the statements about the axioms are carefully formulated and are complete enough, it's not necessary for the man doing the reasoning to have any knowledge of the meaning of these words, and he'll be able to deduce in the same language new conclusions. (Feynman)

You can use the QR code to listen to the whole talk, which is called 'The Relation of Math and Physics'.

Feynman talked about *axioms* as being the starting place for making knowledge in mathematics. Axioms are defining characteristics of mathematical systems. What that means is that once a system, such as geometry or algebra, has been defined, there are certain characteristics of that system which define that system. You can think of axioms, or postulates, which is another word for axioms, as being something like the rules of a game. The rules of a game define the game and they are what make the game different from all other games.

The metaphor of the game as a system and the rules as axioms is not perfect, but it should help us now to notice a few important things about axioms:

- The rules of a game do not need any kind of argument or proof. They are the rules that have been agreed upon by the people in charge of governing the game. In the same way, axioms do not need any kind of argument or proof: mathematicians simply agree to accept them as true. They are the facts of a mathematical system.
- Just as when we know the rules of a game, we know the nature of the game, what we know when we know the axioms of a system is the nature of the system itself.
- When we change the rules of a game, we get a completely new game. The metaphor here for mathematical axioms is not exact, because while we could just decide to change the rules of a game (and in fact, the professional organizations governing sports do, from time to time, adjust rules), we cannot do that with mathematics. The axioms of mathematics are not chosen by mathematicians in the same way that rules are developed for games. The system is defined, and the axioms are the assumptions that automatically come along with that system. To change an axiom, we would have to change the system first.
- Rules only work for one game – we can't apply the rules of baseball to cricket and still call it baseball, as it is known in the United States. In the same way, we can't say that one set of axioms is 'wrong' because that set doesn't work in a different system.

Now we'll move from the metaphorical comparison with games to an example from mathematics: Euclid's postulates for his geometry. First, a little review: Euclidean geometry is the geometry of the flat plane. Euclid defined a flat plane this way:

> A flat surface that is infinitely large and with zero thickness ('Plane').

KNOWLEDGE QUESTION

The example of games serves as a metaphor, or an analogy, for how axioms work in mathematics. What other AOKs rely on metaphor or analogy to provide explanations?

There are only five postulates which form the entire basis for geometry. These postulates are ('Euclid's Postulates'):

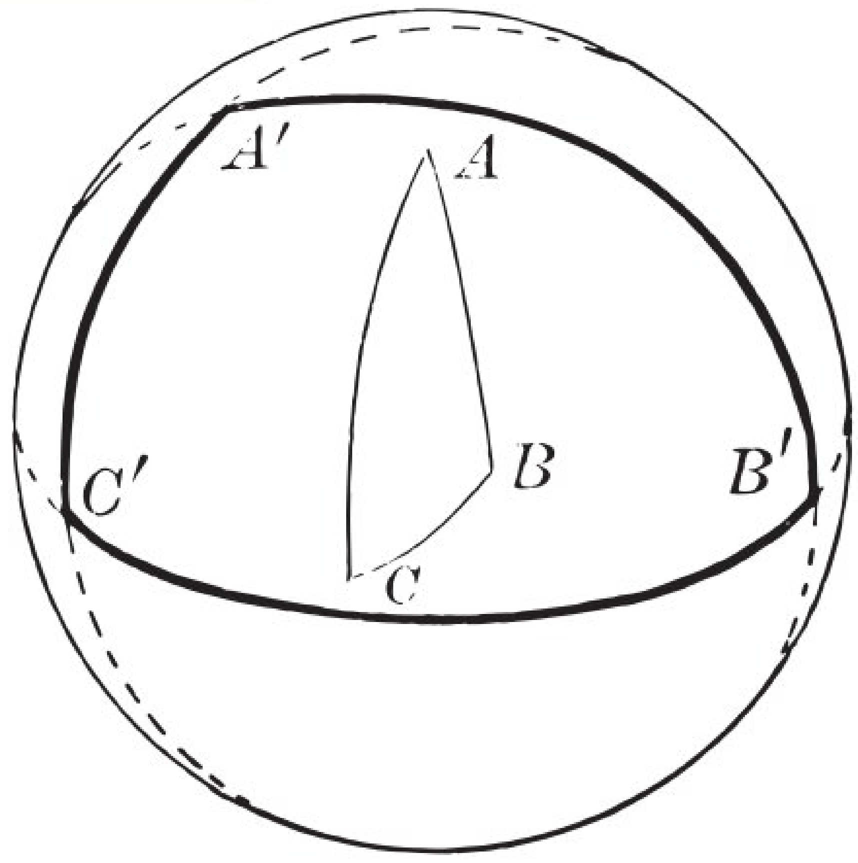
1 A straight line segment can be drawn joining any two points.
2 Any straight line segment can be extended indefinitely in a straight line.
3 Given any straight line segment, a circle can be drawn having the segment as radius and one endpoint as centre.
4 All right angles are congruent.
5 If two lines are drawn which intersect a third in such a way that the sum of the inner angles on one side is less than two right angles, then the two lines inevitably must intersect each other on that side if extended far enough. This postulate is equivalent to what is known as the parallel postulate.

ACTIVITY

Given what you learned about axioms (postulates) using the games metaphor, discuss the following questions with a classmate.

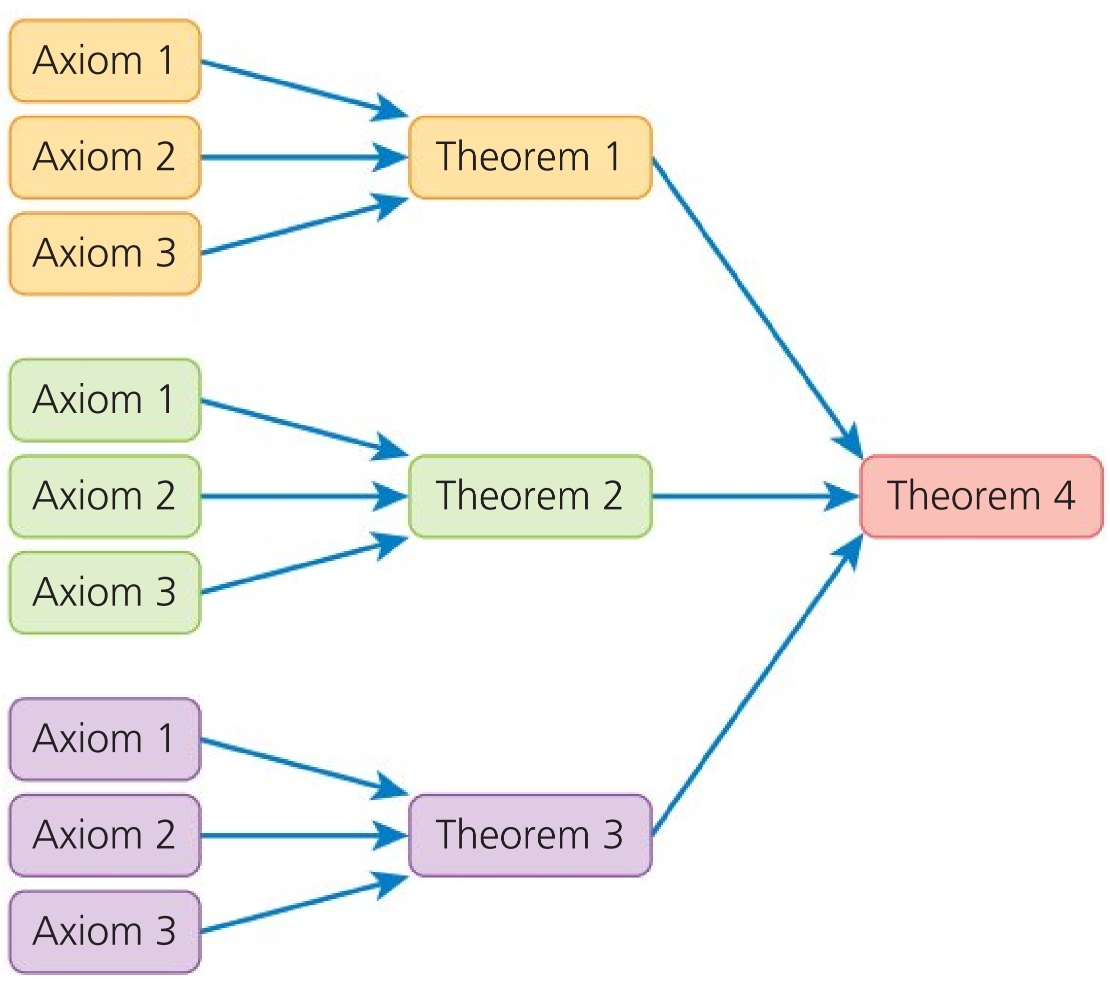
1 Why must all right angles be congruent?
2 Why is it not possible to just decide to eliminate one of these postulates? Consider, for example, the second one. Why can we not just decide that straight lines cannot be extended indefinitely? (Keep in mind the definition of a flat plane, which is what forms the basis for Euclidean geometry.)
3 If we consider the geometry of a sphere instead of the geometry of a flat plane, would you expect these same postulates to apply? Why or why not?

Out of these five postulates, all the theorems of geometry have been derived. One well-known theorem about triangles, for example, is the Triangle Sum Theorem, which you may be familiar with. The theorem states that the interior angles of a triangle add up to 180° (Sloman). If we switch systems, however, from the Euclidean geometry, which is the geometry of flat planes, and we move to the geometry of a sphere, the axioms change. A spherical triangle does not have the same properties as a flat triangle, and the Triangle Sum Theorem cannot apply. In fact, with spherical triangles, the sum of the angles varies with the size of the triangle and can be as large as 540° ('Spherical Triangle').



Spherical triangle

One more important point about pure mathematics: axioms form the basis for defining any system of mathematics, and thus they form the basis for the earliest theorems which are developed in that branch of mathematics. Once theorems have been proven, though (and we will investigate this process further in the Methods and tools section that follows), the theorems become available as premises to be used in developing future mathematics. In Chapter 1, we talked about the nature of formal arguments and their reliance on premises. Axioms are the earliest premises in developing the arguments in any given branch of mathematics which become theorems – established proofs – but every theorem can also be used as premises in later proofs. The diagram on the right illustrates the process.



This diagram is intended only to demonstrate the process, showing how at each level, the new knowledge becomes the basis for the next stage of developing knowledge. It is not intended to illustrate the only possible ways that knowledge grows in mathematics. For one thing, it would not be likely that there would always be three axioms or theorems forming the premises of the argument. For another, axioms and theorems could be mixed at any level. In fact, any effort to develop a new mathematical proof is likely to involve many more premises than are shown here. Andrew Wiles' proof of Fermat's Last Theorem, about which you read in Chapter 4, is 200 pages long ('The Proof'). Clearly, many different mathematical claims formed the basis for such an argument. One important thing to notice in this diagram, however, is that each level is built on the one before it, simply on the basis of logic, rather than on the basis of any kind of reflection of the physical world. The arrows represent the logic which connects the statements at any given level. So long as the logic is valid, and if all the statements in the first column are true, then the statements in the second column are true. So long as the next level of logic is valid, and if the statements in the second column are true, then the statement in the third column is true.

KNOWLEDGE QUESTION

Can natural or human scientists ever use this kind of deductive reasoning in supporting their knowledge claims?

DEEPER THINKING

Euclidean geometry and real space

We have already acknowledged that axioms are assumptions which have been excused from any need for proof. They form the starting point for a long string of logical deductions which become new mathematics, which in turn forms the basis for the invention of still more mathematics. We can go one step further in considering what we know as a result of this process of logical deduction. Feynman made the claim, possibly somewhat shockingly, that mathematicians do not care – or need to know – whether the mathematical facts that they are working from are true or in any way related to reality. We looked, however, at Euclid's axioms for geometry, and we are quite accustomed to thinking that geometric figures are real-world objects. If we build a house, for example, the walls are rectangular or square, and so we can use the geometry that we know to help us design the house.

If we think more deeply, however, we will realize that Euclid's geometry is the geometry of the flat plane. Remembering that the definition of a flat plane is:

> a flat surface that is infinitely large
> and with zero thickness

we can immediately see that no such thing exists. We have flat surfaces, but a flat surface that is infinitely large would spread in all directions indefinitely without end, and that is clearly impossible. Nothing in the Universe, furthermore, has zero thickness. Something with zero thickness cannot exist as a physical object.

Other geometric figures pose us the same problems. Consider the rectangle, which, as we just noted, is a familiar shape which is integral to the building of houses. The actual definition of a rectangle is:

> a 4-sided polygon where all interior
> angles are 90° ('Rectangle').

We have to realize, however, that a rectangle is part of plane geometry, which means that rectangles are figures which exist as part of the plane – the infinite flat surface with no thickness. The rectangle is not infinite, but it does still have zero thickness. Such a rectangle, because it is imaginary and is not subject to the consequences of physical existence, can be understood to be absolutely perfect. That is: it has no flaws of any kind. If we consider that an absolutely perfect rectangle has four 90° angles, those angles are *exactly* 90° – not even the tiniest **smidgen** more or the tiniest smidgen less. In the real world, we cannot create rectangles with that degree of perfection. If we draw one with chalk on a board, it might look perfect to the naked eye, but if we examined the chalk lines closely with a magnifying glass, we would see that the lines have rough edges or that they are slightly wider in some places than others. The angles would be just slightly more or less than 90°. We have tools that help us to get closer and close, and with computers, we can get pretty close, but if we print it out on paper, flaws in the paper or slight inconsistencies in the surface of the paper will mean that anything with visible lines is not the same thing as the imaginary rectangle of Euclid's system. A rectangle on a computer screen has physical lines which we can see, but which do not exist in any kind of visible form in the ideal rectangle that Euclid described. And, perhaps most importantly, if we make a rectangle out of drywall as part of our process of constructing a house, our rectangle's sides will only be as straight as it is possible for our saws to cut, and the corners will only be as close to 90° as it is possible for our tools to make them.

Euclid's axioms, and all the theorems, such as the Triangle Sum Theorem, apply to the imaginary flat plane which Euclid defined. They do not apply precisely and exactly to anything that actually exists in the real world. So when we think about the question of what we know when we know the axioms and theorems of Euclid's geometry, what we know precisely and with absolute certainty (see page 3 in Chapter 1), is the nature of the flat plane and the other geometrical figures, all of which are imaginary.

Fortunately for us, that level of precision is not necessary for us to be able to use the principles of plane geometry in the real world. What we know about the real world when we know the axioms and theorems of geometry is good enough for us to be able to manipulate real-world versions of geometric figures well enough for them to serve our purposes. Our wall is not going to fall down because of tiny errors in measurement, so long as, when we create our real-world rectangle, the corners are as close to 90° as we can make them.

In the discussion of absolute certainty in Chapter 1, we talked about the fact that most of our knowledge does not have to be absolutely certain to be functional. The creation of geometric figures in the real world and the use of geometric theorems to govern the design of those physical objects is a good example of knowledge which is accurate enough for us to use with confidence.

ACTIVITY

Discuss the following questions with your classmates.

1 What is the difference between certainty and absolute certainty?
2 Does that difference have a functional meaning in pure mathematics?

Applied mathematics

We have just seen how pure mathematics proceeds within its own boundaries as an intellectual pursuit without needing any direct connection to the real world. Much mathematics, however, does apply to the real world, and that gives us a third perspective on how and why we make knowledge in mathematics: applied mathematics. Earlier in the chapter, we considered how an alpaca farmer uses mathematics in a variety of ways on a regular basis; the alpaca farmer is applying mathematics to her business. We also considered a variety of other applications of mathematics from architecture to the design of automated cars. In all those instances, mathematics was being applied, but it isn't clear that the people applying the maths were people we would call mathematicians: farmers, architects, construction workers and engineers all use maths – as do many other people – in a wide variety of endeavours every day.

There are, however, people working as mathematicians whose objective, unlike the objective of pure mathematicians, is the development of the mathematics needed in order to solve problems in the real world. One example of this kind of applied mathematician is one who is working on developing 'unbreakable' codes and on how to break 'unbreakable' codes. There are quite a few such mathematicians in the world; most of them work for governments which need codes and code-breaking tools for military purposes. There are specific titles for the mathematicians who do these jobs. The people who create the encryption systems are called 'cryptographers'. The people who work on breaking encryption systems are called 'cryptanalysts' ('The Enigma of Alan Turing).

◆ **Smidgen**: A tiny amount of something. It does not indicate a specific amount, so you have to understand it in context. If someone asks you for a smidgen of cake, then, you would give them a very small piece. In the context in which the word is used here, however, 'smidgen' indicates a much, much smaller amount than a very small piece of cake. A 'smidgen' of variance in a 90° angle refers to an amount so tiny that we couldn't see it at all.

KNOWLEDGE QUESTION

Can homeowners and business owners apply the knowledge made from other areas of knowledge such as history or the human sciences in the way that they can apply the knowledge from mathematics?

CASE STUDY

Alan Turing and the Enigma machine

One such mathematician was Britain's Alan Turing, who famously helped to break the German Enigma cipher during the Second World War.

Some background information: although often used interchangeably, the terms 'code' and 'cipher' are not precisely the same. In a code, the words of the intended message are replaced by other words. In a cipher, the letters of the original message are changed or rearranged ('The Enigma of Alan Turing').

Alan Turing was a cryptanalyst. When he was working on breaking Enigma, he was actually trying to break a very complicated cipher, which had in turn been created out of messages which had already been translated using a code. The reason a mathematician was needed was because of the enormously high number of possibilities that the machine could generate. The machine had three wheels inside of it, and each wheel had all 26 letters. The person encrypting the message would type in a letter, which would be cycled through each of the three wheels in one direction and then back through each of the wheels again. You can use the QR code to read a more detailed explanation and see a diagram of how the complexities of the machine worked.

The Enigma system was so complex that there were 17 000 possible combinations that could be used to assign a coded letter before one had to repeat (Hern). No human could ever figure out how to decode even one letter; a

The Enigma machine

mathematical algorithm was required to figure it out. Turing actually invented and built a computing machine that had the capacity to run the possibilities and break the cipher. It took Turing and a team of mathematicians more than five months to break the code (IWM Staff). As the war went on, Turing developed the mathematics needed to break the Enigma naval code, which was more complicated than the original Enigma code.

Although Turing set out to figure out the mathematics that would help solve the very important problem of the Enigma cipher, the knowledge that he developed also turned out to have wide-ranging application in the world. The work that Turing did during the war became the foundation for the modern computing age, including the development of computing machines, chips and processors (IWM Staff). A major award – the equivalent to a Nobel Prize in computer science – is named after Alan Turing.

CONCEPT CONNECTION

Values

Clearly the work that Alan Turing and the other cryptanalysts did during the Second World War was incredibly valuable to the world. It is credited with saving thousands of lives and with shortening the war by several years. We also saw that the work done then brought us into the computing age, and the value to the world of computer technology is incalculable.

An important point to notice about mathematics, however, is that although applied mathematics is of great importance to our lives in the twenty-first century, pure mathematics is valued deeply as well. In Chapter 4, we heard about Andrew Wiles and his solution to the 300-year-old problem of Fermat's Last Theorem. In 2016, Wiles was awarded the Abel Prize, the mathematical equivalent of a Nobel Prize, for his solution. His prize is equivalent to the prize named after Turing, and so we can understand that to mathematicians, outstanding work is valued, both when it has great utility in the world and when it does not.

KNOWLEDGE QUESTIONS

Are other areas of knowledge equally useful to mathematics?

Are the reasons we have for seeking knowledge in mathematics different from our reasons for seeking knowledge in the other AOKs?

Different perspectives on mathematical content

So far, in terms of different perspectives on mathematics, we have considered how the different perspectives of mathematicians result in different kinds of mathematical knowledge. However, we can also consider how different mathematical systems represent differing mathematical perspectives. In the same way that we have seen how new mathematics builds on existing mathematics, the branches of mathematics also build one on the other. Table 8.2 shows some of the main branches of mathematics and the kind of knowledge that each one generates. Each branch can be seen as a perspective, because it looks on mathematical questions in different ways, using different methods and generating different kinds of knowledge (Lamb).

Table 8.2 Mathematical branches

Branch of mathematics	Focus of attention
Arithmetic	Basic manipulation of numbers
Algebra	An advance on arithmetic in that it still focuses on the manipulation of numbers but adds in the use of symbols for unknown quantities – variables
Geometry	Studies properties of shapes, including points, lines and solids
Trigonometry	Focuses on triangles, including the measurements of angles and the relationship between them and the sides. This is a focused development from geometry, in that trigonometry zeroes in on one geometric form
Calculus	Calculus was invented independently by Isaac Newton and Gottfried Leibniz. Newton's calculus focused on rates of change while Liebniz's calculus focused on the summation of an infinite number of small factors. Newton's is differential calculus, and Liebniz's is integral calculus (Lamb). Newton's calculus is geometrical, while Liebniz's is analytical. The exact nature of calculus developed over a period of more than 100 years into the form we use today ('The History of Calculus')

Table 8.2 shows how the different branches of mathematics relate to each other. Each new branch of mathematics takes a different perspective from the one before it – from basic manipulation of numbers to the inclusion of abstract values into the study, then the move from numbers to shapes, then from shapes to a particular shape, and then on to a complex type of mathematics that deals with the study of objects or systems in motion; it allows us to map how something changes over tiny increments of time (Kleitman).

Invention or discovery?

A final way we can consider the role of perspectives in mathematics is the question of whether mathematics is invented or discovered. Earlier in this chapter, we learned that Richard Feynman thought of mathematics as the 'language of nature', and he declared that if we want to truly understand nature, we must learn its language. This view of mathematics is held by a number of mathematicians and is known as 'Platonism'. The idea in Platonism is that mathematics exists, independently of humans, in the same way that animals and oceans and atoms and molecules exist. Mathematics is more like atoms and molecules, of course, because we cannot see them. The belief is named after Plato because Plato believed in two kinds of objects: the material and the **immaterial**. If we draw a square, then that drawing is a material object, but the actual square, which our drawing represents, is an immaterial object (Anglin and Lambek). For people who hold the view of mathematical Platonism, all of our development of mathematics is the discovery of mathematical principles.

KNOWLEDGE QUESTION

Is the knowledge generated in the different disciplines of the natural and human sciences related in the same way that the knowledge in the different disciplines of mathematics is related?

◆ **Immaterial**: Something is not made up of matter; it has no physical mass. Plato meant that numbers and other mathematical 'objects' exist in the same kind of plane as the human soul. The word 'immaterial' has another meaning, which is 'irrelevant' or 'unimportant', but that definition is not the one which is relevant here.

KNOWLEDGE QUESTION

Consider the other AOKs: Is the question of their invention or discovery problematic in the same way that it is problematic in mathematics?

Many mathematicians hold this view, but it is a contentious one. Many other mathematicians hold the exact opposite view: that mathematics is a human invention which has been developed as a means of describing or modelling reality – it is a useful tool, which we use for solving problems and which we expand by pursuing the logical development of ideas (Knapp).

An interesting thing about this difference in perspective is that they cannot both be right. One view describes the situation as it really is, and the other view does not. We have no way, at least not at this point in time, to establish which belief is true. What is important about this difference in perspective is that our understanding of what we know is completely different depending on which perspective is correct. If Platonism is correct, then part of what we know when we know mathematics is the immaterial world, a reality outside of ourselves. If the anti-Platonist view is correct, however, then our knowledge of mathematics does not reveal anything to us about a reality outside of ourselves that would continue to exist if all humanity suddenly blinked out of existence. Instead, we know something about the way human minds work, and our capacity for developing abstract concepts that we can use for our purposes.

We have now considered three different ways to consider different perspectives in mathematics:

- the different perspectives of the people who study maths, defined by their purposes
- the different perspectives of the content of mathematics, defined by the focus of the different branches of maths
- the different perspectives of the relationship of mathematics to reality.

Considering these perspectives can help us understand the complexity of mathematics and the diversity of the ways in which our mathematical knowledge develops.

In the next section, we will consider in more detail the methods and tools of knowledge-making in mathematics.

ACTIVITY

1 Which of these two views of the origin of mathematics makes the most sense to you: Platonism or the idea that mathematics is an invented system for describing things that happen and things that exist in the physical world? Why?
2 What arguments would you use to try to convince someone who holds the opposite view that your view makes the most sense?
3 Discuss and debate these different perspectives with your classmates.

Methods and tools

Methods of pure mathematicians

Throughout this chapter, we have been considering the **cumulative** nature of mathematics. New maths is created out of older maths. We examined the 'if–then' structure of mathematics: if this is true, then this must also be true.' We also explored the infinite nature of mathematics: there are an infinite number of numbers, and a geometric plane, for example, extends infinitely in all directions.

This infinite nature of mathematics means that we can never demonstrate a mathematical claim by trying out all the possibilities. When Pythagoras proved his theorem that for all right triangles $a^2 + b^2 = c^2$, he did not do it by drawing every possible right triangle and measuring. Such an approach would be impossible, as he could never draw every possible right triangle, even if he had all eternity in which to do it. He had, instead, to use deduction (see page 5) in order to demonstrate that regardless of what the lengths of the sides of a right triangle were, the claim would always hold true.

◆ **Cumulative**: Increasing by one addition after another. To say mathematical knowledge is 'cumulative' is to say that it builds up, so that all the earlier knowledge continues to exist alongside the newer knowledge.

Proof

The formal name for that method of making new knowledge in mathematics out of a series of logical deductions is *rigorous proof*. Mathematicians begin with a conjecture, which is like an hypothesis in the natural sciences: a conjecture is an idea that one or more mathematicians think is true, but which has not yet been through the process of proof. In order to convert that conjecture into a theorem, the mathematicians must subject it to the process of the rigorous proof. 'Rigorous' means that all the possibilities that the proof could be wrong have been excluded, and the proof is absolutely certain.

KNOWLEDGE QUESTION

What is meant by the term 'proof' in mathematics, and how is this similar to, or different from, what is meant by this term in other areas of knowledge?

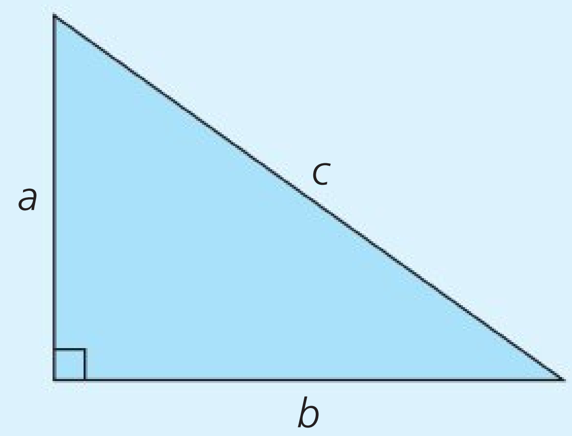
CASE STUDY

The Pythagorean Theorem

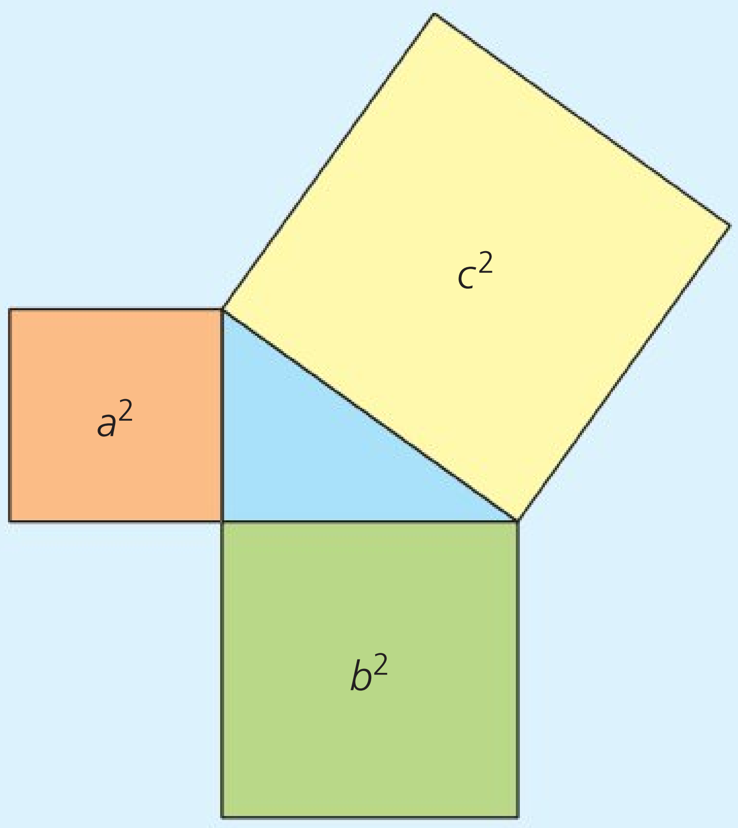
Pythagoras, for example, had to demonstrate that his conjecture was true for every single possible right triangle. Once he could do that, then the conjecture was proven and became the Pythagorean Theorem. The proof itself can be seen as a tool for conveying the logic which ensures the absolute certainty of the proof.

Here is a proof that we can use to demonstrate the absolute certainty that $a^2 + b^2 = c^2$:

We begin with a right triangle with sides of unknown lengths, so we label them *a*, *b* and *c*.



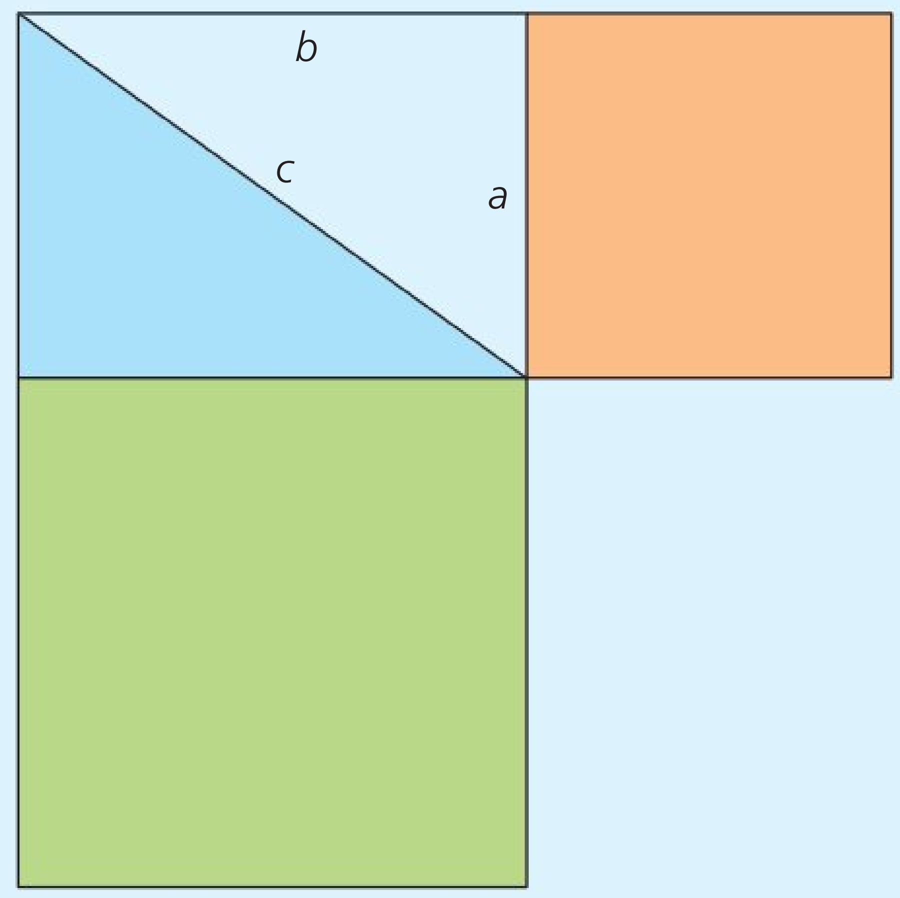
The term a^2 can be physically represented with a square whose sides are all length *a*, so now we draw the squares with the sides *a*, *b* and *c*.



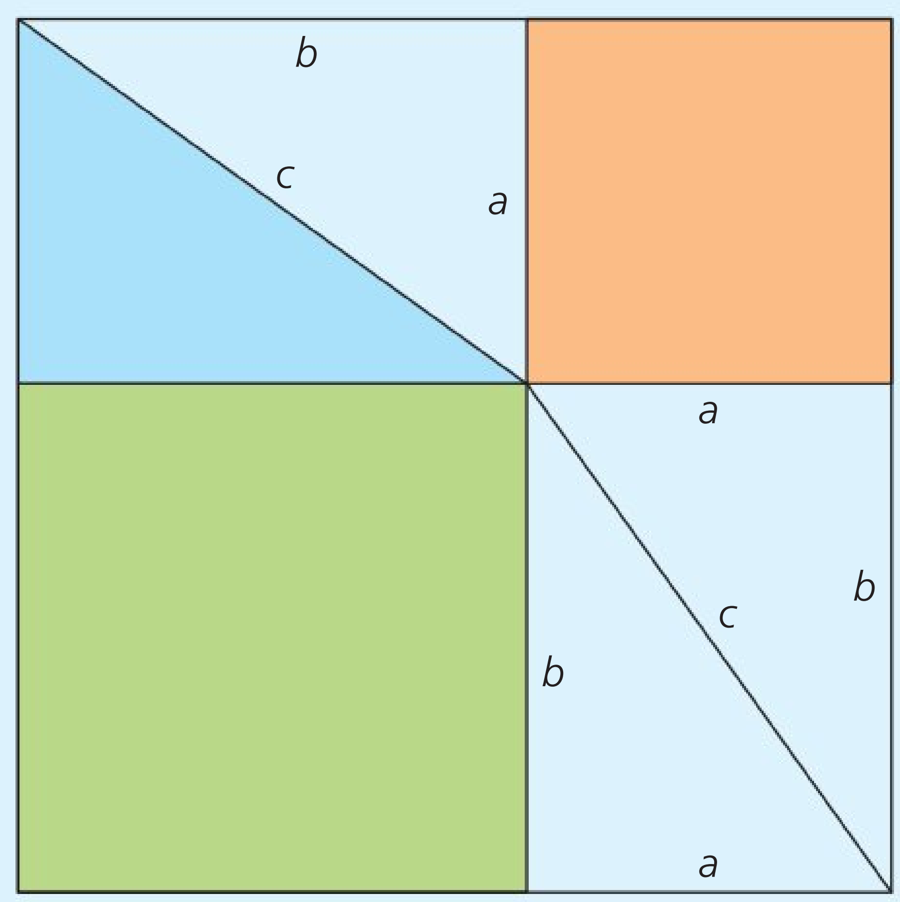
If Pythagoras' conjecture was correct, then the area of squares *a* and *b* would add up to exactly the same area as the area of square *c*. He still couldn't just measure the squares, however, and add them up, because that would only demonstrate the claim for that one triangle. So now we need some creative thinking: how can we show that the area of the orange and green squares combined is equal to the area of the yellow square?

Before you read on, take some time to discuss this problem with your classmates and see if you can come up with an idea of what to do next.

We can create a new figure by moving the square with side *a* over to the other side of the triangle. You can see, when we do that, that there is now a new triangle formed in the empty space, and that that triangle is exactly the same size as the original triangle. The sides are *a*, *b* and *c*.



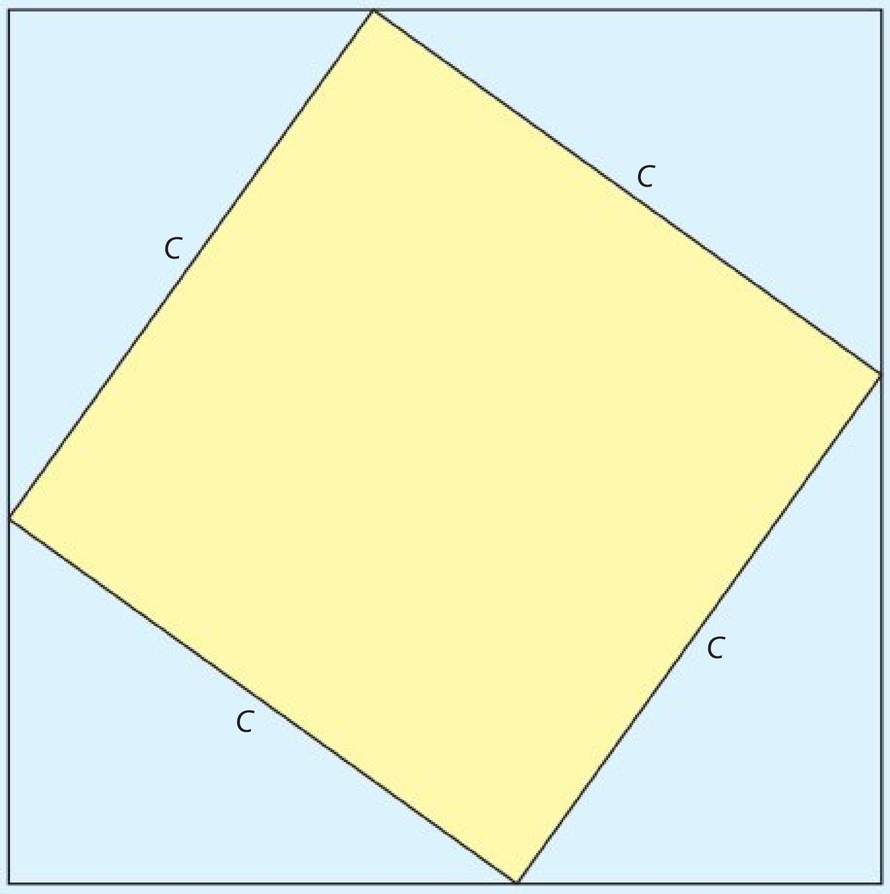
We can also see, now, that, because the two squares have sides *a* and *b*, there is a rectangle just waiting to be formed under the *a* square which is going to have sides *a* and *b*, and will, therefore, be made up of two more triangles with sides *a*, *b* and *c*, just like the ones we just made.



Now we have the original triangle plus three more exactly congruent to it. Congruent means that they are exactly the same in size and shape. We also have two squares, one which has area a^2 and one which has area b^2. The question is: what does this get us?

Before you read on, take some time to discuss this problem with your classmates and see if you can come up with an idea of what to do next.

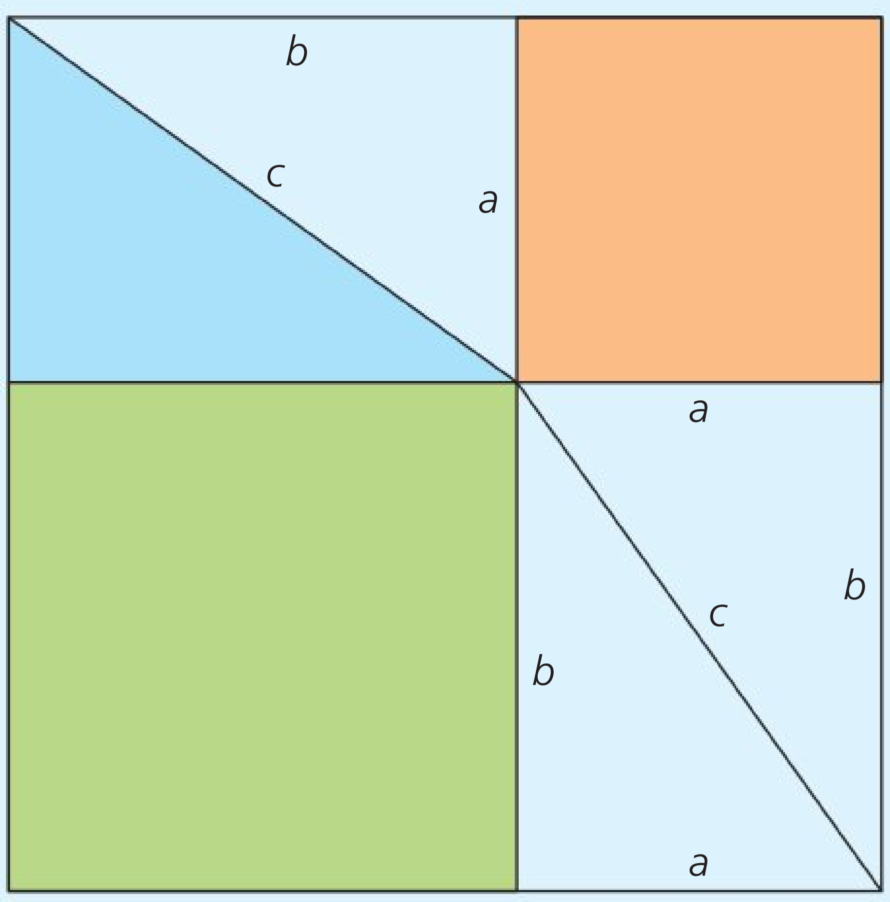
We still haven't done anything with the square with sides *c*. If we draw a box around that square, we get four new triangles. We know that the hypotenuse of each triangle is length *c*, because we made them from the box with sides *c*.

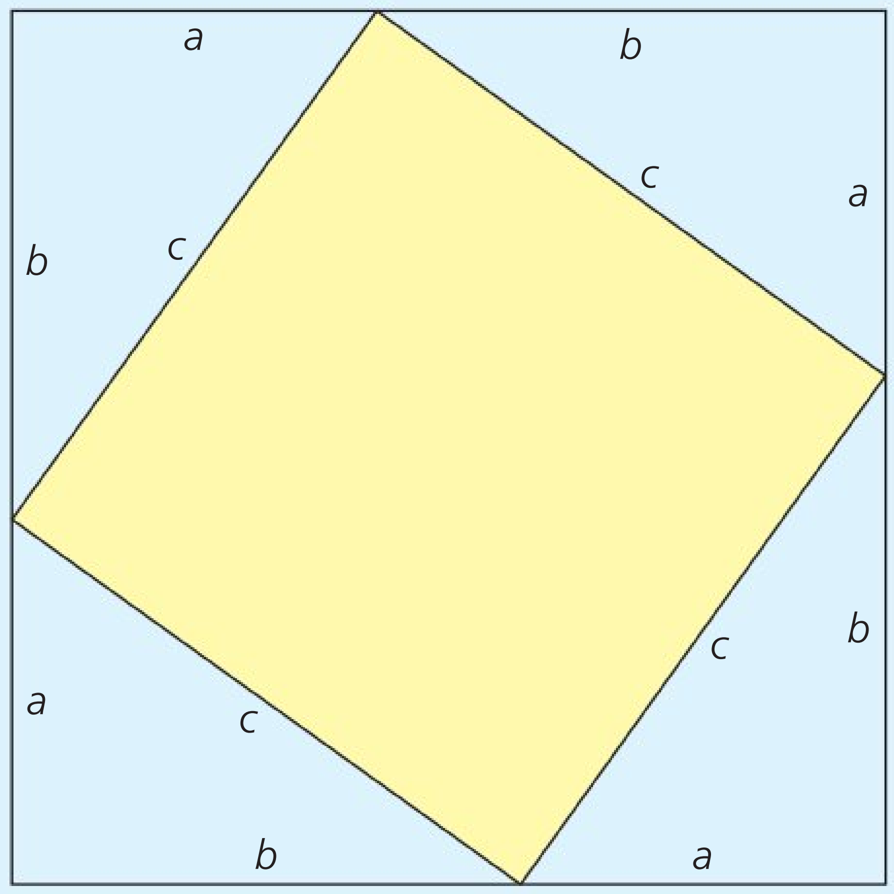


Those resulting four triangles with hypotenuse *c* certainly look as if they are congruent to the original *a*, *b*, *c* triangle, but how can we know that they are?

Before you read on, take some time to discuss this problem with your classmates and see if you can come up with an idea of what to do next.

We know one more thing: the triangles are all right triangles. There is no way to create a right triangle with hypotenuse *c*, where *c* is exactly congruent to the hypotenuse of our original triangle, without also having sides *a* and *b* which are congruent to sides *a* and *b* in our original triangle. Therefore: we have four new triangles with sides *a*, *b*, and *c*.





There is only one step left in our proof: since our conjecture is that the first figure is equivalent to the second figure, we can subtract the parts from each figure which we know are congruent. We can see, furthermore, that both large squares are made up of sides with lines made of two line segments, one equal to *a* and the other equal to *b*. That means that the two larger squares are equal in total area. Now it's easy to see that we can simply subtract out the four triangles from each figure and we are left with the fact that the *a* square and the *b* square together are equal to the *c* square. The conjecture is proven for all right triangles. It doesn't matter what the lengths of the sides are, so we have a rigorous proof, and the conjecture is not a conjecture, it is a theorem.

Here is how this proof looks written out as a series of mathematical statements:

The area of the first square is given by $(a + b)^2$ or $4(\frac{1}{2}ab) + a^2 + b^2$.

The area of the second square is given by $(a + b)^2$ or $4(\frac{1}{2}ab) + c^2$.

Since the squares have equal areas, we can set them equal to another and subtract equals. The case $(a + b)^2 = (a + b)^2$ is not helpful, so let's do the other case.

$4(\frac{1}{2}ab) + a^2 + b^2 = 4(\frac{1}{2}ab) + c^2$.

Subtracting equals from both sides we have $a^2 + b^2 = c^2$.

There are many additional ways that the Pythagorean Theorem can be proved. Use the QR code to watch a video of a clever proof using water.

The method of the rigorous proof is at the heart of the pure mathematician's work. It is important because it results in absolute certainty, which is the standard for knowledge in mathematics.

DEEPER THINKING

Reason and imagination

Pythagoras developed his proof using deductive reasoning and a good dose of creative thinking. The thinking that you must do when you work on mathematical problems is very similar, even when you are not creating original proofs.

Let's think back to the problem involving cats and mice and fish, which you solved at the beginning of the chapter. What methods or tools did you have to use in order to solve that problem? Certainly you had to see in order to read the problem, and you had to use your memory in order to know what cats and fish and mice are, as well as in order to recognize the significance of the mathematical symbols + , − and = , and that memory is, of course, related to your knowledge of language. You had to use reasoning to work out various steps such as 'if there are three cats and they add up to 30, then one cat must be worth 10'. If you had never seen a mathematical problem with cats and mice and fish before, you also engaged in an imaginative act: the ability to imagine that cats and other animals could be symbols for numbers.

All of these processes occurred simultaneously, not one after the other, and you most likely didn't even notice them happening: they were automatic. Probably even the logical deduction that if three cats are 30 then one cat is 10 happened so automatically you did not have to think about it. You looked at the problem and right away knew that one cat = 10.

Discuss the following questions with your classmates.

1. Why were you able to do that much thinking, using sense perception, language, reasoning, memory and imagination, so smoothly and rapidly?
2. We call the kind of instantaneous processing described above, which results in your immediately knowing something (in this case, part of the answer you need in order to solve the larger problem) intuition. What does this example reveal about the nature of intuition?

CONNECTION TO THE CORE THEME

Imagination and intuition

Another of the world's most famous mathematical proofs is Andrew Wiles' proof of Fermat's Last Theorem, which we learned about in Chapter 4 (see page 140). The proof demonstrated that for all equations of the form $a^x + b^x = c^x$, x cannot be greater than 2. Certainly, much of the work Wiles did during the nine years he worked on the proof involved reason; however, reason alone was not enough. He describes the process this way:

> I tried to fit it in with some previous broad conceptual understanding of some part of mathematics that would clarify the particular problem I was thinking about … And sometimes I realized that nothing that had ever been done before was any use at all. Then I just had to find something completely new; it's a mystery where that comes from. (NOVA)

Whenever Wiles ran into a problem he couldn't solve using existing knowledge, he had to come up with something new. Imagination is exactly that: the ability to put pieces of the known together and come up with something new. Imagination, then, allowed Wiles to solve problems that no one had been able to solve before him. The 'mystery' Wiles talks about is intuition – the ability of a mind to work on a problem on the unconscious level, using all of the knowledge one has previously amassed. Imagination and intuition are skills used

I just had to find something completely new; it's a mystery where that comes from.

Andrew Wiles

KNOWLEDGE QUESTION

Does the use of imagination in mathematics differ significantly from the use of imagination in the arts?

by every mathematician who tackles a problem. Students must also use imagination in figuring out how to solve a problem which is new to them. Intuition is likely to be less useful to young students, however, as it takes time – many years, even – for someone to develop enough expertise in a given area so that the unconscious processing is trustworthy and productive. Trained professional intuition is much more than a simple hunch or guess.

Mathematics does not require imagination solely to solve problems; mathematics is, arguably, essentially an act of imagination about the nature of reality. As we have seen, one of the great questions about the nature of mathematics is the question of whether maths exists in the real world, independent of human cognition, and is, therefore, simply awaiting our discovery, or whether mathematics is invented entirely by humans. Those who believe the latter are very aware of the powerful role of imagination in making knowledge in mathematics:

> Contrary to Platonist beliefs about the ability of mathematics to give us these things is the stance that mathematics is actually about multiple realities, relative truths, complexities, and ambiguities. In essence, doing pure mathematics (not merely doing computations) is an exercise in imagination – and imagination, an exercise in abstraction. (Saiber and Turner)

Consider, for example, our ability to use mathematics to describe dimensions beyond the third – realities that we cannot perceive for ourselves and which may or may not exist. Imagination, therefore, is not merely a method of making knowledge in mathematics; mathematics is a system which helps us to imagine the Universe.

KNOWLEDGE QUESTION

How do mathematicians reconcile the fact that some conclusions seem to conflict with our intuitions?

Learner profile

Balanced

How does the development of knowledge in mathematics rely on a balance of our various cognitive skills, such as reason, imagination and intuition?

ACTIVITY

Do you think there is a difference between the way that students must use their imaginations in learning mathematics at school and the way that professional mathematicians such as Andrew Wiles must use theirs? If so, why? If not, why not?

Methods of applied mathematicians

Applied mathematics does not involve exploring the ramifications of existing mathematics through the tool of the rigorous proof. Instead, people who are trying to apply mathematics to the real world generally start with the real-world problem and then either select or create the mathematics that are needed in order to solve that problem.

Suppose, for example, that you have agreed with your parents that you will save £2000 toward your college expenses for your freshman year. You have a job, and you need to decide whether you should keep that job, get one that pays more, or arrange to work more hours between now and the start of university. You know what the problem is; how would you solve it?

1. Think about what you would do.
2. Describe the process and methods that you would have to use.
3. How do those methods differ from the methods of the pure mathematician?

CASE STUDY

Richard Arenstorf

Richard Arenstorf was working at the Army Ballistics Missile Agency with Werner von Braun when the goal of landing a man on the Moon by the end of the 1960s was announced. Among the many problems that had to be solved was a problem that no mathematician had been able to solve for 300 years: the three-body problem. The problem for NASA was that celestial bodies in space exert gravitational forces on each other. The solution to the two-body problem had been fairly easily solved, so NASA knew, for example, how the Earth and the Moon were each affected by the gravitational force from the other. Sending a spaceship to the Moon would necessarily introduce a third body into the system, and NASA needed to know how the gravity from the Earth and the Moon would affect the ship's trajectory. The ship, too, would exert a gravitational pull on both the Earth and the Moon, though obviously that pull would be much weaker than the gravity created by either the Earth or the Moon. It had to be taken into account, nevertheless.

The trajectory of the spaceship would be the path that the ship would follow. It could not just fly in a straight line from the Earth to the Moon the way you might be able to drive in a straight line from one end of your street to the other. Each end of your street remains in the same position relative to the other, regardless of how the Earth turns and travels around the Sun. But the Earth and the Moon do not stay in the same position relative to each other; both bodies are turning and the Moon revolves around the Earth while both Earth and Moon travel around the Sun. A spaceship shot in a straight line from Cape Canaveral in Florida would head out into outer space and miss the Moon by a long way. The trajectory had to be curved. The exact amount of curve had to be controlled, or Apollo 11 could end up flying off into outer space.

Think about moving objects in relationship to each other: if you want to throw a ball at a moving car and hit it, you have to time your throw so that you release the ball before the car is lined up with you. If you throw when the car is in front of you, it will be past you and gone before the ball can reach it. The further away you are from the car, the greater the distance behind the car will be when the ball passes the line where the car once was. The Moon is 238 000 miles away, so if we don't 'throw' the spaceship at it at just the right moment, taking into account how the gravity will affect the speed and direction of the ship, we could miss the Moon by a truly enormous distance. The maths had to be right. (We do not, by the way, suggest that you should go out and throw balls at moving cars!)

The illustration on the next page shows the two different trajectories that Apollo 11 had to take. The bottom line shows the path it would take on the way to the Moon, and the top line shows the path it would take on the way back from the Moon.

In order to work out precisely how to make Apollo 11 go where they needed it to go, NASA needed to know exactly how all the gravitational forces would work on the ship.

Arenstorf knew precisely what the problem was when he set out to solve it. He was able to solve the

■ Apollo 11 trajectories

problem for the exact case at hand: the case in which the three bodies were the Earth, the Moon and the Apollo spacecraft. The problem has not been solved for all cases. Arenstorf did not provide a rigorous proof for this problem; however, he did have to create a justification good enough to convince the rest of the NASA scientists, engineers and mathematicians that it would work. In the end, the fact that his solution was correct was demonstrated because it worked. The trajectory that was planned based on Arenstorf's solution did, in actual practice, get Apollo 11 to the Moon and back.

CONCEPT CONNECTION

Explanation

A proof is one kind of explanation used in mathematics – it is the mechanism for explaining how mathematicians know that a particular claim is absolutely certain. The proof doesn't necessarily work in a situation such as Richard Arenstorf's: he could not develop a rigorous proof, because he solved the problem only for a particular case (and, in fact, as of 2019, that problem has only been solved for a few special cases). Despite the lack of a rigorous proof, however, the work was to be used in a very important, very expensive, very dangerous project – the sending of men to the Moon and bringing them back. Arenstorf needed to be certain that his mathematics was correct, which probably meant demonstrating that he was absolutely certain about the mathematics for that one special case. That need meant that he had to be able to explain, using much the same process of logical deduction, why his conclusion was true.

We saw with the work that Andrew Wiles did on Fermat's Last Theorem that peer review of a proof plays an essential role in the construction of mathematical knowledge. Wiles' proof had to be gone over in **minute** detail by someone who could understand it before the mathematical world would accept the work, and that person did actually find a fatal flaw in the proof. When the error was corrected, Wiles had to submit the paper for careful peer review again, and it was published only after it passed that test. The demand for a thorough explanation of the reasoning that went into any proof is a required step in the process.

We don't know what kind of peer review Arenstorf's work went through, but we can safely assume that it was subjected to careful checking. Without the approved explanation, no one in the mathematical or scientific community would have been able to accept his word that he had solved the problem. Explanation is a crucial element of applied mathematics.

We have looked primarily at cases of applied mathematics in which the problem is known before the mathematics exists to solve it. There are, however, cases in which pure mathematicians create mathematics which can be used later in order to solve real-world problems, although that was not the intention when it was developed. Here are two examples (Rowlett 166–69):

◆ **Minute:** This use of the word 'minute' refers to a very small amount, as opposed to the unit of time.

- Irish mathematician William Rowland Hamilton came up with the mathematics for something called quaternions in 1843. Quaternions are representations of what happens if the complex number system is extended into the fourth dimension – a dimension which we, of course, as three-dimensional beings, cannot experience. Nothing much happened with the idea of quaternions for more than 150 years, until they turned out to have an application in robotics and gaming. The mathematics that no one was very interested in turned out to be extremely useful in an industry worth more than $100 billion.

- Mathematics about probability theory began to be developed in the seventeenth century by a mathematician who was also a compulsive gambler, Girolamo Cardano. Cardano thought he had calculated the odds of being able to throw a double six with two dice at least once in 24 throws, but it didn't work. He called in Blaise Pascal and Pierre de Fermat in 1654, and together they laid the foundations for modern probability theory. One very practical, but unanticipated, application of this mathematics is for use in the insurance industry. Insurers used to think that they should sell few policies because each one was of high risk, but probability theory demonstrates that the opposite is true: it's better to sell many policies because, as shown by the law of large numbers, the bigger the number, the better the prediction.

KNOWLEDGE QUESTION

Can you think of examples from other areas of knowledge in which knowledge that was developed for one purpose was then discovered much later to be very useful for another purpose?

EE links

Research into one or more cases in which mathematical principles which were developed purely for the sake of expanding our mathematical knowledge but actually turned out to be useful could make an interesting extended essay. A research question might be: What is the relationship between pure mathematics and applied mathematics?

Mathematics does not rely on the kind of tools that are used in laboratory science, and for many centuries, the tools that were used were quite simple: a pencil and paper, a ruler, a mathematical compass and a protractor, plus the cognitive abilities of the human mind have been the tools which created much of the world's maths. In recent decades, the electronic calculator and the computer have been added to the repertoire and have greatly extended the ability to process mathematical concepts beyond what the human mind can do. But the basic methods have been unchanged for many centuries: logical deduction and rigorous proof remain the primary means by which mathematical knowledge is extended.

Ethics

Ethical concerns with regard to developing mathematical knowledge

Ethical concerns as they relate to mathematics are different, in some ways, than the ethical concerns for all other areas of knowledge, because only in mathematics is absolute certainty attainable as the standard for knowledge. Given that standard, then, it follows that in order to employ the methods of mathematics ethically, mathematicians must take whatever actions necessary to attempt to attain it.

Learner profile

Risk-takers

What role do ambiguity and uncertainty play in our development of mathematical knowledge?

Ambiguity

At the beginning of the chapter, we asked you to solve a problem that eventually required you to use the order of operations in order to know which steps to take in order to get the correct answer to the problem. That problem is tricky, because it simply assumes that you know about the order of operations and that you will automatically apply it. The creator of the problem put the **onus** on the solver, in other words, rather than taking responsibility themselves for making sure that the problem was clear. The problem doesn't really treat the solver fairly, and, as such, it violates an important value in mathematics: clarity.

◆ **Onus**: Another word for 'responsibility.' If the onus is on you to do something, that means that you have to take the responsibility for getting it done.

The problem at the beginning of the chapter was a relatively simple one, which really had only one possible way to apply the order of operations. There are problems, however, for which it can be much more difficult to determine what to do. PEDMAS says, for instance, that we do division and multiplication before addition and subtraction, but there is not actually a hard rule that we always do division before multiplication, and, in fact, many mathematicians prefer that multiplication comes first (Dr Peterson).

One example of how a lack of clarity can arise from a confusion that PEDMAS cannot necessarily resolve clearly can be found in the following problem (Knill):

What is $2x \div 3y - 1$ if $x = 9$ and $y = 2$?

If we read the problem as being $2x \div (3y) - 1$, we get an answer of 2.

If we read the problem as being $(2x \div 3)y - 1$, we get an answer of 11.

If we read the problem as being $2x \div (3y - 1)$, we get an answer of $18 \div 5$.

Had the person who constructed the problem put the parentheses where he wanted them, there would have been no confusion. In the early days when algebraic notation was first being developed, each writer was expected to provide an explanation at the beginning of his publication so that it would be clear to all readers how that mathematician ordered the operations (Dr Peterson). This meant that there was little consistency, but there was no ambiguity.

The reason that ambiguity is a problem in mathematics is that, in pure mathematics, the standard is absolute certainty. We can't have absolute certainty if any of the premises in the proof are ambiguous, or if the final statement of the claim is ambiguous. In applied mathematics, the standard requires that the mathematics necessary to solve a problem actually helps us solve the problem. If our mathematics is ambiguous, then we are reduced to trial and error to see if we can use the maths effectively.

In one famous example, a $125 million satellite was lost in 1999 because a lack of clarity between two different sets of engineers led to the satellite moving far off course and burning up in the atmosphere of Mars, rather than orbiting the planet as intended (Hotz). The problem occurred because the engineers who built the satellite used the English measurement system which relies on inches, feet, and pounds while the people who planned the launch and designed the flight path used the metric system, which relies on metres, millimetres, and grams (Hotz). It's hard to say who was at fault: the builders for not being clear, or the navigation team for failing to validate their assumptions about which system was used. Either way, this example shows us the importance of clarity, accuracy and precision in applied mathematics.

These days, it is still good practice for anyone writing out mathematical statements to eliminate all ambiguity by using notation in such a way that no one has to interpret it using such mnemonics as PEDMAS or BEDMAS. The onus, in other words, is on the writer, not on the reader.

KNOWLEDGE QUESTION

Is ambiguity a central concern in other AOKs, such as history and the human sciences, as well?

KNOWLEDGE QUESTION

Who judges the validity of a proof?

DEEPER THINKING

Values and ethics

This chapter has pointed out several problems with knowledge-making in mathematics that arise out of human failure to deliver work which is precise enough to represent important values in mathematics. There is no written requirement for precision or clarity in the American Mathematical Society's code of ethics, though the European Mathematical Society Code of Practice does stipulate that in published work, the authors must ensure that 'the mathematical symbols, words, and sentences that are used in the published work are clear and are not a barrier to understanding' (European Mathematical Society). Where the value for precision is formally encoded in the European document, it is not in the document from the American Mathematical Society.

Are values the same thing as ethics? Is a failure to adhere to the important values of mathematics, or any other subject area, the same thing as an ethical violation?

CONCEPT CONNECTION

Certainty

We have said several times that the standard for knowledge in pure mathematics is absolute certainty. Given that requirement, any mathematician who declined to provide a satisfactory explanation as to why their work met that standard would be violating an extremely important value. Any publisher who agreed to publish such a paper as a proof would also be behaving in an unethical fashion.

We must now, however, acknowledge a problem which has arisen in the late twentieth and early twenty-first century which challenges the assumption that absolute certainty is possible. Computers can now generate proofs which are so complicated that they cannot be checked by human minds to the level of absolute certainty. One example is a proof from 1998 which was submitted for publication by mathematician Thomas Hales. The proof claims to have proven the Kepler conjecture, dating back to 1611. It has to do with the most efficient way to pack spheres in a box. Hales' proof, however, involves 40 000 lines of computer-generated explanation, and the whole proof is more than 300 pages long. The proof was checked by 12 reviewers. 'After a year they came back to me and said that they were 99 per cent sure that the proof was correct,' Hales says. 'But the reviewers asked to continue their evaluation' (Khamsi). After four more years of checking, there was no further improvement on that 99 per cent.

The fact that modern technology has made possible mathematical work that cannot be done by a human or humans has created a problem for existing values and ethical practice. Mathematicians are struggling with the idea that absolute certainty may have to be dropped as the standard, which would make mathematics much more like the natural sciences, in which absolute certainty has never been possible in the same way, since science is based on inductive reasoning. (The differences between mathematical and scientific reasoning will be discussed in much more detail in Chapter 9.)

If the value placed on absolute certainty has to change, then so will the ethics based on that value.

Ethical concerns with regard to applying mathematical knowledge

The Mars satellite that was lost in 1999 is an example of why clarity is necessary, if accurate, useful knowledge is to be made in applied mathematics. There is another way, however, that ethics plays a role in applied mathematics: as new technologies arise, new ethical questions and problems also arise. Earlier in the chapter, we considered the technology of the self-driving car, and how the mathematics behind the technology tells us that autonomous cars are safer than human drivers, though humans have a difficult time accepting that. Mathematics is involved in autonomous cars in another way, however: it will be complex mathematical algorithms which make decisions about what to do when the cars find themselves in situations in which an accident is unavoidable.

KNOWLEDGE QUESTION

To what degree is a desire for certainty an ethical concern in other areas of knowledge? Does that desire have the same effect on the methods of those areas as it does in mathematics?

ACTIVITY

Before you read the next section, consider how you would answer each of the questions in the following hypothetical situations. Assume in each case that the death of one person is unavoidable. Which should the car be programmed to choose and why?

1. Should a self-driving car prioritize the safety of passengers over pedestrians, or pedestrians over passengers?
2. Should the car hit a homeless person or a wealthy businessperson?
3. Should the car hit an elderly woman (someone's grandmother) or a young person in her twenties?
4. Should the car hit a college student or a factory worker?
5. Would you buy a car which was programmed to use the choice you picked? Would you buy a car programmed the other way?

Researchers at the Massachusetts Institute of Technology conducted a very large survey (more than 2 million people in 233 countries) to see if any kind of consensus could be found on questions similar to the ones you answered above. Interestingly, but perhaps not surprisingly, the patterns of answers were not universal, but were tied to cultural values in the countries where the respondents lived (Laursen).

CONCEPT CONNECTION

Culture

Use the QR code to watch a video about this study and the ways in which culture affected the ethical knowledge that people who responded to the survey relied on.

All of these choices are extremely difficult. A person driving a car faced with these choices will likely make an intuitive decision, but autonomous cars can't be given intuitions or emotions; they have to be programmed in advance. Because self-driving cars cannot eliminate all accident-related fatalities, we have to be ready for some people to be killed in accidents involving self-driving cars. There are difficult moral and ethical questions regarding how to make the decisions about how the cars should be programmed. Who should decide? Should mathematicians decide? Engineers? Could individual car buyers decide? We do not currently have answers to these questions, which is to say, we do not, as a society, or as teams of mathematicians working on the projects, know what the ethical thing is to do. Ideally, before any such decisions are made, a clear set of values will be identified to serve as the underpinnings for the ethical decision making.

KNOWLEDGE QUESTION

To what extent do you agree with the mathematician Paul Ernest's claim that mathematics 'serves as a training that shapes thinking in an ethics-free and amoral way'?

ACTIVITY

Discuss and debate the questions below with your classmates.

1. Does the fact that decisions can be made in advance about who a car would be programmed to choose when a death is unavoidable make the emotional reaction to the loss of that person worse?
2. Do you think people are more likely to believe that it's better to accept a much greater number of deaths rather than plan ahead for a relatively small number? (Remember, the Intel mathematics suggest that automobile-related deaths can be reduced from 40 000 a year in the United States to only 40.)

KNOWLEDGE QUESTION

How might we compare the ethical uncertainty involved in the application of mathematics to the real world to ethical questions in other areas of knowledge such as history or the human sciences?

The autonomous vehicle is only one example of the way in which developing technologies challenge our ethical decision-making processes regarding the mathematics that underlie the technology. Think back to Chapter 3, for example, where we saw the problems that have arisen as a result of the fact that we can use mathematics to track every click that an individual user makes on the internet. This technology has enabled mathematical algorithms to choose which content those users are then faced with – ads, news stories and entertainment recommendations. These problems have not been resolved, and the question as to whether they *should be* has yet to be satisfactorily answered.

Conclusion

Over the course of this chapter, we have seen how the various aspects of mathematics are intertwined. When we considered the scope of mathematics, we had to consider the fact that there are different perspectives that can be taken towards the subject, because the different perspectives approach knowledge construction in different ways. When we investigated the question of what perspectives there are in mathematics, we had to begin considering the methods of mathematics, because the different perspectives require different methods. When we moved on to exploring the methods, we saw more clearly how the methods depended on the perspectives and how together, they help to define the scope of the study. When we discussed the role of ethics in making knowledge in mathematics, we realized that ethics shapes the methods. This intertwining of the four elements of the framework can be seen in all the areas of knowledge.

One final aspect of mathematics that we have not considered is the fact that mathematicians consider mathematics to be elegant and beautiful. That belief sometimes comes as a surprise to people who have had to struggle with mathematics which has been presented to them as a subject with fixed procedures and formulas that must be memorized. By now, however, we hope that you have been able to see how mathematics is all around us in the world in much richer forms than just the numbers and symbols which make up the language which expresses it. We got a hint of the attitude that mathematics is beautiful when we read Richard Feynman's words about mathematics being the only way we can truly appreciate nature, even for one moment. Bertrand Russell, who began as a mathematician and then turned to philosophy, summed up the feeling this way:

> Mathematics, rightly viewed, possesses not only truth, but supreme beauty – a beauty cold and austere, like that of sculpture, without appeal to any part of our weaker nature, without the gorgeous trappings of painting or music, yet sublimely pure, and capable of a stern perfection such as only the greatest art can show. (Bailey and Borwein 2017)

The fact that mathematics has the ability to express so exactly the world of nature and the world of the imagination makes it elegant, and takes us back to the question of whether maths is invented or discovered. Many people believe that it could not be so elegant if it were invented by mankind. This is a question for you to ponder as you continue your exploration of how mathematics is similar to, and different from, the other areas of knowledge.

CONNECTIONS TO OTHER AOKs

- **Scope:** The scope of mathematics, as we have seen, is far-ranging and touches most aspects of the world, even though we might not often think of that fact. The scope of the arts is also extremely far-reaching; how does it compare to the scope of mathematics? Is the scope of history in some way less widespread? Why?
- **Perspectives:** The differing perspectives in mathematics do not ultimately seem to result in disagreement about what is true in mathematics and what is not. The same cannot be said about differing perspectives in history. What about the nature of history as a knowledge-making endeavor that makes the role of differing perspectives so powerful?
- **Methods and tools:** The possibility of certainty in mathematics reflects the method of the rigorous proof. How do the methods of the other AOKs reflect the less certain nature of the knowledge claims in those areas?
- **Ethics:** Many ethical concerns in mathematics arise from the impact of mathematics on the world and, therefore, on people's day-to-day lives. The natural sciences seem obviously to have the same kind of widespread impact on people; does the knowledge from the other AOKs have the same kind of powerful influence on the world and, therefore, do the ethical constraints arise from a responsibility to humanity, or do they arise from something else?

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9 The Natural Sciences

OBJECTIVES

After reading this chapter, students will be able to:

- define the scope and application of the natural sciences
- appreciate how widely scientific findings are applied in their everyday lives
- recognize the different stages of the scientific method
- understand how the methods of science reflect important aims and assumptions about the nature of the natural sciences
- appreciate the reasons why and conditions under which scientific claims can be trusted
- understand the conditions under which natural science claims are revised
- appreciate the fact that once something has risen to the standard of a scientific theory, it will not be altered in its broad outlines
- understand that the conditions under which the generation and application of scientific knowledge are ethical.

Learner profile

Inquirers

What conventions and methods do we use to shape effective scientific inquiry?

KNOWLEDGE QUESTION

Should the natural sciences be regarded as a body of knowledge, a system of knowledge or a method?

Introduction

Here are two scenarios. One we would call science; the other we would call pseudoscience. Read the scenarios and decide which is which and why you think so.

Scenario 1: Get a small amount of dirt out of the garden or a nearby park and put it in a jar. Then add water a little at a time and observe what happens. Keep adding water until you have a very watery mix. Observe what happens to the colour and texture of the substance in the jar. What do you think is happening? Make a hypothesis: could you separate out the dirt from the water? Why or why not? If you let all the water evaporate, will you be left with dirt that lookes exactly like it did when you put it in the jar in the first place?

Scenario 2: Go out and find a good, solid forked stick. Go to a park or field and hold the stick firmly by the two fork prongs. This activity is called dowsing, and it is supposed to help you find water. One source has this to say about dowsing:

> … dowsers, using a variety of methods, disagree on why water witching works and even on who can do it. They use different woods and claim to be able to predict different things, such as depth of water or direction of flow. But one thing they all agree on – the thing that has been proven by well after well – is that they **do** locate water. (Mother Earth News Editors)

So now make a prediction: do you think that the divining rod (which is the name for the forked stick) will start vibrating when you are over water?

Which one of those activities seem more like science to you? Why?

The first activity, as it is described, is science. It is an examination of properties of some aspects of the physical world – dirt and water. Ultimately, this activity is a chemistry experiment, though a quite simple one. If you actually did the experiment, and you went and got some dirt and put it in the jar and observed what happened, you were exploring the nature of the particular chemicals that make up the dirt that you found and how those chemicals interact with water –

Dowsing for water

the chemical compound H_2O, dihydrogen oxide. Possibly, depending on where you got your water, there were other chemicals present as well.

You observed the reaction that you created, and you formed an hypothesis as to whether it was possible to separate the dirt back out from the water, and, if so, whether the dirt would look exactly the same as it did when you first put it in the jar. From this point, you could test your hypothesis by designing an experiment intended to attempt to separate the two substances. Notice that if you did not actually run this experiment, if, instead, you only sat in your chair and read about it, you were not doing science. Natural science does not generate knowledge through thought experiments, though thought experiments might help a scientist develop a hypothesis or design an experiment.

From this basic experiment, you could explore a number of other questions related to the interaction of the chemicals in your local dirt and water. You could, for example, determine exactly which chemicals are present in each sample, and then you could start experimenting to discover whether different combinations of chemicals resulted in the same reaction of dirt and water. You might explore which soil retains water best for growing certain crops, and which soil dries out too quickly, or stays too wet too long. The initial question that we had about the reaction between soil and water not only provides us with information about the physical world, it also opens up many new lines of inquiry. Lest you think that the question about soil is too simple to be useful in the world, you might be interested to know that there is a whole branch of chemistry called soil chemistry. You can use the QR code on the right to explore a website from the Soil Science Society of America and learn more about the wide range of research questions that soil scientists pursue.

In contrast to the soil experiment, the dowsing activity, as it is described, is pseudoscience. Pseudoscience is an interesting term. Before reading on, think of some activities that you might call pseudoscience or which you have heard others call pseudoscience.

Perhaps you thought of some of these:

- astrology
- psychic readings or fortune-telling
- the search for **extraterrestrial** life
- flat Earth claims
- Moon landing conspiracy theories
- the belief that ancient astronauts visited the Earth.

◆ **Extraterrestrial**: 'Not found on Earth'.

■ What differentiates science from pseudoscience?

Michael Shermer, publisher of *Skeptic* magazine, argues that the most objective way to differentiate pseudoscience from science is to test the work against the standard of how testing is done and see whether the findings generate new questions for other scientists to pursue: 'That is, does the revolutionary new idea generate any interest on the part of working scientists for adoption in their research programmes, produce any new lines of research, lead to any new discoveries, or influence any existing hypotheses, models, paradigms or worldviews? If not, chances are it is pseudoscience' (Shermer).

We saw, with the example of the dirt and water study, that the findings from such a study could open many new lines of research. On the other hand, the claims of the dowsers have not been scientifically established. The article admits that dowsers don't know why it works. They don't know which kinds of wood are best and they can't explain why dowsing only works for some people. They just assert that it does work. We can't take that 'finding' and extend the research, because there is no evidence that any research took place. We don't know who can find water by dowsing; we don't know if demonstrations of dowsing, assuming some have taken place, were controlled in any way to preclude every possibility of trickery. We don't really know if any water has ever been found using a dowsing stick.

Learner profile

Principled

What is the difference between principled scientific inquiry and pseudoscience?

ACTIVITY

We could, of course, decide we wanted to subject dowsing to scientific study.

1. What hypothesis might you formulate as the basis for your study?
2. What are some questions you could ask and how could you test your hypotheses?
3. What would the experiment look like?
4. Why do you think that scientific studies of this sort have not been carried out by dowsers?

CONCEPT CONNECTION

Perspectives

'Pseudoscience' is a bit of an odd term, as it is only applied to activities by people who are not engaged in those activities. Dowsers do not call themselves pseudoscientists; they call themselves 'dowsers' or 'diviners'. Whether a person calls an activity pseudoscience or not is, therefore, a matter of perspective.

There are two main situations in which people use the term 'pseudoscience':

- Often what some people call pseudoscience is not science at all, and the term is used to express displeasure that the activity is being presented as science, or that it challenges the findings of science. Creationism, for example, is often called pseudoscience, but it would be more precise to say that creationism is not science. You learned about the methods for making knowledge in religions in Chapter 6. We will explore the methods of science in more detail later in this chapter, but you can already see that the methods of science – which begin with observation of the natural world – are different from the methods of religious knowledge systems. This difference does not mean that religious knowledge is not knowledge; it is just different from scientific knowledge, and those people who denounce it as pseudoscience are not applying accurate language to describe it.
- Another perspective on the concept of pseudoscience is that 'pseudoscience' is a word that is applied to activities which are in some ways related to science. For example, the dowsing activity above claims to reveal knowledge about the physical properties of the Universe, but does not use the methods of science to develop this knowledge.

KNOWLEDGE QUESTION

In the natural sciences, reliability is established in part through careful experimental design. What features of knowledge in the other areas of knowledge help us to determine its reliability? Are those features more similar to or more different from the experimental design of the natural sciences?

The question of whether some activity is science, pseudoscience or not science at all, is a good one for us to consider at the beginning of this chapter because it helps us to identify the central defining characteristics of science. That is, natural science is the study of the physical properties of the Universe, and that study is undertaken systematically, with the aim of producing knowledge which is as objectively and certainly established as possible. Scientific knowledge is developed from observation, analysis and reason, and does not rely on opinion or thought experiments. Hypotheses are developed as a matter of speculation; however, they remain formally hypothetical until demonstrated by careful study. In the rest of this chapter, we will consider the complexities of the subject and the means by which we come to call something scientific knowledge.

Scope

The term 'natural science' incorporates a wide range of different endeavours. Since natural science has, as its focus of study, the physical properties of the natural Universe, it has, as its subject, the physical properties of everything that naturally exists in the Universe. That means that there are sciences which investigate soil (as we saw earlier), animals, plants, air, water, light, planets and stars. There are scientific studies involving the very smallest particles that make up matter – atoms and sub-atomic particles such as quarks – and the very largest objects in the Universe: galaxies and even other universes. Constructed objects, such as buildings, bridges, artworks, cars and mobile phones are the result of the application of the natural sciences. In some cases, they can also be the focus of scientific inquiry when knowledge is needed to solve problems. We will look at some examples of this later in this section.

KNOWLEDGE QUESTION

What knowledge, if any, is likely to always remain beyond the capabilities of science to investigate or verify?

The natural sciences can be categorized in broad terms which are probably familiar to you: physics, chemistry, and biology, but within those broad categories you will find many, more focused, subcategories. Table 9.1 shows some of the subcategories you can find under the umbrella of biology, for example:

Table 9.1 Subcategories of biology

Name of science	Objects of study
Anatomy	The structure of body parts
Astrobiology	Origins and distribution of life in the Universe
Botany	Plants
Cell biology	Cells
Entomology	Insects
Herpetology	Snakes
Physiology	The function of body parts
Marine biology	Plants and animals that live in the ocean
Mycology	Mushrooms
Zoology	Animals

KNOWLEDGE QUESTION

Are other AOKs organized into disciplines in ways similar to the way that knowledge in the natural sciences is? How does the organization affect the knowledge which is produced?

There are many more branches of biology, and of course the branches sometimes overlap with each other and with fields in chemistry and physics. Biophysicists, for example, use the methods of physics, which includes such methods as the application of complex mathematics to physical problems, to questions about how biological systems work. Biophysicists have done work with how DNA can cause cells to change into cancer, how plants can take sunlight and convert it into food, and how nerve cells communicate ('What is Biophysics?').

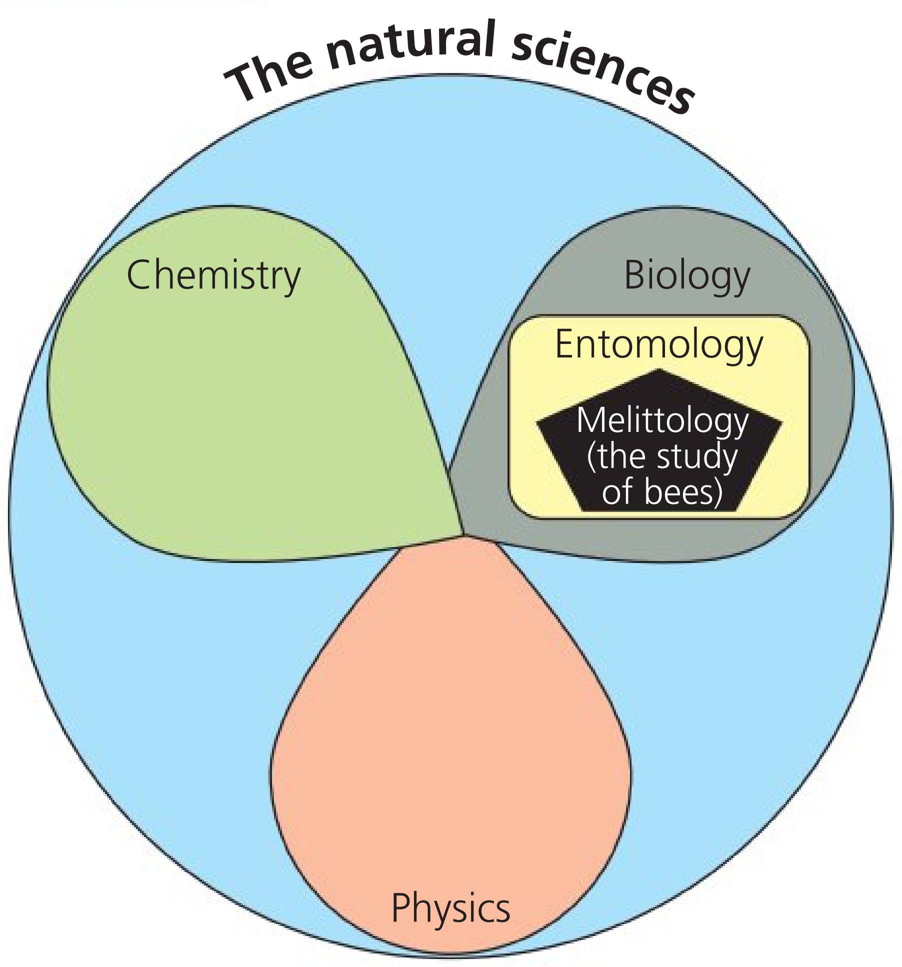
Within the narrower fields of a branch of natural science, even further specialization exists: an entomologist might be any of the following (Bueza):

Table 9.2 Subcategories of entomology

Branch of entomology	Focus of study
Insect ecology	The relationship of insects to their environments
Insect morphology	The structure of an insect's body and body parts
Insect pathology	Insect diseases
Insect physiology	The internal systems of an insect's body
Insect taxonomy	The classification of insects into orders, families, genus and species, so that we can see how insects are related to each other
Industrial entomology	The ways in which insects can be used to generate products, such as honey or silk
Medical and veterinary entomology	The study of how humans and animals can be made ill by insects (with a focus on public health)
Forensic entomology	The role of insects, such as fly larvae and flies, in contributing to an understanding of when and how someone died

There are other specialties within the field of entomology. Some entomologists take a different approach to entomology, and they focus on particular types of insects, such as bees, and study those from several of the different perspectives that are mentioned above. Someone might, for example, spend an entire career studying the ecology, morphology, pathology, physiology and taxonomy of honey bees. The study of bees is called melittology. The diagram on the right gives you an idea of where that person fits in to the larger category of the natural sciences:

When you begin to consider all the hundreds, or even thousands, of different combinations of specialties which are possible within any one of the major branches of the natural sciences, you begin to get a sense of the far-reaching scope of the sciences.



How melittology fits into the natural sciences

ACTIVITY

Go to the website of a university near you (or any university which interests you) and look up a professor in one of the sciences. Find his or her particular specialty and then see if you can place that specialty in the chain of categories and subcategories of science. Draw a diagram like the one for the bee specialist above that represents the relationship of that person's specialty to the pertinent categories.

Applications of scientific knowledge

Biology

The scope of the natural sciences can also be considered from the perspective of how we use the knowledge we get from the work that scientists do. We can see from Table 9.2 that some of the applications of entomology help support the global economy through the development of industries such as the distribution of honey and the sale of silk spun by silkworms (which are the larvae of a moth native to China). The study of insects also contributes to the medical and legal systems by helping people figure out how to stop the spread of disease, cure disease and solve crimes. There are also numerous applications of entomology which affect local and global economies. For instance, a moth from Australia, the Light Brown Apple moth,

The light brown apple moth

has spread to a number of countries such as New Zealand, England, Ireland and the United States. It is considered to be a dangerous pest, because in agricultural areas where it has no predators, such as in California, it could spread rapidly and destroy plants ranging from fruit crops to trees such as oaks, redwoods and cypresses ('Light Brown Apple Moth'). One important application of entomology, then, is the effort to control and eradicate this pest which could endanger billions of dollars' worth of agriculture.

There are similar applications of the study of plants and other animals. Yellow and Dalmation toadflax are two closely related kinds of weed that were introduced to North America in the nineteenth century through a combination of accidental transport by travellers and deliberate introduction as ornamental plants. They have spread throughout North America, and, because they have no natural predators, these plants have caused significant economic impact to agriculture, as the toadflax plants crowd out crop plants. Some of the crops which have been affected include grain, oil seed and oil mint, berries and small fruits (Sing, *et al*). Biologists have studied the problem of these two toadflaxes and have developed methods for eradicating them, the most effective of which involves a biological approach – that is, using other biological entities such as other plants and insects to wipe out the toadflax.

KNOWLEDGE QUESTION

Can the knowledge from other AOKs be used to solve real-world problems in the same way that knowledge from the natural sciences can?

One widespread and common application of biology is the preservation of endangered species. Biologists studying grizzly bears, for example, have helped in the restoration of the grizzly bear population in Yellowstone and Grand Teton National Parks in Wyoming, in the United States. In 1975, there were an estimated 136 bears in the area, but by April 2019, due to legal protections and careful management, there were an estimated 718 bears in the same area (National Park Service). The species was temporarily taken off the endangered species list but was restored in the fall of 2018.

■ Grizzly bears

Another mammal conservation effort is underway to try to save North American bats from the spread of White-Nose Syndrome. The syndrome is caused by a fungus and is fatal to bats of several different species. It seems to have arisen in 2006 and has so far killed millions of bats in North America. The fungus, *Pseudogymnoascus destructans*, or *Pd* for short, has been found in

Europe and Asia too. However, the bats in those regions do not get as sick from the fungus as the North American bats do (White-Nose Syndrome Response Team). As a result, biologists from all over the world are working on the problem.

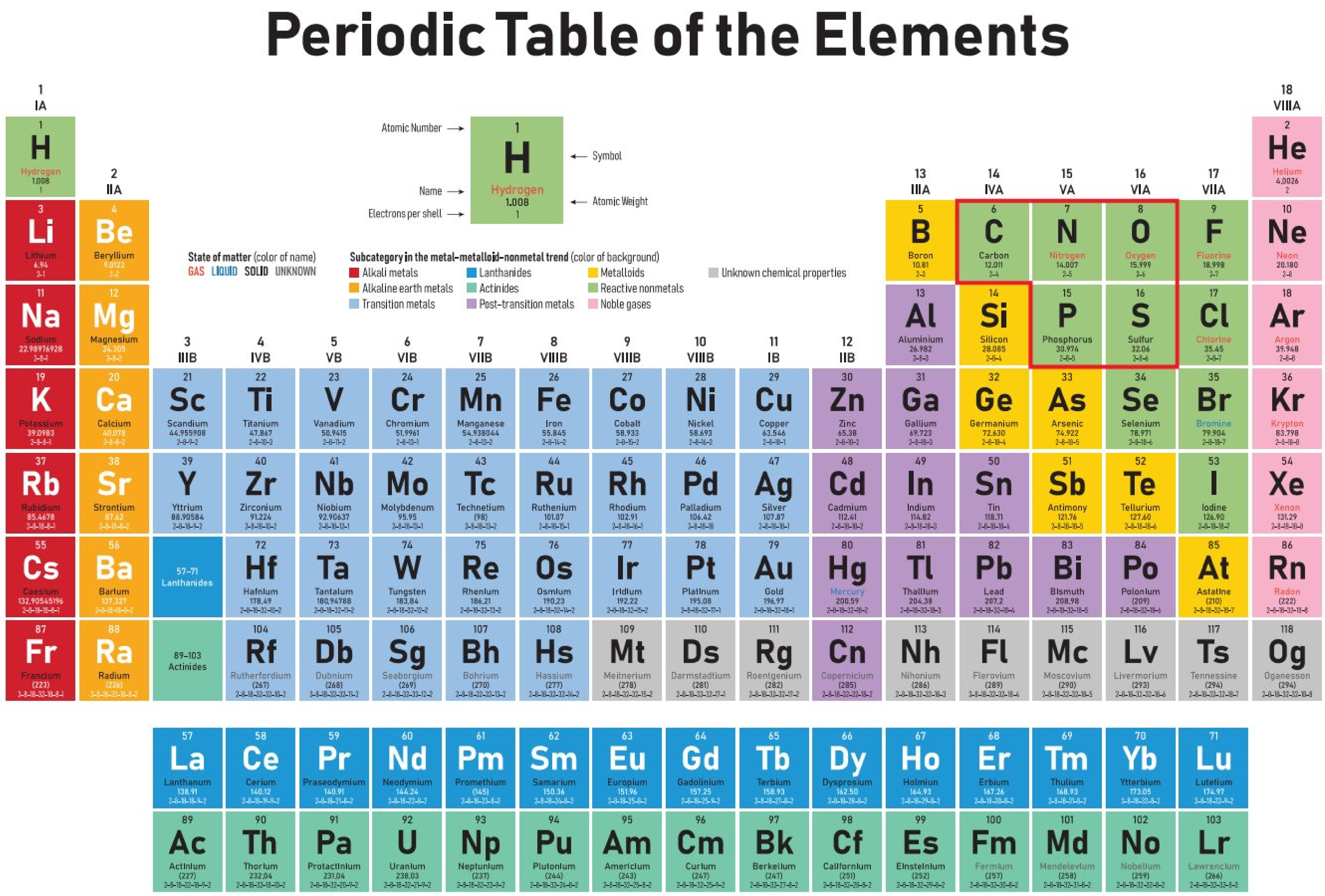
CAS links

The International Union for Conservation of Nature (IUCN) lists 16 306 endangered species of plants and animals as of early 2019 (Kasnoff). You could engage in a CAS project or a series of activities to find out what species are endangered in your area and to educate your classmates and your local community about them and about what could be done to help them. You might arrange guest speakers to come to the school. You could organize fundraisers, or you could volunteer at local organizations engaged in preservation work. As a creative activity, you could create artwork of the endangered species to help familiarize people with them.

Chemistry

Broadly speaking, Biology deals with the nature of things on the large scale, seeking answers to questions such as, 'What is a plant and how does it work?' and 'What is an animal and how does it work?' Biologists are concerned with plants and animals as systems, and they want to know how these systems work, both in terms of the individual living thing and in terms of how they work in the systems in which they live. Chemistry, on the other hand, deals with the fundamental nature of things in terms of what substances they are made of on the molecular level.

Two main branches of chemistry are organic and inorganic chemistry. The difference between the two is that they deal with different elements on the periodic table of elements.



■ The Periodic Table

Nearly all organic compounds are made up of five elements: carbon, nitrogen, oxygen, phosphorus and sulfur (outlined in the red box in the illustration). These, then, are the elements that an organic chemist is going to work with, while all the rest of the elements comprise the compounds that inorganic chemists work with. There are some exceptions to this generalization, but that is the basic division between the two types of chemistry.

Despite the fact that organic chemists normally work with many fewer elements than inorganic chemists do, both organic and inorganic chemistry have applications in a wide variety of situations. Table 9.3 is a list of just a few of those applications, according to the American Chemical Society.

Table 9.3 Applications of inorganic and organic chemistry

Inorganic chemistry	Organic chemistry
Fertilizers, insecticides and soil treatments	Biotechnology – cultivation of plants
Jet and rocket fuels	Biofuels, oil and natural gas
Pharmaceuticals	Pharmaceuticals
Water treatment	Agricultural applications
Plastics	Bioplastics
Paint and ink	Rubber
Fibres (including synthetics used in clothing)	Textiles and paper
Cosmetics	Soap, detergents and cosmetics
Microchips	Petroleum refining and primary metals

ACTIVITY

Think about the objects you use every day – from your toothbrush to your mobile phone to a car or bus. Is there any manufactured product in twenty-first-century society that did not require some knowledge of chemistry, either in its design or in its production?

Chemists do work which ultimately results in more than 70 000 consumer products. 'These base products are then used to make consumer products in addition to manufacturing, service, construction, agriculture, and other industries' ('Organic Chemistry').

CASE STUDY

Using chemistry to solve global problems

In April 2018, the international organization Earth Day Network reported the amount of disposable plastics that are used around the world in a year. Some of these figures are shown in Table 9.4.

Table 9.4 Quantities of disposable plastic objects used around the world (Source: Earth Day Network March 2018)

Disposable plastic object	Quantity used
Plastic water bottles	1 000 000 per minute
Plastic drinking straws	Half a billion every day
Plastic bags	4 trillion annually, of which only 1% are returned for recycling
Disposable cups (including Styrofoam coffee cups)	500 billion a year

Very little of the plastics that is used every year ends up being recycled, and a great deal of it ends up in the oceans. A study published in 2016 by the World Economic Forum found that 32 per cent of 78 million tons of plastic packaging ends up in the ocean every year. To try to help you understand that quantity better, that's the same as pouring one garbage truck full of plastic trash into the ocean every minute. That is expected to rise to four trucks per minute by 2050, at which point there will be more plastic in the ocean than fish (Pennington).

According to the World Economic Forum, another 40 per cent of the plastic we use ends up in landfill sites, with a further 14 per cent incinerated or used in other energy-producing processes. Meanwhile, just 14 per cent is collected for recycling, of which more than a quarter is lost in the recycling process and more than half is recycled into lower-value types of plastic. This means that only 2 per cent of the plastic packaging that we use is recycled for use in the same or a similar-quality application, for example, used plastic bottles being remade into new plastic bottles (this is known as closed-loop recycling).

Plastic waste being sorted for recycling

Chemists are working on trying to help solve this problem. The first step has been the development of biodegradable plastics – products which result from the work of both organic and inorganic chemists. Biodegradable plastics have not proven to be the magic bullet solution that everyone hoped for, however. In 2016, a team of scientists from Ireland and Belgium found that many biodegradable plastics do not, in fact, degrade under conditions in which most people put them. Some do not degrade in landfills or compost, and some require very high temperatures in order to degrade ('Biodegradable Plastic'). They did find, however, that because some plastics degrade under anaerobic conditions (that is, under conditions where no oxygen is present), and because that process produces biogas, there is a potential for developing plastics which consumers could compost at home and convert to biogas, which could be used to power their homes ('Biodegradable Plastic'). Obviously, this is a futuristic idea, one which will not be available in the short term, but this is an excellent example of the way in which knowledge of chemistry can be used to help solve global problems.

EE links

Western countries used to send their recycling waste to China and other Asian countries to be recycled. However, now that China has become more prosperous, it has no need to employ people to sort the materials by hand in order to pick out what can actually be recycled and what has to be burned or put in landfill because it is actually trash. China, alongside Malaysia and Vietnam, have drastically reduced their acceptance of recycling, or have even stopped altogether, and, in some cases, have sent thousands of tons of it back (Joyce). This has caused a significant problem for towns which cannot afford to pay vastly higher fees for recycling, and many locales have stopped recycling altogether – sending materials consumers thought were being recycled to incinerators, which results in increased carbon emissions (Semuels).

The global problem of recycling could be an excellent topic for an extended essay in economics. A potential research question might be: 'Can cost-effective methods of recycling be developed in the wake of the withdrawal of many Asian countries from importing trash for recycling?' Another possible research question for an extended essay in economics could be: 'How can chemistry help make solving the global problem of plastic waste economically feasible?'

KNOWLEDGE QUESTION

How might developments in scientific knowledge trigger political controversies or controversies in other areas of knowledge?

Physics

So far, we have seen that biologists study the nature of plants and animals in terms of the ways in which their biological systems function, while chemists study the nature of all physical objects, including living ones, in terms of the way that their elemental make-up affects their function. Physicists explore the mechanical nature of objects and living beings, learning about how motion, forces and energy work. Objects as simple as a playground slide or a teeter-totter (or see-saw, depending on where you live) rely on physics to make them work (Johnson).

Because physics involves the study of motion, energy and forces, any invention which requires any of those things results from knowledge gained in the study of physics. Some of the applications of physics are described below.

- **The design of wheels**: The wheel is a device that works on principles of physics, so any machine that uses a wheel depends on knowledge of physics. We might guess that the very first wheels were developed on a trial-and-error basis, rather than being deliberately constructed using knowledge of physics, but nowadays wheel design is a highly technical business. In bicycle racing, for example, the weight of the wheel and the design of the spokes can make a big difference in the amount of work that the rider has to put in order to move the cycle forward. You probably never think of the physics of your bicycle when you get on it, but they are actually quite complicated: 'A bicycle wheel needs to be able to handle a variety of forces. Besides holding up the weight of the cyclist, a wheel must withstand the forces of pedalling and braking and the jarring effects of the road surface' (Krizek).
- **The development of corrective lenses for improved vision**: The knowledge that we have of the human eye and how we can see, comes from biology and physics. The chemistry of the eye also comes into play to explain how the rods and cones help us to distinguish colour (Chen, *et al*). The anatomy of the eye, as shown in the drawing below, is a matter of biology, but the way that the structures of the eye interact with light is a matter of physics. In a person who does not need glasses, the light coming into the eye is bent by the lens just the right amount so that it hits the retina just at the point where the light rays converge (Chen, *et al*).

  'Converge' means to come together. The diagram below shows how the lens of the eye takes the light waves reflecting off a particular object and focuses them together so that they all hit a single point on the retina simultaneously. This image is of normal vision – when the light waves converge just at the retina, the object is in focus.

  Two of the most common problems with eyes is when there is an issue with the lens which makes the light rays converge too soon or too late. In a person who is near-sighted, the lens of the eye converges light rays from distant objects too soon, so that they cross in front of the retina. This makes far away objects appear blurry (OpenStax College). In a person who is far-sighted, the lens of the eye fails to converge light rays from nearby objects in time, so they do not converge before they hit the retina. This makes nearby objects blurry (OpenStax College). By using knowledge of physics, the optometrist (the doctor who tests your eyesight) can prescribe the right kind of lens which will compensate for the failure of the lens in the eye. The optician (the person who makes your glasses) can create the properly ground lens to fill the prescription.

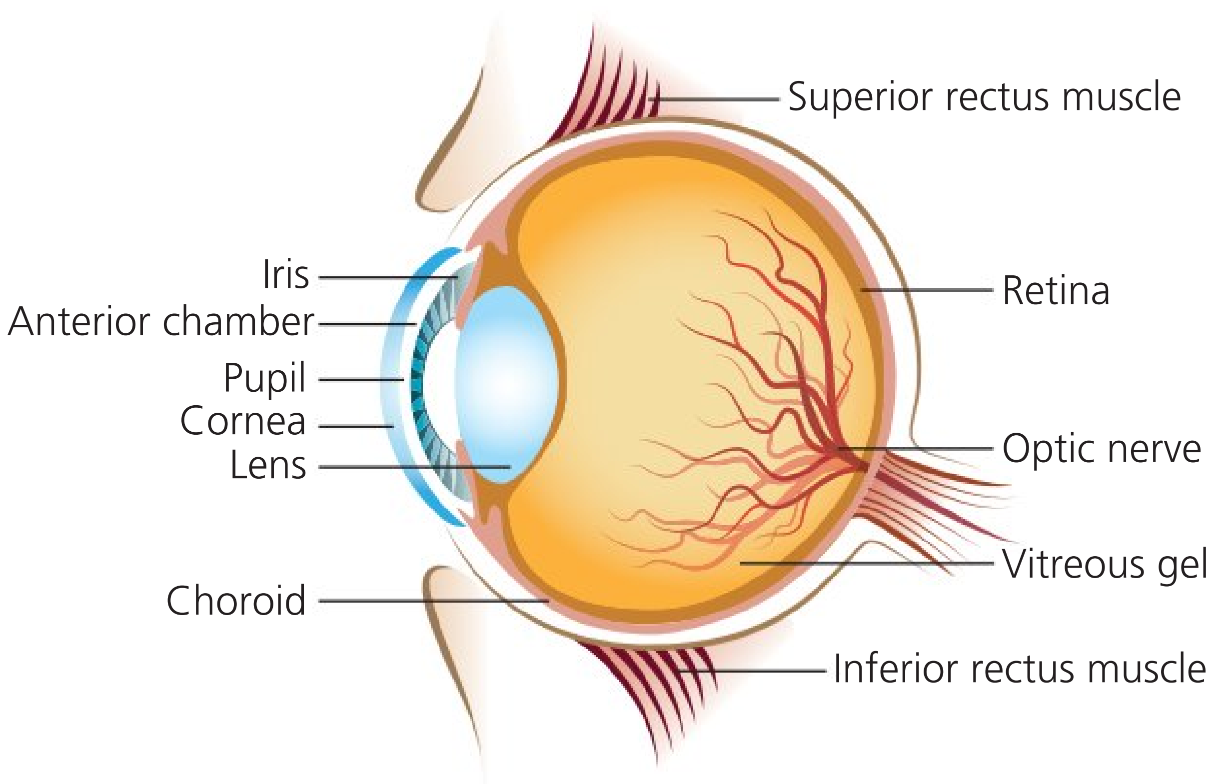
ACTIVITY

Before you read on in this section, see if you can list ten objects that you have used in your personal life which have been created with the help of knowledge from physics.

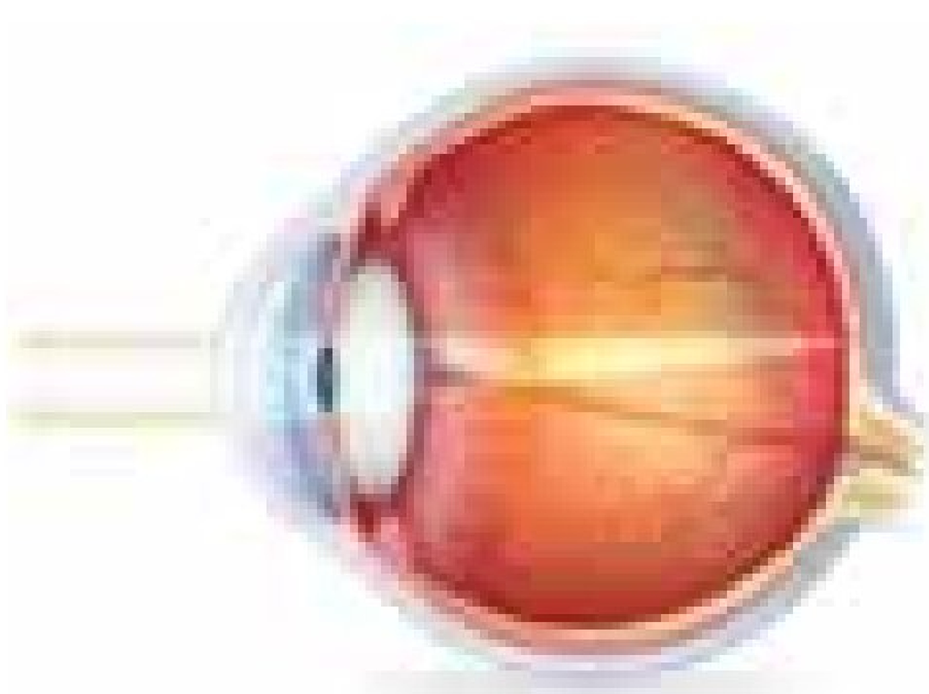
Now try to think of ten more inventions or processes which involve physics but which you may not have experienced directly for yourself.

KNOWLEDGE QUESTION

This example of the study of the eye reveals that the different fields within the natural sciences often function together to solve problems. What are some ways that the same thing happens in other areas of knowledge, such as the human sciences or the arts?



Anatomy of the eye



Light hitting the retina of the eye

- **Medical applications of physics**: If you've ever had an X-ray taken, then you've experienced one of the many medical applications of physics. Knowledge of physics is responsible for many developments in medical technology that allow doctors to treat a wide range of diseases. Radiology for looking at damage to bones, laser surgery, sonograms, which allow doctors to check on the health of developing fetuses, fMRI (functional magnetic resonance imaging), which measures minute changes in blood flow and so provides a way to look at activity in the brain (Radiological Society of North America) and radiation therapy for cancer are all possible because of knowledge made in physics. The invention of the scanning tunnelling microscope in 1982 earned its inventors, Gerd Binning and Heinrich Rohrer, the 1986 Nobel Prize for Physics. That invention opened the door to the use of nanotechnology in medicine, which can now be used for targeted delivery of drugs to very specific areas of the body as well as for cancer treatment (El-Sherbini).
- **Mobile phones**: Physics also made possible the mobile phone. Here are two main ways in which knowledge of physics contributes to your being able to carry a phone around in your pocket and to make calls whenever you want to, wherever you are.
    1. Your voice, which consists of soundwaves, has to be converted to an electrical signal – radio waves – which travel to wherever they need to go and then they are converted back to soundwaves by the phone of the person you are talking to (Institute of Physics).
    2. To be able to talk on the phone while moving around, or to talk to someone who is very far away, you need a cellular network. The phone itself can broadcast radio waves for a short distance, and its antenna can collect waves from a short distance. The phone, therefore, sends the waves to a nearby tower and the tower sends them on to the next tower, and so on. There are about 800 frequencies available in any one network, and you need two of them – one frequency for talking and one for hearing (Institute of Physics). So, 400 simultaneous conversations could use up all the frequencies; however, as your conversation is sent from one cell of the network to the next, the two frequencies you were just using can be picked up by another conversation in that cell. Knowledge of how sound waves work is knowledge of physics, and that knowledge allowed for the design of cellular networks.

Many other modern technologies depend on knowledge of physics: cars, airplanes, military weaponry (including the atomic bomb), spacecraft and satellites are some of the technological developments that have had a significant impact on human life in the last century. In Chapter 8, we took a detailed look at how mathematics helped to put a man on the Moon. The mathematics was developed to model the physical processes of motion and force which were known because of physics.

Did you think of any of these? This is, of course, a very small list of the ways in which physics can be applied in the world and beyond.

We have now seen how knowledge from all three major branches of the natural sciences have widespread applications that reach across the Earth and into outer space. Those applications affect billions of people by aiding them in nearly all the activities in which they engage on a regular basis. As with mathematics, the scope of the natural sciences, though focused on a particular kind of knowledge, is nearly limitless.

KNOWLEDGE QUESTIONS

The natural sciences rely heavily on material tools and technological developments in the production of knowledge; do history and the arts rely on material tools in the same way?

How does the relationship between knowledge and culture in the natural sciences compare and contrast to that same relationship in other areas of knowledge?

ACTIVITY

Do you think that scientific knowledge functions similarly for the Indigenous cultures that you read about in Chapter 5 as it does in highly technological society? Why or why not?

Perspectives

We've already considered one kind of perspective in the natural sciences: the differing views of the natural world from the perspectives of biology, chemistry and physics. We've also seen how those perspectives can overlap and intertwine, as in the example of how knowledge from all three of those disciplines contributes to the ability to create corrective lenses to help people see better. Each of the three perspectives provides knowledge about a different aspect of the physical Universe, and so all three together give us a more complex and complete understanding than any one alone does.

KNOWLEDGE QUESTION

Do differing perspectives in the other AOKs, such as history and the arts, extend our knowledge of the world, cause complications in our understanding, or both?

Opposing perspectives

The human eye is an example of how different perspectives support and extend each other. The opposite case often occurs in science, however, as scientists often disagree about what certain facts mean. This occurs when no one has yet developed a coherent theory that accounts for all the facts, and so the process of developing knowledge is still active and underway.

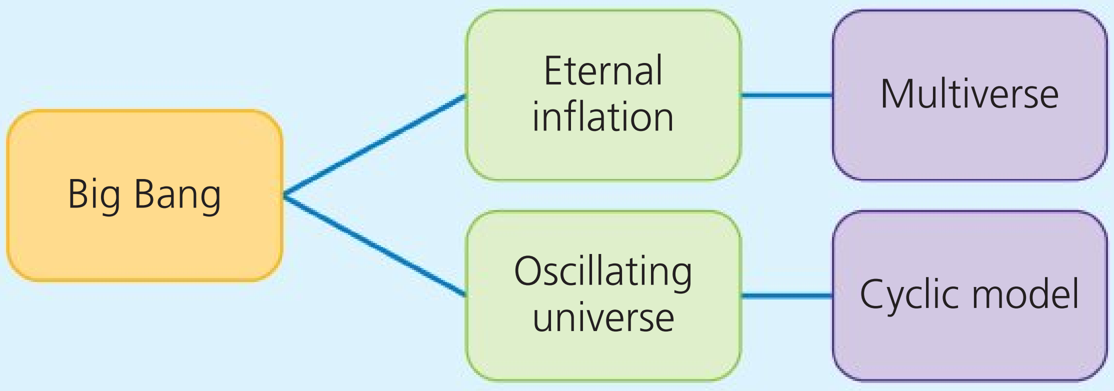
CASE STUDY

The Big Bang theory

An example of this in the present day is the ongoing discussion about the origin of the Universe and the implications for the nature of reality depending on what the origin was. The Big Bang theory is a widely held explanation for how the Universe began. It says that about 14 billion years ago, all matter was compressed into a tiny particle smaller than a single grain of sand, and all at once it exploded, starting the expansion of matter which eventually became what we know of as the Universe ('The Big Bang').

Much about the Big Bang is generally agreed upon, but there is a lot of disagreement about what such a beginning means for what will happen in the future,

The Big Bang



Alternative interpretations of the Big Bang

and even about what it suggests about how many universes there are. The diagram above shows some of the competing ideas about what happened and what it might mean (Tate).

The main difference between these two ideas is shown in the green boxes. If the Universe is expanding eternally, without any end, then a logical conclusion that can be drawn is that new universes are coming into existence all the time, without limit. This concept is called the multiverse. One objection to the idea that there are multiple universes is that the laws of physics could be different in each one. Cambridge physics professor Stephen Hawking, in the final paper he wrote, which was published shortly after his death in 2018, rejected this idea because it ultimately negates Einstein's theory of relativity. Hawking and his co-author, Thomas Hertog, proposed a different model based in string theory and which proposes that the Universe is finite (University of Cambridge). In the present day, there is insufficient evidence to demonstrate the truth of either of these ideas.

The model of the oscillating universe provides a very different explanation for the nature of the Universe. That model suggests that matter in the Universe is not expanding infinitely, but that rather it will reach a point at which it will start collapsing again and will end in a hypothetical Big Crunch. Then, the hypothesis suggests, the process will begin again with another Big Bang. In this model, we may be living in the very first Universe following the very first Big Bang, or we could be living in a later cycle, after an undetermined number of Big Bang–Big Crunch cycles (Villanueva). A number of different variations of this model have been proposed, beginning in the 1920s, when Einstein considered the possibility. Each time a new proposal is put forward, physicists have found significant problems with it in terms of its violating the basic laws of physics. There are recent models which attempt to resolve those problems, but they too are problematic and the most recent evidence, including work on dark matter, seems to be leading toward the negation of this possibility (Villanueva).

Other ideas have been proposed to explain the fundamental nature of the Universe and what will happen to it in the future. These ideas have arisen out of more recent developments in physics involving quantum mechanics and string theory. One is that the Universe is actually something like a hologram projected onto the surface of a sphere. This idea was proposed by two physicists, Leonard Susskind at Stanford and Gerard 't Hooft, a Dutch physicist, in response to a problem that Stephen Hawking discovered with regard to the loss of matter in black holes. The idea was initially thought to be very bizarre; however, an Argentinian physicist, Juan Maldecena, worked out a mathematical principle – the Holographic Principle – which supports the metaphor of the Universe as a holograph. The idea of the Universe as a holograph is taken much more seriously now (The Good Stuff); nevertheless, it is not definitively established. If you would like to know more about the idea of the holographic universe, you can use the QR code to watch a video with Leonard Susskind explaining the idea.

CONCEPT CONNECTION

Evidence

These different versions of the nature of the Universe rely on different kinds of evidence. The evidence related to the expanding universe is physical – scientists can look at events which occurred shortly after the Big Bang. Light travels at a fixed speed per year, and past events can be seen when the light which they gave off reaches us. The evidence for the holographic model, however, is of an entirely different sort: it consists of theorizing about what must be true given facts that we know – very much as mathematical knowledge is made. And, in fact, mathematics exists to support that model. The evidence for one kind of idea is physical and the evidence for the other is based in logic. The kind of evidence being used gives us a window into one fundamental difference in these two perspectives.

KNOWLEDGE QUESTION

How is the kind of evidence used in the natural sciences similar to or different from the kind of evidence used in the human sciences and history?

It is important to note that the discussion here of the various explanations for the nature of the Universe are simplified. Our intention is not to provide you with a detailed explanation of physics; rather we want to demonstrate the ways in which scientists working from different perspectives can see data in different ways and draw different conclusions about them. In a case such as the problem of the nature of the Universe, there is no comprehensive theory. The different perspectives are important because they ensure that questions keep being asked and assumptions keep getting challenged.

KNOWLEDGE QUESTION

Which other AOKs rely on models to help provide explanations, or possible explanations, for phenomena under study?

Paradigm shift

So far, we have seen how scientists with differing perspectives can contribute to the development of knowledge in science by challenging each other's ideas and assumptions and requiring that more and better evidence and explanations are provided before an answer can be determined. In some instances, however, there is widespread agreement about the nature of something, but over time, that agreement comes under challenge because new evidence arises, or someone offers new interpretations of existing evidence. Generally speaking, the first challenges to existing beliefs are ignored or even **denigrated** as foolishness, because they are fringe ideas. Over time, however, if more and more evidence is gradually amassed, **proponents** of the existing paradigm will have to account for it. If they cannot, and if challengers can provide a new explanation which accounts for all the data and observations, then what Thomas Kuhn called a paradigm shift occurs, and the new paradigm takes hold as the most widely held explanation for the observed phenomena.

◆ **Denigrated**: To make fun of something or to indicate that it is foolish or unworthy of consideration.

◆ **Proponent**: Somebody who argues in favour of something.

A paradigm is essentially a system of beliefs about how things are. We have paradigms for many things in our lives. You probably have paradigms for the way your family operates, for what school is like, and for the role of a smartphone in your life, among many others. You can think of a paradigm as being a set of rules or explanations which reflect your understanding of the world. These paradigms might seem to be set in stone – unchangeable – but we can actually imagine that something might happen to change them. Imagine a family, for example, which has always been quite poor. The family interactions are shaped around the need for all family members to work and contribute to the family finances. It has always been this way, and it seems that it always will be. Now imagine that something happens to make the family much more financially stable. Say the father inherits a fortune from some relative he didn't know he had. Now the family dynamic might change quite a bit. Perhaps the mother and children give up their jobs and the children go to better schools. The family might move to a bigger house where all the children have their own rooms, so the expectations about sharing space and possessions changes dramatically. And so on. That change would be a paradigm shift. All the expectations, rules and beliefs about what can and should happen in that family change because of the new situation.

KNOWLEDGE QUESTION

What role do paradigm shifts play in the progression of scientific knowledge?

Learner profile

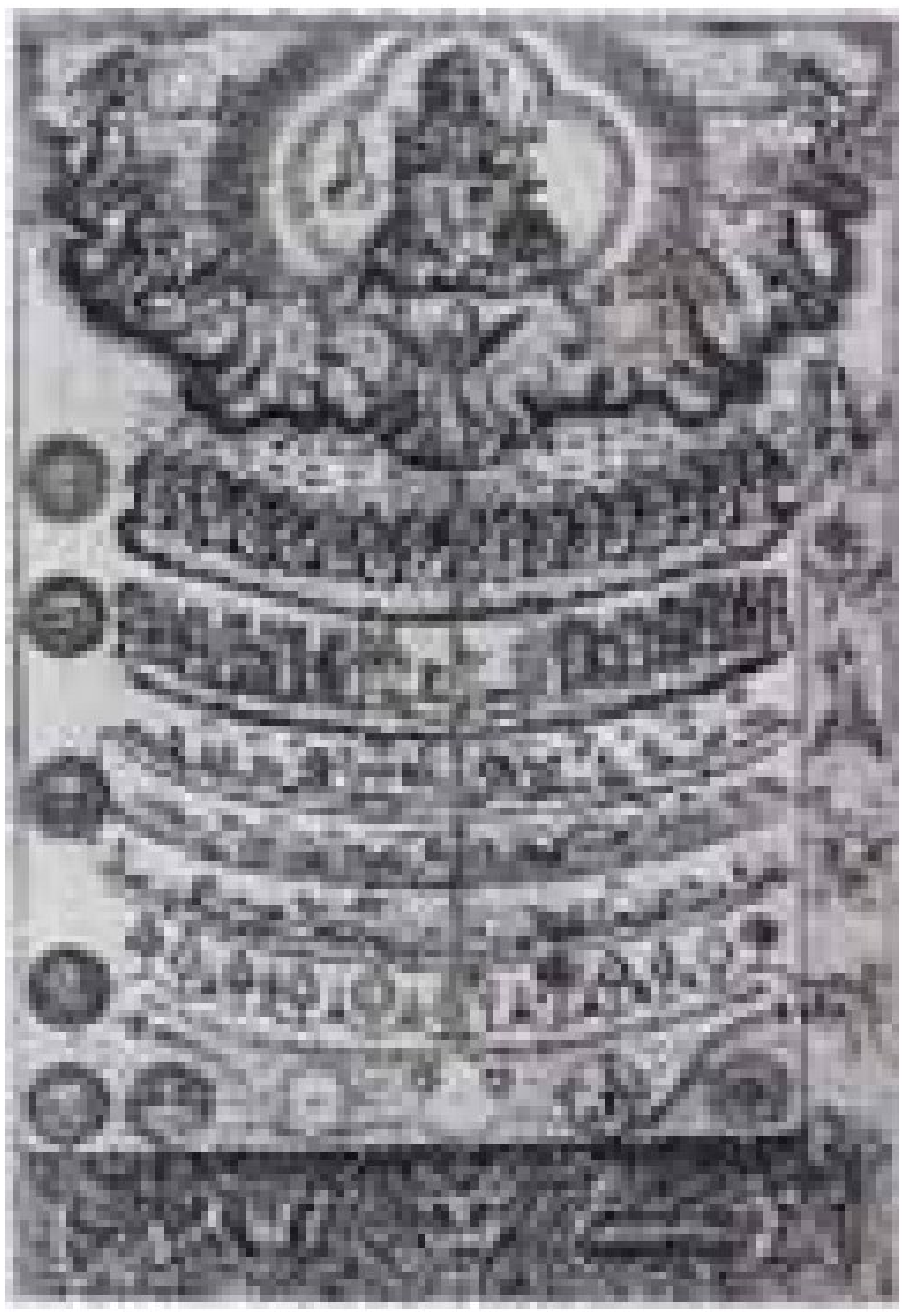
Open-minded

Why is being open-minded an important trait for a scientist to possess?

In science, paradigm shifts work the same way. A particular way of viewing the world is widely held among scientists based on evidence which has been discovered and explained. Over time, however, problems arise with that evidence – or, very commonly, new evidence is discovered, and a challenge is made to the existing paradigm. We saw a process of ideas and counter-ideas very similar to this when we looked at the varying hypotheses about the nature of the Universe. Those relating to the Big Bang theory and the expanding universe have been widely held for a long time, but the explanations have not been solidified into a paradigm; there have always been problems and questions, and there continue to be problems and questions now. Alternative hypotheses have been presented, but we don't have a paradigm shift because we don't have a system which fits all the facts, and which satisfies the scientific community in general.

Aristotelian classification of living things

The illustration from *Retorica Christiana* (1579) by Didacus Valdes depicts the Great Chain of Being, which had its origins in Aristotle's idea that there were two kinds of creatures, strongly divided from each other: celestial beings and earthly beings. The Great Chain of Being took as its assumptions that all living things on Earth, other than man, were put there to serve man. Man in turn existed to serve God. A significant difference between God and man was that



■ Illustration from *Retorica Christiana* (1579) by Didacus Valdes man was changeable and corruptible, while God was perfect (Brake 89). The paradigm was also based on beliefs about certain attributes. Each of the creatures in the chain had one more attribute than the creatures just below it. The attributes on which the Great Chain of Being was based were:

- Existence
- Life
- Will
- Reason
- Immortality
- Omniscience and omnipotence (Snyder).

Only God had all the attributes. The lowest objects, such as rocks, were seen to have existence, while plants had existence and life. Animals had existence, life and will. Man was seen to have existence, life, will and reason. This put man at the top of the earthly hierarchy. Above man were angels, who were believed to possess existence, life, will, reason and immortality (Snyder). In the later version represented by the sixteenth-century drawing in *Retorica Christiana*, animals were further divided into birds, creatures of the sea and animals of the land. The view of the relationship among plants and animals was strictly hierarchical: every living thing was organized in such a way as to demonstrate the superiority of each creature to all those below it. Here is just one short example:

> Wild beasts were superior to domestic ones, since they resisted training. Useful creatures, such as horses and dogs, were better than docile ones, such as sheep. Easily taught birds of prey were superior to lowlier birds, such as pigeons. Edible fish were higher up the totem pole than more dubious and inedible sea creatures. (Brake 89–90)

There are actually remnants of this idea in modern culture: many people still think of the lion as being the king of beasts, for example (Brake 90).

An example of a paradigm shift can be seen in the shift from an Aristotelian classification of all living things to the classification system which was developed by Carl Linnaeus in 1735.

KNOWLEDGE QUESTION

Does paradigm shift function in other AOKs, such as history or mathematics? If so, how is it similar to or different from paradigm shift in the sciences?

Linnaean system of classification

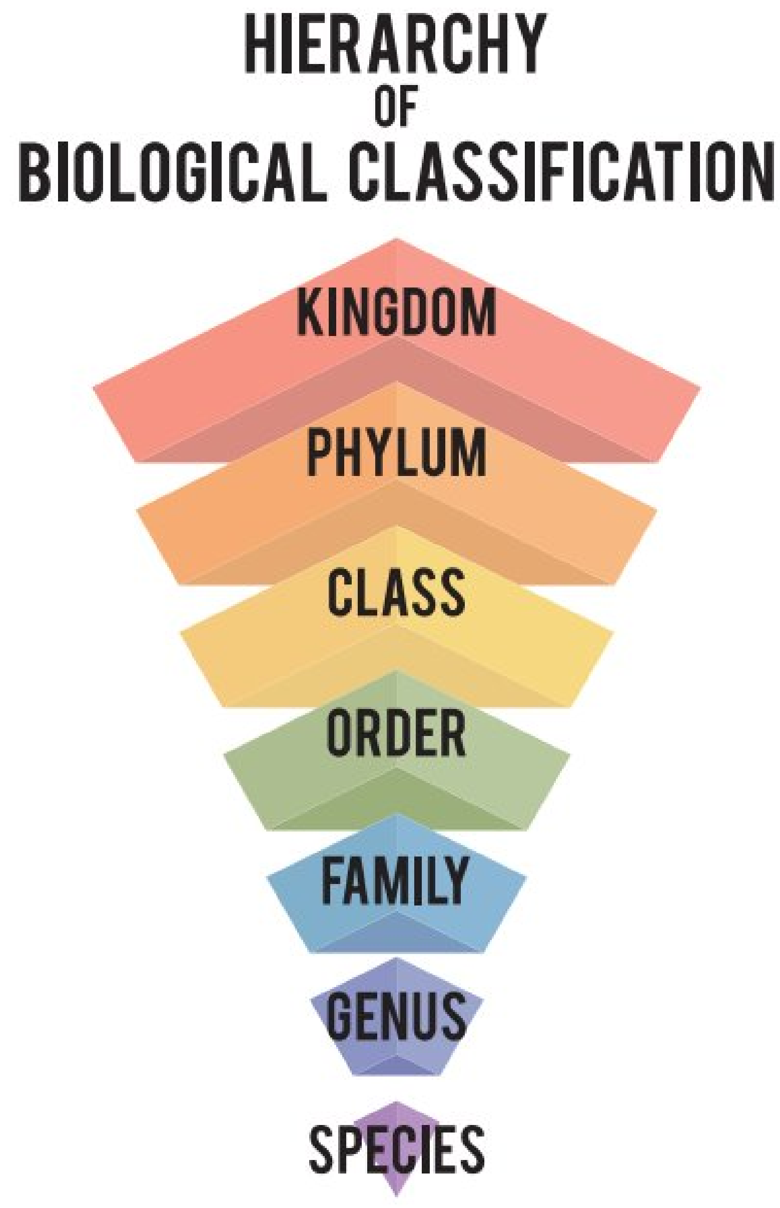
The Aristotelian paradigm for the classification of all creation held sway in Europe until the eighteenth century, when Carl Linnaeus proposed a new way of thinking about living creatures and their relationships to each other.

Linnaeus' system did not include supernatural beings. He divided all the creatures and other objects on Earth into three kingdoms: the animal, plant and mineral kingdoms. Linnaeus created further subdivisions in the kingdoms: class, order, genus and species. Linnaeus' system was, like the older paradigm, hierarchical: he organized the kingdoms with animals at the top, followed by plants, followed by minerals, and within each kingdom he organized the individual species to reflect which he felt were the most important. Within animals, for example, he placed the primates at the top of all the orders and *homo sapiens* (man) at the top of that order (Seddon). The hierarchy reflected Linnaeus' acceptance of some of the basic principles of the older chain of being. This system, which was widely accepted very soon after it was published, represented a dramatic change from the old system of six categories. By the time of the tenth edition in 1758, Linnaeus had identified 4400 animal species and plant species (Gambino). A second major innovation that Linnaeus' classification system introduced was the two-part naming of species based on genus and species (Seddon).

Carl Linnaeus

Before Linnaeus proposed his system of classification, the dominant perspective was that living things existed in a strict hierarchy, in which each plant or animal was lesser than all those above it in the hierarchy. There was one long chain of being. Linnaeus' system rearranged the whole perception of the relation of living things to each other by introducing groups: he proposed three kingdoms, and then, within those very large groups, a series of increasingly smaller groups. He retained some of the old idea of the hierarchy by organizing hierarchies within the groups, but he did away with the one long chain of being.

The Linnaean system of classification is still with us today, although it has been revised, including two major changes: we no longer use it to classify non-living things, and the hierarchical arrangement of kingdoms and orders has been dropped. We now view all members of the same level of classification as being equal; this change represents another paradigm shift which arose largely out of the Darwinian revolution. Linnaeus' classification showed how living creatures are related to each other, but it made no attempt to explain how those relationships came to be. Only when Darwin proposed the theory of evolution did we get that explanation. The development and acceptance of the theory of evolution, which completely altered our understanding of species development, may have been the biggest paradigm shift in the history of biology.



■ The taxonomic hierarchy we use today is based on that proposed by Linnaeus in the seventeenth century

TOK trap

Many students want to write about the Copernican Revolution in their TOK essays, often using it as an example of a paradigm shift. There is nothing wrong with the idea of doing so, but far too often students are not careful about their facts. They think that they know something about Copernicus and the shift from the **geocentric** universe to the **heliocentric** universe, and too often students make the mistake of relying on sweeping generalizations which are, in fact, wrong. To give just one example: as we noted in Chapter 1, Nicolaus Copernicus published his theory of the heliocentric universe in a book entitled *De Revolutionibus* in March of 1543, and then died two months later. The Catholic Church did not ban the book until 1616 (Solis). You can use the QR code on the right to read more about the history of Copernicus and the Catholic Church.

Galileo, on the other hand, was indicted for his 'heretical support for Copernicus' heliocentrism' (Linder) in 1616. An important idea to take away from this TOK trap is that it is always going to be wise to do some research about any example you wish to use in your TOK essay, rather than trying to rely on easy generalizations or 'facts' you think you know from some time in the past.

ACTIVITY

Discuss the following question with your classmates:

How does a paradigm shift represent a shift in perspective?

KNOWLEDGE QUESTION

What methods are used to establish reliability in other areas of knowledge?

◆ **Geocentric**: The idea that the Earth was at the centre of the Universe.

◆ **Heliocentric**: The heliocentric model of the Universe puts the Sun at the centre of the Universe.

◆ **Efficacy**: Means effectiveness in terms of solving the particular problem that needed solving. Vaccines are 'efficacious' because they eliminate disease.

■ Perspectives in the reception of scientific knowledge

A final aspect of the relationship between perspectives and scientific knowledge that we will consider in this chapter is the way in which one's perspective affects how one receives scientific knowledge. In the present day, some scientific knowledge which has been thoroughly substantiated by scientific methods (which we will investigate in the next section of this chapter) is seen as being highly controversial or flat-out wrong by some communities. Some examples of these are the theory of evolution, the existence of global warming and the **efficacy** of vaccinations. Each one of these scientific findings challenges strongly held beliefs. These beliefs are extremely difficult to dislodge, even when they are strongly contradicted by facts and by other people within the community.

CASE STUDY

Evolution and belief

One reason given for the denial of evolution is that it violates a literal interpretation of the Christian Bible, which says that God created all the creatures of Earth. A very strict interpretation of that text in the book of Genesis means that all living things exist today as they existed after the six days of creation. Perhaps the first very serious challenge to this belief came in the nineteenth century when ships began to arrive in England with fossils of Woolly Mammoths, a clearly extinct species whose bones were unlike any those of any known living animal (Conniff). Determined adherents to the biblical story, however, propose that fossils are not evidence that some of God's creations no longer exist, but that, rather, they are traps laid by the devil to sway people from God's word (IBSS).

In the United States, efforts by some religious groups continue to try to remove the teaching of evolution in public school biology classes, or, failing that, to mandate the teaching of creationism alongside evolution. This stance, too, is very controversial, as creationism is not science, and there is much resistance to its being forced into the science curriculum. These strongly felt positions persist despite the fact that many religious organizations have accepted the theory of evolution as being compatible with religious history and doctrine. The official attitude toward evolution from the Catholic Church, for example, has changed dramatically over time. In 1950, in an official statement, Pope Pius XII declared that he hoped that the theory of evolution would prove to be a passing fad, but that 'nothing in Catholic doctrine is contradicted by a theory that suggests one specie might evolve into another – even if that specie is man' (Linder). Forty-six years later, however, Pope John-Paul, in a similar official statement, acknowledged evolution as 'proven fact' (Linder).

Many organized religions have formally accepted evolution, at least in the sense that they have acknowledged that the theory of evolution is not incompatible with religious doctrine. Table 9.5 shows the position, determined by the Pew Research Center, of a number of different religious organizations (Liu).

Table 9.5 Official position regarding evolution by recognized religious organizations

Religion	Official position
Buddhism	No inherent conflict with evolution
Church of Jesus Christ of the Latter Day Saints (Mormon)	Evolution does not contradict church doctrine
Episcopal Church	Passed a formal resolution which affirms that God has the ability to create in any manner he chooses. The resolution officially rejects a dogmatic adherence to creationism
Evangelical Lutheran Church	Affirms the creation of Earth by God; however, acknowledges that creation may not have occurred in six days as we know them (24 hours in duration) and that he may have used evolution as part of his creation
Hinduism	There is no central official position with regard to creation of life; however, many Hindus do not find the idea of evolution to be incompatible with their religious beliefs
Judaism	Evolution is not inherently contradictory to religious doctrine
Protestantism	In 1969, rescinded its older position denying evolution; however, explicitly refrains from either affirming or denying the validity of the theory of evolution
United Methodist Church	Evolution is not in conflict with religious doctrine

Religion and science do not have to be mutually exclusive

There are, however, three religions in the Pew study which expressly deny the validity of the theory of evolution. These are shown in Table 9.6 (Liu).

Table 9.6 Religions that deny the theory of evolution

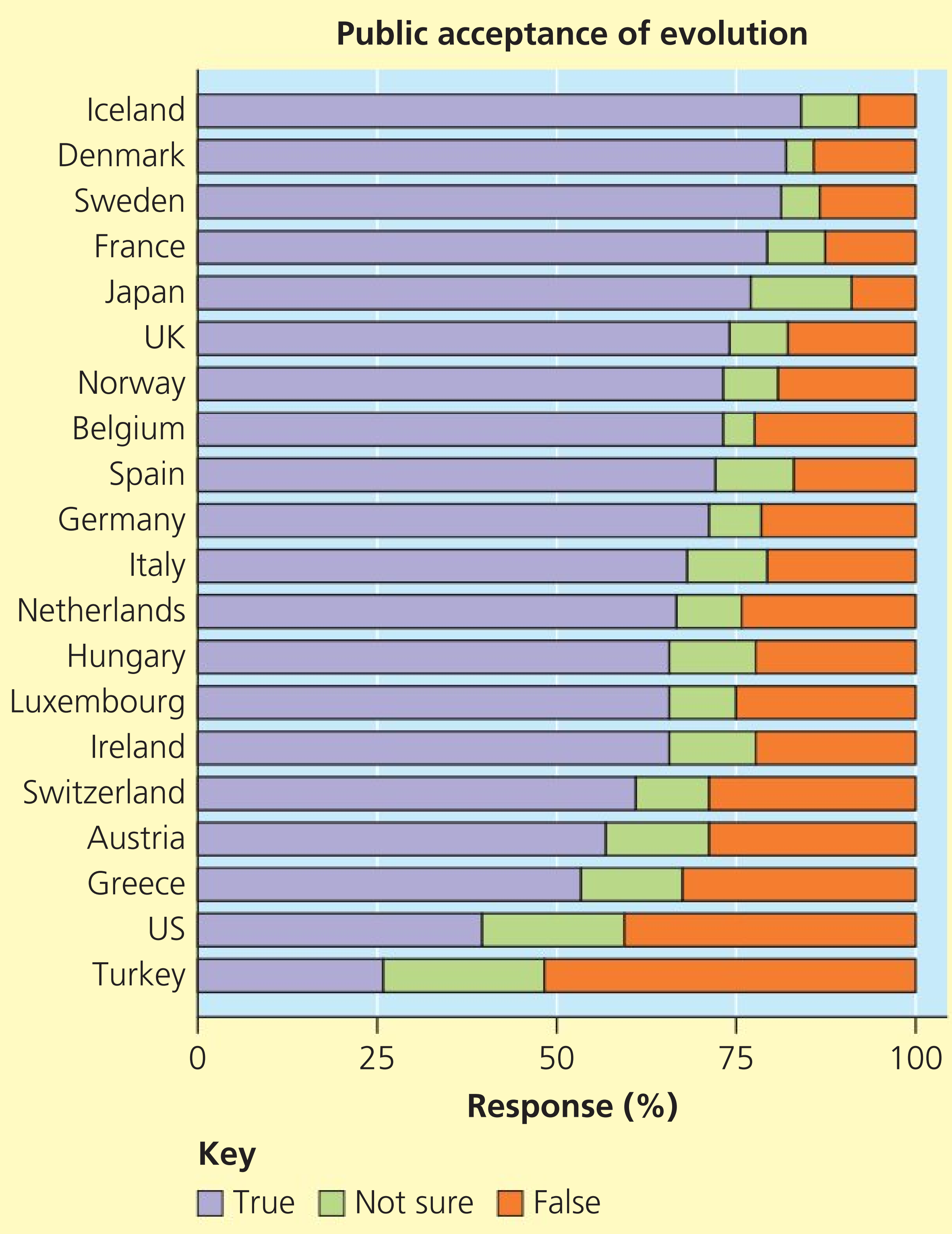
Religion	Official position
Southern Baptist Convention	Rejected evolution formally and asserted that 'creation science' can be supported by scientific evidence
Lutheran Church – Missouri Synod	Rejects evolution or any theory which contradicts the biblical story of creation
Islam	There is a split in beliefs among Muslims: some reject evolution out of hand, while others accept it as compatible with their religious beliefs

Use the QR code to review the research study and explore the sources of its findings if you are interested in a more detailed explanation of these.

We are left, then, with a perplexing situation: scientists and most religious leaders accept the theory of evolution as being an accurate description of the means by which the species that exist today have come to be. It is: 'one of the best substantiated theories in the history of science, supported by evidence from a wide variety of scientific disciplines, including palaeontology, geology, genetics and developmental biology' (Than). The fact that work from so many different fields of inquiry supports the theory of evolution makes the knowledge that much sounder, as it coheres across many disciplines of science. You learned about correspondence and coherence theory in Chapter 2 (see page 45); the theory of evolution is an example of knowledge which can be tested using both of those theories. Despite the complexity of the knowledge which has gone into the theory of evolution, and despite the fact that physical evidence going back millions of years supports it, it remains controversial among some groups. This is a good example of the difficulty of conveying knowledge (especially complicated knowledge) from experts to the general population.

CONCEPT CONNECTION

Culture



Public belief in theory of evolution in different countries

Widespread denial of evolution is a striking problem in the United States. A 2006 study of 32 European countries demonstrated that only one, Turkey, was less likely to accept evolution than the US (Hecht), though significant percentages of people in other countries also reject evolution. The chart illustrates the findings of the study. The highest acceptance of evolution occurred in Iceland, Denmark, and Sweden (Miller, *et al*).

In 2014, a Pew Research study found that a third of people living in the US reject evolution outright (Norman), despite the official positions of a wide variety of religious authorities as shown on the previous page. Half of those claim, wrongly, that scientists are not in agreement that evolution is real. The same survey showed that 98 per cent of scientists accept evolution as biological fact (Norman).

One professor has suggested that the reason for the extremely high incidence of denial of evolution in the US is a result of the fact that in the US, the issue has been politicized, with one political party making it a major issue in its platform (Hecht). This choice appeals to religious fundamental groups, and they have fought, often successfully, to keep evolution from being taught. Such groups require creationism to be taught in biology classes alongside evolution, or, perhaps even more dangerously, ensure that when evolution is taught, it is presented, falsely, as being scientifically dubious. A report from 2007 revealed that: '1 in 8 public high school biology teachers presented creationism as being scientifically credible, and 6 in 10 were teaching evolution in a way that misrepresented its scientific soundness' (Norman).

The theory of evolution is an excellent example of how certain cultural attitudes can have a widespread influence on how scientific knowledge is received in a country as a whole.

The denial of evolution based on arguments that it is not science, or that it is scientifically dubious, or that creationism is an equally sound scientific finding, represents a profound misunderstanding of what science is and how scientific knowledge is made. In the next section, we will explore the methods used by scientists in order to establish claims as being scientifically sound.

ACTIVITY

Biologists are the people with the experience, education and understanding of the science behind evolution. The heads of religious organizations are the experts in religious doctrine and official church policy. Some people, however, reject the knowledge claims made by both of these kinds of efforts, even though the vast majority of people in those groups trust science every day when they go to see a doctor, use a cell phone, ride in a car over a bridge, travel to the 32nd floor of a high rise in an elevator, or get on a plane.

1. What makes it difficult for some people to accept the expertise of those who have undergone the kind of education needed in order for them to become experts?
2. How do we resolve conflicts if experts flatly disagree?
3. Under what conditions do our values help us gain accurate knowledge of the world, and under what conditions do our values hinder our ability to gain accurate knowledge of the world?

KNOWLEDGE QUESTION

We have seen that sometimes experts in the natural sciences are effective in influencing the consumption of knowledge and sometimes they are not. Are experts in other areas of knowledge equally regarded and disregarded? Why or why not?

ACTIVITY

Evolution is not the only scientific finding which has not been easily received by the public. Well-known controversial topics include the safety of vaccines and the fact that human activity has contributed in a very significant way to rapid global warming. Others include the safety of nuclear power and the need for embryonic testing. All of these are accepted by scientists but have not been universally accepted by the public.

1. Think of at least one area of settled scientific knowledge which causes controversy in your community and explore the reasons for that conflict.
2. Do you think the conflict arises from the personal perspectives of individuals? From a lack of clear communication and education? Or perhaps from important cultural beliefs?

Methods and tools

At the beginning of the chapter, we asked you to do a small experiment with dirt and water. If you did that experiment, you were engaging, in a small way, in scientific method. The scientific method is a framework that defines the way that knowledge is developed, tested and revised in the natural sciences. The process begins with the observation of some phenomenon in the real world, followed by the development of a hypothesis about how or why that thing happens. The explanation must in turn allow for predictions to be made, and then further tests are made to see if the predictions pan out. The framework itself is straightforward, and when the science is uncomplicated, so is the method. Table 9.7 on the next page describes the processes involved in the observation of what happens when water is mixed with dirt.

KNOWLEDGE QUESTION

Is there a single 'scientific' method?

■ **Table 9.7** Basic framework of the scientific method

Stage of process	Description
Observation of phenomenon	You observed what happened when you added water to dirt. No doubt you first got thick mud, and then, as you added more and more water, you got a soupy solution in which the dirt was suspended. The colour probably changed: at first, it got darker, and then, with more and more water, it got lighter and lighter. Maybe some of the dirt did not blend into the water and formed a sludge on the bottom of the glass.
Making an hypothesis	A hypothesis is a guess, although it is a guess based on observation and experience, not a wild guess! From observing the water mixing with mud, you were asked to form a hypothesis about whether it would be possible to separate out the dirt and water again, and, if so, whether the two parts would be the same as they were when you began. Perhaps your prediction was that yes, you could separate out the water, but that no, you would not end up with the same products as before. The mixture could be heated to remove the water, in which case, the water would no longer be liquid, but gas. This would also be true if you did not heat the mixture, but rather waited for the water to evaporate. If you found a very fine strainer to try to strain the water out, you would not get it all, and you would likely lose some of the dirt. A prediction about the state of the dirt after evaporation might be a little harder to make. The dirt alone in the jar probably looked like pretty big clumps. Once a lot of water was mixed in, however, the dirt suspended in the liquid likely consisted of very small particles – maybe even particles that were not visible to the naked eye. It seems like a logical guess that when the water evaporates off, the particles of dirt would not get bigger again.
Making a prediction	Let's imagine that you tested the hypothesis and found that you were correct. (If you did actually test the hypothesis, then you can continue thinking through how the experiment fits the scientific method using your actual findings, rather than the imagined ones here!) Now we can make a prediction: if we mix a large enough quantity of water into a quantity of dirt so that the dirt becomes suspended in the liquid and itself appears to be part of the liquid, we will not be able to remove the water in such a way as to restore the dirt to its original texture and appearance. (Maybe your prediction would be somewhat different, depending on what your actual findings were.)
Testing	The prediction you made in the last step can now be tested by other scientists in an effort to verify your finding or to disprove it.

This simple experiment helps to demonstrate the basic procedure of how scientists do science, but as it stands, it is not nearly precise enough. There are two main problems:

- the hypothesis has two parts, rather than just one. We can't effectively test two things at one time because we won't know what in the experiment affected which part of the hypothesis
- the prediction is too vague. It doesn't specify how much water or how much dirt, or what kind of dirt. Sand might not produce the same results as the kind of dirt which is used on farms to grow things, and possibly both of those would produce different results from what would happen if red clay soil were used.

The fact that scientists would not make such a vague prediction underscores the very important point that scientists don't make claims which apply outside of the conditions in which they made the observations and in which they conducted the test of the hypothesis. Scientists are concerned with making the most precise claims that they possibly can, and in order to be able to do that, they must be very **accurate** about what they observe and what they think the implications of those observations are.

Underlying assumptions

The basic framework of the scientific method has its roots in a set of assumptions that scientists make. The Geological Society of America published a brochure entitled 'The Nature of Science and the Scientific Method', in which they detailed a list of those assumptions, including the following:

KNOWLEDGE QUESTIONS

What is the role of imagination and intuition in the creation of hypotheses in the natural sciences?

What is the role of inductive and deductive reasoning in scientific inquiry, prediction and explanation?

KNOWLEDGE QUESTIONS

Do other AOKs employ a method similar to the scientific method?

Which features of the scientific method help people to make knowledge in other areas?

◆ **Accurate**: In the sciences, 'accurate' and 'precise' have two distinct meanings. To say that some measurement is accurate is to say that it matches reality.

1 The world exists apart from our sensory perception of it.
2 Humans are capable of perceiving the real world accurately and attempting to understand the physical Universe.
3 Natural processes are sufficient to explain or account for natural phenomena or events. Scientists must, therefore, explain the natural world in terms of natural processes. They must not explain the real world in terms of supernatural processes, which cannot be observed or tested.
4 All human perceptions are shaped by our past experiences, which means that our ability to perceive is shaped by those experiences. Our perceptions, therefore, *may be* inaccurate or biased.
5 Scientific explanations are limited. Scientists cannot observe every instance of any phenomenon; therefore, scientific knowledge is necessarily **contingent** knowledge rather than absolute. This means that scientific knowledge must be open to revision if new evidence arises. It is impossible to know if we have thought of every possible alternative explanation or every variable. The technology available to us at any given time might be insufficient for helping us observe all that is there, in the real world.

Let's consider these assumptions. The first two mean that the pursuit of scientific knowledge must be, first and foremost, based in *observation*. Scientists are trying to observe what is really there, outside of ourselves, and to understand it. We see those beliefs reflected in the first stages of the scientific method: that observation is the starting place, and then a hypothesis is made based on observation.

The third assumption is quite interesting. It is purely an assumption which is based in the fact that we cannot observe supernatural acts, test our ideas about supernatural acts or make predictions about what supernatural acts will happen next. The nature of supernatural acts, if they exist, is completely different from the nature of observable physical phenomena: by definition, omnipotent beings capable of creating the Universe, for example, can do anything and are not controlled by forces outside of themselves. There is, therefore, no way to predict what they might do. This assumption is reflected in scientific method in the fact that scientific knowledge must be *predictive*. If we cannot take what we have observed and tested and make accurate predictions about what will happen the next time and in all future times, then we do not have scientific knowledge.

The fourth assumption expresses an acknowledgement that humans (including scientists!) can make mistakes, and the requirement that other people must be able to do the same experiment and get the same results is a reflection of that awareness. Scientists are not satisfied with one person's word that natural processes work in a particular way. The process of scientists checking each other's work is called *replication*.

The final assumption on the list above accounts for a number of features of the way that scientific knowledge is generated. First, it contributes to the need for findings to be expressed in very *precise* knowledge claims. Since knowledge in science is contingent, then it matters that we make transparent exactly what the conditions are under which the knowledge claim is true. Good science does not consist of claims which cover a whole bunch of circumstances – if scientists are not precise, then the knowledge claims they make are even more contingent and even more likely to be overturned in the short term.

Secondly, this fifth assumption contributes to the need for peer review of scientific findings. We accept that scientific knowledge is contingent, but we do not think that means we can be sloppy about work and careless about claims and then just shrug when our claims are overturned. Quite the opposite. Scientists take care not to make claims until they are thoroughly checked and

KNOWLEDGE QUESTION

How do the underlying assumptions which shape inquiry in other AOKs, such as mathematics or history, compare and contrast to the underlying assumptions of the natural sciences?

◆ **Contingent**: Means that something depends on the circumstances. When we say that scientific findings are contingent, we mean that they are based on conditions that exist at the time of the finding.

KNOWLEDGE QUESTION

How can it be that scientific knowledge changes over time?

KNOWLEDGE QUESTION

How do the underlying assumptions of the other AOKs shape the kind of inquiry, including methods and tools, that is central to that AOK?

established beyond reasonable doubt, under the conditions which currently exist. Peer review is a way for scientists to check each other's work, to validate the processes used to generate claims, and to correct any errors in reasoning that may have marred the findings.

CONCEPT CONNECTION

Objectivity

Another important reason for peer review is that scientific knowledge must be made as objectively as possible. The aim of science is to find out about the world as it is, not as scientists think or feel or believe or wish it to be. One function of the scientific method is to screen out as much as possible any bias or subjectivity on the part of the scientist, and peer review acts as a final check for any such interference with facts.

Another method which arises from the fifth assumption is the ongoing development of new technologies and continuing research in fields about which we already know a great deal. The microscope and the telescope are both examples of technological developments that allowed scientists to see parts of the physical universe previously inaccessible to humans, given our limited eyesight. Both of those developments led to major changes in scientific understanding. We don't know what technological advances might yet open up the world, and so the effort to develop them continues. With every new invention, scientists revisit past findings.

The fact that scientific findings are contingent also means that we cannot prove things in science the way that we can prove them in mathematics. In creating proofs, mathematicians are able to account for every conceivable instance of what they are studying. We saw in Chapter 8 that in proving the Pythagorean Theorem, Pythagoras was able to demonstrate that the theorem accurately described every possible right triangle. Scientists cannot do the same thing: for example, no scientist could ever observe every green plant that exists, let alone all the ones which might exist in the future, to show that they use photosynthesis to create food for themselves from light.

Natural scientists, then, do not try to prove things, and when peers attempt to replicate an experiment to see whether the findings were sound, they do not try to prove the original scientist right; instead they try to prove them wrong. This process is called *falsification*. If an attempt to falsify a scientific claim succeeds, then the claim is wrong. If an attempt to falsify a claim fails, however, then the original claim is strengthened. If the claim is repeatedly supported by experiment, then it becomes stronger and, over time, may rise to the level of a theory, especially if the claim fits in with knowledge about how related processes work.

Finally, this assumption is the reason that scientists call established frameworks 'theoriess', rather than 'proofs' or 'facts'. Scientists don't call anything a theory until enough evidence has been amassed to make the knowledge virtually certain. But in science, because the process is inductive,

The image on the left shows microscopic imagery of sodium borate, while the telescope on the right enables us to make new discoveries in astronomy. What other technological developments have radically changed our understanding of the world?

KNOWLEDGE QUESTIONS

Do other areas of knowledge have published sets of underlying assumptions like the natural sciences do?

Are the underlying assumptions of other areas, such as the human sciences, significantly different from the assumptions which underly the natural sciences?

ACTIVITY

Which technological developments do you think have had the greatest impact on our ability to perceive the natural world more accurately? Why?

rather than deductive (see the discussion of certainty in Chapter 1 for a review), knowledge claims can never be absolutely certain, the way they can in mathematics. Scientists are, as we noted earlier, concerned about precision. It would not be precise to call theories proofs, because no matter how well established they are, they might be altered at some point in the future based on new evidence.

CONCEPT CONNECTION

Certainty

In the natural sciences, we can be absolutely certain only about things over which we have control, which is to say, things which have been invented by humans. We are absolutely certain about the names of species under Linnaean classification, because those names have been assigned by humans. If those who have the authority to do so decided to, they could change some of those names, and then we would be absolutely certain about the new names. This is what happened with Pluto in 2006. The International Astronomical Union (IAU) redesignated Pluto as a dwarf planet ('Pluto and Ceres'). The IAU is the group with the authority to determine the classification of astral bodies, and so we are absolutely certain that Pluto is not a planet, but rather is a dwarf planet. At some future date, the IAU might develop still more categories and then there will be new names, and we will be absolutely certain about those names.

Notice that although we can say that we are absolutely certain about aspects of science that we invent (which very often involves the naming of things), this does not mean that that reality will not change in future. Where we can actually alter reality, we can be certain of the reality until we change it, and then we will be absolutely certain about the change that we made. The same cannot be said of natural objects and natural processes which are not invented by humans. By definition, they are those things which would exist even if we were not around to observe them. We do not have control over how those work; scientists are in the business of discovering them.

A theory, such as the theory of evolution, is a framework for explaining a natural process, or constellation of processes, which is extremely well established. The basic existence of evolution as a mechanism through which species develop and go extinct over long periods of time is thoroughly settled. There is virtually no chance that the whole notion of evolution will ever be proven wrong. But the existence of a theory doesn't mean that learning stops. Scientists continue to study the details of evolution and how it has played out in different species over millions of years. All of the increasingly accurate understanding that has been developed in the last 100 years or so, however, has fit into the paradigm of evolution. Nothing has occurred to cause any significant challenge to the understanding that species develop through small genetic changes, and there is no reason to think that there ever will be any finding that could undermine the idea of evolution in a significant way. The possibility, however minute, exists though, and so scientists, acknowledging the truth of assumption number 5 on page 313, use the term 'theory' to describe their most certain findings.

ACTIVITY

Create a chart for yourself like the one below. Fill in the second column with notes about which aspects of the methods scientists use to make knowledge are related to each of the assumptions which underlie science.

Foundational assumption	**Methods and tools in natural science related to each assumption**
The real world exists independently of our perception of it	
Humans are capable of accurate perception of the real world	
Natural processes are sufficient to account for natural phenomena	
Our perceptions may be biased or inaccurate	
Scientific explanations are contingent	

The scientific method in context

Biologists studying the behaviour of octopuses has led to a new hypothesis about their intelligence

KNOWLEDGE QUESTIONS

How does the social context of scientific work affect the methods and findings of science?

Does the social context of the other areas of knowledge affect the methods and findings of those areas of knowledge in similar ways? How so?

There is no one scientific method. The guiding principles and the general methods that we have looked at so far are a framework which can be applied in a great many situations. However, what the method looks like differs greatly from context to context. We do not have room in this book to explore many different contexts in detail, so we will consider a few examples in order to give you an idea of the range of possibilities.

Observation means quite different things in different contexts. Biologists studying the behaviour of octopuses, for example, have to get out into the ocean in areas of the world where the octopuses they wish to study live, such as Indonesia, and then they have to actually follow the octopuses around in order to see what they do. Those observations require the scientists to have access to boats and to be able to dive in order to get where the octopuses are. Octopuses could, of course, be studied in captivity, but it would not be scientific to simply assume that the way they behave in captivity is the same as the way they behave in the wild – maybe they do, but maybe they don't. Scientists could not make such a hypothesis until they had observations that could support it.

◆ **Teuthologist**: A scientist who studies cephalopods, such as octopuses.

One particular kind of observation led **teuthologists** to hypothesize that octopuses are actually quite intelligent. Drs Julian Finn and Mark Norman, marine biologists at Museum Victoria in Australia, observed an octopus in the oceans of Indonesia using coconut shells as tools. You can use the QR code to see some of the footage that Dr Finn shot of the octopus at work. This was the first time that any cephalopod had been observed using tools; previously, it was thought that tool use required a large, complex brain. This extraordinary observation led to a new hypothesis about the intelligence of octopuses.

The kind of observations that Finn and Norman made are dramatically different to the kinds of observations that a physicist interested in determining whether subatomic particles, such as the Higgs Boson exist, has to do. The existence of the Higgs Boson has been theorized since 1964. The hypothesis was based on complicated observations involving other particles and on knowledge of Einstein's theory of relativity (Gray and Mansoulié). In order to try to observe these particles, physicists had to build the Large Hadron Collider at CERN, in Switzerland. The LHC is a particle accelerator, which is a machine that can separate atoms into their component parts. Particle accelerators are used as an important technology in the pursuit of finding out what the smallest components of atoms are (*TechTarget*).

The LHC is 27 km in circumference. It cost $4.5 billion and took a decade to build (Knapp). When the LHC was run, the observations that were made were quite different from taking a scuba dive to make a video of an octopus that can easily be seen with the naked eye. No one can see the tiny subatomic particles; they have to be detected by tracking the energy which is released when particles collide with each other. Physicists, then, use complex statistical analysis to demonstrate that what they are seeing is activity which results from the behaviour of particular kinds of particles (Gray and Mansoulié).

The Large Hadron Collider at CERN in Geneva

We can see from these examples how important being able to observe the world is to the ability to create hypotheses and to the ability to test them. What it is possible to hypothesize depends on the nature of what we have been able to observe at any particular point. If an activity is truly scientific in nature, then new observations collected in aid of trying to demonstrate the validity of a hypothesis – or to falsify it – generate more questions to be answered.

ACTIVITY

One hypothesis about the nature of the Universe which we did not mention in the section on perspectives in science is the idea that everything that we know and experience of the Universe is actually just a simulation being run in a massive computer by beings who are vastly more intelligent than we are (Moskowitz). This might sound like kind of a kooky idea; however, it has been given serious consideration by some big-name physicists. In 2016, it was the focus of the annual Isaac Asimov Memorial Debate at the American Museum of Natural History in New York. The debate was moderated by Neil de Grasse Tyson, and featured physicists from MIT and Harvard, among others. Use the QR code to read an article about the discussion, and then answer the following questions:

1. What evidence is offered in support of this hypothesis?
2. What arguments were offered in opposition to the idea?
3. Can you think of any way in which physicists might begin to test the idea through observation or experimentation?
4. What does the idea suggest about the nature of mathematics?
5. What crossover into other areas of knowledge does this idea raise?

CONCEPT CONNECTION

Evidence

Evidence is one of the 12 key course concepts in TOK, and evidence plays an essential role in the natural sciences. What counts as effective evidence, however, varies dramatically depending on the kind of scientific work being done. We saw with the study of the Indonesian octopus that the evidence was a video of the octopus using coconut shells as tools. If you watched the video, you saw that a particularly important piece of evidence was the fact that the octopus took his coconut shell with him – he saved it for future use. In the case of the search for the Higgs Boson, the evidence consists of the statistical analysis of readouts of data collected from the energy release of particles colliding with each other.

Astronomers trying to work out what happened in the aftermath of the Big Bang need evidence that is roughly 14 billion years old. It is possible to view really old light. Light takes a known amount of time to travel from one place to the other – the definition of a light year is the time it takes light to travel in one year. If astronomers want to see light that is nearly 14 billion years old, they need to work out where that light would be now. As our capabilities of observing light in galaxies which are very far away from us, and moving away, have improved, scientists have been able to observe very old light.

One piece of evidence in support of the Big Bang theory is that if it happened the way astronomers think it did, then they should be able to find photons generated in the aftermath of the Big Bang, and those photons have, in fact been found. Their existence is known as cosmic background radiation (Nagaraja).

Other problems with establishing precise details about the Big Bang have arisen, however, from increasingly detailed observations that have been made by extremely advanced modern technology.

One proposal for an explanation which solves some of these problems is that immediately after the Big Bang, a short burst of inflation occurred. If that did indeed happen, then such an event would have caused primordial energy to be unevenly distributed in the Universe. Astronomers have been able to make observations which support that explanation (Nagaraja). So far, then, astronomers have been able to collect evidence which demonstrates that the Big Bang happened, and that there was an inflationary event which occurred immediately afterward, expanding the size of the Universe dramatically.

There is still a problem, however: if this inflationary event happened, something must have powered it, and so far, scientists have no evidence of what that might have been. To get the evidence, astronomers have to be able to look at the Universe from a time before photons were visible, and we have no technology which allows us to do that. So, our technology has allowed us to collect *some* of the evidence that we need in order to understand the Big Bang, but we do not have *all* of the evidence we need in order to explain the event in detail. Without that evidence, we cannot say that we have satisfactory knowledge about the origins of the Universe. We have a partial, but incomplete, explanation.

Scientific explanations must be based in evidence; until scientists have evidence, they don't make claims. They offer hypotheses, and they keep looking.

CONNECTION TO CORE THEME

Case study of an individual scientist

As a final example of the way in which the scientific method is shaped by the study being done, we will take a look at a rather extraordinary experiment. As you read, consider how the work reflects the five underlying assumptions that we have already discussed, and how the various steps in the scientific method are tailored to this study.

In 2001, a professor of entomology (the study of insects) at the University of California, Dr Jerry A Powell, published a ground-breaking paper which both illustrated the remarkable fact that a particular species of moth can remain in diapause for 30 years and explained how diapause works (Powell 2001). Hibernation is an overwintering mechanism which allows insects and other animals to synchronize their periods of feeding to the time during which their food source is abundant (Lee). Diapause, on the other hand, is a state of dormancy during which the physiological development of the insect ceases (Denlinger).

Yucca moths on a plant

Additionally, diapause is not merely an overwintering strategy, but rather can last for more than an entire year. Prior to Powell's study, diapause was known to last in some insects for as long as 12 years (de Faria). When the study was originally undertaken, the intention was to observe diapause in a species of moth, to see whether it worked the same way in this species as in other species.

Powell's study involved the specific species of yucca moth, *Prodoxus y-inversus.* This moth has a **symbiotic** relationship with a yucca plant, in that the moths lay their eggs in the flowers of the yucca, and in so doing pollinate the plant (Moisset). In turn, the larvae of the moth are encased in the seed pods which the yucca drops, and they develop there until ready to emerge, after diapause, as adults.

Powell collected some yucca pods in the mountains of Nevada in the spring of 1970 and carried them with him back to his lab in Berkeley, California, where he set them up for observation. The pods were kept in several different outdoor environments and temperatures at each site were monitored, as were the number of adult moths that emerged each year (Powell 491). For quite a while, not much happened: in 1972, 12 moths emerged, and in 1974, one additional moth emerged. Other than that, no moths emerged from any of the pods at any of the sites, until suddenly, in 1985, after 16 years in diapause, 120 moths emerged, followed by 61 more in 1986 (Powell 491).

Such a dramatic occurrence needs an explanation, and the obvious question to be answered was: 'What caused the moths suddenly to emerge in large numbers?' This is obviously not the sort of experiment which is likely to be replicated by other entomologists – it had, after all, taken 17 years to this point. Another barrier to replication is the fact that the conditions of weather and rainfall which existed over that 17-year period could not possibly be recreated, nor could the exact physical condition of the objects under study: the larvae of the yucca moths. Dr Powell would have to work out an answer from the data he had already collected.

The key to the answer came from an unexpected source which was not part of the formal experiment. In an interview, Dr Powell explained that he opened his electric bill one spring day in 1985 (remember that this was the era before email and internet, and paper bills came in envelopes through the postal service!), and he read the electric company newsletter which was enclosed with his bill. The newsletter contained the information that the preceding winter had, as a function of daily average, been slightly but significantly colder than it had been for a number of years preceding it. He called the electric company for more detailed information, which he subsequently included in his published paper. Powell explained that he had not previously considered that colder temperatures could have provided the trigger for emergence, because the winters in Berkeley were significantly warmer than the winters in Nevada. Upon learning that there had been a significant difference in Berkeley's 1985 winter temperatures from preceding years, however, he began to think that maybe the larvae in diapause could actually acclimate to the local temperatures and could then be triggered by a winter which was suddenly, by contrast, colder.

He proceeded to test that hypothesis by controlling the winter temperatures of his yucca pods, subjecting them to normal winters for four years and then, in the fifth year, subjecting them to much colder temperatures. In so doing, he was able to force mass emergences at 20 years, 25 years and 30 years, thus verifying his hypothesis.

Let's think back to the cognitive tools we discussed in Chapter 2. Which tools were used in this study? Any scientist working on any study is an individual knower. As such, they use all the same tools that you use as an individual knower, including the various cognitive tools that we all have – reason, emotion, imagination and so on. During the first 17 years of this experiment, the primary cognitive tool in use was obviously sense perception in the form of sight: the yucca pods had to be observed directly and any emergences seen. The temperature also had to be taken, which would have been done by reading a thermometer. Sense perception was not the only necessary tool, however: language must have been used for the recording of observations. Notice that while sense perception is fundamental, intuition is not relevant in this context: the job of the scientist making observations is to record what actually does happen, and not what they intuit ought to happen.

Following the observation stage, however, as Powell tried to answer the question of what mechanism caused the sudden mass emergence of moths, additional cognitive tools had to come into play.

- Written language: this provided a critical piece of information in the form of the electric company newsletter.
- Imagination: this was necessary for applying the information in the newsletter to the apparently unrelated situation of the scientific experiment.
- Reason: this had to be used in order to test the plausibility of the hypothesis about the relationship between temperature and emergence from diapause.

Finally, imagination, reason, observation and language all had to be used together to design the follow-up experiment and to run the test for the next 15 years. None of these tools was used in isolation: consider, for instance, that imagination and reason had to work in tandem, both for developing the hypothesis and for designing the experiment. Imagination which is not tempered by reason could not provide a useful solution.

Finally, one additional cognitive tool played an important role in this study: faith. In order to complete a study that requires 30 years of work – the first 15 of which produced nothing but negative results – one must have faith in the scientific process. Faith that even negative information is a kind of knowledge, and faith that just because we haven't observed something doesn't mean that something isn't happening. In 2010, Dr. Powell was still monitoring the yucca pods. His reason? He thought that the pods were probably empty, but cutting them open to see would kill any remaining moths, and since he didn't know for sure, he thought it was better to approach the problem scientifically and observe what *actually is* rather than making assumptions about what he might be ('Conversation with Dr Jerry A Powell').

ACTIVITY

Dr Powell's articles about the yucca moth study went through peer review before they were published, but, due to the extraordinarily long time that it took to run this experiment, it is extremely unlikely that this study will ever be replicated.

1 Do you think that we can consider the knowledge he gained to be sound without that step?
2 Why or why not?

In this section, we have examined the beliefs which shape the way that scientific knowledge is made. We have looked at the basic features of the scientific method and explored the fact that, while the overall shape of scientific inquiry has shared features, regardless of the situation, the specific steps taken and tools used depend on the specific work being done. In the final section of the chapter, we will consider how ethical considerations also help shape scientific inquiry.

◆ **Symbiosis**: The relationship between two biological creatures in which each one helps the other achieve something it needs.

KNOWLEDGE QUESTION

Is the depiction of the 'scientific method' traditionally found in many school science textbooks an accurate model of scientific activity?

Ethics

The overall aim of the natural sciences is the discovery of the precise nature of physical objects and physical processes in the Universe. The material under study is the natural world, which, as we have seen, scientists assume exists outside of ourselves. We cannot know what the natural world is like or how nature operates if we allow our own perspectives, the limitations of our physical nature, or our inability to observe and analyse to get in the way of the truth about that external world.

As you saw in the previous section, the methods of science have been shaped in such a way as to deliberately try to stop any of those problems from happening. These methods are, then, a matter of ethics: the truths that scientists are after are truths outside of themselves, and so there are right and wrong answers to scientific questions. Scientists want to be as right as it is possible to be, and to correct any wrong, or inaccurate, ideas as soon as it is clear that there are problems. A lot of what happens in the pursuit of scientific knowledge, therefore, is ongoing testing so that scientists continue to amass data, and they continue to evaluate new evidence to refine their knowledge more and more precisely.

The ethical practice of science

We know that one specific mechanism used both by scientists doing lab experiments and by scientists doing field observations is the hypothesis. Given the aim of the natural sciences, a hypothesis is necessarily a statement which aims to reflect a real-world fact. A hypothesis is, however, also fundamentally a human construct – a person's idea about what the real world is like. Obviously, then, hypotheses can be wrong. If, moreover, a scientist was too wedded to a particular hypothesis, they might design an experiment which was slanted in favour of that hypothesis. They might interpret data favourably or ignore data which did not support the hypothesis. Such an experiment would very likely result in a failure of the aim of natural science: if a scientist discovers what they want to discover instead of what is really there, then that 'scientist' did not properly engage in science. We can, therefore, quite easily see that it is a matter of ethical principle that hypotheses be rigorously developed and tested by processes which eliminate as much as possible any potential personal investment or bias.

Indeed, we find that the expectation among scientists is just that: As Carl Sagan said: 'If there's something to be explained, think of all the different ways in which it *could* be explained. Then think of tests by which you might systematically disprove each of the alternatives' (Shermer and Linse 2). Sagan explains that the development of a single hypothesis is insufficient; a professional, ethical scientist actively tries to find explanations other than their own and must disprove all of those before they can be satisfied that theirs is the best answer it is possible to know at the present time.

An example of this process can be found in the work of Julian Finn and Mark Norman on the octopuses in Indonesia. On observing an octopus stacking and carrying coconut shells to use as shelters, the research team hypothesized that this was an example of tool use – something not previously observed among invertebrates. As a matter of ethical practice, Finn and his teammates identified and negated these explanations for the octopus, behaviour: stimulus response (such as ants using leaves to carry food) and simple behaviour around an object that is present all the time (such as a hermit crab using a discarded shell as protection) (Finn, *et al*). They identified as evidence of actual tool use the facts that: the octopus had to manipulate the coconut shells in a particular way (stacking them inside each other) in order to carry them, the carrying of the shells over considerable distances, despite the fact that 'This unique and previously undescribed form

KNOWLEDGE QUESTIONS

Do scientists or the societies in which scientists operate exert a greater influence on what is ethically acceptable in this area of knowledge?

In what ways have developments in science challenged long-held ethical values?

Learner profile

Principled

What, given the scope of the natural sciences, are the important principles for natural scientists to adhere to?

KNOWLEDGE QUESTIONS

How do the ethical standards of each AOK shape the methods and tools of knowledge making?

Which AOKs have ethical principles which are similar to the natural sciences? Which are more different?

of locomotion is ungainly and clearly less efficient than unencumbered locomotion (ie, costly in terms of energy and increased predator risk compared with normal walking or the faster jet swimming escape'), and the fact that the shell is carried for future use – which the researchers observed (Finn, *et al*). At no point do the researchers claim that their idea is unequivocally right; they offered a hypothesis and they gathered evidence that supports it, as well as trying to determine whether alternative explanations might make more sense given that evidence. To violate this process would be ethically wrong because it would result in 'knowledge' which did not describe or explain what actually happens in the real world.

The formulation and testing of hypotheses in the natural sciences, in other words, are bounded by the ethical principle that actual truth exists and that the charge of the sciences is to discover and explain it, not to distort or misrepresent it.

KNOWLEDGE QUESTION

Should scientific research be subject to ethical constraints or is the pursuit of all scientific knowledge intrinsically worthwhile?

ACTIVITY

If you review the discussion of the other stages of the scientific method from the last section of this chapter, you will begin to see that the same ethical principles which shape the making of hypotheses apply to the other stages as well.

How does the need to make accurate statements about the world outside of themselves shape the way that scientists gather evidence, analyse evidence, test findings and use peer review and falsification?

CASE STUDY

Scientific malpractice

Use the QR code to read about Professor Marc Hauser who had to resign his position at Harvard University after having been found to have engaged in research misconduct. Dr Hauser was in the psychology department but was conducting biological studies on some monkeys in order to establish the evolutionary development of certain mammalian traits. At the bottom of the article, you can read a statement from Dr Hauser in response to the findings from an investigation by the Office of Research Integrity (ORI), in the US Department of Health and Human Services. He suggests that people should not feel that all of his work has been laid open to question because some of his studies were found to be flawed ('Marc Hauser').

Based on the ethical conduct of science, do you think that if a scientist is found to have engaged in misconduct, all of their work needs to be rechecked, or can we be confident that all earlier work has resulted in accurate knowledge? How could we know that a scientist who has at some point begun to engage in practices which call into question the legitimacy of the claims made as a result of the work has never done so before?

Ethics and the application of science

Ethics can relate to scientific knowledge in other ways. One problem that arises fairly often in the process of trying to make and share scientific knowledge is the way in which politics shapes the inquiry.

In the eighteenth century, people tried to use the classification of creatures in order to justify slavery. The argument in favour of slavery was that the non-European races were inferior beings. People attempting to attack this argument and those trying to support it turned to science. Abolitionists argued that the Bible, which says that mankind is descended from Adam and Eve, supports the idea that humans changed from looking like Adam and Eve (who were presumed to look like Europeans) into many other forms. 'If Adam and Eve looked like Europeans, then obviously the facial features of African people must have arisen subsequently; or vice-versa. Thus, from the very fact of human variation, coupled with a single origin for the human species as recorded in Genesis, the earliest theories of microevolution were deduced' (Marks). Such an argument aims to demonstrate that all humans are part of the one species created by God, and, therefore, no humans should be enslaved. People (including scientists) interested in justifying slavery, however, argued that science showed that African people were related to apes. Science seemed to link non-European races to apes through measurements of the skull and face, at least according to scholars concerned with justifying the practice of slavery by dehumanizing African people (Marks.)

In the early nineteenth century, a new argument was offered by a medical doctor named Samuel Morton. He collected human skulls from anywhere that he could get them, and he filled them with pepper seeds. From this practice, he developed a claim that skulls from people of different races had consistently different volumes and that, based on the assumption that greater volume meant greater intelligence, he could order five races in terms of intelligence. 'Morton believed that people could be divided into five races and that these represented separate acts of creation. The races had distinct characters, which corresponded to their place in a divinely determined hierarchy. Morton's "craniometry" showed, he claimed, that whites, or "Caucasians", were the most intelligent of the races' (Kolbert). He then listed, in order, Mongolians, South East Asians, Native Americans and Ethiopians. Defenders of slavery embraced Morton's ideas as a means of supporting their claims that slaves were less than human (Kolbert).

KNOWLEDGE QUESTION

How was evidence misused in this particular experiment?

ACTIVITY

Use the QR code to read the description of Samuel Morton's experiment.

1 Did the experiment follow the scientific method?
2 If so, identify the different stages. If not, explain what was missing.

All of these arguments relied on interpretation of knowledge from religion and incomplete science, or pseudoscience. There was no conclusive information to settle the question one way or the other; people were able to choose the argument which served their purposes. In the early twenty-first century, however, when the actual scientific project of mapping the human genome was completed, it demonstrated conclusively that there is no such thing as race at the genetic level. Not only are all humans closely related to each other, but all humans are to some degree African:

> By analysing the genes of present-day Africans, researchers have concluded that the Khoe-San, who now live in southern Africa, represent one of the oldest branches of the human family tree. The Pygmies of central Africa also have a very long history as a distinct group. What this means is that the deepest splits in the human family aren't between what are usually thought of as different races – whites, say, or blacks or Asians or Native Americans. They're between African populations such as the Khoe-San and the Pygmies, who spent tens of thousands of years separated from one another even before humans left Africa. (Kolbert)

KNOWLEDGE QUESTION

Do ethical principles shape the use of evidence in history and the arts in the same way that ethics shape the use of evidence in the natural sciences?

All non-Africans are descended from people who left Africa approximately 60 000 years ago. The map on the next page shows the migration over time, and establishes the fact of the descendance to Europe and the Americas from older humans from Asia and Africa.

The ethical use of science requires that we make our claims about the relationships among people from different races based on the most up-to-date science which is available. It also requires, however, that we use science which resulted from studies that were properly conducted. Speculation about relationships among species based on the Bible or on skull measurements did not result in scientific claims. We always need to be alert to attempts to claim that something is true based on science. Rather than just accepting the claim, we have to know how the 'scientific knowledge' was developed. If it was done in accordance with scientific methods, then we know we can trust it.

Map showing human migration out of Africa over time

A more recent accusation of an ethically questionable use of science was made in an article by the evolutionary biologist Colin Wright titled 'The New Evolution Deniers'. In his article, Wright argues that the age-old objections to Darwin's theory of evolution from right-wing evangelical Christians (as discussed in Chapter 6 and on page 309 of this chapter) have been usurped by a new form of denial from the political left, in the form of 'blank-slate psychology'. An old question in psychology is whether humans are born as blank slates or whether they are born with certain traits innately present; this is known as the nature vs nurture debate. Some social justice activists, Wright argues, are committed to the blank slate idea – the idea that human traits, including gender and sexual identity – are the result of each person's exposure to their environment. In other words, he says, some social justice activists want to promote the idea that all brains – male and female – start out identical to each other and then change as a result of socialization (Wright). This 'blank-slate psychology' is, however, rejected by scientists:

> the evidence for innate sex-linked personality differences in humans is overwhelmingly strong. But experts also universally reject that this view demands we embrace biological essentialism, because the environment does play a role, and observed sex differences are simply averages and overlap tremendously between the sexes. Sex no more determines one's personality than it determines one's height. Sex certainly influences these traits, but it does not determine them. For instance, most of us know females who are taller than most males, and males who are shorter than most females, though we are all aware that males are, on average, taller than females. In humans, the same is true for behavioral traits. (Wright)

In other words, the human and natural sciences tell us that our traits are partly shaped by our biology and partly by our environment. What is still unclear is the degree to which each one influences people.

Wright goes on to state that some activists have argued that biological sex is itself a social construct, the product of environmental rather than biological factors. Traditionally speaking, humans have been considered sexually binary – they are born with male sexual organs or they are born with female sexual organs. Gender identity, in contrast, is a different proposition altogether.

KNOWLEDGE QUESTION

Are findings of other areas of knowledge subject to controversy arising from political pressure in the same way that some findings of the natural sciences are? Why or why not?

Gender identity is strongly shaped by environment, and biologists have made no attempt to claim that physical biology determines a person's gender identity. Wright suggests that social activists have **conflated** gender and sex to make the case that all people – including transgender people – are the same, and, therefore, deserve equal treatment under the law.

However, a closer look at some of the articles Wright is responding to suggests things might be a little more complex. He refers to a number of articles and **editorials** from well-respected and ostensibly apolitical scientific publications that argue that the traditional understanding of sex as a binary model is reductive and potentially harmful to people born with hormonal, genetic or anatomical ambiguities that make it difficult to be classified categorically as male or female. The most inclusive definitions suggest that as many as 1 in 100 people exhibit such differences of sex development (DSD). 'These discoveries do not sit well in a world in which sex is still defined in binary terms', writes Claire Ainsworth, a science journalist with a PhD in developmental biology. 'Few legal systems allow for any ambiguity in biological sex, and a person's legal rights and social status can be heavily influenced by whether their birth certificate says male or female' (Ainsworth). This means that parents of babies with DSD are often forced to make difficult decisions about whether to bring their child up as a boy or a girl, a decision that might involve surgical intervention to 'normalize' their baby's genitals, and which might clash with the child's ultimate gender identity.

The truth of the matter, Ainsworth concludes, is that there is no one way to categorically define sex. 'So if the law requires that a person is male or female', she asks, 'should that sex be assigned by anatomy, hormones, cells or chromosomes, and what should be done if they clash?'

It is clear that this is a complex scientific issue, one made all the more difficult by the strong political and emotional responses inevitably provoked by questions of gender identity. It is important to note, however, that whatever conclusions we draw, there is no scientific justification for discriminating against transgender people or people with DSD. The question, rather, is whether science provides a basis for suggesting that sex is not the binary dichotomy it is commonly believed to be, and if so, what implications this has, if any, for the social and legal statuses of transgender, non-binary and intersex individuals. This is, however, still a question, not a resolved finding. Given a discussion which is so far new and unresolved, and which is, as we have seen, quite complex, any attempt to make dogmatic claims that science supports one particular political perspective on this question is a misuse of science, in the same way that science has been misused to support the anti-vaxxer movement or to deny humans' role in accelerating global warming.

◆ **Conflate:** To combine two things in order to suggest that they are fundamentally alike. Generally, when we use the word 'conflate', it is to suggest that the two things should not have been connected. In this case, biology cannot be conflated with psychology. The things that biologists study are quite different from the things that psychologists study, even though, as you will see in the next chapter, there are some ways in which natural science can aid psychologists in making knowledge in their area.

◆ **Editorial**: An article in a publication expressing the opinion of the editor. In academic or scientific publications, editorials may not be subject to the same peer-review process as the other articles.

ACTIVITY

Read the article by Colin Wright and those he is responding to using the QR codes. Think about the following questions:

1. How do we decide between the competing claims of qualified scientists?
2. What evidence does each author provide for their claims? Is the evidence sourced to scientific studies?
3. What are the strengths and weaknesses of each article?
4. Which author, in your opinion, is using scientific thinking in a more ethical way?

ACTIVITY

1. What do you think the forces are which work on people's minds in such a way as to cause them to prioritize something above reality? In other words, what kinds of things happen in people's experience to drive them to care more about what they *want* to be true than what *is* true?
2. In many cases, wanting something to be true can be a positive force, in that if the goal is achievable, that desire can drive us to action. In other cases, however, goals are not achievable, but people try to realize them anyway. How can people know whether what they want is reasonable and achievable and when it is not?

KNOWLEDGE QUESTION

How do the values that influence the production of knowledge in the natural sciences compare to the important values in mathematics?

CONCEPT CONNECTION

Values

We saw in Chapter 7 how deeply intertwined political knowledge and values are. We have seen in this chapter how deeply dependent the acquisition of scientific knowledge by non-scientists can be on other personal values, which may either aid or impede the acceptance of that knowledge. The methods for making knowledge in the natural sciences reveal that scientists in general value careful observation, rational processing of data and caution in making claims, even when they are well-founded, because some finding later might arise to alter those claims. Perhaps more than anything else, that caution reflects the values of those who generate scientific knowledge: scientists value the idea that their findings express the truth about the way the world works, as much as it is possible to achieve that goal. This is why theories are called theories and not facts, even though they are well-founded, and this is why the search for knowledge in all scientific arenas continues. Scientific knowledge is never 'finished'. New technologies, new findings in other fields and new ways of thinking about things can, at any moment, cause scientists to revise or refine their knowledge.

Conclusion

We have seen in this chapter that the truth that scientists aim to establish is accurate knowledge and precise descriptions of the nature of physical properties of everything in the Universe, including how they function. We have also seen that scientists acknowledge, as a matter of ethical principle, that they will never be able to claim that they know with absolute certainty or that they will, at any point, know all there is to know, as we cannot ever claim that we have access to all the evidence there is. Many scientific claims have been, and will be, established with a very high degree of certainty, and that certainty is strengthened as time passes and more scientific knowledge coheres with what is already known. However, because scientists value truth so highly, all findings are open to reframing whenever new evidence arises that can increase our understanding by making them more accurate or more precise.

The scientific truths that we have established are good enough to allow for prediction, invention and control over many aspects of our lives. These include technological development, medical advancements and increased understanding of how to preserve this world for future generations, as well as to explore the possibility of other worlds which might be developed should that one day become desirable. The truth of scientific claims must be established rationally through observation and logical induction, and it is tested pragmatically, by the fact that the claims work when we endeavour to use them in order to improve people's lives.

In Chapter 8, we were introduced to the physicist Richard Feynman, who provided some insights into the nature of mathematics by way of the contrast of mathematics and science. As a

KNOWLEDGE QUESTION

Do the natural sciences provide us with good examples of people who approach knowledge in a rigorous and responsible way?

Richard Feynman

physicist, of course, Feynman used mathematics as a tool to help him do science. As a scientist, he expressed the central ethic of the natural sciences in a very simple statement: 'If it disagrees with experiment, it's wrong'. In that simple statement is the key to science: 'It doesn't make any difference how beautiful your guess is, it doesn't matter how smart you are who made the guess, or what his name is … If it disagrees with experiment, it's wrong. That's all there is to it' (Feynman).

This simple, elegant statement sums up the relationship between science and truth very beautifully. The guiding principle of scientists requires them to determine what *is* rather than what they wish or imagine or hope things to be.

It doesn't make any difference how beautiful your guess is, it doesn't matter how smart you are who made the guess, or what his name is … If it disagrees with experiment, it's wrong. That's all there is to it.

Richard Feynman

CONNECTIONS TO OTHER AOKs

- **Scope:** The scope of the natural sciences is widespread but is limited to the physical properties of the universe. What other AOKs focus, at least in part, on the physical world? Does the scope of history and the arts have any overlap with the scope of the natural sciences?
- **Perspectives:** Sometimes differing social and ethical questions, such as the question of the gender of human beings, affect the way in which scientific findings are interpreted and applied in the world. Should social values shape scientific findings? Is the impact of social values on knowledge claims in other AOKs a positive or a negative feature, in terms of developing accurate knowledge?
- **Methods and tools:** Knowledge making in the natural sciences has historically been very dependent on technologies which have extended our ability to observe the physical world in greater and greater detail, among other things. How important is technology as a tool in other AOKs? Is the knowledge in the human sciences or mathematics, for example, as dependent on technology as it is in the natural sciences?
- **Ethics:** In the natural sciences, ethical principles are integrally tied to the fact that the point of the effort to make knowledge is to find out what is real, outside of our minds. Anything which interferes with accurate, objective observation is therefore an ethical problem. How does that relationship between aim and ethics compare to other AOKs?

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10 The Human Sciences

OBJECTIVES

After reading this chapter, students will be able to:
- identify and reflect on the differences between the natural and human sciences
- identify and understand some of the main perspectives available in psychology and economics
- reflect on elements of the 'scientific method' as it applies to human behaviour
- understand the difference between qualitative and quantitative data in the human sciences and reflect on the effect of this distinction on the reliability of the AOK
- explore the role of models in economics and reflect on how well they apply to the world
- reflect how ethical values are an important part of the scope of the human sciences and how this might constrain the development of new knowledge.

Learner profile

Reflective

Can we ever be completely objective in our study of ourselves?

Introduction

The growth and explanatory power of the sciences is extraordinary. From the furthest reaches of the Universe and the most fundamental physical facts about the smallest elements of reality to the immeasurable benefits provided by the biological and chemical sciences, the natural sciences are continually improving our ability to understand and utilize for our benefit the natural forces found in the world. These benefits have fundamentally changed the human experience both for the better and the worse: we are able to live longer, have more leisure time, travel the planet, explore the solar system and share information in ways that were unimaginable to even our grandparents.

One of the great strengths of the scientific method is its *predictive* power. In 2004, the Rosetta Spacecraft was launched into space. Ten years later, after travelling around Earth three times and past Mars (using the gravitational pull of these planets to create speed and the correct trajectory), past two asteroids, entering a 31-month hibernation and waking up again, it finally arrived at its target, the Comet Churyumov–Gerasimenko. It orbited the comet, which itself is orbiting Jupiter every 6 years and travelling at a speed of 135 000 km per hour. The ability of astrophysicists and rocket engineers to make use of their knowledge and to use the natural forces of the Universe coupled with our own tools and technology to make all this happen is extraordinary.

KNOWLEDGE QUESTION

Do some AOKs have more 'predictive power' than others? How does this relate to the respective scopes of those AOKs?

How is it we can send a spacecraft hundreds of million of miles from Earth with pinpoint precision but fail to predict fluctuations in the economy?

In 2008, the global economic markets fell into a deep **recession**. This happens from time to time, but the severity of this recession was so great that people immediately wondered how this wasn't predicted, particularly when an entire academic discipline was devoted to using the methods of science (including observation, hypothesis, application of theory and prediction) to describe exactly this sort of phenomenon. Economics is generally considered a 'science', albeit a 'human science', but if the natural sciences are able to apply the level of predictive power needed to send a rocket into deep space and find its target, why can't economists identify and defend against recessions?

◆ **Recession**: An economic downturn characterized by higher unemployment, greater inflation and lower rates of industrial production.

One answer to this is that the human sciences are simply not capable of the level of prediction offered by the natural sciences. While we might be able to manage rockets in space, managing the economy is beyond us. The difference? It is the 'human' element. Humans are just not very predictable. We are not very reliable when it comes to consistency and trying to guess what others will do when faced with a choice is nearly impossible. Human scientists, however, still give it a shot. They do this largely because of the success of the scientific method; its application has given us huge amounts of knowledge and control over our environment. But it is precisely the use of the scientific method, particularly in its use of mathematical modelling (very useful in astrophysics), on *human* individuals and institutions that some suggest as the reason why many didn't see the recession coming. The precision and unassailable logic of the mathematical models used to describe the world's economy provided the *illusion* of control (Knowledge@Wharton). However, the economy cannot be controlled in the same way that rockets can. Rockets can be controlled because the underlying forces of physics are not making choices, they just do what they do. People are not forces – they make choices – and we cannot *really* predict what those choices will be.

What use, then, is the scientific method when applied to human beings? This chapter explores the ways in which elements of the scientific method *are* applied in the human sciences and provides opportunities to reflect on that application, the quality of the outcomes, the values inherent in such an application and the particular care needed for the subjects of that application, human beings.

ACTIVITY

What other factors or explanations can you think of to account for our limitations when it comes to predicting human behaviour? Make a list with your classmates.

Scope

Not the natural sciences

Theory of Knowledge has been organized in a way that suggests that there are different types of sciences: the natural sciences (discussed in detail in Chapter 9) and the human sciences.

The TOK student in you should immediately wonder about this. If they are both 'sciences', then why should we be treating them as different categories of science? What are the differences and what are the *roots* of those differences? Are those differences significant enough to suggest that they are indeed different things?

KNOWLEDGE QUESTION

Is it possible to discover laws of human behaviour in the same way that the natural sciences discover laws of nature?

ACTIVITY

1 Create a grid like the one below. Fill it in with your initial thoughts about these two different AOKs.

	The natural sciences	The human sciences
Some *disciplines* included in this AOK are …		
What does the AOK study?		
What problems are solved by this AOK?		
Are there any assumptions inherent in the AOK?		
What are the weaknesses of the AOK?		
How effective is the scientific method in this AOK?		

2 Complete the table individually then compare your responses with a partner. How are your initial views similar and different? How have your ideas changed in relation to your partner's?

So, what is the difference between the 'natural' and the 'human' sciences? We should probably start with the obvious difference: each science focuses on a different object (what is investigated). As we've seen, the natural sciences has as its object of study *natural* features of the world like bushes, rocks, atoms and stars, whereas the human sciences study human beings. This is pretty obvious stuff.

But are humans not part of the natural world? Biology, physics and chemistry have all been used very effectively in the study of human beings. Obvious examples might include how biologists have explained how our genes are passed from generation to generation, or how chemists have developed healthy foods and medicines, while physicists have worked wonders in understanding why we get sunburned and in developing X-rays and MRI machines to see inside the human body to help treat illness.

Magnetic resonance imaging systems and X-rays show the inside of a human being, but do they show what it means to be a human being?

In these examples, however, the elements being explored by these natural sciences have precious little to do with what makes human beings *human*. They each treat humans as if they were objects and explain an aspect of the *physical* body. Genes, chemical interactions and the effects of ultraviolet radiation on human skin are all the sorts of things that don't require any mention of human thoughts, beliefs or psychology. There are other questions about humans, however, that require more than descriptions of physical interactions and processes. While biology might be able to explain the mechanisms involved with inheritance, we still might ask whether our genes dictate our behaviour or our personalities. While chemistry can tell us what is in our food and (along with biology) what will be healthy for us, we still might wonder why we eat so many things that we know are bad for us. While physics might explain why our skin burns in sunlight, this nevertheless doesn't really answer questions about why some people might put themselves at risk of skin cancer by over-tanning. These further questions require an explanation that relates to concepts describing human behaviour and beliefs.

KNOWLEDGE QUESTION

How significant are the differences between disciplines within the human sciences?

For example, in the human science of geography (we will explore the different types of human science shortly), we might be interested in the movement of people during different stages of a large city's growth over time. Simply pointing out that the city has grown or that it has grown in this or that direction is only half the story. A human geographer would also need to appeal to why people moved as they have. Concepts like 'economic opportunity', 'incorporate', 'smart growth', 'city planning' or 'housing markets' all draw on the beliefs, desires and expectations of individuals – concepts irrelevant when describing 'natural' geography (in most cases).

What best explains the growth of Paris? Or the decline of a town?

One difference, then, is that human sciences take as their object of study the relationship between human *action* and human belief. Human scientists need to know facts about human bodies and their interaction with physical features of the environment, but their questions are primarily about humans as *agents*, things which have beliefs, consider choices, make decisions and engage in goal-oriented behaviour.

The human sciences, then, are focused on 'agents', that is, we act in relation to reasons and beliefs and the various human sciences attempt to investigate that relationship.

CONCEPT CONNECTION

Explanation

Various areas of knowledge provide different types of explanations. Here we are outlining a difference in the types of concepts and ideas which would be appropriate in the natural sciences and the human sciences. If we were to suggest that layers of sediment at the bottom of a river *wanted* to become rock in 100 million years to describe the process of rock formation, we would be accused of offering a poor explanation because the concept of *desire* plays no role in the natural science of geology. The 'reasons' provided by the natural sciences refer to impersonal natural forces that act in the world. However, *not* including the concept of 'desire' in the explanation of why different people spend their money on different types of goods and services would equally be a poor explanation because 'desire' is a fundamental concept in economics. Any 'reason' for an economic downturn, or some particular distribution of resources would incorporate at some level the thoughts or beliefs of human beings.

KNOWLEDGE QUESTION

What are the differences between the use of the concept of 'cause' in the human sciences and the natural sciences?

ACTIVITY

1. What other concepts do you think are fundamental in the various explanations offered by the different human sciences?
2. What role would these concepts play in other AOKs?

Another difference between the human and the natural sciences is a direct consequence of the assumption that human *belief* is the root of human behaviour. If beliefs are part of the explanation of human behaviour, and if science is about recording observable phenomena, then how might the human scientist gather data about these beliefs?

While we might be familiar with our *own* beliefs and have some awareness of how they relate to our behaviour, we wouldn't be able to *observe* another individual's beliefs directly. We might *infer* their beliefs from how they behave, but we do not have direct access to their own motives, beliefs or desires. Were we to observe a woman giving up one job and moving to another city for another, more highly paid job, we might infer all sorts of beliefs: she wanted to earn more money; she prioritized the new job more than her desire to live in the old city; she expected that she would be happy in a new city. However, we can only speculate about those beliefs, we could not directly observe them.

The human scientist would need to find direct evidence of which belief actually explained the behaviour. The traditional way of doing this is through interviewing the subject or *asking* the subject. The answers to these questions can then form part of the human scientist's evidence.

The human scientists, then, will certainly use *observation*, like natural scientists, but in many cases human scientists must gather a different sort of evidence, based on the testimony of the humans being studied. Once gathered, this evidence can be said to be 'observed' in the sense that a human scientist might be able to evaluate and analyse this information. This sort of data, however, raises questions of reliability due to its *qualitative* nature. We will explore the nature of this sort of evidence and its effect on the reliability of knowledge claims in the Methods and tools section of this chapter.

TOK trap

Speculation about other people's beliefs or motives is *not* a reliable way to evidence claims about behaviour. While *we* might think that some person acted for various reasons, and it might be plausible to make this inference (as in the example of the woman moving cities above) the *best* evidence, the type of evidence which supersedes the rest, is to have direct evidence of that belief in the form of the woman's own explanation or testimony. Therefore, in the context of TOK, to merely speculate about others' beliefs is to identify *plausible* claims about people, not reliably evidenced claims. Since TOK is partly about learning how to identify more and less reliable claims, offering unreliable claims in TOK as part of your analysis is not a good strategy.

So far, we've suggested that human scientists take as their object things (humans with beliefs, motives, goals, etc) that are importantly different from objects in the natural world and must therefore use different methods to identify and observe relevant evidence. These points help us make sense of the 'human' part of the human sciences, but what about the 'science' part? What does it suggest that we call them the human *sciences*?

This suggestion that the human sciences assume a difference between human behaviour and the events we observe in the natural world, however, raises a challenging question. The difference rests on the assumption that we have reasons and beliefs and that these are part of the explanation of why we act the way we do. The question is to what extent those beliefs determine what we do. Given what we have learned about the 'scientific method', one might say that the 'human sciences' attempt to apply the scientific method to understanding the relationship between human behaviour and belief.

KNOWLEDGE QUESTION

How would you characterize the relationships between the Scopes and the Methods and tools of other AOKs?

Like natural scientists, human scientists will construct knowledge by:

- observing the behaviour of people (which might be individuals or groups)
- creating hypotheses about why they behave that way (appealing to the beliefs, motives, goals of those observed *and* to the previous theories and 'laws' that have been developed in the field)
- developing experiments and predictions to see if the hypothesis can be confirmed
- evaluating the data from the experiments to see if their hypotheses have been confirmed or not.

These sorts of stages of knowledge construction are quite similar to those we suggested were at the root of the construction of knowledge in other 'sciences'. Following these steps is what it means to be 'scientific' and there's good reason therefore to accept that the human sciences are rightly called scientific. Whether the claims in the human sciences are as reliable as those in the natural sciences, however, is a fundamentally different question. We will explore this question later in the Methods and tools section of this chapter.

Perspectives

The human sciences comprise an incredibly diverse range of different types of human behaviour. What they each have in common is the application of the scientific method in constructing knowledge claims in relation to various types of human behaviour. Table 10.1 on the next page shows what a possible list of such sciences includes.

Table 10.1 The human sciences

Human science	Area of study
Psychology	The study of the human mind (thoughts, beliefs, opinions, etc) with particular reference to its effect on human behaviour
Economics	The study of the production, distribution and consumption of resources, goods and services
Sociology	The study of human social structures, including societies, institutions and groups, and patterns of human interaction
Anthropology	The study of human cultures and societies generally from a long-term historical perspective, and in relation to physical character and environmental and cultural relationships (*anthropos* = Greek for 'human')
Political science	The study of the state, systems of government and political activity
Human geography	The study of human interactions with the physical environment, including the effects of human activity on that environment

KNOWLEDGE QUESTION

How do we decide whether a particular discipline should be regarded as a human science?

This incomplete list includes some of the disciplines which are traditionally considered as human sciences, but there are others, such as philosophy, critical theory, literary criticism, linguistics, art history and law. These aim to systematically study various other aspects of human behaviour, but they have a weaker connection to the scientific method. Each of the different human sciences has as its focus a different aspect, but they all relate directly to human behaviour.

One way of exploring the differences between all these disciplines and AOKs is to highlight the *reductive* nature of science. It is traditional to offer a scientific explanation by pointing out the interactions between the most fundamental elements of the system. Chemistry explores this by looking at the elements of the Periodic Table. Physics is concerned with fundamental forces. Biology uses concepts like proteins, genes, cells and organisms as building blocks in its explanations. The human sciences also aim to reduce complex phenomena to their smallest features. Economics uses concepts like price, demand, supply and value. The fundamental features of human psychology vary depending on the perspective taken: some might say Freud's Id, Ego and Superego are the starting points, while others might see neuro-physical features of the brain or its various cognitive functions (like attention or memory), or language, intelligence or emotion as the fundamental concepts. Even Plato back in the fourth century thought the human soul or psyche was constituted by reason, passion and desire, and behaviour could be explained by the interplay between them.

KNOWLEDGE QUESTION

Do natural scientists use perspectives in similar ways to human scientists, or in different ways? What is the significance of any differences for understanding the scope of those AOKs?

In this chapter we will be primarily focusing on two of the human sciences, psychology and economics. They serve as good examples of the central issues in the human sciences and the questions and issues discussed in relation to them can be applied with relevant changes to the others.

Psychology

Like other areas of knowledge, there are various ways of being a human scientist, each with a significantly different approach to the subject. The object of each is broadly similar (the explanation of human cognition and its effect on behaviour), but there are significant differences. Think back to the discussion of maps in Chapter 2, where we explored why different maps of the world have different features contained within them. Sometimes they show roads, sometimes cities, sometimes national borders, sometimes the natural features of the landscape. The suggestion is that each map prioritizes certain information and understanding a map requires you to understand what information the map is prioritizing. The different perspectives in psychology also prioritize different features of human cognition.

Table 10.2 outlines the most prominent ones (Mcleod 2013).

Table 10.2 Psychological perspectives

Perspective	Explanation
Behavioural	• The starting assumption in behavioural psychology is that the environment determines much of what we think and do • Behaviourists will focus on observable human behaviours, seeing behaviour as *determined* by the environment • Conditioning is a key concept in behavioural explanations of human behaviour: this is the thought that we have been *conditioned* to respond to stimuli in our environment (Pavlov, who trained dogs to respond to bells, was a behaviourist)
Psychodynamic	• Psychodynamic psychology considers the conscious mental life of human beings as being only part of the human psyche • Our conscious thoughts are the product of non-conscious processes, memories of experiences and the dynamics of various elements. Sigmund Freud labelled these other features the Id, Ego and Superego • Carl Jung suggested our cognition was the product of 'archetypes' common to all human minds which shape our thoughts and beliefs • When we talk of 'repressed childhood memories' influencing our behaviour, we are applying a psychodynamic approach
Humanistic	• Humanistic psychology approaches human cognition in the context of the whole being and the individual's own self-image of themselves • The humanistic approach leaves greater room for 'free will' or the ability for an individual to take more control of their own mental states and flourishing
Cognitive	• Cognitive psychologists prioritize understanding the *processes* in human cognition, like memory, sense perception and attention • Cognitive psychology focuses on how the mind processes information • When we question the reliability of memory or eye-witness testimony, or consider how various non-conscious 'cognitive biases' might impact our knowledge construction, we are applying this approach because we are questioning the *processes* involved in the construction of mental states (beliefs)
Biological	• Biological psychologists start with an analysis of the physical nature of the brain to understand human mentality • The best explanation of human thoughts and behaviour from this view starts with an understanding of how the brain works, so requires a deep understanding of neuroscience • Psychiatrists generally apply this approach, identifying the biological issues underpinning mental illness and then offering medicines or direct treatment on the brain • When people are offered medication for things like psychosis or ADHD, a biological approach is being applied
Evolutionary	• Evolutionary psychology offers explanations of human behaviour in terms of the evolutionary pressures in the early development of the species • According to this view, our general behaviours are the result of selective pressures. Most of us have a natural fear of creepy-crawlies, for instance, because having such a fear tended to keep us away from dangerous snakes and insects and kept us alive

One key feature of these different approaches is that they are not necessarily mutually exclusive. You can be a behaviourist and your friend can be an evolutionary psychologist and you both might offer viable explanations of some behaviour. The charitable reading is that human cognition and behaviour are incredibly complex things and no one approach can capture all the nuances. A less charitable view might suggest that the choice of a perspective is little more than a matter of taste: it is interesting, for instance, to think about Jung's archetypes in terms of human storytelling (the similarities between various myths across cultures, or the power of these myths to illustrate the features of common human experience), but having an *interesting* perspective is different from having a scientifically valid perspective.

ACTIVITY

For each of the different perspectives in Table 10.2, consider the following questions (it might help to keep thinking of each as a type of 'map').

1 What are the fundamental *concepts* and *ideas* that are applied in these approaches? Where do these concepts come from? Are they borrowed from other disciplines?
2 What are the fundamental (most basic) facts of this view upon which other facts can be built?
3 Where do you see overlap in terms of the concepts and facts being used by the different perspectives?
4 In what ways do you think the perspectives guide the thought processes of the researcher? What questions will they ask? What types of answers will they provide?
5 What are the *limits* of these perspectives? Are there types of behaviours that they might not be well suited to answer?
6 How grounded in observable *fact* do you think these approaches are? Can you rank them according to how much their conclusions or explanations can be evidenced through observable events?
7 How would you rate these perspectives in terms of their being more or less suited to the job of explaining human cognition or behaviour?

One way of offering some criteria about which perspectives are valid is to consider the links between the perspectives and scientific research. The Freudian psychodynamic perspective for instance, postulates the existence of some feature of our minds called the 'Id' (rhymes with 'lid'), which is meant to be the seat of our biological urges like the sex drive or the seat of aggression. Some would argue that treating these 'urges' as if they belonged to a distinguishable feature is to add too much to a theory of human cognition. Instead, it would be simpler to explore other explanations that didn't require the existence of this unobserved and unobservable aspect beyond the behaviour itself. As our understanding of the human brain progresses, or our understanding of human *society* and its effects on individuals progresses, some of these perspectives might be able to better draw on them and incorporate them into their explanations.

Economics

What exactly is being *observed* in economics?

What is the economy and how does it work? The term 'the economy' refers to all the decisions we make about producing, consuming and allocating the goods and services that drive the world around us. On every day, in every country on the planet, people are buying and selling, trading, creating, donating, making and using things they have bought or sold. All these decisions and actions together are called 'the economy.' Both at the small scale of individuals and larger scale of entire industries or countries, there are times when things are going well (when people have good jobs, earning good wages) and times when things don't go so well, and there is a lot of swinging back and forth between these two situations, like a pendulum. These swings can be quite damaging to individuals, companies and countries, so learning how they work is the job of the economist.

Trying to develop descriptions, explanations and predictions of these phenomena is incredibly challenging but the human sciences have nevertheless made an attempt. The primary difficulty in this discipline is the same problem we have seen elsewhere in the human sciences: it often is impossible to know precisely what an individual is thinking when acting a certain way (even asking them might not lead to a truthful answer), and *predicting* a person's behaviour is equally challenging.

KNOWLEDGE QUESTIONS

Are predictions in the human sciences inevitably unreliable?

Is human behaviour too unpredictable to study scientifically?

As with any of the other maps we apply to the world, choices get made over just what sorts of things should be included in our descriptions and how to handle them. These various approaches, or perspectives, each has its own set of values, priorities and assumptions.

Macroeconomics and microeconomics

One way of carving up the economic landscape results in the difference between what we call 'macroeconomics' and 'microeconomics.' As the names suggest, their difference has to do with the scale at which the researcher is investigating. Microeconomics has to do with the behaviour of individuals, families or individual businesses; it is like a map whose scale is very small and includes lots of close-up details. Whether you should buy last year's car during the end-of-year sales or whether you should hold out for a newer but more expensive model is a microeconomic decision, as would be a decision of a company owner to give their employees a bonus, given the recent upturn in sales. Often in microeconomics the decisions directly affect a limited amount of people in close proximity.

Macroeconomic research, however, is focused on economic phenomena at a much larger scale and doesn't often describe what *individuals* are doing. Instead of looking at what choices individual people are making with their money, macroeconomics would describe economic trends in that individual's wider community or country. Rather than describing which car you should buy, macroeconomics asks about what is happening with the entire car industry: how many new cars are being produced by all the car makers this year as opposed to last year? How have social trends affected the growth of the car industry? In terms of the individual company owner, macroeconomics would explore the trends related to the company's type of business at the national or international level: how has international trade influenced the industry? Has the national unemployment rate affected this industry harder than others?

These scales of description are not entirely separate, obviously. Like any maps of different scales, they both describe the world, but do so by highlighting and prioritizing different elements. For instance, a national bank raising interest rates when the economy is strong (ie, there is a lot of money and resources being exchanged) is a feature of the macroeconomic landscape. However, higher interest rates means that it is more expensive to borrow money (because the borrower must pay back more in the long run). This means that a company might hold off on expanding or an individual might opt for a cheaper car, which are decisions made in the microeconomic landscape.

Is it possible to measure economic behaviour?

KNOWLEDGE QUESTION

Do other AOKs have a 'macro' and a 'micro' element like economics does?

Just how the micro level relates to the macro level, however, is a challenge. Economists suggest that the macroeconomy is the *aggregate* of the micro-level choices of individuals, meaning that the macro-behaviour (what happens at the macro level) is the sum total of all the micro-level choices. However, developing a more 'law-like' relationship is a genuine challenge: just think of the difference in describing how your friends, behave individually with how a whole crowd of people would behave. While describing your friends' behaviour might be relatively easy, describing how a stadium full of people will behave is far more difficult. It is not a question of just adding up the choices.

The TOK point here, then, is twofold: how reliable are those descriptions at the micro level and do all those individual choices 'add up' to anything at the macro level that you can then measure or describe reliably? 'The economy' at the macro level isn't a *thing* or an *object* we can study. To even identify what we mean by 'the economy' we must make decisions about what sorts of data we are going to use in the discussion. Do we use information about how many people are at work? What sort of work: full-time? Part-time? Permanent contracts or limited term contracts? Do we try to include undocumented workers? Maybe we measure the amount of capital or the amount of debt? Like real maps, economists must decide what is going to feature in their descriptions and what will be prioritized. These choices will affect the descriptions offered.

We'll explore some fundamental assumptions in economic theory which are highly questionable after the next section.

Neoclassical and Keynesian economics

This discussion about what sorts of things to prioritize in an economic description and what scale to describe them at leads us to a central distinction in economic theory, the classical/neoclassical approach and the 'Keynesian' approach. These approaches are often called 'paradigms', but this is not the same usage as paradigms in the natural sciences, as we'll see.

Economic theory really started developing in the eighteenth century with the Scottish economist Adam Smith. In his *Inquiry into the Nature and Causes of the Wealth of Nations* (1776), Smith constructs a picture of 'the economy' which prioritized the production and supply of goods. The focus for the subsequent classical and later neoclassical approaches was to see the economy in terms of producers seeking to promote their own profit by creating goods and services and sending them to market. The neoclassicists emphasized the role of the individual making rational choices. The central idea of this approach is that the economy may weaken or get stronger, but in the long-run the economy will 'right itself' and that there needed to be no intervention by governments: leave the economy alone, let people produce and spend money according to their rational choices, the accumulated wealth of the rich will 'trickle down' through investment and employment to the poorer and all will be well.

However, during the late 1920s and early 1930s, the world's economy went into sharp decline. Companies were unable to sell what they produced, wages dropped and people were unable to spend money. Unemployment grew and the cost of goods rose. British economist John Maynard Keynes (pronounced 'canes') questioned whether the neoclassical description was adequate – after a number of years, the economy certainly didn't seem to be righting itself.

In 1936, Keynes published *The General Theory of Employment, Interest, and Money* which advocated for a stronger role of the government in the economy. Rather than letting the economy alone, governments should, in times of trouble, increase its spending to make it easier for the consumers of society to spend money. Rather than the neoclassical's emphasis on producers supplying goods to the economy, Keynes argued that a healthy economy is driven by demand (the consumers) and recessions happen when people are unable to purchase desired goods, no matter how many of them are available.

These clashing positions in what constitutes the fundamental forces driving an economy have been called 'paradigms', meaning each draws on a different set of beliefs about how the economy works. They are not a true scientific paradigm, however, because the two can co-exist: there is nothing in the economy being described which decisively *shows* the other to be false. As we saw in Chapter 9, in scientific paradigms the evidence will ultimately confirm one theory over the other and one cannot hold the earlier view unless one ignores the evidence.

KNOWLEDGE QUESTION

Are all AOKs (or disciplines) affected by world events in the same way that economics might be?

CONNECTION TO THE CORE THEME

Values and interpretations

The neoclassical position and the Keynesian position amount to different *interpretations* of the same landscape. The facts are simply that people are buying and selling, producing, trading and consuming, but just how that dynamic is *described* is significantly different. An individual's choice between the two perspectives often draws on other non-economic beliefs. The neoclassical approach fits very well with certain *political* views about the priority of the individual in the political sphere and the limited role of government, allowing the wealthier in society to continue to push for profit. This political view is also not one which can be determined by an appeal to *facts* in the world; it is an individual value judgment. The Keynesian approach fits with the political view that a government's role definitely extends to a larger duty to intervene in the economic affairs of the country and may result in the government offering more protections for the poorer sections of society.

We can see therefore that the choice of economic theory might not simply be a choice based solely on economic principles, but will also draw on our own political values and intuitions. The value of the theories, like different maps, may depend on our individual interests, questions and goals.

In what ways do *political* beliefs influence theories in the human sciences?

ACTIVITY

1. Use the QR codes to read two articles about neoclassical economics and see if it is possible to identify *political, social or moral* beliefs (ie, beyond simply economic beliefs) that you think might be impacting the descriptions of the economic principles. Consider in what ways an individual's pre-existing political beliefs might impact the choice and application of ethical theory.
2. Do you think that economic theories and political theories can be separated?
3. In what ways do their scopes overlap?
4. Do all AOKs have overlapping scopes like this?

Can paradigm shifts occur in the human sciences?

In Chapter 9 we saw that the natural sciences show genuine progress in our understanding of the world, in the sense that whereas once we used to believe in all sorts of interesting theories to help us make sense of what we experienced in the world, we have given up on many of those theories because they no longer make sense. Aristotle (384–322 BC), for instance, taught us that all change could be attributed to how the essential elements of all objects (earth, fire, water and air) interact to produce qualities of hot or cold and wet or dry. Depending on an object's qualities it would naturally change its state into another combination of hot/cold and wet/dry. In the eighteenth century this theory was finally put to bed in favour of the explanatory power of Newtonian physics. While it might be a useful Theory of Knowledge exercise to think about how Aristotle would explain changes we see today, at best it would be an exercise in seeing how our understanding of the physical world has *progressed*; here are theories we no longer believe, and here is why we no longer believe those theories.

KNOWLEDGE QUESTION

How do paradigm shifts function differently in the natural sciences? What does this suggest about the nature of the AOKs?

In the human sciences, however, it is not at all clear that we progress in the same way. The concept of 'paradigm shift' still exists in the human sciences, but the final stage of a shift, where the old theory is seen as no longer appropriate, is not as clearly achieved.

Rather than the knowledge developing via paradigm shifts, where new theories are developed to account for weaknesses in old theories, new perspectives in the human sciences are developed which *interpret* the data in different ways. The different theories lack **incommensurability**, in that old theories might still be used alongside new ones. There is nothing in the data gained from observation of the world that will show one to be decidedly false and the other true: both old and new can co-exist. If this is true, however, then it is difficult to think of the human sciences as *progressing* in significant ways like we might suggest the natural sciences have. This suggests that human science is not *cumulative*, but *interpretive*; the different perspectives in human psychology, for instance, are simply different ways of seeing things as opposed to theories that once were accepted but which have now been shown to be false.

◆ **Incommensurable**: Mutually exclusive. One cannot, for instance, think 'today is Monday' and 'today is Tuesday' at the same time.

Paradigm shifts in the natural sciences result in new theories that are incommensurable with old theories: one cannot believe Aristotle's theory of the essential elements *and* believe in the theory which has identified the basic elements of chemistry and the ways they interact as described by modern physics. It is not a matter of interpretation – the first theory has been shown to be wrong or false.

KNOWLEDGE QUESTION

In what ways might we say that our knowledge improves over time? Would your answer differ in relation to different AOKs?

In economics, for instance, we might take a 'functionalist perspective' and view the economy in terms of its ability to maximize output and reward. The goal in this case is to provide participants in that economy the best opportunities to make the most of their resources and their opportunities. We might, however, interpret the economy as a system in which conflict is the main dynamic, where participants are attempting to (or should be left alone to) maximize their or their own economic class' opportunity and access to resources at the expense of others. This is often a charge of Marxist critics against a capitalist perspective; that an economy is somehow unhealthy or unfair when the society's wealth is concentrated in the hands of an elite at the expense of those who are suffering as a result of that inequality. In that case the privileged will always have an unfair advantage in the economic conflict (Matresse and Lumen Learning).

The idea here is that these are *interpretations* of just what 'the economy' is and how it works. No matter our perspective, we will be able to identify examples of economic activity which seems to confirm our perspective, but the other perspective will equally be able to interpret the data in relation to their own perspective. This suggests that the data cannot decisively show one theory *mistaken* and the other *true*. We cannot do this with Aristotelian physics; his paradigm has no bearing on any modern observations of the world.

On this view, then, prediction is not genuinely possible because *any* outcome will be interpreted in whatever way the theory suggests it should be, and this interpretation will come *after the fact*. The world might not behave the way that some theory suggests it should, but the theory will be applied to interpret the event in a way that makes sense, as opposed to showing that the theory is *false*.

KNOWLEDGE QUESTION

In what ways does the perspective of the knowledge producer influence the knowledge produced in other AOKs? Are the human sciences especially affected by the perspectives of their experts?

Normative and positive claims in the human sciences

This might be a good time to introduce another key distinction in the human sciences, having to do with *types of claims* often provided. On one hand, the human sciences use and describe objective facts. These are called 'positive' claims (not 'positive' in the sense of 'good' but meaning 'descriptive'. Positive claims describe what is *there*). All human science disciplines make positive claims. Economists can quantify the unemployment rate of a country or recognize the value of a country's currency against some other country's currency. Human geographers can track the numbers of people from various demographics moving into and out of cities. Anthropologists can agree on the age of some artefacts found in an archeological dig. Psychologists can agree on the numbers of people who report suffering from mental distress of some sort, or the fact that certain brain processes lead to certain mental states. These are facts about the world, discovered through testing, and can, with evidence be shown to be false. In theory, they can be fully agreed upon by the communities of experts involved.

KNOWLEDGE QUESTION

Do AOKs other than the human sciences have normative claims? How do other AOKs manage the influence of normative values?

However, the human sciences also make other sorts of claims about *what needs to be done* in the face of these facts. These other types of claims are called 'normative' claims. They provide guidance for our behaviour and often are rooted in values rather than facts. If the rate of unemployment is high, and getting higher (a positive claim), a Keynesian economist might suggest that the government needs to intervene in the economy to stop this, while a neoclassicist economist might suggest that nothing needs to be done by the government, that the problems facing the economy will eventually right themselves (both normative claims). The human geographers might agree that affluent people are moving back into poorer neighbourhoods in a city, which is pushing up the rents in those neighbourhoods. Some might see this as a problem in that the people living in those neighbourhoods are no longer able to afford the rising rents, but others might see this as a process of 'urban renewal'.

We see, then, that the scope of the human sciences (in their attempt to both describe and predict human behaviour) drives experts in those fields to move beyond the facts and provide explanations and interpretations of the facts in a way that often leads to quite different positions. These normative claims are not likely to be decided upon through appeal to the facts, since they are *interpretations* of those facts and are grounded in values and judgment that often come from outside the field (like the political beliefs affecting the choice of economic theory). Any attempt to develop a *policy* out of a series of facts requires an economist to develop a claim about what is right or what *should* be done in some situation. On one hand, this shows that ethical beliefs (beliefs about what actions are 'good' or 'right') are deeply part of economics, but on the other hand, it should make you wonder about just where those ethical beliefs come from and how they can be justified.

Sometimes the normative statements are treated as if they are simple facts. Consider the dilemma when a low-income neighbourhood encounters an influx of wealthier landowners or renters. With them comes more money, which then results in a more affluent area, more shops, restaurants and perhaps city infrastructure. Some would argue that this is obviously a good thing; it is a fact that rising rents and property values are a good thing, at least from the perspective of the landlords and homeowners. However, if the incomes of the people who have lived in that neighbourhood don't rise along with the property values, then they might be forced to leave because the rents and the prices of the goods for sale in that neighbourhood might rise. This might result in a loss of culture and more difficulties making ends meet for those forced to move. So, while 'property prices are low' is a positive claim, 'urban renewal is an important part of a successful city' is not entirely obvious. After all, who defines what a 'successful city' looks like?

ACTIVITY

After you have completed this activity you can check your answers by using the QR code. Decide whether the following statements are positive or normative. If you think the statement is positive, indicate what sort of evidence you think you would use to justify that position. If you think the statement is normative, indicate on what values someone who believes it would base it.

- Appraising staff takes around 60 hours a year.
- This is an important task for middle managers.
- Men are generally more aggressive than women.
- Aggression is a good trait in business.
- Crime costs insurance companies $12 billion a year.
- We should always lock up criminals after one offence.
- Increasing the money supply leads to short-term unemployment.
- Medium levels of unemployment are a price worth paying for a growing economy.

Methods and tools

Observation

Earlier, we discussed the challenges faced by the human scientist in applying the steps of the scientific method. If the object of investigation is human cognition and its relation to behaviour, then, the scientists must come up with ways of *observing* this cognition. This is a challenge when thoughts, beliefs, attitudes or motives are known directly only to the person having the beliefs. In addition, psychologists regularly point out that we often are mistaken in just what we think our own beliefs actually are.

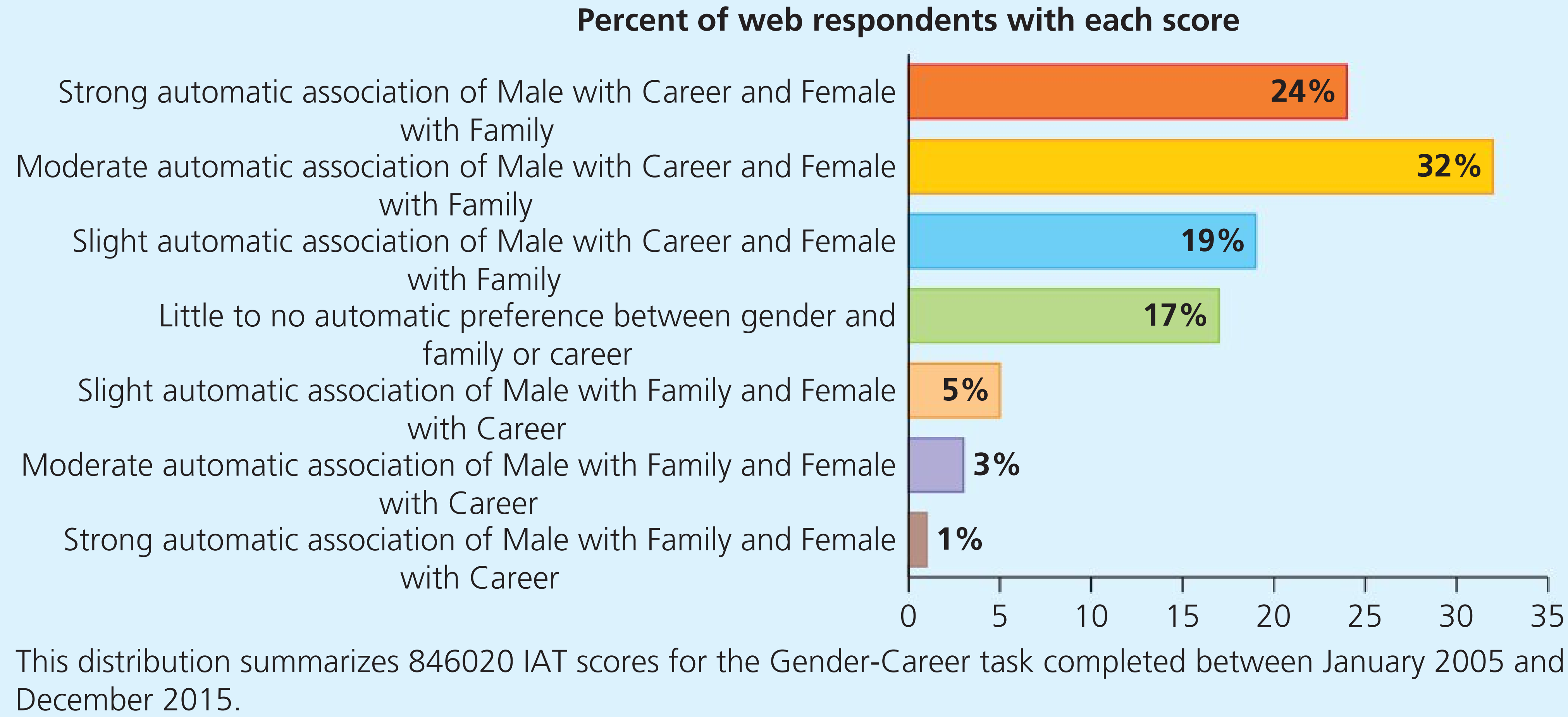
In this section we will largely be focusing on psychology as an example of human sciences, because it has a large number of what we would consider scientific experiments which attempt to make human thoughts, values and beliefs observable. For example, we know that we are sometimes biased in our dealings with other people, often unconsciously, but the fact that they are unconscious makes it difficult for us to identify our biases and deal with them.

KNOWLEDGE QUESTIONS

Is it possible to eliminate the effect of the observer in the pursuit of knowledge in the human sciences?

How might the beliefs and interests of human scientists influence their conclusions?

CASE STUDY



■ Aggregate results of the Project Implicit online test

Project Implicit

In an attempt to measure what psychologists call 'implicit social cognition', that is 'thoughts and feelings outside of conscious awareness and control', three social scientists formed Project Implicit. It was designed to identify an individual's non-conscious attitudes and biases towards a number of different characteristics, which has grown to include race, religion, favourite US presidents, weapons and body weight.

One test explores the extent to which concepts like male and female are associated with other concepts like career and family. Since the focus of the test is to uncover non-conscious beliefs, simply asking 'are you more likely to associate "male" with "career"?' will, of course, not work. One reason for this is social expectation: when asked sensitive questions about bias or prejudice we might not want to give genuine answers, instead opting for what social pressure suggests we *should* say. In this case, presumably, we would want not to be seen to consider 'male' and 'career' to be associated as this is a gender stereotype which modern society is keen to overturn. Knowing this, Project Implicit instead asks participants to play a word categorization game, where we are asked to classify terms under headings like 'Family' and 'Career'. The terms are men's and women's names (like Ben, Julia, John, Rebecca) and terms related to the workplace (like 'employment', 'work' and 'salary'). Participants are asked to classify them to either Male/Female or Family/Work *as quickly as possible*. The time it takes to classify each term becomes the observable data and the assumption is that people will find it easier and quicker to categorize terms in line with their non-conscious biases. The time it takes to categorize the pairings is measured and the quicker times are indicative of your biases.

Interpreting the reliability of this test is problematic. Taking this test at different times, in different conditions, tends to yield different results. This suggests that the phenomenon being studied might not be as observable as assumed. In fact, the test designers are aware of this and suggest that the data provided in the test is valuable 'in the aggregate'; that is, using the results attained by a large sample of many people might tell us about a population, but might have little relevance if applied to individuals (Lopez). They also suggest that the data should be used carefully in making decisions based on it in reality (Project Implicit 'Understanding and interpreting IAT results'). Just because you take it once, that doesn't mean that the results from that one test describe you well. You would have to take the test many times, in different situations (in different physical contexts and at different times), in order to identify a general trend about yourself.

This is one example of how human scientists have discovered clever ways of 'making observable' what is going on in the minds of participants, even though those beliefs themselves are unobservable, sometimes even to the participants themselves. We've seen in this case, however, that the results of these experiments might not be reliable, or they are only reliable in certain situations and conditions.

ACTIVITY

Use the QR code to find out more about Project Implicit and take the test.

1 What do you think the *point* of a test like this is?
2 Are there *values* written into this test?
3 How might the results of a test like this impact our future behaviour?

KNOWLEDGE QUESTION

How does new knowledge in other AOKs affect individual ethical values?

DEEPER THINKING

The Hawthorne Effect

This discussion of Project Implicit raises a challenge to the usefulness of some forms of data gathering in the human sciences, called the Hawthorne Effect (or the Observer Effect). The general idea is that people behave differently when they know they are being observed (or tested). In the 1920s and 1930s, a series of experiments took place in a factory in Hawthorne (a city in the US) to see whether or not lighting levels would have an effect on the productivity of workers in the factory. Researchers found, however, that continually decreasing the light actually correlated with an increase in production. Could it be that the darker it was the more effective the factory workers were? This seemed implausible. The final conclusion was that the workers were not responding to the light at all, but rather were responding to the fact that *they were being observed* and so worked harder, wanting to 'do well' (Kenton 2019a). You might have experienced this if your school has ever been inspected by some outside body or your class has been inspected by the principal or head teacher. You might have noticed that the lessons offered while the teacher is being observed are significantly different than the day-to-day lessons and the students tend to behave better!

This highlights another important challenge to the human sciences, namely the humans involved can influence the data if they know they are being tested. If they *want* to promote a certain conclusion, they might behave quite differently. In the implicit bias test above, participants might not *want* to appear biased, so they will try their best to avoid giving the impression that they are. This will have an effect on the final data, even though the designers of the experiment have tried to avoid such an influence. One way to overcome this problem is by instructing that the test be taken a number of times to provide an aggregate. However, this suggests that data collected after a single experiment is not valuable. Another way to avoid the observer effect would be to conduct the experiment in such a way that the subjects being tested don't know that they are the subject of an investigation, but this raises serious ethical issues about whether or not the participants have consented to take part. One famous example of this is the Milgram experiment, which we will discuss later in this section.

Replicability

An important way of testing claims in the sciences is replicability (meaning to replicate or copy). The idea is that if what some scientist claims is 'true', then another scientist can run the same experiment and come up with similar findings. Successfully replicating results means that there were no hidden influences or biases or manipulation of the results. If a different scientist with perhaps a different background and perspective arrives at the same results, then the results are said to be reliable. However, being able to replicate studies in the human sciences can be a

Is it possible to replicate precisely a study in the human sciences?

KNOWLEDGE QUESTION

What is the relationship between 'replicability' and 'reliability' in the scientific method? What are the differences between how the human and natural sciences apply that method?

challenge, given some of the reasons we discussed in the opening sections of this chapter: human beings are unique – each brings with them their own set of background experiences, beliefs, goals and ideas. What might be true of one set of individuals is not necessarily an indication of what is true of some other set of individuals in a different context.

This is why in 2013, researchers at the University of Virginia, led by psychologist Brian Nosek, established the Center for Open Science, whose aims state that 'the challenges of disease, poverty, education, social justice, and the environment are too urgent to waste time on studies lacking rigor, outcomes that are never shared, and results that are not reproducible' ('Show Your Work'). The emphasis on *reproducibility* shows the importance of this for rigour in the sciences. Unfortunately, the Center found that of 100 replication attempts of a wide range of psychological studies only 39 of them were able to reproduce results similar to those of the original studies (Baker). Since 2013, the Center has worked to raise the profile of reproducibility as a crucial step in the processes by which the sciences make their claims more reliable. They produced a pamphlet highlighting reasons why reproducibility is necessary to avoid a 'crisis' in the sciences (Figueiredo and Janz). In this case the focus is on research in the political sciences.

ACTIVITY

Use the QR code to research the seven reasons why replicability is important for robust scientific knowledge.

1. For each reason, explain why replication in that instance will help make the research stronger.
2. What do you think are the reasons why replication is such an important feature of the construction of knowledge in the human sciences?

Quantitative versus qualitative data

One of the great strengths of the scientific method is its insistence on quantifiable data. 'Quantifiable' means measurable by some objective standard, a standard that doesn't depend on an individual's tastes or opinions. Any scientist using the same measurement techniques and scales should agree on the observed phenomenon they are studying. This means that the data is 'reliable'; in the strict scientific sense, a 'reliable' conclusion or measurement is one that other scientists would also arrive at. To see this, just think of the measurements you make in your own science classes.

The effects of a painkiller on a patient's *body* can, in principle, be observed and described by any expert observer of the human body and presumably these physical and chemical effects could be agreed upon. However, the extent to which a patient's headache (the 'pain' element) has reduced is only 'observable' by that patient. So, the claim that the medication has 'worked' in the sense that the pain is gone, is something *unobservable* to scientists.

In the human sciences, the investigations often require researchers to seek data that is subjective to the individual (like pain) and this sort of data is a challenge to measure with any reliability. The effectiveness of a school initiative on student well-being could measure some quantifiable data by measuring things like the numbers of students visiting the school psychologist, the number of days missed or the number of students on the 'vulnerable' lists. At some point, however, the data will have to include information gathered from the students themselves about *how they feel*. This sort of data, which relies on an individual's introspection or self-reporting internal states is called 'qualitative'.

As an example, the World Health Organization studies the well-being of young people all over the world and relies heavily on qualitative data in doing so. Rather than letting students make

KNOWLEDGE QUESTIONS

In what ways do the human and natural sciences manage the challenges posed by qualitative data?

Do other AOKs use quantitative data as much as the human sciences? How might the historical method, for instance, manage or use quantitative data?

up their own responses, a series of possible answers are offered. Use the QR code to see the full results and analysis of one such study.

Some of the questions they asked are shown in Table 10.3, together with the types of responses the participants could choose from (Currie, *et al*).

Table 10.3 World Health Organization questions to determine health and well-being among young people

Types of questions	Responses offered
How often they experienced a number of unpleasant symptoms in the last six months (eg, headache, stomachache, feeling low, irritable or bad tempered, feeling nervous, difficulties in getting to sleep, feeling dizzy)	A range from 'about every day' to 'rarely or never'
How they would rate their 'life satisfaction'	A 'Cantril Scale', where the top of the scale represents the best possible (for the individual) and the bottom represents the worst possible (for the individual)
How they would describe the state of their health	A scale offering 'excellent', 'good', 'fair' and 'poor' as answers
Whether they find 'most of the students in my class(es) are kind and helpful'	A range of options ranging from 'strongly agree' to 'strongly disagree'
How pressured they feel by the schoolwork they have to do	Response options ranging from 'a lot' to 'not at all'
How they *perceive* their teachers' beliefs about their school performance compared to their classmates	Response options ranged from 'very good' to 'below average'
How many close friends of the same gender they have	Response options ranging from 'none' to 'three or more'
How easy they found it to talk to their parents, 'about things that really bother you'	Response options ranging from 'very easy' to 'very difficult'
How often they had taken part in the bullying of another student at school recently	Response options ranging from 'I have not bullied another student at school in the past couple of months' to 'several times a week'

ACTIVITY

1 Consider the questions and types of responses shown in Table 10.3. Identify elements that you think would refer to observable facts or facts which could be measured objectively (quantitative) and elements which are known only to the participant (qualitative).
2 Make a list of the evidence a participant would need to use to justify their response. Is that evidence valid?
3 To what extent do you think that these questions will lead to genuine data?
4 Do you think the types of questions and the available responses might limit the objectivity of the data?
5 Might there be contextual elements that would influence the responses? What if a young person took the test after a fight with their parents? Or at a time when they were feeling particularly lonely?
6 Do you think those questions would capture genuine *facts* about the individual?

The questions above all rely on 'self-reporting', meaning that the students were asked questions that required them to disclose information about themselves and there are some very *subjective* elements to them. Consider the question about what *they* think their teachers think about them. This question is ripe for subjectivity. What if the question was being answered after a particularly bad day at school when the student received a poor grade from a teacher? The student is very

KNOWLEDGE QUESTION

Do other AOKs suffer the challenges posed by non-neutral questions to the same extent? What differences in the scope and methods and tools of the AOKs can you use to explain your answer?

likely in that case to think that the teacher doesn't think they are as good as other students, but this might simply not be true. Similarly, the question about talking to a parent about 'things that really bother you' would surely depend on just what the student is bothered by: some things they might talk to their mother about, but some other things they would not.

The last question in Table 10.3 also raises an interesting challenge for human scientists gathering qualitative data. That question asks about whether the student considers themselves to be a 'bully'. A bully is generally not something a student *wants* to be thought of as being, so asking whether someone is a bully might make them want to answer 'no', regardless of whether they are or not.

■ Are some important facts unmeasurable?

One thing to keep in mind when evaluating the value of qualitative data, especially data that has been collected through self-reporting, is what the goal of the research is. In this case, the World Health Organization (WHO) is interested in the well-being of young people, so whether or not it is true, if a student *believes* that their teacher really doesn't think they are very smart, it will very likely have a negative effect on their well-being. In other words, the *facts* being captured by these questions are sometimes not really what they appear to be about. In Theory of Knowledge we consider the 'scope' of areas of knowledge, meaning we investigate what types of facts are being investigated or what problems are being solved by the AOK. In this case it's worth keeping in mind the 'scope' of the investigation, which is about how students feel about themselves rather than whether those feelings reflect the truth.

KNOWLEDGE QUESTION

Does non-neutral language affect knowledge constructed in other AOKs as much as it might in the human sciences?

■ Questionnaires

Using questionnaires, like the one by the WHO, raises another methodological problem in the human sciences: how to ask the right sorts of questions. Imagine you were asked, 'How old are you?' This question is straight forward, it is asking a question about a quantifiable fact about you. You can appeal to objective facts (the date of your birth) to answer it. Now imagine a question at the opposite end of the spectrum, 'Have you stopped kicking your dog?' Suppose that you are not a dog-kicker. The question, then, is worded in a way that makes it impossible to answer, due to the *assumption* that you have been a dog-kicker in the past. If you answer yes, then you're admitting to the charge, if you answer no, then it seems you're still doing it. In other words, the question is not 'neutral' because there are hidden assumptions guiding your response.

Learner profile

Communicators

How does the way we ask questions affect the responses we get?

This is an extreme example, but consider the following: 'In what ways have you been discriminated against because of your race?' This question is clearly assuming that you *have* been discriminated against, and, if you cannot think of a time when you've been discriminated against, it makes it difficult to answer. Consider, 'How important is the support of your parents in your academic studies?' This seems neutral because you might say 'not at all', but the *assumption* is that parental support *is* the sort of thing that *should* be an important part of your academic studies.

In a real-life example, a recent survey in New Zealand gathered data about people's attitudes towards a law which prohibits smacking or spanking their children. Voters were asked, 'Should a smack as part of good parental correction be a criminal offense in New Zealand' and received a 'no' response in an overwhelming majority of responses (87.6 per cent responded with 'no'). There

■ Is it possible to create a genuinely useful questionnaire?

were criticisms of this vote however, given that the survey was conducted by a group explicitly aimed at overturning the law, suggesting that the motives behind the survey were negatively influencing the collection of the data. The complaint focused on the wording of the question; the suggestion was that elements of the question would have unfairly swayed the respondents towards a 'no' response.

ACTIVITY

Consider the following questions and explain whether you think elements of each might be worded in a non-neutral or leading way. For those that you think are leading the respondent, can you formulate a more neutral question that still genuinely captures the same sort of data? Don't get caught up in a discussion around what the answer should be, rather you are investigating whether the question's wording *leads* you towards a particular answer or shapes how you think about the issues.

1. Are you enjoying school?
2. Do you have any problems with any of your teachers?
3. To what extent has India's exposure to the global market weakened its long-term protection against recession?
4. How would you respond to the accusation that your implicit bias means you are a racist?
5. Don't you think that the school is doing all it can to help you learn?
6. What sorts of long-term damage do you think that psychological experiment inflicted on the participant?
7. What do you think of your country's attempts to provide shelter for the homeless and equal access to financial goods?
8. Most respondents agree that sustainability should be a priority for the school. Do you?
9. How much do you support your school's policies on inclusion?

ACTIVITY

Use the QR codes to carry out some research on how to avoid leading questions and how you can promote neutral questions. You might find that you think that some of the advice given is still leading or non-neutral, but that's fine – it just means that you're applying your knowledge!

ACTIVITY

Construct a survey for an end-of-year TOK feedback survey

At the end of many courses in school, teachers ask the students to fill in a survey about their learning experiences in a particular class. This is valuable qualitative data which could help your teacher and your school develop a better TOK Programme.

1. Undertake some research about the learning experiences of those on the TOK Programme. Construct a feedback survey, using the knowledge you've developed from your research, and give it to the TOK students leaving the programme.
2. Write an evaluation of your questionnaire and the data collected. Did you collect the right data (and how did you decide which data to collect)? Was the data something you think your teacher might be able to act on? In what ways did the responses you decided upon influence the neutrality of the questionnaire?

Experiments

One of the strengths of psychology is its use of experiments to test its hypotheses. Find a psychology textbook and look at the references and you'll find literally hundreds of studies referenced. Some of them have to be extremely clever to uncover beliefs and attitudes the participant doesn't know they have; some are more obvious. The Stroop Effect was named after John Ridley Stroop, who asked participants to name the colour of a coloured word on a page. It turns out that it is a real challenge to do this quickly and accurately due to something called 'cognitive interference'. The point being made is quite interesting from a TOK perspective, but the experiment amounts to just having a participant saying the colours in which words are printed as fast and accurately as they can.

PURPLE YELLOW RED
BLACK RED GREEN
RED YELLOW ORANGE
BLUE PURPLE BLACK
RED GREEN ORANGE

■ How quickly can you say the colours of each of these words?

You can take an online version of the test by using the QR code on the right.

One very famous experiment in the history of psychology is the Milgram experiment from the 1960s. This experiment is very popular to discuss in TOK, but very often is not fully developed or analysed from a TOK perspective. A thorough discussion is offered here.

CASE STUDY

The Milgram experiment

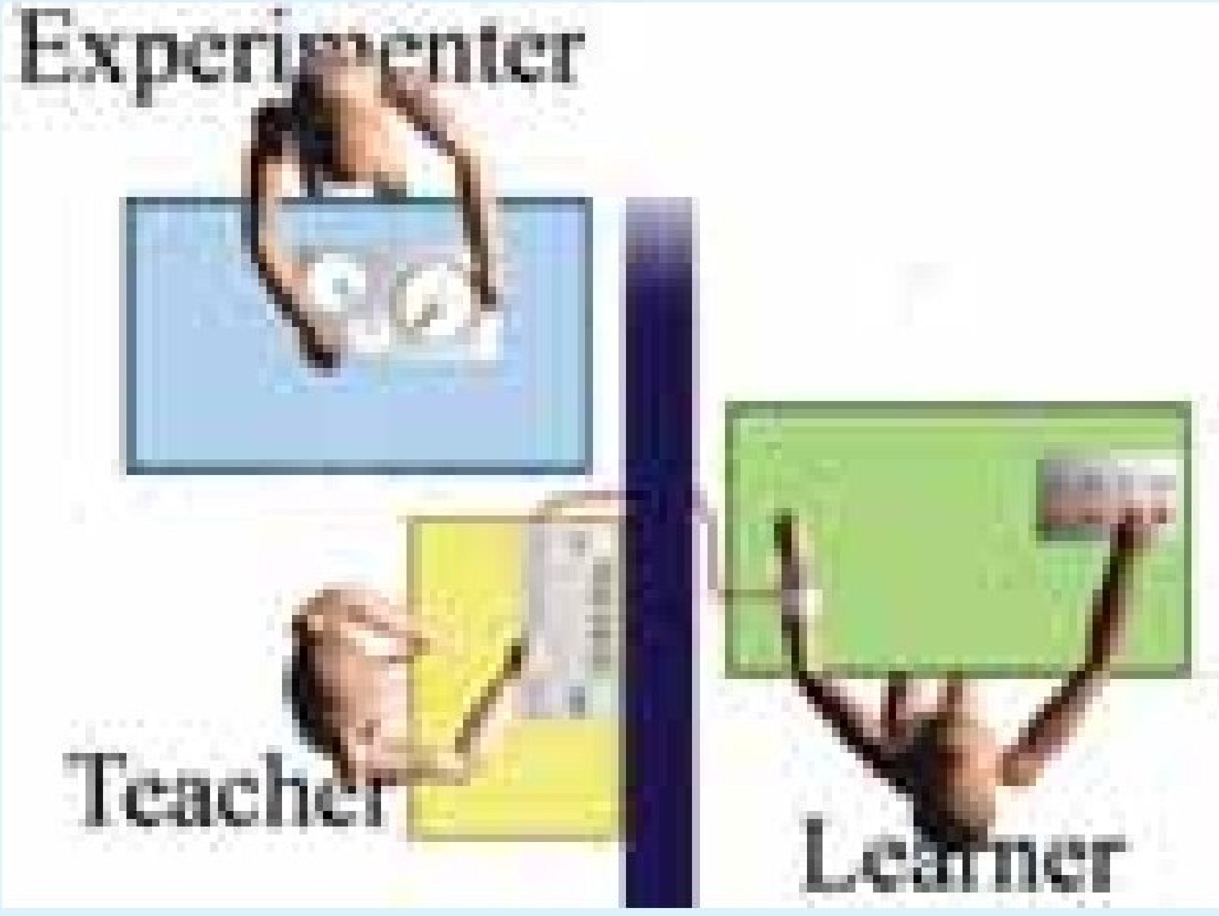
In January 1942, a Nazi officer by the name of Adolf Eichmann was charged with the task of sorting out the logistics of the mass deportation of Jews living in Europe to extermination camps in eastern Europe. After the war, Eichmann evaded capture, but in 1960 he was finally found in Argentina by the Israeli secret service. He was brought back to Israel for trial, was found guilty of war crimes and sentenced to death. He was executed in 1962. Throughout the trial, Eichmann insisted that he was not responsible for the intention to murder Jews, nor was he part of any decision-making hierarchy of the Nazi leadership; he insisted he was merely following orders. However, he also admitted to never letting his emotions, including sympathy for the individuals who were on the trains he had organized, interfere with his work. He insisted he was a product of his times and that only those responsible for the decisions should be responsible for the crime (Kershner).

Should we accept such an excuse? Is it really plausible that individuals, in the full knowledge of the pain and suffering they cause, can shrug off responsibility for horrific actions against others, simply because they were 'following orders'? Or, was this plea simply an excuse? Surely someone who otherwise harboured no animosity to an individual could never be persuaded to harm or kill that person simply because they were ordered to do so by someone in authority. From a TOK perspective, we might use the experiments and their results to explore

■ Adolf Eichmann on trial

our beliefs about *authority* and how authority works from a knowledge perspective.

To test Eichmann's excuse and to see whether normal people could be ordered to do horrible things to others, Stanley Milgram, a psychology professor at Yale University in the US, devised an ingenious experiment in 1963, which has become one of the most famous psychological experiments of all time. Milgram recruited individuals, telling them that they were needed to act as teachers for a study on learning. They were to be 'teachers' and would be working with a 'learner' who was in a separate room to the teacher. The learner would be attached to an electrode and the teacher would ask questions over a headset;



The Teacher thinks he is administering electrical shocks to the Learner in an adjacent room. The Experimenter encourages the Teacher to continue if the Teacher is reluctant

if the learner got the questions wrong, the teacher would administer an electric shock. The teacher was told that they would be helping develop data on how punishment influences the ability to learn. The teacher was then sat before a machine by which he could raise the voltage of the shock with each wrong answer. The voltage was small at the beginning and would only produce a mild shock. However, the teacher's machine allowed the teacher to raise the voltage progressively higher and higher until they would be administering lethal shocks for incorrect responses, electric shocks that would kill a human being.

As it turned out, there was no learner. The *teacher* was the test subject and the scientist issuing the orders was an actor. As the teacher pushed the button, thinking that he was administering shocks, a recorded voice from the other room would scream in pain and terror and beg the teacher to stop the experiment. When the voltage reached a high enough level, the shouting stopped altogether, as if the learner had died or passed out. When the teacher would query whether giving these painful shocks was the right thing to do, the 'experimenter' (usually dressed in a white lab coat to look like a scientist) would merely say things like 'the experiment requires that we continue'.

In 65 per cent of the cases in the main experiment, the 'teachers' continued to raise the voltage with each wrong answer, administering what they knew to be lethal electrical shocks. All participants carried on to 300 volts, which is astonishing, given that electrical plugs in the US have 110 volts, with the rest of the world at about 220 volts. Milgram concluded, that 'the extreme willingness of adults to go to almost any lengths on the command of an authority constitutes the chief finding of the study and the fact most urgently demanding explanation' (Milgram).

Use the QR codes to find out more about the Milgram experiment. The first is a video with Milgram explaining the experiment in his own words, with footage from the original experiment. The second video is a recreation of the Milgram experiment by British mentalist and illusionist Derren Brown. The third QR code links to an episode of the podcast *Radiolab*, in which the conclusions of the Milgram experiment are shown to be less clear than we might think.

Milgram says that the main finding, that adults are willing to follow the command of an authority almost 'to any lengths', demands explanation. The conclusion that we are likely to follow orders even to the detriment of others is a psychological claim, that is, it is a claim about human psychology. So, what can we make of it from a Theory of Knowledge perspective?

We might consider the results from the perspective of *what other knowledge* or background beliefs the participants were holding which might explain their behaviour beyond the straightforward claim that 'people obey authority'.

As it turns out, the results of the Milgram experiment are far less clear than we might expect. The rate at which the participants would administer high-voltage shocks were highest in those conditions which are the most famous: where the participant sits at a bank of switches, overseen by a 'scientist' in a white coat, and where the 'learner' is being shocked in another room, all on the campus of a hugely prestigious university.

One requirement for following orders to the extent that the participants did would be that the participants must *already* accept or believe in, the legitimacy of that authority. Milgram required that his researchers (the 'scientist' in the room) be costumed in the traditional white coat. This produced in the minds of the participants an awareness of *both* the expertise of the 'scientist' (an authority: a source of scientific knowledge) *and* an awareness of his being in authority. In the initial experiments, Yale students and people from the surrounding city were brought into the university to perform the experiments. This environment would have also reminded the participants that something important was going on. Finally, that it was a scientific experiment, would have suggested that the work itself was important; they were in the search of 'scientific knowledge'. Together, these factors produce an environment which activated a number of pre-existing beliefs in the minds of the participants having to do with the legitimacy of the 'scientist', the prestige of the institution they were in and the general importance of the work. It is not at all clear that it was simply a tendency towards obedience that motivated the people to administer fatal shocks; it was also due to a set of beliefs about what sorts of things we *should* be obedient towards.

Milgram changed the conditions in a variety of ways and the results varied dramatically. When the experiment was held outside prestigious Yale University, the rate of obedience fell to 50 per cent. When the 'learner' and participants were in the same room (so the participant saw the actor getting a shock), the results dropped to 40 per cent. If the 'scientist' is on the phone or didn't show genuine interest in whether the participants obeyed or not, or if the scientist was thought to be a non-scientist, the rate dropped to 20 per cent. If there were *two* scientists who disagreed about whether the participant obeyed, the rate dropped to zero ('The Bad Show', Radiolab 2012 and Mcleod 2014).

ACTIVITY

1 During one day at school, make a list of all the elements of the environment of your school that remind the students that what happens here is important, and for which your general 'obedience' is required.
2 What pre-existing beliefs (knowledge) do you have that leads you towards generally doing what the school and your teachers ask of you?
3 Where do you think you would draw the line if your obedience required you to act in a way that conflicts with what you think is 'right' behaviour?

KNOWLEDGE QUESTION

Do other AOKs have more or fewer ethical constrains on the construction of knowledge than the human sciences? What do you think explains your answer?

CONCEPT CONNECTION

Power

Another interesting TOK-related element of this experiment are the prompts of the 'scientist' during the experiment. Their language had drastic effects on the behaviour of the participants.

There were four scripted responses to be used by the 'scientist,' when the participant showed reluctance to continue:

- 'Please continue.'
- 'The experiment requires that you continue.'
- 'It's absolutely essential that you continue.'
- 'You have no other choice but to continue.' (Mcleod 2017)

You can see that the language of the second and third prompts remind the participants of the necessity of the experiment. However, when the 'scientist' used the final prompt, reminding the participant of the role of *choice* in their actions, *none* of the participants continued with the experiment. Every one of them refused, once reminded of choice. It seems that the basic belief that we have a choice of how we should behave is strong, even in the face of authority. Once reminded of that choice, participants made their choice and stopped the experiment.

The fact that Milgram was careful enough in his design of the experiment to think about how language *might* influence the results shows just how important getting the language of interaction in psychological experiments right really is.

Another well-known experiment which underscores the significant effect language has on eyewitness testimony is provided by Loftus and Palmer in their 1974 experiment. They asked participants to watch a video of a car crash, then asked participants to estimate the speed at which the cars were travelling when they collided. However, when asked about the collision, different words were used to describe the impact.

The variant questions were 'about how fast were the cars going when they smashed/collided/bumped/hit/contacted each other?' It turns out that the choice of word in the question influenced the speed estimated, with the average estimate of 'smashed' being 10 miles per hour faster than 'contacted'. Additionally, although the videos of the collisions showed *no* broken glass, participants who had been asked about the cars 'smashing' into one another were more likely to report that they had seen broken glass in the video (Mcleod 2014).

This again raises a challenging question for human scientist researchers, one we have considered above: just what language should be used when trying to collect data from individuals? Is it possible to use language in a 'neutral' fashion, one which doesn't impact the responses provided by the participants? Consider the activity where you created the feedback survey for students at the end of the TOK course. Would the choices you made regarding the language in those questions have shaped the responses? If so, would the data be reliable?

■ How do the words we use in questions influence the answers we receive?

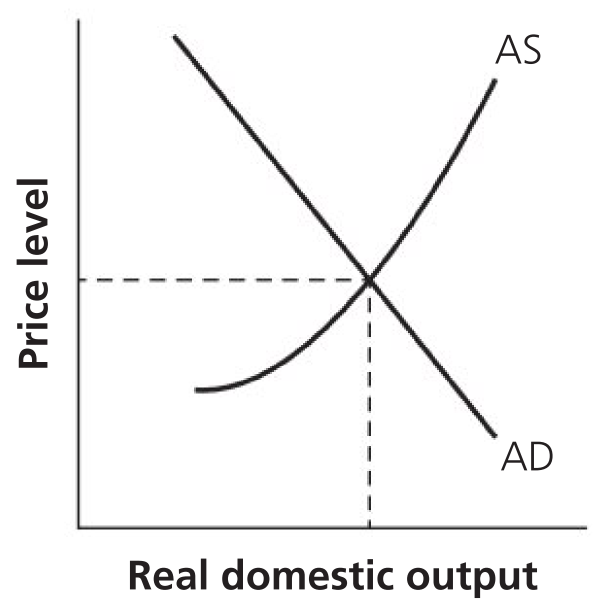
It seems, then, that the complex relationship between a person's beliefs about authority and the contextual elements of the experiment are hugely important when it comes to whether people will follow another's order. Later psychologists suggest that people follow authority when they believe in and accept the importance of the knowledge being produced. One commentator on the study says, 'People will only obey orders to harm others when they identify with those orders and believe the good outweighs the harm. In Milgram's experiments, participants obeyed when they believed the good of the scientific cause outweighs the harm being done' (Oxford Psychology Team). The participants who administered high-voltage shocks, in other words, were engaged in an activity which they felt was right; they felt they were doing the *right* thing for the construction of important data. The participants' own acceptance of the value of the experiment was crucially important.

It seems, then, that Milgram's claim that his study shows the 'extreme willingness of adults to go to almost any lengths on the command of an authority' is highly oversimplified, especially given the lessons learned from his own variant experiments.

Models

Any discussion about how to describe the complexity of human behaviour leads naturally to an investigation of the role of models in the human sciences. Models are *analogies* that help us make sense of the complexity of the real world.

Economics makes heavy use of models. The AD–AS model is one such example. This is a model because it is a human construction which is meant to illustrate some phenomenon in the world. It is a graphical representation of an interpretation of real-world phenomenon: the aggregate (total) demand (AD) and the aggregate supply (AS).



■ The AS–AD model

The curves also function as *analogies* in that the curves are mathematical in nature (graphs are mathematical tools) and can be the source of discussions about what happens when you alter the values represented in the graph. The equation for the aggregate demand is:

$$AD = C + I + G + (X - M)$$

You don't need to understand any of the details to understand that by changing one variable in the equation (e.g. government spending ('G')) , the other variables will necessarily change as well. This is the internal logic of the model.

DEEPER THINKING

What is an analogy?

An analogy is a way of comparing two seemingly unlike situations. Like metaphors and similes, they can offer a new perspective to something by comparing it in surprising ways to unlike objects. Metaphors and similes are different, however, in that they offer static comparisons, meaning that they don't *necessarily* involve a logical progression. Therefore, in using a metaphor and saying that 'the old man was a buzzard', the emphasis remains on the old man, and the purpose of likening him to a buzzard is to bring out some characteristics of his personality. We don't have to think much about the buzzard to make the application.

Analogies are slightly different in that they generally contain an *internal logic*. When saying that situation A is *analogous* to situation B, we mean that there is a series of logical relationships *within* situation A that we want to use to uncover certain dynamics in situation B. There is an *argument* or a *description* or an *explanation* of situation A, that is then applied to situation B, but B might not be fully explained. We explored a famous analogy in the Perspectives section of Chapter 6, where we discussed the design argument for the existence of God (pages 193–5). The idea was that situation A (the complexity found in a pocket-watch requires the logical assumption of a designer, the watchmaker) is analogous to situation B (the complexity of the world indicates the existence of a designer, God). The point is that the argument really only occurs in situation A. We have to *understand* the logical progression in A and then we *apply* that understanding to B, but the *evidence* that the logic works only comes from situation A. The claim that the logic works in situation B is only an assumption. One way to think of this is that in the use of analogies, we really only learn more about situation A. The *assumption is* that it applies to B is only that, an assumption.

The logical relationships in the graph and the changes in the values represented by the graph are then assumed to be *analogous* or assumed to model the changes in the relevant events in the real world. However, the models are necessarily simplified and represent only particular elements of the complex world of economic phenomena. The graphs, curves and models are not *themselves* the economic phenomena; they merely represent or are assumed to represent a simplified version of the real world. Imagine the complexity of the equation that provided a variable for *every* component of the aggregate demand – it would have to include variables for every person and every economic choice that that person made, added to all the other people in that economy. It would be infinitely large and useless as a model.

KNOWLEDGE QUESTION

What models are used in other AOKs? What makes a good or bad model? In what ways do the models used impact the knowledge being conveyed?

ACTIVITY

Understanding and using the AD and AS curves (or any other mathematical model) requires an understanding of the mathematical and logical relationships within the graph. However, the relationship between producers, consumers, buyers and sellers in the real world are not mathematical, they are social.

1. Knowing this, do you think that the analogy between the changes described in the AS and AD curves represent genuine phenomena in the real world?
2. Does the use of these models affect how one justifies, or explains, economic phenomena in the real world?

Assessment advice

The AS–AD model is an important model in economics and its effectiveness could be analysed in the context of a TOK essay, provided the question allows it. Many of the AOKs use models to explore the world and you might be able to build strong comparisons by evaluating how effective the different models are.

Assumptions

If you knew every relevant physical fact, could you accurately predict the weather? If you knew every physical fact, could you predict human behaviour?

As we've discussed above, the economy is an incredibly complex phenomenon with innumerable interconnected parts. How best to approach the study of it? We might consider the economy as being similar to something like a hurricane. Hurricanes are nothing more than a system of incredibly complex and interconnected natural phenomena. If we knew everything about each component of that system (wind velocity, fluid dynamics, ocean temperature and currents, etc.), then we could presumably predict the behaviour of hurricanes exactly, like we can predict the arrival of a solar eclipse in 10 000 years' time. It is just physics; run the numbers (if you know how!) and see what you get. The only problem is that the calculations are infinitely complex. Any unpredictability comes from our lack of a complete understanding and inability to deal with that number of variables.

The economy (and human behaviour in general), however, has as its subject the unpredictable creature that is a human being. We are not like the physical objects and forces involved in a hurricane, but rather complex creatures whose decisions and behaviour is often unpredictable (even at the micro-level).

In order for there to be any hope of developing a 'science' of the economy (where economists identify and articulate 'laws' which individuals within the economy follow), there must be a set of core assumptions which simplify the erratic behaviour of humans. In economics those assumptions take the varied and multi-dimensional human beings and turn them all into the same sort of thing: 'a rational decision maker' or a 'rational agent', someone who makes decisions based on reason and whose decisions can therefore be predicted.

The suggestion is that when faced with decisions, an individual will make decisions based on reason rather than emotion. If you cannot really afford a new phone, no matter how many of your friends have it, or how fantastic that phone is, you won't buy it. You would consider your disposable income, your current financial commitments, weigh up your need or demand for the phone against other goods and services that you need and make the best decision. What constitutes the 'best' decision is determined by the second main assumption in economic theory, namely, that people seek to maximize their profit. In this case, then, you would want to make sure that buying any other phone wouldn't leave you with more money and/or more

ACTIVITY

1 How do you think the inclusion of mathematical modelling in economics influences the *reliability* of the subject? Does it become more or less reliable?

2 While it might be a mathematical fact that shifting the values on the graph around will result in other values shifting, what relation does that fact have to events in the real world?

KNOWLEDGE QUESTION

What assumptions underline the methods used in the human sciences?

KNOWLEDGE QUESTION

Do other AOKs rely on assumptions in similar ways to the human sciences?

satisfaction. (Economists calls this 'opportunity cost'.) You would pass on the really bad phone and buy the expensive one, even though the bad one might have been the cheapest, because the bad phone would lower your overall satisfaction. But if there was a phone with *exactly* the same functionality but half the price, you would feel dissatisfied by buying the expensive version because you would know you paid too much. There are two key assumptions at work, therefore; first, that you will be making a rational decision, and second, that you will make it to maximize your profit-to-satisfaction ratio.

As we see time and time again, though, people don't really act like the rational machines they are assumed to be. We see people pouring coins into gambling machines because they think the next spin simply *must* be a winner since all the previous were losing spins. We buy things that we know are wildly overpriced because we cannot bear to wait until we can find the cheaper versions and we know that everyone else will have it too. We buy things we know we don't need, and at prices we know are too high for all sorts of reasons, few of them 'rational'.

KNOWLEDGE QUESTION

What assumptions about human beings are made by other AOKs?

Do other AOKs also have to assume that human beings act rationally if they hope to construct knowledge about the human world?

Do you buy the cheapest phone? Your favourite phone? The most popular phone?

ACTIVITY

Think of a big purchase you have made with your own money.

1. To what extent was that decision based on rational calculation of your need and the cost of the product? What emotional elements were involved in that decision?
2. Was the desire or the desire for the product the result of what *other people* were doing or buying? Was the desire the result of emotional advertising? To what extent was that desire for the product genuinely your own?
3. Now think about a purchase that someone else has paid for. Would you have been willing to pay for it yourself?
4. What do you think your answers suggest about this core assumption at the heart of economic theory – that we make rational decisions when it comes to spending our money or allocating our resources (or spending other people's money)?

CONCEPT CONNECTION

Interpretation

The sciences use a similar language when talking about what they produce. Concepts like 'law' and 'theory' are both used in the natural and human sciences, but their meanings are slightly different. In each case they refer to regular patterns that are observed in the world.

Laws in the natural sciences are descriptions of regular and repeatedly observed phenomena; they describe a regularity in the world. In physics, these laws are often depicted in mathematical terms. Laws are developed when repeated observations are obtained and described, for example, the law of gravity or a law of thermodynamics.

There are laws in the human sciences, too. In economics there are laws like the law of demand (the higher the price, fewer people will want it), the law of supply suggests that as the price of a good goes up, producers will tend to make more of it. Say's law (which Keynesians dispute) suggests that as production of a good increases, so too does the aggregate demand for it.

■ Do economic laws reflect reality in the same way as laws in the natural sciences do?

Evolutionary psychologists might suggest that there is a law which states that behavioural adaptations are the result of evolutionary pressures (kissing, for instance, has an evolutionary explanation). In the human sciences, however, the laws are less observations and descriptions of phenomena and more interpretations of events, or definitions. The law of demand, for instance, doesn't describe an event (it cannot, since it purports to describe a collection of events, happening at different moments in time), but it does create an interpretation to make sense of events. A law in economics provides a definition which then provides the conditions under which we can measure or observe, while laws in the natural sciences generally *start* with observations and the generalizations follow. The law about behavioural adaptations mentioned above in psychology is like a policy statement, which says '*this* is how we are going to understand this behaviour'; it *applies* a perspective, it doesn't derive it.

The meaning and use of 'theory' is also slightly different in the natural and human sciences. Theories provide natural scientists well-documented and evidenced explanations of phenomena; rather than saying that objects behave in regular ways, a theory will explain through appeal to a system of laws. In the case of the law of gravity, appeal to Einstein's theory of general relativity is what explains *why* objects are attracted towards each other in the way described by Newton's Law. Theories in the natural sciences are generally extremely well evidenced and have very little valid counter evidence. One cannot simply shift from theory to theory, because the prevailing theory (the 'normal science' stage in Kuhn's stages of paradigm shifts) is thought to be the 'true' one. This is why critics of scientific theories like evolutionary theory are completely misunderstanding the term when they say evolution is 'only a theory'. Gravity is 'only a theory' as is 'atomic theory'. As we saw in Chapter 9, the word 'theory' in the natural sciences is more synonymous with 'all reliable evidence and all other things we know about the world say that this is true', not 'this is just a guess'.

In the human sciences, however, 'theories' can be seen to be more like interpretations; a set of beliefs which define the terms and create the concepts that will be applied. For example, cognitive psychologists are loyal to a theory which says that you *should* treat human cognition a certain way and provides the concepts to do so. But they might understand that a behavioural psychologist might approach the same behaviour from a different perspective. Theories here are not necessarily mutually exclusive. This is the same point we made with regard to 'paradigms': in the human sciences, different experts might still hold different theories, and appeal to evidence won't provide definitive 'proof' one is better.

ACTIVITY

Compare and contrast the development of laws and theories in the human sciences and the natural sciences. You should research Kuhn's notion of 'paradigm shifts' to do this.

1. Create a list of reasons why paradigms will shift in the natural sciences and see if you can identify similar shifts in the human sciences.
2. What do the similarities and differences between the AOKs suggest about their scope? Are they trying to answer similar questions?
3. Are their methods similar enough for them both to be called 'science'? Does your answer depend on which discipline within the human sciences you're considering?

KNOWLEDGE QUESTION

If two competing paradigms give different explanations of a phenomenon, how can we decide which explanation to accept?

Another fundamental assumption at the heart of economics is the assumption of *ceteris paribus*, which is a Latin phrase meaning 'all other things being equal'. (You might recognize 'ceteris' as being similar to 'et cetera' which means 'and others'.) While the rational agent is part of the starting point of economics, *ceteris paribus* is an assumption which helps economists make and test predictions. What it means is that the economist can assume that all the other variables in a system remain the same, so they focus on only one variable at a time. It is the same move that a natural scientist will make in their lab when they only change *one* variable to see its effect.

However, this assumption has a downside:

> Like prices, many other factors that affect the economy or finance are continuously in flux. Independent studies or tests may allow for the use of the *ceteris paribus* principle. But in reality, with something like the stock market, one cannot ever assume 'all other things being equal'. There are too many factors affecting stock prices that can and do change constantly; you can't isolate just one. (Kenton 2019b)

The difference is that the market or the 'economy' is a wonderfully complex system with untold numbers of variables, any of which might be having an effect on the outcomes. When economists construct models to understand how certain variables relate to one another, they will pin down all of the *other* variables that they are not interested in so that those variables don't affect the results. This is very helpful for economists as it helps them explore cause-and-effect relationships (generally with a model). They can develop predictions related to one variable and see if their predictions come true. However, the models are *not* reality, so, in effect, those other variables are still exerting whatever influence they will naturally exert, meaning that the model's predictive power is hampered.

KNOWLEDGE QUESTION

What are the core assumptions in other AOKs? Does recognizing them challenge how reliable or convincing you find that AOK?

ACTIVITY

1. Given these pretty fundamental assumptions at the heart of economic theory, how reliable do you think it is as a 'human science'?
2. Mathematics has become a large part of the 'language' of economics. What role do you think that the inclusion of mathematical principles in the laws of economics plays in how reliable it is?
3. Does mathematics play a similar role in other AOKs?

Ethics

Ethical values about what is 'right' or 'good' or what *should* be explored heavily affect the human sciences. Given that the main subject of investigation of the disciplines within the human sciences are human beings, this should come as no surprise, but this does raise an interesting question about the knowledge in these subjects. There is a tension here between the science element attempting to describe a world of objects and explain things, but also the impact of social and ethical beliefs.

Learner profile

Caring

How do ethical considerations affect our study of other human beings?

Values in economics

Earlier, we discussed the difference between positive and normative statements, where normative statements have some suggestions of value or significance that is not in the objective features of the world. We might say that, 'all the buying and selling in an economy contributes to the **gross domestic product (GDP)**' is a positive statement: given the definition of GDP, the statement is true. However, saying 'a strong economy is one with a high GDP' is to make a *value judgment* – a judgment about what is good and what should be valued. This is a normative statement.

◆ **Gross domestic product (GDP)**: The total monetary or market value of all the finished goods and services produced within a country's borders in a specific time period (Chappelow).

We also discussed earlier one of the fundamental assumptions of economic theory, namely that economic agents (people who participate in the economy by making decisions about buying and selling products) should seek to optimize their profits or economic standing. This is a normative statement valuing economic growth, but why should this be the case? Why would the most rational economic agent be constantly seeking *more* money or profit? Growth need not be the only assumed good thing about an economy.

Since the nineteenth century, people have been producing more and more and this has been valued, but in doing so we have consumed much of the world's resources, polluted the environment, contributed to climate change and ignored the vast majority of people in the world for whom 'economic growth' is not a liveable option. This raises genuine ethical questions about the nature of this focus on growth: do we need to seek greater and greater profit? Perhaps there are other things to value or to aim for in our economy? One argument is that the *rational* thing for an economic agent to do at this point is to recognize the damage we do in the name of profit and growth and try to construct normative judgments, values and goals that seek to address or avoid some of the problems we've encountered in the traditional view.

ACTIVITY

If an economy isn't designed to maximize profit, what else *could* it be designed to achieve?

1. Use the QR codes to watch Dan O'Neill's TEDx talk and Kate Raworth's TED talk. They each present a different vision for what values economic theory should be designed to achieve. What are those visions? Do you think they are realistic?
2. What character traits and motives in human beings do you think might make adoption of these different visions a challenge? What new motives (other than 'maximizing profit') would need to take their place?
3. Do you think it is appropriate for a human science to make these sorts of value judgments?

Ethics in psychology

We might also recognize that ethical values are key to the construction of knowledge in psychology as well, primarily in the application of the method. For any IB Psychology student who has tried to design an experiment, the ethical implications of their research are paramount to that process. Two ethically dubious experiments are described on the following pages.

CASE STUDY

Little Albert

One particularly heart-wrenching example is the case of 'Albert B' or 'Little Albert'. In the 1920s, Dr John Watson of Johns Hopkins University wanted to test the theory that by exposing an infant to environmental pressures he could *create* psychological states like fear. He was confident that the environment was the main determiner in our behaviour and thought that he could show that he could condition human behaviour. He claimed:

> Give me a dozen healthy infants, well-formed, and my own specified world to bring them up in and I'll guarantee to take any one at random and train him to become any type of specialist I might select – doctor, lawyer, artist, merchant-chief and yes, even a beggar-man and thief, regardless of his talents, penchants, tendencies, abilities, vocations, and race of his ancestors. (Smith 2017)

Watson was building on the work of Pavlov, who showed that he could get dogs to salivate at the sound of a bell by ringing it a number of times while presenting food. He did this until the dogs would salivate at the sound of the bell even when no food was present. In Watson's case, he started with a baby (Little Albert) who had no particular fear of animals or white fuzzy things. He stood behind Albert with a hammer and bar and would strike the bar at the same time as presenting Albert with a white rat. Albert would be startled by the sound and burst into tears. Very quickly, he learned to associate white rats with loud frightening noises and soon would cry and try to get away from white rats even without the loud noise. So effective was this conditioning that Albert seem to be afraid of many animals and even soft fuzzy things that were not animals, like fur coats. Watson had confirmed his initial hypothesis.

Little Albert ended up fearing all sorts of white fuzzy things that weren't rats

However, the trauma on Little Albert seems a high price to pay in constructing this claim. Our ethical discomfort here is multiplied when we learn that there was no attempt to 'de-condition' Little Albert after. Presumably, this fear of soft fuzzy things lingered for some time. What happened to Little Albert after the experiments is not known for sure (Smith 2017). Use the QR code to read a description of classical conditioning and to watch a video of Little Albert.

This case underscores the close link between any human science that conducts experiments on *human beings* and ethical principles. We generally believe that we should treat human beings with a high level of respect and do our best to avoid harming them unnecessarily or unjustly, but what happened to Little Albert seems simply cruel. It may be argued that the knowledge constructed is useful, but we must remember that the cost of this knowledge, for Little Albert at least, was pretty high.

CASE STUDY

UCLA Schizophrenia study

Another case shows that even when the participants are not *directly* harmed, they nevertheless need protecting, especially in terms of how much they know about what is going to happen to them during the experiments. In a study which began in 1983, UCLA doctors wanted to find out how patients with schizophrenia would respond to having their treatment withdrawn: what would be the effects and how serious would they be?

Patients were informed that the point of the experiment would be to withdraw their medication and that their conditions might 'improve, worsen or remain unchanged', but they were not told about how severe any relapses might be, how soon a relapse might come or how long it would be until they would return to their medication. One patient suffered a particularly severe relapse and threatened to kill his parents, and another relapsed and ultimately committed suicide. Researchers defended the study, saying that they didn't drive patients into relapse (so not directly harming them), but others suggest that the fact that the basic aim of the study was to have patients regress and that the patients themselves were unaware of possible consequences means that the study was unethical (Hilts).

Without their medication, many of the patients' schizophrenia returned

In an effort to hold psychological researchers to a high ethical standard, the American Psychological Association has provided the 'Ethical Principles of Psychologists and Code of Conduct' which provides the guidelines and rules designed to protect participants and researchers from unethical research practices. Central to the code is the notion of *informed consent*, which means that participants need to be made aware of all aspects of the research which may affect their decision to take part, including any short-term harm or possible long-term consequences. Before consenting to take part, participants must understand:

- the purpose of the research, expected duration and procedures
- participants' rights to decline to participate and to withdraw from the research once it has started, as well as the anticipated consequences of doing so
- reasonably foreseeable factors that may influence their willingness to participate, such as potential risks, discomfort or adverse effects
- any prospective research benefits
- limits of confidentiality, such as data coding, disposal, sharing and archiving and when confidentiality must be broken
- incentives for participation
- who participants can contact with questions (Smith 2003).

KNOWLEDGE QUESTIONS

To what extent are the methods used in the human sciences limited by the ethical considerations involved in studying human beings?

Do other AOKs have similar ethical limitations on the construction of knowledge?

ACTIVITY

Research other questionable experiments involving humans, but which were genuine attempts to construct what could be useful knowledge about human beings. You might consider the following:

- The Tuskegee and Guatemalan Syphilis experiments
- The Neubauer triplets experiments
- The Monster stuttering experiment
- The use of prisoners as test subjects
- The case of Henrietta Lacks
- The Stateville Penitentiary Malaria Study.

These are common examples and many more can be found in an internet search. Try to develop a clear TOK-style analysis by exploring the value of scientific knowledge in relation to the ethical principles that you think are being violated. In some cases, you might analyse the role of the participants' beliefs and the circumstances surrounding their decisions to participate, or any justification that the research had for choosing that particular population of test subjects. Does it matter that a small number of people were harmed (sometimes being unaware of that harm), when the knowledge gained will benefit many others?

ACTIVITY

1 To what extent do you think there is a conflict between the search for genuine scientific knowledge about human behaviour and human psychology and the expectation that patients be treated according to some code of ethical behaviour?

2 What value do you think research might provide, even if the methods by which it was gained violate an ethical code?

TOK trap

Don't try to argue *whether* these examples are 'right' or 'wrong'. That is a philosophical debate. Your job as a TOK student is to identify and explore the ethical implications of those examples of knowledge construction, whatever the ethical judgments.

TOK trap

Notice that the horrific experiments conducted by the Nazis on their prisoners is not included in the list. This is because too many students automatically default to Nazis whenever these sorts of questions arise. They are good examples, but often students simply refer to these experiments to illustrate their point without analysing the dynamics involved. When you are seeking examples, try to find those that might not be used by many others. Some of the examples above are actually quite common, but you can nevertheless turn them into *good* examples by offering precise and clear analysis.

ACTIVITY

Finally, discuss and debate the following question with your classmates:

Do you think that knowledge in the human sciences is *hindered* by ethical constraints?

Conclusion

We've seen that there are a lot of similarities and differences between the human and natural sciences. The human sciences seem trapped between two worlds. On one hand, they try to join the world of objects: identifying and describing and explaining the patterns we see in the world around us. Human beings are, after all, objects in this world and it turns out that we often exhibit patterns of behaviour which can be explained. On the other hand, however, and especially at the individual level, we tend to be unpredictable. We have the conscious ability to make *choices* and sometimes we make them in ways that others might find unreasonable, irrational or unjustified. Some people think that human beings actually do *not* have a choice in how they think or behave. They think that our behaviour is *determined*, meaning that all our thoughts and choices are physical effects of the physical elements of our bodies and the world around us. This position is called *determinism* and means that if we can develop a full understanding of all physical facts in the world, then we would also have a full description and understanding of human behaviour. If this is the case, then there is a lot of hope for a full natural scientific description of everything about us, in terms of neuroscience and the biology, chemistry and physics beneath it.

On the other hand, many philosophers and people believe that we have free will, meaning that our experience of choice is a real feature of the world and that it cannot be reduced to other facts about brain cells or biology. If that is the case, then applying a deterministic, cause-and-effect paradigm on human behaviour will always fall short. At best, it will be able to describe how we *tend* to act at a large scale but could never apply that description to the individuals at the lowest scale.

The choice between free will and determinism is one that ultimately cannot be made by appealing to evidence because an individual can appeal to their own beliefs as explanation for their behaviour as evidence for free will, and we can appeal to their brain and the power of natural science for determinism. The human sciences are trapped, it seems, between two powerful perspectives, either there are no human sciences (it is all natural science), or the human sciences comprise a distinct and valuable addition to human knowledge systems.

Which do you think is true?

CONNECTIONS TO OTHER AOKs

- **Scope:** Human scientists put human beings at the centre of their investigations, but individual human beings are rarely as predictable as objects in the world, and human beings have all sorts of motives for their behaviour. Do you think other AOKs related to human beings (like history or the arts or the natural sciences) do a better or worse job in their exploration of human activity?
- **Perspectives:** The human sciences make use of a number of perspectives which are not necessarily mutually exclusive. What about the human sciences allow this when this might not be possible in the natural sciences in the same way? Does it make sense to say that there are better perspectives to take? How should human scientists make decisions about what perspective to follow?
- **Methods and tools:** Some human scientists apply the basic methods of the scientific method, but human beings don't necessarily behave in predictable ways. Does this mean that the human sciences cannot achieve the same level of reliability as other AOKs? If human beings want to learn about themselves, shouldn't the human sciences be the most important AOK?
- **Ethics:** Many ethical concerns in the human sciences arise from the fact that the experiments and their findings impact individual human beings and their lives. The knowledge gained through experiments, however, can genuinely help people. Do other AOKs have deep conflicts between the value of the knowledge and possibility that the knowledge might negatively impact people's lives?

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11 History

OBJECTIVES

After reading this chapter, students will be able to:

- understand the definition of historiography
- appreciate the differences between 'historical facts' and 'historical narratives'
- recognize the nature and value of individual 'perspectives' in history
- identify and evaluate the different stages of the historical method
- recognize and appreciate the role of selection in the construction of historical knowledge
- appreciate the specific nature of 'bias' and know when to apply it to historical narratives
- understand the role and appreciate the power of a shared understanding of common histories in various communities
- show awareness of the role of journalism and censorship in the wider context of history
- appreciate how a shared history can provide individuals and communities with meaning, direction and value
- appreciate and reflect on their own history curricula and how it might shape their perspective on the world.

Learner profile

Open-minded

How does the appreciation of different perspectives enrich our understanding of history?

Introduction

On 30 December, 1890, at a Native American encampment on the banks of a little river called Wounded Knee, in the southwest corner of South Dakota, USA, this happened:

> At that hour [8 a.m.] the cavalry and dismounted troops were massed about the Indian village … Colonel Forsythe ordered all the Indians to come forward and away from their tents. They came and sat in a half circle until counted … The order was then given to twenty Indians to go and get their arms. Upon returning it was seen that only two guns were had and detachments at once began to search the village, resulting in thirty-eight guns being found. As this task was about completed the Indians, surrounded by companies K and B, began to move. All of a sudden they threw their hands to the ground and began firing rapidly at the troops, now twenty feet away. The troops were at a disadvantage, fearing the shooting of their own comrades. Indian men, women and children then ran to the south battery, firing rapidly as they ran. Soon the mounted troops were after them shooting them down on every side. The engagement lasted fully an hour and a half. (Bismarck Weekly Tribune)

… or maybe it didn't. Perhaps this is what happened:

> Towards the end of 1890, no Native American Plains people were living free on their own lands; they had either been shepherded on to US Government-run reservations or were running and hiding in the wilderness, holding out against an inevitable fate. During that autumn a new movement of hope rose, called The Ghost Dance. Word spread among the Native Americans that a new dawn was coming, one that would see the return of the native way of life. The buffalo would return, and the white man would disappear, if only the Ghost Dance was taught throughout the land.
>
> One chief, called Big Foot (also known as Spotted Elk), once an advocate of the Ghost Dance, was no longer sure of its promises and decided to lead his band back towards the Pine Ridge Reservation in South Dakota to discuss

terms and see what peaceful conclusions might be had. General Miles, having been ordered from Washington with 5000 troops to quell the Ghost Dance movement, misread Big Foot's intentions and ordered the 7th Cavalry under Colonel John Forsyth to intercept him. Big Foot was nearly dead from pneumonia, too sick to even sit up, and was riding under the white flag to show his peaceful intentions. Forsyth intercepted the band and led them to a creek called Wounded Knee to camp for the night. The following morning, 30 December 1890, while the camp's children played in the nearby fields, the troops searched the village and confiscated weapons, including knives and axes from the women. One warrior, who was deaf, was reluctant to give up his rifle, which had cost him a lot of money to buy. At this same moment a medicine man began to dance the Ghost Dance, calling on the Ghosts of their ancestors to intercede. At the same moment that the dancer threw a handful of dirt into the air asking the Great Spirit to scatter the soldiers as he scattered the dirt, the scuffle between the deaf warrior and the soldiers escalated and the rifle went off. Immediately, the order was given to the rest of the soldiers to open fire on the unarmed camp, first at close range with pistols and rifles, then with cannon from the surrounding hills.

When the shooting stopped, over 250 men, women and children were dead, including the children who had been playing in the fields. Some of the camp's women had been pursued for over two miles before being killed. The bodies were buried in a mass grave, but not for three days, due to a blizzard which had moved in that afternoon, freezing the bodies to the ground where they had been shot. Wounded Knee was the last of the violent encounters between the US Government and the Native Americans; the Plains Wars had ended.

(Author's own narrative, influenced by 'Like Grass Before the Sickle')

A colour engraving depicting the events at Wounded Knee that featured in a contemporary US newspaper

Survivors of the Wounded Knee Massacre. The photograph is titled 'What's left of Big Foot's band'

The events of that wintry day in 1890 are gone and they cannot be repeated. Trying to understand what happened, then, poses something of a problem. In the natural sciences, if we want to know more about a natural phenomenon, we can often recreate it in experimental conditions and *observe* what happens. If we want to make sure that we have characterized our observations correctly, we can run the experiment again and observe it again.

The historian, however, does not have this privilege. The events that are being described, like the events at Wounded Knee in 1890, have disappeared into the past, never to be seen again. The places might exist, for a time the people might still exist (the last of the soldiers present died in 1964 (McNally)), but the event itself no longer exists. Those were one-off occurrences which have disappeared into time. How, then, are we able to say anything about what happened and how are we to be sure that what we say happened is an 'accurate' reflection of what *really* happened?

ACTIVITY

1. What did you do a week ago last Saturday? Where did you go? Who were you with? While your own memory might be a convincing method by which you can determine what you were doing, do you have any other evidence to which you could appeal to prove that you were, in fact, doing what you remember doing? You might compile a statement from a witness who saw you there. You might have receipts from what you bought on the day, perhaps an admission ticket or a public transport receipt.
2. Gather as much evidence as you can and present it to a partner who was not involved in what you were doing a week ago last Saturday. Ask your partner to write a one-page summary of what happened to you on that day, based only on the evidence you provide. Can your partner faithfully reconstruct your day? What is different from your memory of the day and your partner's reconstruction? Has your partner made any claims beyond a **chronology** of facts, like *why* you did what you did, or what the later consequences were?
3. What conclusions about the nature of history does this make you think about? Are there facts or events that your partner missed? Why do you think that is? Do you think an event-by-event chronology of the day is enough to capture what, from your perspective, was important or significant about the day?

ACTIVITY

These accounts and images all relate to the same event.

1. What are the differences?
2. What differences can you see in the details and facts provided?
3. Do you think some are more or less reliable than others?
4. What knowledge do you think the differences and similarities between these resources raise? Write these issues down and keep track of them as you read through the rest of the chapter.

KNOWLEDGE QUESTION

Is it possible to have knowledge of the past?

KNOWLEDGE QUESTION

Do other AOKs rely on the choices made by individuals as much as history? How does this affect the quality of the knowledge produced?

◆ **Chronology**: A list of events ordered by time.

How accurate would you say that your partner's account is? Given the evidence that you provided to your partner, was it complete? We mentioned that the events themselves were gone and that a historian cannot recreate the events (in a way that natural scientists can). Historians are left to build an understanding of the events through *evidence*. Eye-witness accounts, physical artefacts, other references and other accounts are what the historian must use to piece together the events of the day. The historian cannot recreate the event to gather *new* evidence but is instead limited to what evidence happens to exist. This is a significant difference between history and natural science that we'll explore shortly.

KNOWLEDGE QUESTION

Is it possible in other AOKs to describe the same phenomenon in such different ways?

However, a chronological account of events is not the only aspect of what a historian does.

Consider this: Would you agree that the account your partner gave of your day was even adequate or are there important elements missing, like why you did the things you did, or how you felt doing them, or what the results of what you did were? Perhaps instead of arbitrarily choosing some day in your own history, we had asked you to think about a day of significance to you, perhaps a family wedding or reunion, or a special visit to an important place. Would a moment-by-moment list of what happened be *enough* to capture that day?

■ How do we decide what constitutes an important event in our life? What about historically?

ACTIVITY

1. Think back through your life. What would you say is your *most important* day? Of all the days you have to choose from, try to think of one that you think has been the most important. We are not going to define 'important' for you, but to complete the task, you will need to make a decision about what criteria you will use for a day to be more or less important.
2. How did you choose what was going to be important? You must have had to consider that day in relation to later events; a day cannot really be important if there are no subsequent *consequences*. Did you have to take into consideration things which happened *before* that day as well?

One of the things which you probably came across in that activity was the idea of *cause and effect*. In other words, something about that day had huge effects on your future life and identifying and articulating the importance of that day (explaining why it was important) required you to link that day to later days, and possibly even earlier days.

KNOWLEDGE QUESTION

Do the terms 'cause' and 'effect' have different meanings in the sciences, history and mathematics?

By way of introduction to history as an area of knowledge, then, we have considered two very important elements of doing history:

- Firstly, the historian is interested in finding out *what happened*, that is identifying facts about the events that happened in the past – this might be captured by the idea of chronology mentioned above. Without these facts, historians would really be nothing other than fiction writers.
- Secondly, historians move beyond this list of events which we accept happened and move to a discussion of those facts *in relation to one another*. It is not enough to simply point out that X and Y and Z happened on some day; rather, historians seek to argue that Z happened *because of* Y, or that Y was a *consequence* of X, or that X was the *origins* of Y and Z. In other words, the events that a historian studies happen generally for reasons, they are not (or not

always) accidents. In your previous study of history, you might have come across questions like, 'What are the origins of the Second World War?' or, 'What explains the success of the Spanish conquest of South America?' These questions take for granted the idea that the Second World War or the Spanish conquest of South America didn't happen by accident; there were a number of events which had to happen first, in order for those events to happen, and historians work to understand those reasons.

Our discussion so far has drawn on a very important starting point in the discussion of history as an AOK. There are different ways we might use the term 'history'. We might use it to describe those things which happened in the past. When we say that we 'all have our own histories', we are using the term 'history' in this way, simply to refer to the obvious fact that things have happened to us in the past. 'History' can also refer to 'what professional historians *do*'. History is an academic discipline wherein historians look into the past, identify events and explore, reflect on and articulate the relationships between those events. This latter sense of the word 'history' is what concerns us in the world of TOK. Professional historians call this 'historiography', which means, broadly, the study of how we describe the past. It is a naturally critical process, meaning that responsible historians take great pains to create *reliable* or *credible* descriptions of the past, ones that are well tied to established facts. Otherwise, the product is merely fiction.

We are perfectly willing to accept that things happened in the past and this is one form of knowledge. But the historical knowledge that we in the TOK classroom are most concerned by, the questions and the tensions which arise, begin the moment we try to describe what happened. Even if we accept that things happened to us in the past, it is not entirely clear how we can or how we should access those events.

KNOWLEDGE QUESTION

Is it easier to identify a fact in other AOKs than in history?

The suggestion is that even attempting an 'impartial' examination of the evidence requires some element of interpretation. As we will see later in the chapter, historical events do not speak for themselves: historians select evidence, they *categorize* it and they relate events in a way that transcends the mere events. From their perspective, historians can see the causes and consequences in a way that the people involved in the events could not. 'Hindsight is always 20/20' suggests just this fact: that from where we stand, we can see more than what the people in the past could have seen.

We hope to convince you that history as an AOK is one of the most important elements of the TOK course and one which could be the most useful as you are thinking about modern culture and the current state of our political landscape. Being skilled in developing a reliable and credible historical analysis is a guard against what has come to be known as 'fake news'. Without these skills, we are susceptible to being led by our noses into whatever those who control information wish us to believe.

As Walter Lippman, a US journalist in the early twentieth century, suggested:

> Men who have lost their grip upon the relevant facts of their environment are the inevitable victims of agitation and propaganda. The quack, the **charlatan**, the **jingo** … can flourish only where the audience is deprived of independent access to information. (Alterman)

◆ **Charlatan**: Someone who falsely claims to have knowledge and manipulates others because of this presumed knowledge.

◆ **Jingo**: A person who supports a policy favouring war, especially in the name of patriotism (it is now considered an out-of-date term).

The historical method provides a process whereby individuals can evaluate evidence, reflect on the credibility and reliability of claims and develop their own evidence-based claims.

Over and above just identifying reliable claims, however, history provides narratives that matter to us in ways that are profound, deep and sometimes non-conscious. Taking the time to think through how we construct our histories, how we teach each other our histories and the use we make of them is crucial and cuts to the heart of who we think we are in the present.

KNOWLEDGE QUESTION

Do you think other AOKs impact the ways in which people think of themselves or self-identify in the same way?

History is not a straightforward chronology of events leading to *now*, for as we saw earlier with the events of 30 December 1890 at Wounded Knee, there are any number of ways we might describe an event. That there was an event is one thing – how we describe it is another, and how it *guides* us, is yet another.

Scope

In the Theory of Knowledge syllabus, history has always been given its own special place as a stand-alone area of knowledge. This suggests that there are distinctive elements of the study of history which make it importantly different from other AOKs. History stands outside the sciences because what it studies no longer exists, making it impossible to justify claims through prediction and experimentation. It is, nevertheless, reliant on evidence, suggesting that some level of objectivity is required. In this section we will try to carve out some of history's unique characteristics and explore the significance of them in terms of truth, reliability and credibility.

One way to explore the nature or scope of history is to ask:

- What does a historian *look at*?
- What types of events does a historian attempt to describe?

KNOWLEDGE QUESTIONS

Is truth the goal of historical inquiry? Do other AOKs treat the concept of 'truth' differently than History?

DEEPER THINKING

Historical 'facts'

Throughout this chapter we will be discussing historical facts, sometimes distinguishing them from what historians write (histories) and sometimes distinguishing them from other types of facts (eg, scientific facts). But what is a historical 'fact'?

Generally, a fact is some way that the world *is*. Our claims about the world are true or false depending on whether or not they actually describe a fact. In most cases we would agree that it is a fact that Brazil is south of Guatemala – that is just how the world is. The *claim* 'Brazil is south of Guatemala' is *true* because it corresponds with this fact (for more on this, see the section Knowledge, belief and opinion in Chapter 2 – page 42).

Consider now the following facts which you might see in the AOK of history:

- Singapore became an independent republic in 1965.
- The Japanese army laid siege to Allied forces in Kohima in 1944.
- Montezuma II was an Aztec ruler in the sixteenth century.
- In the UK, women were given the same right to vote as men in 1928.

These facts are 'historical' in that they are about events that happened in the past, but you wouldn't want to confuse these with what history as an AOK really is. The historian will certainly seek out these facts, but a simple list of such facts does not amount to a history. Such facts can be considered 'building blocks' which the historian uses to construct historical narratives that link such facts together into genuine histories. For instance, while it is a fact that Singapore gained its independence in 1965, a historian would be more interested in what the *causes* of this event were.

Consider the differences between the facts listed on the left and what the historian might be more interested in:

- How did British colonialism impact the role Singapore played when it was a state in the Malaysian federation from 1963 to 1965?
- To what extent did the events at Kohima contribute to the overall Allied victory over Japan?
- In what ways did Spanish conquistador Hernán Cortés use local mythology to effectively weaken the Aztec position in Mexico?
- What actions by Emmeline Pankhurst and her daughters were the most significant in the women's suffrage movement?

These questions, and their answers, are not factual in the same way as the others. They are built of facts, and the answers to these questions cannot be separated from such facts, but their answers are debatable in a way that the others are not. While the facts in the first list on the left might be debated to some extent, they can be evidenced by memory, documents and other artefacts to such a degree that they are considered beyond doubt. The answers to the questions, however, require historians to make arguments and ultimately remain debatable. This is largely because they seek to make claims about *cause and effect relationships* and *connections* between facts, which cannot be seen or tested, but also because they require interpretation by the historian. Given a set of facts and a question, historians must make choices, apply theories and interpret facts in a way that provides connections between them. The strength of an historical interpretation depends both on the amount and strength of the facts the interpretation is based on, and the general plausibility of that interpretation. It would be implausible, for instance, to think that British colonialism had *no* impact on the relationship between Singapore and the rest of the Malaysian federation, given the British role in creating the economic strength of Singapore in the region.

How best to articulate the answers to the set of questions? It won't do to simply list further facts because concepts like 'most significant', 'effective', 'to what extent' and 'impact' require a different form of writing. We usually call this form 'historical *narrative*' to bring out the nature of historical writing. The idea is that the historian creates a narrative which links the facts together. The term 'narrative' might bring to mind novels (and we will consider the relationship between historical narratives and fictional narratives shortly). However, the term here is meant to point out that historical writing comprises an internally coherent set of connections which link facts together into a story that provides a message, an argument or a standpoint, in a way that facts cannot. Writing histories, then, also requires a level of creativity which a TOK student might consider when thinking about the reliability of historical knowledge. Keeping with the facts-as-building-blocks theme, the facts are the blocks and the history is the house built with the blocks.

We know that Montezuma and Cortés met in 1519, but what were the wider implications of this meeting?

However, this role of interpretation and the creative ways in which historians must step beyond simply listing facts in chronological order when developing a historical narrative raises many questions which this chapter seeks to address.

As suggested earlier, there are facts that historians cannot avoid and which are central to the task of the historian. Things happened in the past whether or not we know that they happened and regardless of how much we know about them, and it is partly the historian's job to explain these facts. These facts are the stuff of chronology. For example, in 1863, Abraham Lincoln addressed a crowd on the battlefield in Gettysburg Pennsylvania in what has become known as the 'Gettysburg Address'. We know quite a few facts about this event. At the other end of the spectrum, there are also a number of facts surrounding the *moai*, the human figures on the island of *Rapa Nui* (Easter Island), but we know far fewer of them. We believe that they were carved sometime between AD 1250 and 1500, but don't really know by whom, or why.

KNOWLEDGE QUESTION

What counts as a fact in history?

There is a sense in which these facts are objective in that they are the way they are, they cannot change, no matter what we think of them. The trouble with these facts, however, is that there is an infinite amount of them, and most have left no trace. Consider all the facts surrounding the most **banal** interactions between people since the beginning of time: all the dialogue and all the moving about which has never been recorded and which has been immediately forgotten. While there certainly are facts regarding these events, they are utterly lost to historians today, even if they were interested in them. One can imagine a historian making the following claim: 'In the Spring of 1653, William, living in Market Harborough, England, said "Good Morning" to his mother.' Perhaps it is a *true* claim, but it is a claim which has no hope of ever being *evidenced*. This element of evidence is the crucial element of how historians deal with the infinite number of these sorts of facts: without some element of evidence that the claim is true, the purported fact it captures is insignificant.

◆ **Banal**: Lacking in originality or importance.

Facts – events which happened – are therefore absolutely crucial to the historian, and evidence for these facts are a necessary element. Without the evidence for some fact, the use of that fact is nothing more than fiction in the mouth of a historian.

KNOWLEDGE QUESTION

Are other AOKs limited in what can be known in the way history might be?

As we suggested earlier, however, the facts themselves are not all that a historian deals with. Simply listing a chronology of facts, one thing happened after another, is a framework for the historian, but historians are far more interested in the *relationships* between those facts. Rather than saying, for instance, that the Rapa Nui people carved the human figures we find on Easter Island at a certain time and place, the historian wants to know *why* they did so. What was happening before their decision to build them and what happened as a consequence of their building them? Similarly, with Lincoln at Gettysburg: *why* was he standing in that field giving the address? What had happened which led him to be standing there rather than in his office in Washington DC? Why did he choose *those* words and what were their significance to those who were listening?

These questions of why people did the things they did are a different sort of historical fact, however. Unless we find some sort of inscription where someone explains the human carvings or we find a diary entry where Lincoln spells out every element of his Gettysburg address, historians are tasked with constructing for themselves the reasons why. These types of claims are a challenge in that, while they are based in *evidence*, they do go beyond the types of historical facts mentioned above.

Collingwood's inside/outside distinction

One way of thinking through these different types of historical claims is through a distinction developed by historian RG Collingwood (1889–1943) between the *inside* and the *outside* of an event.

Collingwood accepts something like the distinction we've set out above. He uses as his example Julius Caesar crossing the Rubicon (a river in northwest Italy) in 49 BC, marking Caesar's deliberate challenge to the authority of the Roman Republic and beginning a civil war that resulted in Caesar's rise to Emperor. Collingwood suggests that there are two related but distinct elements of that event – the *outside* and the *inside* – both of which are necessary to the job of the historian.

Why did Julius Caesar cross the Rubicon? What does this question mean to a historian?

KNOWLEDGE QUESTION

If 'all history is the history of thought', would knowledge derived from the human sciences make for a better historian? In what ways do experts in one AOK use the knowledge from others in developing more reliable knowledge?

By 'outside' he means 'everything belonging to it which can be described in terms of bodies and their movements' (Collingwood). In the case of the event of 'Caesar crossing the Rubicon', then, this would be a description of the soldiers, their number, their formation, their speed and direction. The outside of the event is just a description, in other words, of what could be empirically observed were we to be witnesses to the event. It is what we could see, what might be recorded were we to be there with our smartphones or video cameras.

The historian, however, doesn't stop there. The historically important elements of the event are what Collingwood calls the *inside* of the event, which he says are those elements of the event which can be described in terms of thought. This is the *why* element we've been discussing above, but it's not a practical why, as in 'Why did Caesar cross the Rubicon? Because it was on the way to Rome.' Rather the *inside* of the event is what Caesar was *thinking* about which caused him to cross the river. He crossed the river because he had particular desires, particular plans and particular goals in mind. The historian's unique job, according to Collingwood, is to explore the *inside* of the events.

KNOWLEDGE QUESTION

Do the natural sciences speak literally when they describe animal behaviour using terms like the 'desires' or 'goals' of animals?

We might think back to the opening event of the shooting at Wounded Knee to apply this distinction. A description of the *outside* of the event would focus on the numbers of cavalry and Native Americans, the various movements of the soldiers and villagers, the firing of a rifle and the subsequent running and shooting of the soldiers and villagers. We would be making claims like:

- 'On 30 December 1890, the 7th Cavalry was camped above a Native American village at Wounded Knee.'
- 'Colonel Forsythe made the order for his soldiers to confiscate the weapons in the village.'
- 'Big Foot lay ill on a pallet on the ground.'
- 'The medicine man began to chant.'

All history is the history of thought.

RG Collingwood

These facts are all focused only on 'bodies and their movements' or what we might observe were we standing on the bluffs that morning watching the scene unfold.

The *inside* of the event, however, would be populated with another sort of fact altogether, one which focuses on the thoughts, motives, desires, fears, plans and reasons of those present:

- 'Colonel Forsythe resented the Native Americans and believed that Big Foot's tribe was inherently hostile.'
- 'Big Foot wanted a peaceful return to the Government's reservation.'
- 'The medicine man wanted his ancestors to come and destroy the Army.'
- 'The US Army's goal was to forcibly return all Native Americans to reservations.'
- 'The deaf Native American warrior didn't understand the commands he was given.'

While the outside of events can be described in terms of what we would observe (much like a scientist might describe what is observed in an experiment), the inside of events requires a different sort of description. It requires a description of thoughts. The historian, according to Collingwood, must 're-think' the thoughts of the individuals in the historical event. To develop a genuinely historical account (as opposed to a scientific account) of an event, we must think the thoughts of the characters involved: we must understand (though not necessarily agree with) the logical connections between the thoughts and the actions. The historian, then, in trying to understand the events at Wounded Knee would rethink the thoughts of Forsythe as he gave the order to open fire on the village. Understanding his command would be to understand his beliefs about the wider progress of the US Government's war on the Native Americans, understand his prejudice against the possible good intentions of the tribe before him and understand the experience of anxiety and fear he was undergoing when that fateful shot rang out. Understanding these thought processes is what a historical understanding amounts to.

Given that historical events have these two elements, Collingwood suggests that the historian's role is to explore each in relation to the other, albeit prioritizing the inside. He suggests that there is a difference between knowing what happened (a scientific understanding) and understanding what happened (a historical understanding). The historical story being told is one about people's motives and reasons for acting the way they did, not merely a story about what happened. A description of Caesar's journey to Rome wouldn't, in this view, be a 'history', any more than a list of how people moved about would be a history. Through such descriptions we might know what happened, but it would take an examination of the thoughts that motivated the actions for us to understand them.

KNOWLEDGE QUESTION

Is empathy more important in history than in other AOKs?

ACTIVITY

1. With a partner, identify and research a historical event of interest to you. Try to identify elements of the event which Collingwood would characterize as the outside and the inside of the event.
2. When describing the inside, try to articulate what you think would be the actual thoughts being exhibited in the behaviour of the historical characters you are studying.
3. How confident are you that you can identify the thoughts of the individuals?
4. Are you able to step outside your own perspectives and beliefs in order to charitably understand the thoughts of the individuals you are hoping to understand?

You might like to use a table like this:

Inside – described in terms of thought	**Outside – described in terms of bodies and their movements**

TOK trap

Having described and explained a TOK point, many students leave their analysis there, without exploring the *significance* of that TOK point. In the context of an essay, it is one thing to explain Collingwood's distinction and apply it to a case: this shows a certain level of quality TOK thinking. The best students, however, will then use the description of the TOK elements to develop an analysis of those elements. You might consider this a 'so what, who cares?' moment – why is this distinction *important* to the over`all discussion? What follows here is an attempt to show why Collingwood's distinction is helpful in a more general analysis of history as an AOK.

Why might this distinction be important for the TOK student? Collingwood's distinction helps us understand the differences between the AOKs of history and science, which then helps us further understand the nature of history as a way of knowing the world. According to Collingwood, our understanding of nature does not require anything like an inside to an event. The events that science describes are only described in terms of bodies and their movement; from tectonic plates shaping the world's landmasses, to the infinitesimally small electron shells at the subatomic level, the natural sciences describe *how* bodies interact. Any 'why' questions asked about interactions between bodies will only refer to natural forces, not anything like independent human thought:

> In the case of nature, this distinction between the outside and the inside of an event does not arise. The events of nature are mere events, not the acts of agents whose thought the scientist endeavors to trace … Instead of conceiving the event as an action and attempting to rediscover the thought of its agent, the scientist goes beyond the event, observes its relation to others, and thus brings it under a general formula or law of nature. (Collingwood 214)

The general formulas or laws of nature sought by scientists that Collingwood is referring to are laws that apply to all cases. The historian, however, recognizes that the thoughts and reasons which are in the minds of the agents they are exploring are unique to the situation and constitute a one-off circumstance. Understanding the event is to understand those unique circumstances.

The human sciences also study human behaviour, so what makes history different from the human sciences? The same thing applies here; the goal of the scientist (natural or human) is to try to develop 'general formulas or laws of nature'. Human scientists, unlike historians, will try to explain human behaviour by developing law-like generalizations which suggest that all humans would behave in a certain way *because they are humans*. That is, the reasons why people behave the way they do is because of some characteristic which is common to all human beings. The historian, in Collingwood's view, however, recognizes that no humans share all their beliefs and each carries within himself or herself a unique set of beliefs, motivations and desires which are relevant for this one moment in time. Rather than seeking a 'general' law then, the historian is attempting to uncover and articulate the specific reasons that were impacting the people involved at that moment.

The thought that the historian must in some sense re-think or re-enact the thoughts of the people they study raises a couple of challenging questions for the historian. Firstly, how can the modern historian guarantee that they are able to properly understand exactly what was going through the minds of the people they are considering? Historians are people too and carry with them a whole series of beliefs, expectations and perspectives which will become part of their attempt to understand the thoughts of the individuals they study, but those individuals are themselves part of a different cultural context. Trying to recreate thoughts of individuals who are from an entirely different time and context and trying to do so charitably (in a way that takes the other culture seriously) might be a real challenge.

KNOWLEDGE QUESTIONS

If historians are not trying to find generalizations that explain how all human beings act in certain situations, then what is the value of history?

Are historical claims less useful for understanding human beings than claims in the human sciences?

Collingwood also raises the point that in recreating the thoughts of the individuals being studied we are naturally critical of those thoughts. Being critical here doesn't necessarily mean opposing the ideas, but rather testing and reflecting on them. When we, for instance, put ourselves into the mind of Colonel Forsythe of the 7th Cavalry in order to understand why he might have commanded his soldiers to open fire, we can understand that a person holding Forsythe's beliefs would act in the way he did. In doing so, however, we naturally relate Forsythe's beliefs (the inside of the event) to our own. We might, for instance, accept that Forsythe's command to fire is consistent with his beliefs, but at the same time, judge Forsythe's beliefs about the Native Americans as prejudicial and bigoted. This suggests that the historian's own views about the topics being studied are always present in their analysis of the past. The extent to which this means that the historian's claims are reliable or not will be considered in later sections.

Perspectives

Consider the following quotation from historian Ramachandran Guha in an article called 'The Historian and Chauvinism':

> Traditionally, history writing was dominated by **upper-caste** males, and, of course, this had to be challenged. You needed Dalits and women to write histories too. At the same time, it is equally important for high-born historians to transcend their privileged identity, to acquire what the poet Keats called 'negative capability', the ability to empathise with a different perspective or point of view. For, a historian must never become a prisoner to his or her identity. Historical truth crucially depends upon the success with which the historian transcends the **chauvinism** of identity. (Guha)

Guha raises an important point about the nature of historical inquiry. History is written by individuals and individuals, no matter how similar an education or experience they have had, will carry with them their own unique outlook on the world around them. These outlooks, or perspectives, are built up of a lifetime of experiences with the society around them and can become embedded in ways that we might not recognize but which might influence what we consider 'true' or 'real'.

In the AOKs of mathematics and science, these perspectives will have objective facts to be weighed against: mathematics utilizes the rules of logical inference which are arguably the same for everyone and the sciences use facts gained through direct observation of the phenomenon being investigated. In history, however, the events being considered have disappeared and are thus unavailable to the historian. Historians are only left with the documents, testimonies and other artefacts which have withstood the ravages of time to end up on the historian's desk.

The primary task for the historian is to identify and articulate the connections between the left-over artefacts – to tell a story about how they are related. This is a task which takes the historian beyond the confines of his evidence, however. For instance, if one is presented with facts about the conditions of factory workers in pre-First World War Czarist Russia and then is presented with facts about the Bolshevik Revolution in 1917, one might wish to make a connection between these sets of facts and construct a narrative about one causing the other.

The issue Guha raises has to do with just how an individual historian constructs such connections and whether or not the connections being developed are reliable. The point he makes is that each individual historian has a personal history. They have been raised in a certain cultural context, they have been educated a certain way and they have had certain experiences, and these circumstances will form the context in which the individual *thinks*. Often these personal

◆ **Upper caste**: In traditional Indian society there are various social classes, where many professions were tied to various castes. 'Dalit' (or 'schedule castes') refers to the lowest of the castes.

◆ **Chauvinism**: An excessive support for a particular position or perspective. For example, a person who assumes uncritically that their own perspective is the only *possible* right position, could be accused of being 'chauvinistic'. The focus here is on *excessive*, meaning a person does not consider or refuses to take into account other possible views. You might consider your own view correct, but to avoid being chauvinistic you would consider other views and perspectives before coming to your final position.

KNOWLEDGE QUESTIONS

Do you think experts in other AOKs are as influenced by the pressures of culture, caste, class, religion, etc., as historians? Why or why not? How does your answer help illuminate your thoughts about the nature of those AOKs?

experiences and circumstances will form a 'perspective' from which the individual naturally views the world. There is nothing wrong with this, it's just a fact about individuals. However, Guha points out that sometimes we might be unaware of how these perspectives influence the way we interpret historical facts and the way that we construct historical narratives.

'Perspective' comes from the Latin for 'seeing through'. We 'see through' a perspective in a way that we might see through the lenses of our glasses or a window. Extending the metaphor, the idea is that historians see through a perspective in a similar way. Guha is not suggesting we avoid these perspectives entirely; this would be impossible. But he is suggesting that different people with different backgrounds and experiences might bring a new perspective to topics that have previously been explored only from one perspective. He suggests that Dalits and women should be writing histories too, suggesting that each group might bring a new approach or a new set of questions – which perhaps have not been thought of before.

KNOWLEDGE QUESTION

How do different AOKs manage the influence of individual perspectives when evaluating knowledge in that field?

ACTIVITY

1 Imagine that you are a professional historian writing about a topic. What do you think would be the 'blind-spots' in your own perspective? In other words, which characteristics or beliefs do you hold that might affect your own historical conclusions in a way that might be considered non-objective?

2 Consider this question in relation to the following different types of historical subject-matter. Would your own characteristics or beliefs impact these topics differently?
   - The causes of a regional or world war.
   - The impact of Martin Luther King Jr's 'I have a dream' speech (1963) on the United States Civil Rights Act (1964).
   - The role of memorials or statues dedicated to slave owners, or people or institutions who profited from the slave trade during the seventeenth and eighteenth centuries (eg, Cecil Rhodes and the University of Cape Town).
   - Women's suffrage movements around the world.
   - The impact of the Stonewall riots (1969) on current LGBTQ+ rights and legislation.
   - The growing role and impact of women legislators in your country.

A statue of Cecil Rhodes. Should we take down memorials to historical figures whose attitudes are today considered unacceptable?

KNOWLEDGE QUESTION

Is it unfair to judge people and actions in the past by the standards of today?

Guha suggests that 'a historian has beliefs and prejudices, which, like his or her personal identity, cannot ever be entirely suppressed. But one must continually be aware of them and seek to limit their influence on one's work' (Guha). It is possible, then, that one's perspective both *informs* our interpretation of historical facts, but it might also limit our ability to interpret them *fairly*. There must be some awareness of the impact of a historian's own perspectives, accompanied by an honest effort to limit their impact on their interpretations if they are to transcend the chauvinism of their identity.

CONCEPT CONNECTION

Objectivity

These issues raise questions about whether history can be objective. The short answer is 'not really'. Historical facts such as 'Colgate started the mass production of toothpaste in 1873' might be considered objective in the sense that all rational observers would agree that the evidence settles the question. However, we have distinguished historical fact from genuine history and the interpretations and perspectives involved in the development of a historical narrative suggests that we cannot achieve objectivity. Perhaps the goal should be (if such a goal is desirable) *consensus*. In other words, with the understanding that historical analyses are not analyses of objects equally observable by all parties, historians should be aiming for well-justified interpretations, which are compelling in the presentation of their claims.

Revisionism

Guha's quotation suggests that new perspectives on historical questions add value to traditional historical understandings. He suggests, for instance, that women and people from social classes other than the privileged should be writing histories because they bring new ideas to the discussion. Bringing new ideas to old topics is a form of what is called revisionism, the idea being that with the application of new perspectives to old questions we are encouraged to *revise* our understanding of previous ideas. This is undoubtedly a healthy process in any AOK: the examination of old questions in a new light, perhaps from a new perspective or with new evidence.

One example of this is the publication of Sheila Rowbotham's *Hidden from History* in 1973. In it she explores the role that women played during a number of revolutions in the past 300 years, a topic that had not really been considered by traditionally male, traditionally capitalist historians. Her argument that the history of women is best understood through the perspective of social oppression and the struggle for social emancipation provided a new way to consider a number of socialist movements since the seventeenth century. Her new perspective created a revised understanding of these movements.

'Historical revisionism' as a term, however, is often used in a negative way, particularly when the revision being argued for is an upheaval of generally accepted views, sometimes accompanied by an unjust application of the historical method. When historians are purposely trying to overturn a generally accepted view of the past, motivated by a modern ideological debate, very often this goal overrides a reasonable selection of evidence and a reasonable interpretation of the evidence.

One such debate surrounds the religious beliefs of the United States' **Founding Fathers** and whether or not their beliefs are consistent with modern conservative Christian beliefs. Some historians, for instance, attempt to interpret the Founding Fathers of the United States as holding the same types of deeply conservative religious beliefs that are held by modern evangelical Christians, and therefore we should be able to interpret various elements of the Constitution (1789) in light of modern Christian understanding. Others argue that given the philosophical and religious trends of the time (and the writings of the Founding Fathers themselves), the differences

KNOWLEDGE QUESTION

Is objectivity more or less difficult for the historian than experts in other AOKs?

KNOWLEDGE QUESTION

How might the existence of different historical perspectives be beneficial to historical knowledge?

KNOWLEDGE QUESTIONS

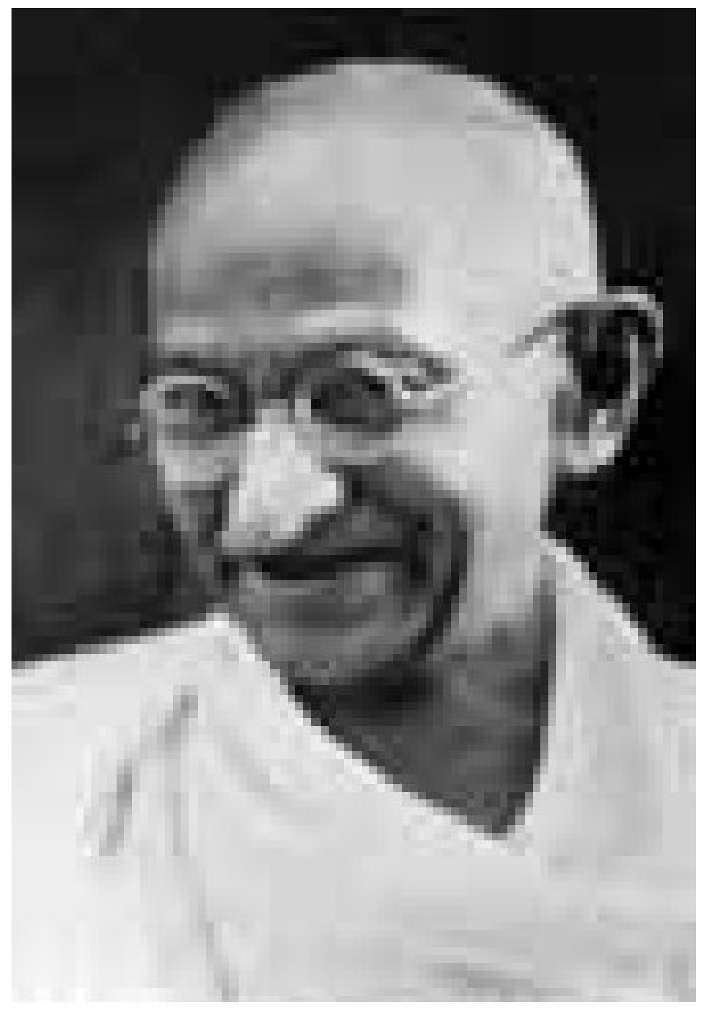
Are all AOKs subject to the same revisions as history? Do historians treat past knowledge in the same way as other AOKs? Is questioning previously held beliefs as important in other AOKs as it is in history? Why or why not?

◆ **Founding Fathers**: A term relating to the men who developed the United States Declaration of Independence, the US Constitution and stood as the early political leaders.

between these and the modern evangelical beliefs means that they would not have been recognizable as having a faith anything like modern evangelical Christian beliefs. To suggest they were could be called historical revisionism: the attempt to reinterpret established historical views in order to further modern ideologies and for modern political or religious ends.

Use the QR code to read a longer discussion of this issue.

Methods and tools



Mahatma Gandhi

In March 1945, Mahatma Gandhi was asked how Indian historians could best serve the soon-to-be independent country. How best to describe the history of India? Gandhi replied: 'He can serve by writing a true and original history of the people. If there is progress he will describe the process; if he finds there is decline he will record the decline' (Guha). What Gandhi is suggesting here is that the historian's main role is to be honest – to describe and record what is there – and not create fiction. This is not as easy as it seems for reasons we've described above: the threat of applying uncritical or unconscious assumptions and perspectives is ever present in the historian's work.

Given, then, that the historian must walk a fine line between admittedly working from a perspective on the one hand, while identifying and interpreting material fairly and accurately on the other, how does a responsible historian manage their work?

The historical method

Just as scientists use a 'scientific method' (see Chapter 9), historians use what can be called a 'historical method'. There is no set or definitive list of precisely what makes up the process which every historian must use, rather there are a series of activities and concepts that they will use in order to try to develop reliable claims. As an attempt to outline these broad categories we will offer the following five steps (Schneider 201) and develop an analysis of each:

- Selection of a subject or topic
- Identifying relevant facts and ideas
- Critically reflecting on the source materials
- Synthesis
- Presentation.

KNOWLEDGE QUESTION

Do historians have similar constraints on the methods by which they produce knowledge as experts in other AOKs?

Selection of a topic

In order to begin the process of developing a historical narrative, the historian must find a topic which interests them. John Dewey, a philosopher of history whom we will discuss in more detail later, argues that *all* historical claims have their origin in the observations of the historian in the present, stating that 'some present state of affairs is always the occasion of the reconstruction of the past event' (Dewey 224). The historian often begins with a question arising from some experience of some present fact or observation and uses a historical analysis to develop an answer (see page 383 for more on Dewey's understanding of history).

That the process of history, which deals with events which are lost in the past, might begin with an immediate observation from the present, may seem contradictory at first glance. However, think about what is happening when we speculate about the history of some far-off event, say, what was happening 5000 years ago in the city of Ur (which lies about 300 km upriver from the ocean on the Euphrates river in modern day Iraq). Of course, we cannot see what was happening, but what *can* we see? Indeed, why do we think there was a city at all?

One thing that we can observe is the Ziggurat of Ur, which rises out of the desert by around 30 metres – you can't really miss it! It was discovered in the mid-nineteenth century by British archeologists and was excavated more fully in the early twentieth century. While a historian cannot see what was happening during the construction, they can see the product of that construction and interpret what must have happened for it to exist. Indeed, the Ziggurat sits within a site which has been identified as the ancient city of Ur, which archeologists believe to have existed for over 5000 years. There is a wealth of artefacts which have been found there; the point being that *these* are what the historians are observing here and now in the present, as they develop historical claims about the city and its people over 5000 years ago.

■ The Ziggurat of Ur

◆ **Mesopotamia**: The name given to the areas in modern Iraq in and around the Tigris and Euphrates river systems.

DEEPER THINKING

Motives and interests

It is unlikely that a historian who wants to write about the ancient civilizations in **Mesopotamia** would *accidentally* find themselves standing in the middle of the desert looking at the Ziggurat of Ur. In other words, the observations which begin the process are generally preceded by some *interest* or some other experience which gives rise to the initial question.

A genuine TOK analysis of the preceding motives, interests or questions, however, would not stop simply at the claim that the historian is motivated by some question, since analysis of why an individual has the motives and interests that they do is a question within the field of psychology, not TOK. A TOK student might instead analyse the motive to determine whether it will be impacting the later process unfairly. We all have motives, but TOK students need to wonder how those motives impact the reliability of the subsequent claims. For example, if our interest in Ur is to prove that it is the ancient birthplace of Abraham (see Chapter 6 for a discussion of who Abraham was), and we are setting out to *prove* that the biblical account of Genesis is historically accurate, then others might suspect that our motives are going to colour the later development of the historical analysis. We clearly have the goal in mind: 'Genesis is historically accurate'. We might instead set out to see what it is possible to confirm, whatever that might be. We might instead ask, 'Archeologists have uncovered a city called Ur and the Genesis story of Abraham says he came from a city called Ur. Could they be the same city?' This question is far more neutral, in that it doesn't pre-judge what we are hoping to conclude.

The previous interests, moreover, might be themselves the result of earlier observations. We might be interested in the Ziggurat because of some other experience or observation we have had, perhaps in a textbook, or online. The question, 'What is that and how did it get there?' might not sound like a historical question, but to answer it we must create a historical narrative, describing the object sitting in the desert of Iraq *today*, with the object as it was 5000 years ago when it was constructed. Thinking back to Collingwood's inside/outside distinction, the outside would be a narrative about the object itself (stones, mortar, building techniques), while the inside would be why it was built, the knowledge of the designers, the motives of the builders and whoever commissioned its construction.

Identifying relevant facts and ideas

Once a historian has made some initial decisions about what sorts of things they are interested in and what sorts of topics they want to discuss, they then must seek out material that will help them develop their ideas. But what facts should they be seeking? What facts are relevant to the topic or question?

John Dewey, a philosopher writing in 1938, argued that 'all historical construction is necessarily *selective*' (Dewey 235, emphasis ours), meaning that a historian must sift through evidence related to the event being discussed. All the historian is left with, however, is whatever has been left behind by the event itself: personal testimony, artefacts, records, documents, photographs, etc. None of these are the event itself, only remnants of that event.

The task of the historian, therefore, is to develop a question to *ask* of the evidence, and the questions being asked of the evidence are those which are immediately and presently relevant to the historian at the time they are asking them. Depending on the questions that are on their mind, the historian may select some items as 'evidence' and leave other items out of the equation. We might, for example, be interested in the role of women in the early Christian church and wonder, 'What does this inscription [the one that is immediately present to us] which has been uncovered in an archeological dig, add to my understanding of this topic?' (Borschel-Dan). There are other artefacts related to the archeological dig, but because they are not relevant to our question, we won't select them as part of our evidence. Or we might be interested in German foreign policy in the run up to the Second World War and wonder, 'Does the Hossbach Memorandum [facsimiles of which we can easily access online] faithfully represent Hitler's own views?' (Hossbach Memorandum). (The Hossbach Memorandum was a summary of a meeting between Hitler and his military and foreign policy leadership held in Berlin in 1937.) There is a whole slew of other documents created by Hitler's command during the 1930s, but again we wouldn't select them as they would be irrelevant to our question.

Assessment advice

The examples we're using here (the Ziggurat of Ur, the inscriptions on a church wall and the Hossbach Memorandum), are artefacts – objects that are human-made – and they might be the sorts of things that you can use as part of your internal assessment exhibition. There you must identify three human-made objects and use them to offer a response to one of the IA prompts listed in the subject guide and used in this book.

Dewey suggests that there are two ways in which selection affects the historian as part of the process by which they identify relevant facts.

Firstly, the people being studied provide one layer of selection in that they select in some ways the sorts of things that will survive to become evidence for the historian. In our examples above, for instance, someone decided to create the inscription and the paintings for the church walls. They didn't have to write anything on the walls, nor did they have to write what they did. But they 'selected' what they did and stuck it to the walls of the church. Clearly this choice was because they felt that the inscriptions and paintings were important. The Hossbach Memo didn't have to be written, but it was. Nor did it have to be written the way it was, in terms of content. But it was written that way and this is a form of *selection*. We might also consider the accounts of the event at Wounded Knee with which we opened the chapter. The first selects certain facts to portray to the reader. Regardless of what actually happened on that morning, those facts were what the writer decided to record.

KNOWLEDGE QUESTIONS

Are the criteria for what counts as good evidence different for the historian than for the mathematician or scientist?

Can the historian be free of bias in the selection and interpretation of material?

Historians have to select evidence based on the types of questions they wish to answer. Do experts in other AOKs have similar choices to make at the beginning of their processes? How might those choices influence the reliability of the knowledge produced?

The historian, then, is faced with the consequences of the actions of the people they study, in that these people in the past have already made a number of decisions which influence the body of evidence available to historians. The Egyptians *decided* that their Pharaohs and the afterlife of the Pharaohs were more important than the workers building the tombs. Therefore, the tombs were built of stone or carved into stone, which would presumably last forever, while the workers' houses were built of mud or wood, which they knew would decay over time. And decay they did, so we have little evidence of what the workers' homes were like. The ancient Vikings selected items to place into their burial tombs which suggests that those items captured beliefs and ideas that were important to them and which the historian can try to recreate. The front page of any newspaper is a selection of events which the editor of that newspaper has selected as 'important' enough for the front page. A historian in one thousand years' time trying to understand our world might therefore have only those events to base their understanding of our time upon.

KNOWLEDGE QUESTIONS

What role does circumstance or luck play in the use of evidence for the historian? Is this similar to other AOKs?

ACTIVITY

1. Consider your own social media feed on Instagram, Twitter or Facebook. What decisions have you made in relation to what you put on your feed? Consider the types of things you *could* have put on your feed. (You might even put the fact that you're reading your TOK textbook at the moment!) Why didn't you put these other events onto your social media feed?
2. Consider now what you *have* put on your feed. What sort of impression of you do all the items you have posted say about you to an observer? If you were a historian studying the individual who posted all this material, what sort of impression would you have of that person? Is that historical impression the same as what you intended?
3. Think about others whose social media feeds you follow. To what extent do you think that the impression you've gained of that person through their presence on social media actually captures what they are genuinely like?

What would a historian of the future be able to decipher about your life from your social media profiles?

Secondly, we have a layer of selection we've already hinted at: the selections made by the historian. If history is a 'reconstruction of the past event' based on a question in the mind of the historian, then it is possible that not every element of evidence is *relevant* to the question being asked. If the historian is interested primarily in the living conditions of the workers who built the Pyramids at Giza, for instance, then we can imagine a historian ignoring the huge pyramids at their back as they examine more closely the scant remains of the workers' houses at their base. If another historian is interested in the lives of women in Native American culture, the fact that the *Bismarck Weekly Tribune* doesn't mention women, might mean that the historian would not consider the account of Wounded Knee as evidence at all. Dewey argues that 'from this selection there follow selective appraisals as to (1) the relative weight and relevancy of materials at his disposal and (2) as to the way they are to be ordered in connection with one another' (236), by which he means that the historian is required to make choices about how much weight (if any) to give evidence and the connections between the evidence.

CONCEPT CONNECTION

Evidence

Evidence is the bedrock of knowledge. It creates the conditions under which fiction can be distinguished from fact, or speculation can be distinguished from truth. What counts as evidence and how much is needed are both questions we should be asking of the historian. As we've seen, what might be evidence for one historian might not be for another. Where the historians are investigating different topics, this might not be a problem, but if the historians are asking similar questions and identifying different evidence, or using the evidence in different ways, then care must be taken to evaluate the reasons why some evidence is being used while some is not. Much historical debate revolves around just what is relevant to the question and what should count as evidence.

Primary and secondary sources

One of the most relevant factors in choosing which facts or evidence to rely on when developing a historical narrative is the primary/secondary source distinction. 'Secondary source' refers to sources that are at some distance from the events that they describe, whether they be recordings of what people have *heard* about some event (such as testimony from someone who wasn't at an event but heard about it). 'Primary source' generally refers to direct accounts of events recorded by the witnesses themselves. The assumption is that, when the eyewitness is reliable, then the direct testimony of someone *who was there* will be more reliable than some second-hand account, though of course this might not necessarily be true. You might find an account of an event (perhaps like the account of the *Bismarck Weekly Tribune* on page 367) which is itself highly prejudicial or biased. In those cases, even primary sources must be used carefully.

Learner profile

Reflective

What measures can you take to overcome your own biases?

TOK trap

Not all historians are biased. All this talk about the inevitability of historians having a perspective and the role of selection in the historian's identification of relevant facts, seems to lead many students to the conclusion that in some sense 'all historians are biased'.

However, this is not a fruitful critique for the reasons outlined on the next page.

'Bias' in the context of TOK refers to the ways in which information is used or interpreted. To be biased means that you are inclined to interpret the facts presented in a way that is some how unfair or unjustified. The classic example of this are conspiracy theories, where proponents of a theory will never accept evidence against their position, instead always interpreting the evidence in a way that supports their initial beliefs. They've already decided on the conclusion they wish to reach, and they will interpret the evidence in such a way to support it, no matter what. To call someone 'biased', therefore, is a critique of the way in which they are using and interpreting evidence.

To take the more general point being discussed here (that historians often interpret evidence or develop analyses from a certain perspective) and call it bias is spreading the term too thinly. It is, what we might call an ***ad hominem*** argument, which attacks the speaker, rather than the ideas they are presenting. The 'all historians are biased' claim is basically saying that *because* they are historians, they *must* be biased. This, then, paints all historians with the same brush and doesn't allow us to reserve genuine critiques against those particular historians who really do manipulate evidence and ignore responsible **historiography**, or those who consciously manipulate and twist evidence towards their own ends. In other words, we lose a tool by which to differentiate *reliable* historical accounts from those that are *unreliable*.

Understanding the process of selecting relevant evidence might help us think through those instances where we want to suggest that a historian is biased. We can now ask whether the historian's selection of the evidence is warranted, justified or 'correct'. If not, then we might accuse them of bias; if the selection being made is warranted, then we might say they are not biased (even if they have a perspective).

Some historians, for instance, might be interested in understanding the role of the US Government in the current state of Native American culture in North America, but decide to entirely ignore the events at Wounded Knee in 1890, or, perhaps, *only* use the material from the *Bismarck Weekly Tribune* mentioned at the start of this chapter. Given the wealth of evidence available to the twenty-first-century historian, deciding that Wounded Knee was irrelevant, or selecting only the *Bismarck Weekly Tribune's* account (and actively ignoring the rest) would be seen as irresponsible. If, in addition, the historian has already decided that they are going to make a particular point and have therefore decided to consider only certain evidence and disregard the rest, we would say that this historian is biased. In other words, the historian's application of the *method* was unjust, unwarranted and 'broke the rules' of being a responsible historian. Instead of allowing the evidence to guide their historical interpretations, they fit the evidence to the story.

The responsible historian is, therefore, in a difficult position. On the one hand, they must use their own interests and questions as a way of sifting through the evidence to decide what is relevant and what is not. On the other hand, they must make sure that they are being fair in considering what actually is relevant and not ignoring important information. They must also make sense of the evidence in a way that doesn't pre-judge what they think the evidence will say or force the evidence into a narrative that they have already decided to tell. They must let the evidence guide their interpretation.

Recognizing that there are better and worse ways of selecting and interpreting evidence in history is an important step for the Theory of Knowledge student and allows you to explore better and worse selections of evidence. We can then praise as 'reliable' a good selection of evidence, and 'unreliable' a poor one.

◆ **Ad hominem**: Latin for 'against or towards the man'. This means you accuse the *individual* of some short-coming in order to discount whatever it is they are saying, while ignoring the actual arguments that individual is offering

◆ **Historiography**: The process of reflecting on the methods the historian uses when writing. The questions we ask in TOK regarding history are historiographical.

ACTIVITY

Review the discussion of cognitive bias in Chapter 1 (pages 22–24) and discuss the following questions with your classmates.

1. How do you think these sorts of non-conscious biases might affect the reliability of historical claims? Where in the historical method do you think it would have the most effect?
2. How might a historian challenge these non-conscious biases?
3. How much responsibility do you think a historian has to self-reflect?
4. Should historians be required to undergo the psychological tests which are meant to uncover these biases?

Assessment advice

Curation is the process of selecting items and grouping them in a way designed to create a particular impression. Your social media feeds are a curated exhibit of *you*, built up of images, videos and text all designed to provide the viewer an impression of what sort of person you are. This notion of curation is central to both of the assessment tasks but in different ways.

- For the essay, you will need to curate the ideas you've had on the topic presented in the prescribed title (rather than just spilling out any old idea that happened to drift through your mind). The essay needs to stand as a singular and *crafted* response.
- The exhibition requires you to identify three objects and discuss them in relation to a response to one of the Internal Assessment prompts. For this you will need to choose or select three objects which can each act as a response to that prompt. Again, you have the ability to choose from any number of objects, but you must select three, and have good reasons for your selection.

Critically reflecting on the source materials

Once the historian has identified material to use, they must remain critical and reflect on any bias or prejudice which may be in the source itself. They cannot take it for granted that everything in the source is reliable. Even in the case of primary sources, historians must remain on guard for ways in which the information being offered is unreliable. Source criticism (something all history students will be very familiar with) requires students to ask questions like those listed in Table 11.1.

Table 11.1 Critically reflective questions to ask as part of source criticism

Aspect	Questions to be asked
The source's provenance or production	• Where does the source come from? • What do we know about the source and/or its author? • Is the author otherwise reliable? • Why was it written? • Who is the audience?
The source's context and form	• What is the nature of the source? • What is the purpose of the source? • What sort of source is it? • What cultural, legal or social context is it a part of?
The source's content	• What is the source actually saying? • What is the source arguing for? • Does the source offer evidence or quality arguments? • What assumptions or values are reflected in the message of the source? • Does the source interpret events or record events?
The source's relationship with other evidence	• How does the source fit with other information or knowledge? • Does the source offer a message which is consistent with or contradictory to other knowledge of the topic? • Is there other material which might corroborate the messages of the source?

The list of critically reflective questions in Table 11.1 is certainly not exhaustive, but it does provide a framework by which the historian can evaluate the material from which they hope to derive a historical analysis.

Even in cases of simple eye-witness testimony, the historical researcher must take care not to assume that what is being said is not also inaccurate in important ways. Stories of the 1912 sinking of the *Titanic* told by survivors reported that the ship had risen up some 45 to 90 degrees before crashing back down as it sank in the North Atlantic Ocean. Later, mathematicians and physicists

KNOWLEDGE QUESTION

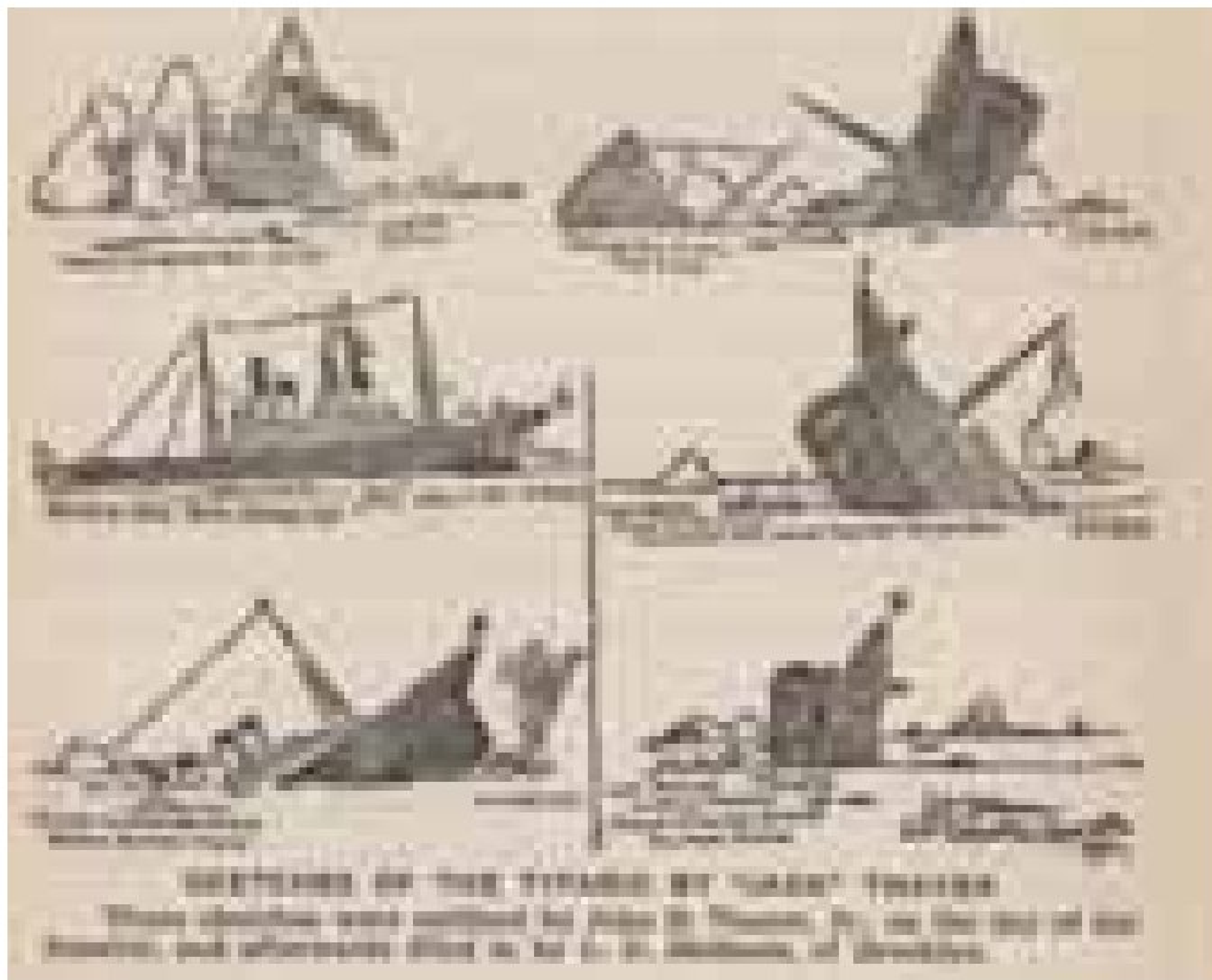
On what criteria can a historian evaluate the reliability of their sources?

KNOWLEDGE QUESTIONS

Consider the critical questions outlined in Table 11.1. In what ways might you as a student in other AOKs apply these questions to the sources you find? Is there a need to be as critical of the sources in other AOKs?

working on the debris found that this would have been physically impossible. The strength of the ship wouldn't have allowed it to rise any more than about 12 degrees (Finton). Famously, Loftus and Palmer in 1974 provided further evidence that eye-witness testimony can be altered simply by asking questions using different words. Use the QR code for a more in-depth account of this study.

These examples suggest that the responsible historian must spend considerable time and energy on this element of the historical method. On one hand the historian must remain sceptical and apply all that he knows about the topic to this reflection. We've seen here that a thorough knowledge of the background of the topic is needed, plus an understanding of the psychology of eye-witness testimony. On the other hand, historians must, at some level, trust their sources once a *bona fide* attempt has been made to uncover any unreliability.



Sketches of the sinking of the *Titanic*

KNOWLEDGE QUESTION

Is the relationship between personal experience and knowledge different in history than in other AOKs?

Synthesis

Suppose now that the historian has chosen a topic and a general question, identified and gathered relevant evidence and facts and exposed that evidence to a robust critical examination to ascertain its reliability. What next?

The next thing for the historian to do is to develop what might be called a 'synthesis', meaning that the historian determines just what the evidence actually suggests. The facts and sources do not 'speak for themselves' in that they do not themselves provide their own interpretation in light of the questions being asked. Granted, if our question is something like, 'Who signed the Declaration of Independence?' and we find the actual document which tells us this, then the evidence does really speak for itself. However, we've suggested that these singular facts are the building blocks of history, not history itself. If our question was instead 'Why were there so many signatories to the Declaration of Independence?', having the document before us could not provide a full answer.

This is the moment that the historian and the scientist really diverge in their task. The historian now has to *interpret* the evidence in light of their initial question and provide a *narrative* which links the evidence together into a coherent and well-justified account. Collingwood suggests that the historian's task in this way is similar to the novelist's as they are both in some ways works of imagination. Clearly the novelist is using their imagination to conjure up the elements of the story, but the historian too is imagining what must have been the case, or what was likely to have been the case, given the evidence. Think back to the account of the events at Wounded Knee with which we started the chapter. While we don't have a clear statement of why Colonel Forsythe ordered his troops to open fire (or even if it was a clear order), we might imagine what the reasons were. Collingwood, however, argues that there is a pretty big difference between the historian's task and the novelist's, namely that the historian's is meant to be true (Collingwood).

This is the whole point of building a narrative on evidence. The novelist need not adhere to anything like a fact, but the historian must have facts every step of the way. Where there is no evidence, there can be nothing *but* imagination and claims of this sort belong to literature, not history.

This element is where the historian is most vulnerable to their own biases and prejudices. Historical facts are not like Lego bricks which have built into them the methods by which they must be connected. Instead, historical facts are like oddly shaped tiles – they need some principles to show how they should be put together. In this example, something which says 'the outcome should be something along these lines' for a flat tiled bathroom floor. We must therefore put the tiles together in a particular way (keep them flat, don't overlap them, keep the distance between tiles the same).

In other words, historical synthesis needs a context, a paradigm which suggests how events link together. Given the same evidence, different historians may yet come to quite different conclusions, argue for different motives and causes and emphasize different forces at work, largely depending on the 'perspectives' that we discussed earlier. A Marxist historian, for instance, would interpret the evidence in a way that would highlight the impact of social class and economics on the actions and events under consideration and would assume that social and economic class is *always* one of the driving factors in human affairs (but not the only one). A feminist historian would explain the connections between events in terms of the perspective of women, again assuming that gender dynamics are always *one of* the driving forces in human dynamics. These perspectives might have also impacted the earlier selection process.

As discussed above, these perspectives need not amount to *bias*, but they do colour the interpretation of the facts. Where one historian might see a connection or a dynamic between events (e.g. a Marxist would start investigating the causes of war by thinking about social and economic forces), another might instead focus on something else. The responsible historian won't ignore their own perspective, but they will take care to not let it dictate the possible interpretations available to them.

Presentation

The topic has been chosen, the evidence gathered and critically assessed, and the interpretation has been developed and justified. The final stage in the overall method is when the historian actually *presents* the history, ie, writes down the synthesis or interpretation of the facts. Here, too, the historian must walk a fine line between a cold, hard adherence to facts and the art of writing well. No historical narrative will be compelling if the historian cannot 'weave a good tale'. However, when developing the language with which to express the narrative, the historian must take care that the material is not misinterpreted.

For example, when discussing an army's manoeuvres in the face of an enemy, do we call it an 'attack', or a 'charge'? Charge certainly has far more romantic connotations. Each word might be legitimate, but the historian might choose one over another if they are to capture and maintain their audience's interest.

Now let's consider this account of the final moments of the Battle of Little Bighorn in 1876, when General George Armstrong Custer and his men were defeated in their attack/charge against the Sioux in what is now Montana:

> What a sight it must have been, especially for George Armstrong Custer, who was – probably – at that instant leading his men toward the spot on which Crazy Horse stood. Behind Crazy Horse, Custer would have seen the thousand warriors, all painted, many with war bonnets, some holding spears high in the air, their glistening points aimed right at Custer … The ponies were painted too, with streaks and zigzags and other designs … They snorted and pranced, caught their second wind, and were ready for battle. (Ambrose 440)

This passage is full of genuinely emotive and powerful imagery, and a fair bit of speculation. However, the facts presented (the archeological evidence of the battlefield, facts about how the Sioux conducted battle and their battle costumes, the documented behaviour of the Sioux's

ACTIVITY

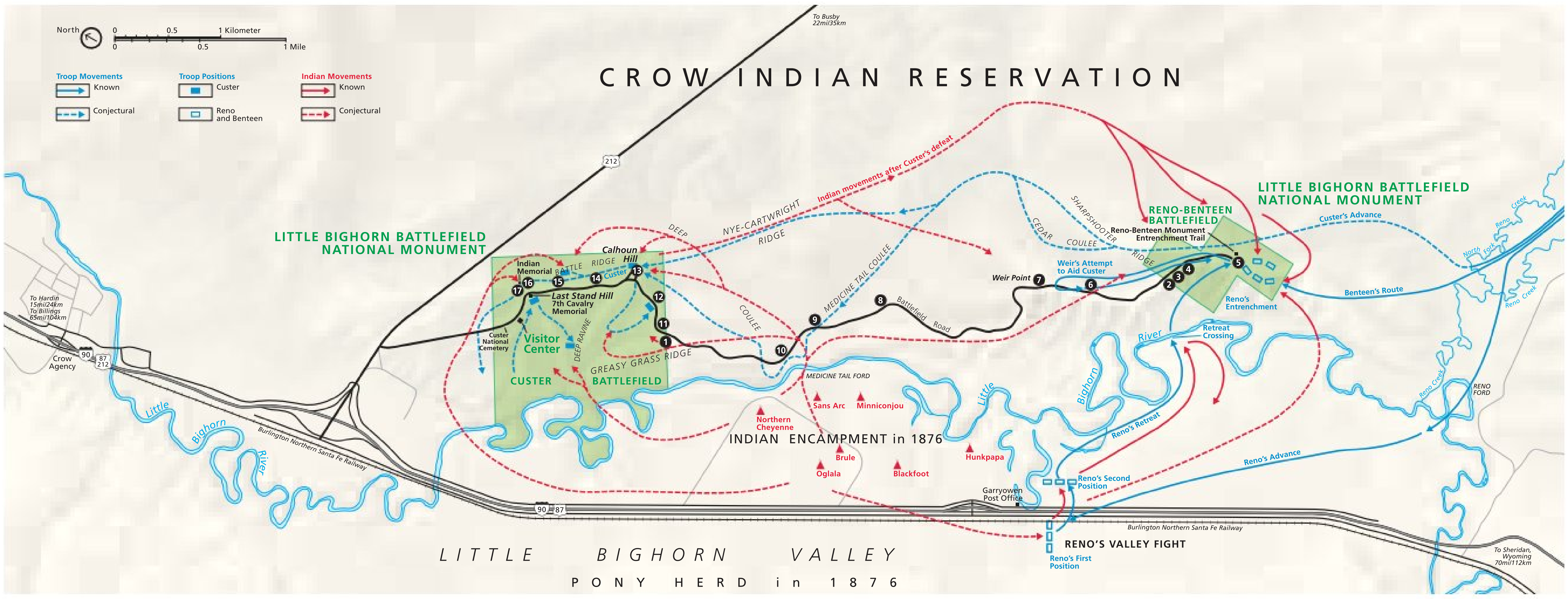
Consider the opening newspaper report of the events at Wounded Knee (page 367).

1. Identify the language which you think carries an emotional impact. Do you think the writer was aware of this impact? Why do you think the writer would have chosen to write the account in the way that he did?
2. Do this first individually, then share your findings with a partner. Do they have similar or different emotional reactions to the language? Why might this be? What might this suggest about the challenges of constructing historical narratives and reading historical narratives?

KNOWLEDGE QUESTION

Does it matter in other AOKs how the knowledge is presented to others? Shouldn't the knowledge simply speak for itself?

ponies) are all well evidenced. The imagery and behaviour illustrated would be entirely consistent with all the facts about the battle. However, Ambrose has woven them into a *narrative* which creates a powerful scene, one that is far more engaging from a human perspective. Granted, Ambrose is a 'popular' history writer, one who writes not necessarily for the community of expert historians, but for the 'lay historian' (someone who is interested in history but is not academically trained as a historian). This provides some leeway for the writer in terms of style and approach, but it still does not license him to stray from what can be considered *factual*.



■ A map of the military movements at the Battle of Little Bighorn

ACTIVITY

Compare and contrast the information about the Battle of Little Bighorn presented by Ambrose in the excerpt on page 389 and the battlefield diagram above.

1. Which of the representations of the Battle of Little Bighorn do you think conveys the most information? Each might be said to be a 'map' of the event, but are they setting out to map the same information?
2. Do you find one more reliable?
3. Do you find one more *effective?*
4. What do you think the primary objective of the historian is: to communicate reliably or effectively? Are these necessarily different?

KNOWLEDGE QUESTIONS

What role does the language used to convey knowledge impact the acceptance of that knowledge in the various AOKs? Are some AOKs susceptible to the impact of language? How do different AOKs manage the impact of language?

Aside from maintaining the reader's interest, however, the language used might genuinely alter the meaning and intent of the piece. You may have noticed that throughout this chapter we have used the slightly awkward phrasing 'the events at Wounded Knee'. This phrase is odd in that it is overly neutral and has little descriptive power – it merely suggests that *something happened* at Wounded Knee. This is purposeful because the language in which those events are usually described undoubtedly convey a particular perspective on the event. Generally, the events are described as 'the Wounded Knee Massacre', connoting unjust killing. The events there have also been called 'the Wounded Knee Battle' or 'Clash' or 'Conflict', and these connote something more like a pitched battle between two foes. The point is that the words used to even identify a historical event can colour the event in the mind of the reader. Historians must keep this in mind and *justify* their use of the terms. In this instance, we would prefer to use "massacre" in identifying the events at Wounded Knee, given the evidence provided by sources.

ACTIVITY

There are many examples of how language might colour how an event is understood.

1 Research the following terms and historical events and consider the role that specific use of language plays in the historian's attempt to construct a justified and reliable historical account of the events. Do you think the language used is *neutral*? Do you think the language used *should* be neutral?
   - Korean comfort women
   - The Rape of Nanjing
   - The July Fourth Incident
   - The War of Northern Aggression
   - Resettlement policies in South Africa.

2 Consider the history of your own country or region. Are there other, more personal examples of the importance of language in history?

3 Do you think that a historian would be justified in using some of the more connotative language (like 'massacre') in order to bring out a deeper truth about the events which might be smoothed over by less connotative language? What might your answer suggest about the *nature* of history?

DEEPER THINKING

Bias and knowledge consumption

Theory of Knowledge often prioritizes the *construction* of knowledge in the various areas of knowledge. However, a fruitful direction of analysis is to consider the *consumption* of knowledge by individuals who have not been part of the construction of that knowledge. You are a consumer of knowledge every time you read a book, listen to the news, listen to a podcast or browse someone's Instagram feed.

Given all that we've said here about how a historian must be on the lookout for their own prejudices, preconceptions and biases when constructing historical knowledge, how do you think your own prejudices, preconceptions and biases might impact your consumption of knowledge? Have you ever read something and immediately felt it must simply be false? Was this because you considered it or because you held certain assumptions and were unwilling to let go of them and consider new perspectives? Similarly, have you ever been surprised by some historical fact? If so, then this might be an example of you bringing assumptions and pre-existing ideas to the table but showing a willingness to allow them to be challenged.

As we consume information, we cannot help but bring with us a whole set of background beliefs, experiences and knowledge through which we access and engage with new information. What responsibilities do you think we have as consumers, knowing that we too are affected by our own prejudices and preconceived notions of the world?

ACTIVITY

Consider again the scientific method described in the Methods and tools section of Chapter 9 (page 311) and this section on the historical method.

1 What similarities between the two can you find? Do you think that they use broadly similar processes?

2 How might any similarities between the historical and scientific method apply to the question of whether, or to what extent, historical claims can be reliable?

3 Now consider the differences between the historical and scientific method. Why do you think these differences occur?

4 What is it about the nature or scope of science and history that might account for these differences?

■ What are the major differences between the scientific method and the historical method?

KNOWLEDGE QUESTION

Is bias equally inevitable in the production of knowledge in different AOKs?

CONCEPT CONNECTION

Responsibility

Understanding that the historical method is open to malpractice, historians are under some pressure to guarantee that both their source material and their own analyses are beyond reproach. Moreover, understanding the importance that communities place in their own shared histories, the role of the historian in helping to define group identity shouldn't be underestimated. (For more on this topic, see the Ethics section that follows.) Our histories tell us who we are to a great extent. This suggests that historians must take care when constructing knowledge, remaining self-aware in order to root out any manipulative perspectives. We should reserve accusations of bias for those historians who perhaps ignore this responsibility and try to manipulate the evidence or manipulate their readers.

CONCEPT CONNECTION

Truth

If knowledge construction is about finding out and articulating what is 'true' about the world, what, then, are we to make of the concept of truth, given all that we've said? To review, historians often select evidence and different historians may select different facts and evidence depending on their own perspectives. Despite there being a broad historical method, there are still many worries about the reliability of the historical endeavour. There can be no 're-running' of an historical event in order to find out what really happened; instead historians have to rely on whatever evidence happens to exist, and much of this evidence might be subject to manipulation and bias. Historians themselves might be subject to non-conscious bias which could manipulate or shape their own interpretations, not to mention the historians who try to manipulate their reader's understanding by crafting their own narratives to suit their purpose. It is not even clear how best to refer to various events without imposing an interpretation. These worries don't seem to bode well for the notion of historical truth.

In many respects, historians simply have to accept these problems and nevertheless continue applying the method in the struggle towards *reliable* knowledge. The historian (like the scientist) might do well to reflect on their use of the word 'true' and instead consider using terms like 'reliable' or 'confirmed'. This is *not* to suggest that we cannot fully endorse particular claims as undoubtable or certain. Calling a claim 'true' in the context of history, then, might be more like, 'This claim is well-justified by the available evidence. The interpretation of the evidence shows care and critical reflection and, while it might be speaking from a particular interest or perspective, it nevertheless maintains academic integrity and a responsible application of the accepted method.' It is a bit long-winded but captures the important elements of what makes 'good' history.

There is a danger here of reflecting on the nature of historical truth. We do *not* want to fall into the trap of first suggesting that 'there is no truth' in history, and risk opening up a hole which can be exploited by conspiracy theorists and 'truth-deniers'. We are *not* denying truth by suggesting that the concept of truth must be carefully considered in the AOK of history.

■ Auschwitz. The proliferation of conspiracy theorists underlines the importance of appropriate and reliable historical methods

What we are suggesting is that 'truth' is attainable, but the focus should be on 'reliability' and the reliability of a historical claim is tied directly to the quality of the evidence and interpretation. Thinking about historical truth in terms of the appropriate use of the historical method, does *not* mean that conspiracy theories like 'there was no Moon landing' or (far more importantly) Holocaust denial, can be 'true'. It means rather that the holders of these conspiracy theories are very poor historians. They appear to have allowed their own ideologies (such as a pre-existing deep distrust of government, racism or a wilful lack of intellectual humility in ignoring convincing counterarguments) to impact their application of the method. They ignore or wilfully misinterpret evidence, or develop interpretations that stray away from evidence and drift into fiction. They consciously produce texts and documents that exploit people's ignorance and fear to drive home a point. Whether or not some of them are morally corrupt is one thing, but the analysis here shows that they are very bad historians.

Ethics

The existence of harmful conspiracy theories and the misuse of history suggests that the work of the historian is important, not just in developing reliable claims about the world, but in providing a context in which we can understand the world and ourselves in it. There is, in other words, an ethical dimension to constructing historical knowledge. We've already discussed the responsibility that individual historians have to follow a method in a good faith attempt to weed out various cognitive biases. However, history also has an impact on individuals in profound ways. In this section we'll look at the importance of a free press and the damage censorship might play in developing later historical understanding of a period or time. We'll also be considering the role that a shared understanding of history might play for a community's or individual's understanding of themselves.

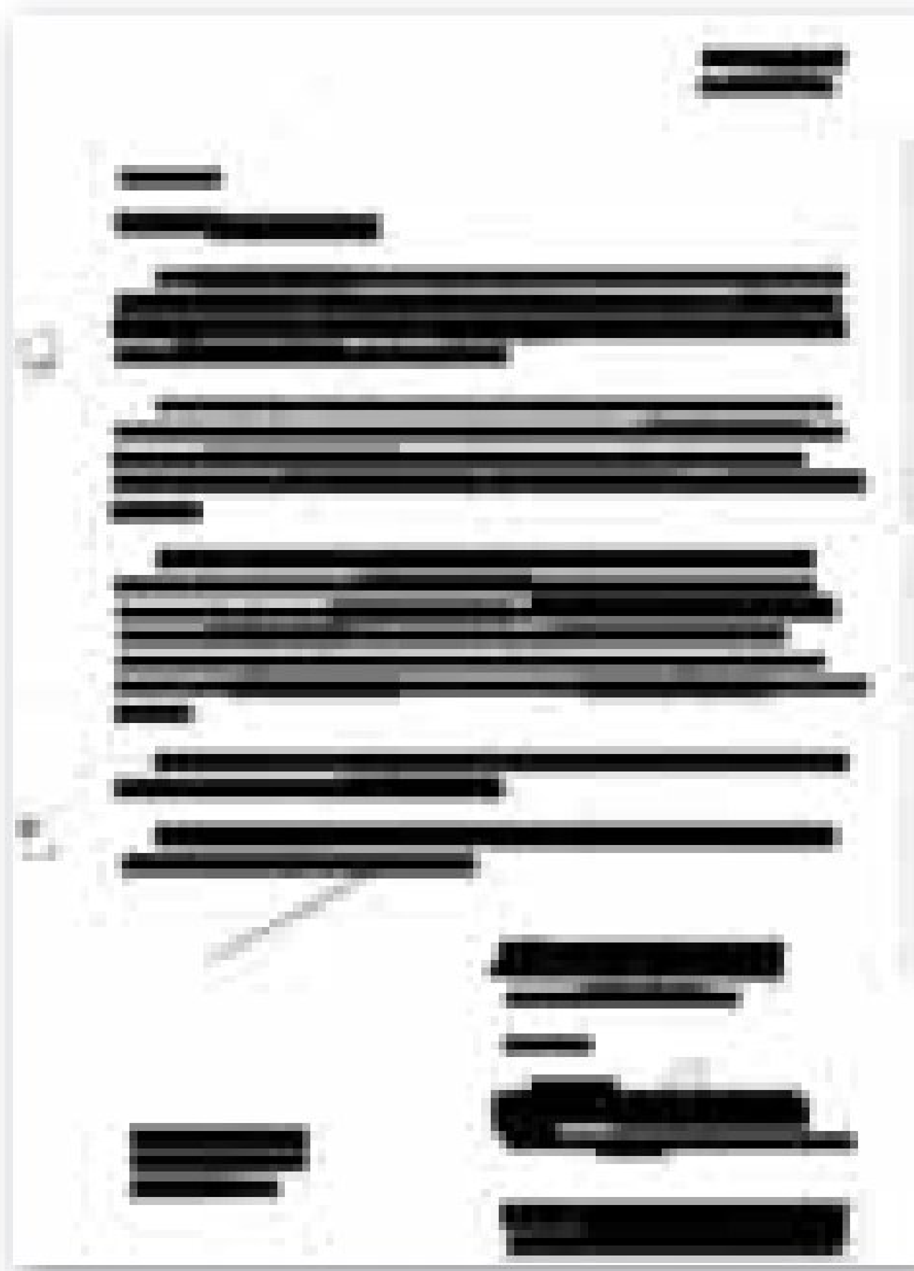
KNOWLEDGE QUESTION

Do historians have a moral responsibility to try to ensure that history is not misused and distorted by people for their own ends?

Journalism, censorship and history

One of the most popular discussion points in TOK is the question of censorship. Censorship is the deliberate limiting or constraining of information for some principle or ideological reasons. Censorship is about limiting people's access to knowledge which might be otherwise available. Examples of censorship include the movie ratings systems with which we are all familiar: some movies, because of their content, are rated as being only appropriate for people of a certain age. For individuals younger than the film's rating, this system *limits* the information available to those individuals. Many students will be familiar with the experience of a film being rated for one age in one country, but then another age in a different country.

Film rating systems, however, are not as controversial a form of censorship as others (nor does it have as much to do with history as an area of knowledge as other forms of censorship). Governments are often the main censors when it comes to access to knowledge. For instance, individuals working within a country's government will have different levels of security clearance and know more secret information about what their or other governments are doing than the general population. In many cases this seems perfectly reasonable: in any organization there is information which is perhaps best kept to those in charge of making the relevant decisions, rather than giving that information to everyone in the organization or country.



A redacted letter is an obvious form of censorship

However, there are instances where individuals feel that their access to information is *unjustly* limited – these are what we traditionally are worried about when we worry about censorship. One form of censorship is when journalists are censored, meaning their work is not allowed to be disseminated or when they are simply kept from reporting on or writing about certain events. This form of censorship means that knowledge of events which are happening in the world are kept from the general population. In most liberal democracies the 'freedom of the press' is a basic right and expectation. This is the idea is that journalists should be able to write about and say whatever they like (so long as they are not lying or simply making things up) and that this is one way that keeps governments from acting in irresponsible ways. If a journalist can write about, for instance, the human rights violations of a government, then people will learn about this and challenge the government with legal action or vote the responsible officials out of office.

What does the freedom of the press or censorship of journalists have to do with history as an area of knowledge or the ethical consequences of history? Though they are, of course, quite different in nature, the work of the journalist and the work of the historian have a lot in common. Journalism, in fact, has often been referred to as the 'first rough draft of history' (Shafer).

Journalism is the first rough draft of history.
Jack Shafer

ACTIVITY

1 Why do you think journalism might be considered as 'the first rough draft of history'? How might a historian use the journalism of the past in their work? What do you think the words 'rough' and 'draft' add to the idea? In what ways do you think the historian should exercise caution when reading past news reports in their research?
2 Now extend your thinking and consider how *important* you think the journalist's work is in relation to providing future historians with material. What would happen if journalists were *told* what to write, or were unable to write what they wanted because of government constraint? How might that affect a historian in the future?

The work of the journalist supports the work of the historian to a large degree. Consider the opening of this chapter: the report for the *Bismarck Weekly Tribune* has provided us as historians an account of an event which we can then use in our creation of the historical understanding of those events. In the terms offered by Collingwood, we can use the journalist's work as a way of uncovering both the outside of the event (a description of what happened) and the inside of the event (the motives and thoughts of the individuals involved). Journalists, in other words, *create evidence* which later historians might use in their own historical narratives. Journalists record events, create and gather eye-witness testimony and provide initial interpretations of events which become part of the 'historical record' which later historians can use.

Like historians, journalists are meant to take an objective stance, that is, their work must be based on *facts* accompanied by a reasonable and non-prejudiced interpretation of them. Journalists cannot make up facts and they are expected to make a reasonable effort to consider the influence of their own individual biases and prejudices. However, journalists, like historians, also make choices, deciding in many cases what *needs* to be reported, thereby imposing their own interests and goals. A journalist could cover anything they wanted to, but they may find some topics more interesting or more important than others. Some journalists have made names for themselves by actively seeking to tell very particular types of stories.

Censorship of the press, then, can be seen as an attempt by the censors to remove evidence or facts which later historians can use to develop historical narratives. Historians need facts to ground their narratives in truth and censorship is a direct challenge to truth.

Imagine now a situation where a country either dictates or refuses to allow journalists the freedom to report on what they see fit, or so constrains their work that they are unable to honestly report the facts as they see them. The effect of this is that the events which would have been reported on are no longer part of the historical record for later historians to make sense of. There are undoubtedly an uncountable number of events which have left no historical record, and which therefore cannot be part of any historical account, but imagine if certain events were never recorded. Or they were recorded in a way that only one party to the events wanted it recorded.

KNOWLEDGE QUESTION

How are other AOKs prone to censorship and what effect might this have on the general population's knowledge of truth in that field?

CASE STUDY

Marie Colvin

Marie Colvin died in February 2012 in Homs, Syria while covering the civil war there. She died in a rocket attack instigated by the Syrian government, who claimed that the city of Homs had only been populated by rebel forces. Colvin knew better. She and her photographer colleague, Paul Conroy, had pushed through Syrian lines into a neighbourhood Colvin knew to be populated by civilians to report on their plight. She and Conroy were in a make-shift media centre, from where she made contact with CNN and Channel 4 News to offer reports of what was happening.

These transmissions were picked up and traced by the Syrian government which, through a purposeful targeting strategy, finally pinpointed their location. Colvin and a French reporter Rémi Ochlik were killed in the blast and Conroy was injured. He escaped six days later with the help of local residents, many of whom would not escape Homs. They told Conroy, 'Your friends are dead, our friends are dead, their families are dead, most people are dead, the world isn't listening; if you get out, tell our story.' Conroy says, 'I made a promise to tell their story, and I take that seriously' (Moss).

Colvin's reports and Conroy's images and videos are not 'history' in the sense that they were not producing what professional historians produce. However, they were creating what we've called the 'first draft of history' in the sense that they were recording *facts* that historians can later use in the production of genuine historical narratives. Colvin made her career in seeking out and recording stories that otherwise would not have been told, stories that she felt needed to be told. This is similar to the choices that historians make when choosing to ask certain historical questions. Journalism, however, can lack the emotional distance, or the rational objectivity that is common to a historical account. But in some cases, like the types of stories Colvin wanted to tell, the historical facts speak for themselves. Colvin's recording of facts was purposeful and sought to directly engage with the politics of the time. For instance, in 1999, East Timor held a referendum on independence from Indonesia and Colvin's reporting of the subsequent crack-down from the Indonesian military put huge pressure on the UN to support East Timor's independence, which it finally gained in 2002 (Hilsum). Because the facts about the military quelling of dissent in East Timor and the direct military targeting of civilians in Homs speak for themselves, journalists like Colvin hold an incredible amount of power and purpose.

Use the QR code to view Colvin's final report for Channel 4 News on the horrific details of the war.

This would create a historical record that was either incomplete because of the omissions or manipulated because the facts are not honestly presented.

Journalists recording facts can be thought of as the construction of a collective *memory*, which is crucial to the construction of truthful histories and cultural identities. 'The memories that are public and enduring, not private and transitory', said John Dewey, 'are the primary material within which conscious and deliberate historians do their work' (Dewey 235). This underscores the *power* of the historian – by seeking out facts and creating narratives about those facts, societies have a process by which the individuals within that society might reflect on what sort of society it is and what sort of society they wish to live in.

KNOWLEDGE QUESTION

Is knowledge in other AOKs as important to know as it might be in history or politics?

ACTIVITY

There are often stories of journalists being harassed or targeted for the stories that they are trying to cover. Find such an article in a newspaper or online and research the story.

1 What facts is the journalist attempting to record?
2 How important do you think those facts are for future historians?
3 What do you think the impact of *losing* those facts might be?
4 What do you think are the motives and goals of trying to censor those facts?

History as myth

The preceding discussion of the *power* of historical narratives is an important one to discuss. A historical narrative can serve as the glue which binds certain communities together. We saw in Chapter 5 on Indigenous knowledge systems that people form communities around a common understanding of their shared experience. However, this role of history as a way of bringing communities together is not limited to Indigenous cultures. Consider your own country's 'national day' such as Independence Day (The Fourth of July) in the United States or 9 August in Singapore.

ACTIVITY

Use the QR code to watch Singapore's National Day 2019 official video for the theme song 'Our Singapore'.

Look for the ways in which the song, its lyrics and the images bring to mind the common understanding of Singapore's own history in the minds of its people.

1. What do you think the main goal of the video is? Is it simply a catchy tune or does it seek to do something more?
2. What role do the references to the country's past play and how does this link to the messages about Singapore's future?

Using the Singapore 2019 National Day theme song as an example, we can see how a common view of history can serve as a cultural glue which binds the community together. Singapore is still a relatively young country, having established its independence from Malaysia in 1965. It was previously part of the British Empire, and members of the 'Pioneer' generation (those who were alive during the transition to independence) are still alive and well. Maintaining a common vision of the struggles and difficulties of forging a new, modern and multicultural country out of the post-Second World War destruction and chaos has become central to Singapore's vision of itself. The National Day video makes this clear in its imagery (the black and white opening, the inclusion of a diverse range of people, but all clothed in the national colours) and lyrics (which remind listeners of the struggles, the goals and the successes they've enjoyed: 'And now we look around us and we see / A nation built with love for you and me / a land to treasure right down to the core / Our Home, Our Heart, Our Singapore) (National Day Parade 2019 Theme Song – Our Singapore).

This role of a shared view of a community's history is not to suggest that there is anything false about that view. Historians create their narratives from the facts they are able to identify and interpret, but sometimes that interpretation is aimed at providing emotional connections between individuals in a way that unites them. The Singaporean song doesn't necessarily offer facts, but a common vision about the nation's history, and serves to remind the community of how to view those facts.

Sometimes the historical facts themselves can serve as a binding agent to a community. In her 2017 book *Why I'm no longer talking to White People About Race*, Reni Eddo-Lodge opens with a long and detailed account of the historical facts about the black community in the UK. These facts are highly selective, but consciously so; she is aiming to tell a very particular story, which as we've seen is a common feature for historians. The book is not itself a 'history', but the historical survey in her opening chapters provide a common framework composed of statistical and cultural facts which remind the reader that this is what has been happening to the black community.

What we are suggesting here is that a community's history, told honestly but in a particular context, can take on a different role than simply interpreting what has happened in the past.

KNOWLEDGE QUESTIONS

Do other AOKs provide a cultural narrative in the same way or in similar ways as history? If history tells us who we are, do the human and natural sciences simply tell us what we are? Is there a difference?

Furthermore, this speaks to the *power* of history. History can take on a mythological status and by 'myth' we do not mean 'false stories'. In Chapter 5 (pages 169–172) we discussed one feature of myth as providing a community with a common narrative that both reminds the individuals of that community of who they are, but also provides a set of values that are common to the community. History can serve this function too. The linking of history to the concept of myth is to highlight the role that a shared understanding of a community's history can play in providing a set of values and goals for individuals by which they can orient themselves and help them find their place. These values and goals, developed through a shared understanding of its history, can provide a community with strong ethical values and guidance.

KNOWLEDGE QUESTION

Can knowledge from other AOKs influence a group's identity as much as historical knowledge might?

CASE STUDY

The Donner Party

Another example of how history can take on a mythical status might be the tale of the ill-fated Donner Party. In 1846, a group of settlers set out for California from the midwestern United States. They were trapped by severe weather in the mountains of eastern California and were forced to spend nearly four months of the winter snowbound with little food or other supplies. Of nearly 90 settlers, only 48 survived the winter, and some survived only because they had resorted to cannibalism.

While a clearly documented historical event, the history of the Donner Party did more than just teach generations of young Californians about the state's history. It highlighted a number of key values and beliefs that Americans were meant to exhibit: a sense of adventure, a struggle for individual merit, perseverance, commitment to the group, the inherent significance and value of struggle and an almost sacred regard held for the settlers of the west. In other words, the teaching of historical fact managed to take on a mythical dimension: Californian school children weren't taught this just for the sake of it, they were taught this to help guide them in life – it gave them an identity.

In the context of other stories of early US colonization and westward expansion, American school children developed an approach and identity which is in some ways quite different than other countries around the world. This regard for the settling of the west for many is at the expense of other stories from the Indigenous people who already lived in the area. Their stories are often simply not taught because they cast quite a different light on the stories of the American settlers.

Historians then, in their choices of content and emphasis also make *value* judgments. They therefore have something of an ethical obligation to reflect on the narratives they choose and to consider the consequences of their selections.

With today's globally mobile world there has arisen a new group of people some call 'Third Culture Kids'. These are young people who don't 'fit' into any one culture, but often have lived in many different places and sometimes have parents from two different cultures. The challenge for young people like this is that they don't have deep connections to any one community's history, so they find it difficult to identify with any one cultural or historical narrative. This underscores the point we are making here: that deep connections with and acceptance of a community's history provide a sense of identity and grounding which helps individuals fix themselves in an ever-changing and multicultural world. Having such a connection certainly isn't inherently *better* than not but does emphasize one role that knowledge of history provides.

CONCEPT CONNECTION

Values

Human values are developed in a variety of ways and the point here is that a shared understanding of the history of your community (or communities) can provide another source for them. These histories embody the knowledge of a community, but it is a sort of knowledge or a way of knowing that is never meant to have the same status of unambiguous scientific description. We don't tend to develop communities around facts pertaining to the velocity of objects sliding down a frictionless plane, or 'identify' with the respiration rate of algae in ponds, or the varying rate of exchange between currencies. However, individuals do use historical facts about, for example, the treatment of minorities, to develop their view of who they are, or use historical facts about the process of imperialism to develop their values.

KNOWLEDGE QUESTION

Do other AOKs influence culture as much as historical knowledge does?

The role of curriculum

ACTIVITY

Review your school's history curriculum. Keeping in mind that no history curriculum can ever cover 'all' of history (ie, it has to make choices and be selective), note what choices the curriculum developers (whether it be your teachers or an exam board like the IB) have made and reflect on those choices.

1. Are the curriculum developers prioritizing certain facts over others?
2. Are there particular values being emphasized over others?
3. What types of individuals, events or trends are being focused on?
4. Now consider what facts or elements are *not* being expressed. How would a student of history think differently about the past were those facts offered instead of others?
5. What might this suggest about the non-conscious messages offered by the selection of material to present in history?

Learner profile

Inquirers

How has your school's history curriculum contributed to your identity?

That a school history curriculum can impact one's general perspective on the world is well illustrated by a controversy that arose when the College Board exam board altered their Advanced Placement US History curriculum in 2015. The College Board suggested the new curriculum provided a 'clearer and more balanced approach to the teaching of American history' with 'statements that are clearer and more historically precise, and less open to interpretation or perceptions of imbalance' ('The 2015 AP US History Course and Exam Description'). Nevertheless, when it was published, many politically conservative writers suggested that the curriculum maintains an 'underlying bias' to politically liberal values, citing the following example:

> … it variously downplays, omits, and distorts the significance of the assimilationist ethos in American history. Instead of conveying the nature and importance of assimilation, the College Board projects a contemporary multiculturalist perspective onto earlier eras. This does an injustice both to the facts and to a theme that rightly serves as a foundation for successful civic education: assimilation. (Fonte and Kurtz)

In relation to previous versions of the curriculum, one local school board member suggested that history materials 'should promote citizenship, patriotism, essentials and benefits of the free enterprise system, respect for authority and respect for individual rights. Materials should not encourage or condone civil disorder, social strife or disregard of the law', which they felt were over-emphasized in the content on the civil unrest of the civil rights movement (Ganim). This brings out explicitly the fact that the very teaching of history can support wider ideological and

KNOWLEDGE QUESTIONS

Do the curriculum choices made in other AOKs matter as much as they might in history? Consider the choices your own school has made in the curriculum being offered in the sciences, or the arts or mathematics. What choices were available in developing the topics being taught? Do the choices made matter in the same way as they might in history?

political agendas, providing a framework for communal values by which we might live, and again underscores the ethical obligation historians have to reflect on the consequences of the choices and selections that they make.

This sort of controversy affected the United Kingdom as well. In 2013, the coalition Conservative and Liberal Democrat government sought to change the history curriculum taught in schools from the ages of 4 through to 16. Critics, this time from the left, suggested that the curriculum was too focused on British history, prioritizing a rose-coloured view of British imperialism and history, without due consideration of other major events and themes in world history (Mansell). About the proposed curriculum British historian Simon Schama argued:

> History is not about self-congratulation. It's not really about chasing the pedigree of the wonderfulness of us … Nor is it about chasing the pedigree of the reprehensible awful nature of us . . . History is meant to keep the powerful awake at night and keep them honest. (Furness)

History is meant to keep the powerful awake at night and keep them honest.

Simon Schama

ACTIVITY

1 What do you think Simon Schama means by this quotation? Can you think of an example of work that you've done in a history class, or from your own learning, that might be dangerous to 'the powerful'?
2 How might the work of this Theory of Knowledge course provide you with an awareness or skills which might be 'dangerous' to those in power?

What does this discussion suggest about the nature of history as an AOK? Not only do historians make choices about what topics they wish to write about and select among the evidence they wish to use, but the curriculum developers themselves also must make choices about what sorts of historical facts to teach *you* and what sort of context to place them in. These choices are all part of a wider perspective and they form a picture that is far from a neutral list of facts. The histories we learn and teach to those in our community provide a framework for developing the values of that community and an orientation for what those individuals will consider important or significant. The challenge is to develop this framework justly, that is, in a way that is the result of critical reflection and awareness of the impact on individuals in that community.

Conclusion

History as an AOK is an incredibly rich and powerful way to illustrate the main themes and approaches developed in the TOK course. We accept that history deserves its own area of knowledge, despite the fact that many see it as a version of a human science. Human scientists attempt to identify general laws or trends which, in a deterministic way, dictate our behaviour. Historians, however, construct narratives and explanations of the relationships between events in our past, sometimes between them and other past events, sometimes between events in the past and the present. History has far more freedom from anything like a rigid scientific method, though the responsible historian must still maintain what Collingwood calls 'a peculiar relationship to evidence' (Collingwood), meaning that the historian must ground their interpretation with reference to reliable historical facts.

Still, history moves well beyond those facts in developing connections and interpretations of those facts. The historian's goal is not to list or explain *every* fact, but rather to identify an issue or a topic and select facts relevant to that topic in order to show why that topic is important to us today. This link to value and meaning is one of the most powerful elements of history. While the subject matter of history is events from the past, we bring our histories with us into our present and extend them into our futures. We look to the past – to who we were and what we did – in order to help us understand who we are now. Thinking about it in the opposite direction, we also can use who we are *now* to re-examine and develop new understandings of where we come from and how we have changed and how we might continue to change. We cannot alter the facts of our past, but, as historians, we can revisit them and re-examine them in the light of new experience.

History is important. It supports us and guides us. It tells us who we are and who we need to be. Rick Williams, a member of the Lakota tribe, whose ancestors were at Wounded Knee, puts it this way:

> Wounded Knee happened yesterday. For Lakota people, Wounded Knee is today. Wounded Knee represents all the frustrations of those years and years and years on the reservation. Even though it happened in 1890, it's fresh in Lakota peoples' minds and in their hearts. That tragedy, that destruction, that devastating thing that happened to them, it exists today. It exists in our hearts and our minds, the way we think when we see about, when we talk about Indian-White relations, that's the first thing that comes to mind. We'll never forget Wounded Knee. ('Like Grass Before the Sickle')

CONNECTIONS TO OTHER AOKs

- **Scope:** Given that there are so many challenges to the production of reliable historical knowledge, is there any hope of anything like an objective historical record? If not, then what is the purpose of history? Does the relative objectivity of some other AOKs mean that they are better, or does history capture something more important that the others?
- **Perspectives:** History seems particularly susceptible to the bias of the knowledge producers and a responsible use of the historical method is meant to manage this impact. What is the effect of the personal circumstances of the knowledge producer on the knowledge in other AOKs? Are some AOKs better or worse at managing this influence?
- **Methods and tools:** Are the methods available to the historian enough to meet the challenges posed by the impact of bias? Do other AOKs suffer the same sorts of challenges? Are their methods better suited to weeding out bias and pre-judgments in the construction of knowledge?
- **Ethics:** The way we construct, record and transmit our own culture or group's history to ourselves and others impacts who we think we are. Do historians have a special responsibility in preserving a culture's or a group's identity and transmitting it faithfully to future generations? Should knowing our group's history matter in knowing ourselves? Do other AOKs have the same impact on self-knowledge as history might?

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12 The Arts

OBJECTIVES

After reading this chapter, the student will be able to:

- provide an effective definition of art
- appreciate the broad scope of the arts
- understand the role that art plays in human experience and culture
- explain what kinds of knowledge we can get from the arts
- understand the relationship between the artist, the artwork and the audience in terms of generating meaning
- understand the complex ways in which judgments about what constitutes quality in art are made
- appreciate the role of truth in the arts
- recognize the wide-ranging methods of making art and the important methods of interpreting art
- understand the role of ethics in the making of art
- understand the role of art in helping to form ethical viewpoints.

Learner profile

Communicators

How and what does art communicate to an audience?

ACTIVITY

1 Put each of the objects shown in the photographs into one of two categories: 'art' and 'not art'. Each object must go into one or the other of the two categories, but not both. Be sure that you can explain your reasoning when you are done – what feature or features did you use to differentiate between things which are art and things which are not art? For the purposes of this activity, consider the object in each photograph, not the photographs themselves. If the photograph is of a painting, you must consider the painting, rather than the objects in the painting.

2 Compare your two lists with those of some of your classmates. Share the decision you made about how to differentiate between things that are art and things that are not art.

Introduction

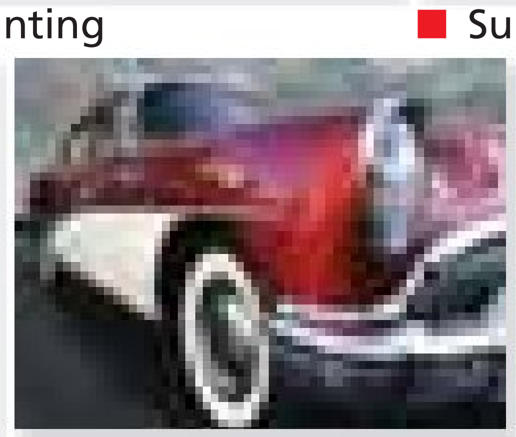

Cat

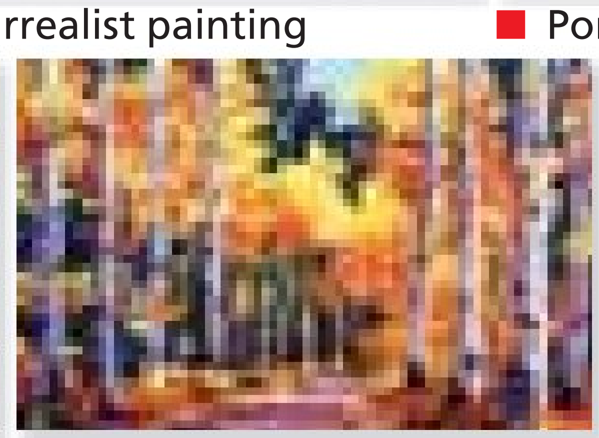

Aboriginal painting


Surrealist painting


Portrait of a young woman


Lawnmower


Car


Landscape painting


Tree


Indian wedding clothes


Child's painting


Sydney Opera House


Statue of Buddha

The activity required you to make two categories, but it is sometimes tempting to try to claim that what is art is a matter of opinion, and, therefore, everything is art. That argument is not very **compelling**, however, because if we try to claim that everything fits into some category, then we negate the category. If everything that exists could be called 'cat', for example, then we would not need a word to distinguish cats from all other things that exist. One important function of words, as we saw in Chapter 4, is that they have meanings which help us to know what things are and how they are different from each other. The fact that we have a word for art, then, means that there is a concept of what art is and that some things are not art.

◆ **Compelling**: Convincing.

KNOWLEDGE QUESTION

Are the arts best seen as a system of knowledge, a type of knowledge or a means of expressing knowledge?

In trying to determine which kinds of things do belong in the category called 'art' and which do not, we have to figure out what particular characteristics define art and differentiate it from other things. One feature that we often associate with art is beauty. If, however, we try to categorize the objects above into 'art' and 'not-art' based on whether they are beautiful or not, then we have two problems: first, we would have to include the cat, and possibly the tree, as both can be seen to be beautiful. Trying to categorize a cat or a tree as art is problematic because they are not things which are created by humans. The word 'art' is related to the word 'artificial', which is a word for things which are not natural – not part of nature – but which are created by humans. Dating back to the fourteenth century, the word 'artificial', in both the Old French and Latin referred to things which 'belonged to art' ('Artificial'). Given the idea that only objects which are artificial, or created by humans, belong in the category of art, we can eliminate the cat and the tree from the set above. We are still left with the question of whether beauty can be the determining factor.

CONCEPT CONNECTION

Subjectivity

What makes the use of 'beauty' as a differentiating factor problematic is that beauty is a highly subjective concept, and all 12 of the objects on page 403 could be seen as beautiful by different people. Perhaps the lawnmower or the child's painting might be the two objects which people might find difficult to call 'beautiful'. However, many people do find machines to be beautiful – a fact which is easier to see with the classic car, which has been restored to a gleaming treasure from the past. The lawnmower is also in pristine condition, shiny and new. It has a pleasing colour combination of black and orange. It also has what we might call sleek lines. The child's painting is not 'beautiful' in the strict sense of being visually attractive, but we can easily understand that to the parents of the child, the painting would naturally be beautiful as a reflection of their child's vision of the world.

The subjectivity of the concept of beauty means that 'beauty' cannot be used as a defining characteristic when we are trying to figure out how to tell whether something is art or whether it is not.

Another problem with trying to use the concept of beauty as a determining factor for deciding whether something is art or not is that we can also think of many objects which would be classified as art, but which are not physically beautiful. Consider this painting by Georges Braque, called *The Portuguese* (1911).

The painting is in the Cubist school. Cubism is a style which was developed by Pablo Picasso and Georges Braque. The focus is on flattening out objects so that the three-dimensional world is displayed in two dimensions. The image is not traditionally beautiful, and, although it is more than 100 years old, it is still considered to be one of Braque's masterpieces. It is in the collection of the Kunstmuseum in Basel, Switzerland.

Many other works are accepted and appreciated as art although they are not traditionally beautiful. Use the QR code on the next page to

■ *The Portuguese* by Georges Braque

listen to Delia Derbyshire's composition for the original theme of *Doctor Who*, written in 1963. The music might be quite familiar to you now, as the show has become **iconic**, but it is electronic music, and atonal. It was revolutionary in the time in which it was composed (Sherman).

◆ Iconic: Something that is widely recognized as being representative of its type because it is a perfect, or nearly perfect, example. To say that something is iconic implies admiration of that thing.

ACTIVITY

Do some research and find some recognized artworks in a variety of genres – including dance, poetry, and sculpture – which are not traditionally beautiful.

1. When were these works of art created? Are they all modern?
2. Can you find some art which is not traditionally beautiful from any time prior to 1900?
3. How do you know that these artworks are examples of art?

We have now made some progress in defining art: we know that art is something which is created by humans and that beauty, because it is too subjective, is not a defining characteristic. Where do we go from here?

In his essay 'What is Art and If We Know What Art Is, What Is Politics?', Tom Robbins defines art as that which has been created for the express purpose of appealing to our sensory receptors (Robbins 200):

> That is not to say that a work of art can't convey other, additional values, values with intellectual and/or emotional heft. However, if it's really art, then those values will play a secondary role. To be sure, we may praise a piece for its cultural insights, for the progressive statement it makes and the courageous stand it takes, but to honor it as 'art' when its aesthetic impact is not its dominant feature is to fall into a philistine trap of shoddy semantics and false emphasis. (Robbins 199)

Art exists, in other words, primarily, if not exclusively, for the sake of our desire to share our perceptual experiences with each other, to find out how the world seems to be to other people, and to determine whether what we experience is like what others experience or whether it is different. The work of art is the medium for this communication, and the perceptions it endeavours to convey are hard to pin down in direct, assertive statements.

KNOWLEDGE QUESTION

Do any of the other AOKs rely in such an integral way on the personal world view of the person who is working on generating knowledge? Why or why not?

Try, for example, to explain exactly how it feels to be absolutely thrilled to have achieved some goal – winning a race, or scoring the highest possible mark on an important test, or receiving a gift of something that you really wanted but did not expect to get. To use direct statements – such as 'I was absolutely thrilled!' – does not convey the intensity or the nuance of the feelings. The reader of that statement will know, intellectually, that you were happy, because you said so, but he or she will not experience that moment perceptually. The best way to ensure that the audience of a work of art experiences the feeling is for you, as artist, to provide an image or scenario or a metaphor or some other indirect means by which the audience will be able to experience vicariously (indirectly) some of the same happiness that you experienced.

One way to describe this kind of feeling is to say that art appeals to the aesthetic. 'Aesthetic' is a somewhat difficult concept. Most dictionaries will tell you that 'aesthetic' refers to things of great beauty, but as we have already seen, beauty is not a good standard for determining whether something is art or not – although many works of art are, of course, very beautiful! 'Aesthetic' is therefore not a very good adjective to describe the experience of engaging with art. A more nuanced definition of 'aesthetics', however, is that it is our ability to appreciate a work of art – or any object (Mastin), which includes our ability to judge whether it is beautiful or not.

Beauty is truth,
truth beauty …

John Keats

We can also expand our understanding of what 'beauty' means. In his poem 'Ode on a Grecian Urn', John Keats famously said, 'Beauty is truth, truth beauty …' That line gives us the insight that beauty does not have to be physical. We can experience a work of art which is not physically attractive and find in it something that we can connect to. That connection might be a revelation about human experience, insight into a mind which is like ours or which we can admire, or a truth about life. We can, therefore, find that work of art beautiful because of that connection. We can appreciate art, in other words, for many different reasons, not all of which have to do with the degree to which it is attractive to look at or listen to.

CONNECTION TO THE CORE THEME

Art, sense perception and emotion

The question of what 'aesthetic' means also requires an understanding about how you, as an individual knower, experience art. When Tom Robbins talks about art being something which is created specifically to appeal to the senses, he shows an understanding of how our senses and our emotions are related. William James, a nineteenth-century philosopher, first defined the connection between sense perception and emotions:

> If we fancy some strong emotion and then try to abstract from our consciousness of it all the feelings of its bodily symptoms, we find we have nothing left behind, no 'mind-stuff' out of which the emotion can be constituted, and that a cold and neutral state of intellectual perception is all that remains. (Damasio 129)

James explained that in order to experience any emotions we must first have a physical response to some stimulus. The brain translates that physical response into an emotion. Robbins was correct, therefore, because the emotional response that we experience – empathy, revulsion, horror, joy, suspense – when we experience any work of art has its roots in a perceptual reaction to stimulus. We see or hear a work of art, or possibly we can touch it, and our bodies react, physically, to the sensory information that we collect. We might get goose bumps, or our heart might start to race a little, or some of our muscles might tense up. Sometimes we might be moved to tears. Our brains translate those responses into emotions seamlessly, and what we generally notice is the emotional feeling, not the physical feeling.

If you understand the nature of an aesthetic response, you also understand something significant about how sense perception and emotion work to help us make knowledge in the arts. Other cognitive tools are also involved in that process, so it would be wise not to think that you only use your senses and your emotions in interpreting a work of art, as we shall see later in this chapter when we explore methods and tools.

KNOWLEDGE QUESTION

A sense of the aesthetic is important in the arts. Does it have the same kind of importance for knowledge generation in any other areas of knowledge such as mathematics or history?

We will take, then, Robbins' idea that art is that which exists primarily or solely for the purpose of fulfilling our aesthetic needs as our definition of art. Given that definition, we can see that some of the 12 objects in the photo collection at the start of this chapter are quite different from the others, in that they serve functional purposes. Table 12.1 shows how we can consider all 12 of the objects in terms of their **utility**.

◆ **Utility**: Usefulness. In this case, we are categorizing the items in terms of whether they are useful to humans for some practical purpose, as a tool, essentially, or not.

Table 12.1 Utility of objects

Living things	Objects created for practical or social uses	Objects created for aesthetic reasons only
Cat	Lawnmower	Aboriginal painting
Tree	Car	Surrealist painting
	Sydney Opera House	Portrait of a young woman
	Indian wedding clothes	Landscape painting
		Child's painting
		Statue of Buddha

ACTIVITY

Speak to your classmates. Do you agree with this definition of what constitutes art? If not, how would you define it? The ability to define what is and what is not art is important because until we can know what art is, we can't know what kind of knowledge we get from it.

So far, this categorization seems clear, but some of the items don't seem to sit easily in their columns. We can make an argument that the Sydney Opera House, the wedding clothes and the religious statue of Buddha were all created for a functional purpose. However, all of them also feature artistic elements not needed in order to make them function as they are intended to.

The purpose of building an opera house is so that it can be used for the staging of operas. The Sydney Opera House hosts a wide variety of events including plays, dance, symphonies, musical theatre and films. The opera house does, however, certainly have architectural features which go well beyond the simply functional. Sydney could have decided on a design for an opera house which was quite plain, so long as the acoustics inside were effective for music and the theatre was large enough to accommodate an audience. Instead, they chose a design which:

> 'was inspired by nature, its forms, functions and colours. The designer, Danish architect Jørn Utzon, was influenced in his designs by bird wings, the shape and form of clouds, shells, walnuts and palm trees. He looked upon nature for guidance when designing, as nature over time combined both efficiency and beauty, hand in hand'. (Ryan)

Many people think that the opera house looks like billowing sails on boats, an effect which is emphasized because of the position of the building out on a point in Sydney Harbour.

It is, of course, the shell design of the roof which makes the opera house so striking and memorable. Not only was that design not necessary for the opera house to function as intended, it also posed a huge problem for construction. Engineers struggled for years trying to figure out how to construct the shells. It was Utzon himself who finally worked it out, and the solution was revolutionary in architecture (Sydney Opera House). He claimed that his solution was inspired by peeling an orange. If combined, all 14 of the separate roofs would form a sphere (Ryan). This design, and the successful implementation of it, reveal that the builders of the Sydney Opera House cared about more than simple functionality, and its recognition, in 2007, as a UNESCO World Heritage Site suggests that people around the world appreciate the building for more than its function as well.

The wedding clothes are designed to be worn during a Hindu wedding ceremony. They are functional in the same way that all clothing is functional, to help preserve people's dignity and privacy and to keep them warm and safe from the elements. They have also been designed with features which are intended to make the clothing especially suited to the particular occasion and to ensure that it reflects long-held cultural traditions. The bride's gown is called a *lehenga* and it is very often red, because red is a symbol of happiness and good luck. The groom wears a tunic, called a *sherwani*, over trousers, called *churidas*. The turban is called a *Safa*, and the brooch on the turban is a *Kalgi*, and symbolizes respect ('Today's Bride'). The clothing helps to create the traditional ceremony which then connects the bride and groom to the long history of brides and grooms which came before them. It is also beautiful and helps to make the bride and groom the center of attention on an occasion that they will never forget. Wedding clothing in many cultures performs the same function, and it is generally never worn again. The money and effort spent in creating and acquiring wedding clothes reflects people's value for those clothes beyond the merely useful.

The statue of the buddha is the Phuket Big Buddha in Thailand. It was granted the name of Phra Phutta Ming Mongkol Akenakakiri by the Supreme Patriarch of Thailand in 2008. The name means 'Happiness on Top of Nagakerd Mountain' (Limrudee). The statue was built because some friends were hiking through the Nagakerd Hills and came upon the mountain top, which has spectacular views in every direction. It was a perfect viewpoint, and as time passed, they thought it would make a perfect place for a statue of the Lord Buddha ('Phuket Big Buddha'). The purpose for creating the Buddha, then, was reverence – to celebrate the Lord Buddha in an exceptionally beautiful natural site. The large statue is also dedicated to King Bhumibol, and so the site functions also to express respect and admiration for the king. Finally, it has become an important

KNOWLEDGE QUESTION

Does the relationship between functionality and the aesthetic feature in any other AOK as part of its scope, or as part of any other aspect of the AOK?

tourist destination in Thailand, with as many as 1000 visitors a day ('Phuket Big Buddha'). Visitors to the site can pay a fee to leave messages in memory of loved ones who have passed away. The Buddha has been designed with an artistic ideal in mind. It is made out of concrete and then layered with Burmese white jade marble to reflect the light.

All three of those objects – the Sydney Opera House, the Indian wedding clothes and the Phuket Big Buddha – feature strikingly artistic characteristics, but all of them have specific functions other than the aesthetic. One is a place for entertainment, one provides physical protection and symbolic significance during a ceremony and one is the object of reverence. In Table 12.1, we have put the first two in the middle column based on the idea that the practical functionality of the object is greater than the artistic function, while we put the Buddha in the last column, based on the idea that reverence is an aesthetic experience, and so the functionality of that work of art is mostly, if not entirely, aesthetic.

TOK trap

It can be tempting, when writing about the arts for your TOK essay, to claim that everything is art if you want it to be art. Such an overly-simplified claim is likely to lead to weak arguments. You will do much better if you can make a more sophisticated argument based on a clear definition of what makes something art. We have offered one here: art is that which functions only as art.

We have seen that, while many objects can easily be classified as either art or not art using that definition, some objects are still more difficult to classify. Remember, when you are classifying things according to a particular definition, there are no 'right' or 'wrong' answers; instead, your job is to define your category and then justify your choices as to what belongs in the category.

Perhaps you would prefer to categorize the Sydney Opera House as art because of its extraordinary architecture, or perhaps you would prefer to classify the Phuket Big Buddha as functional because of the tourist industry it has inspired. You must present in detail the thinking which justifies your decision. The most sophisticated answers will demonstrate your understanding of the reasons that the classification is a problem by pointing out the tension between the characteristics that would seem to make the object art and the characteristics which would seem to make it a functional object.

ACTIVITY

After you have completed this activity you can check your answers by using the first QR code.

Now that you have read the discussion about how to define a work of art, classify each of the following things in terms of whether it does or does not fit the definition of art. Be sure to explain your reasoning.

- Advertising jingle (use the second QR code).
- T-Mobile dance (use the third QR code) – consider the dance itself and the video of the dance.
- Totem pole – consider the totem pole itself and the photograph of the totem pole. You may need to do a little research on the role of totem poles in Native American societies such as the Alaskan Tlinget people.
- Concept graphic – animals in clothes.

One final observation is that we have been considering here the question of what art *is*. The question of whether something is *good* art is a separate question altogether. We will consider that question in the Perspectives section later in this chapter.

Scope

What kinds of things are art?

We have seen already that the arts encompass many different genres, including painting, sculpture, dance, theatre, music, literature and so on. Within those various forms, there are also many different media. Music, for example, ranges from religious music to rap music, to classical music, to musical theatre and many more. Drawing and painting includes work in ink, pastels, pencil, charcoal, watercolor and oil paint.

We have seen in Chapters 8 to 11, that mathematics, the natural sciences, the human sciences and history each have a particular content focus, a particular aspect of the world and human experience which the practitioners of those areas of knowledge try to understand. In natural science, for example, the focus is on physical characteristics of the Universe, while in history, the focus is on the facts and connections among events which have happened in the past. The scope of each of those areas helps to shape the nature of the inquiry and the methods that practitioners use in order to make knowledge in those areas.

When we come to consider the scope of the arts, however, it is harder to identify a particular segment of the Universe or of human experience on which the arts focus. Table 12.2 lists some works of art and their subjects – the content on which the artworks focus. Use the QR codes to find out more about each work:

KNOWLEDGE QUESTION

Is the question of what constitutes the scope of any other area of knowledge contentious in the same way that it can be contentious in the arts? Why or why not?

Table 12.2 Works of art and their subjects

Artwork	Content
Film: *Life of Brian* by Monty Python (England 1979)	Religious satire
Novel: *The Handmaid's Tale* by Margaret Atwood (Canada 1985)	Imaginary dystopian society in which there are only a few fertile women and they must serve wealthy men, whose wives cannot bear children
Poem: 'The Cat's Song' by Marge Piercy (USA 1992)	Cats and the relationship between cats and people
Poem: 'Pi' by Wislawa Szymborska (Poland 1976)	The number pi – mathematics

Artwork	Content
Play: *Rosmersholm* by playwright Henrik Ibsen (Norway 1886)	Politics, marriage, guilt and suicide
Painting: *The Roll Call* by Elizabeth Southerden Butler (England 1874)	Soldiers after a battle in the Crimean War
Painting: *Lady with an Ermine* by Leonardo da Vinci (Italy 1489–90)	Portrait of the mistress of an Italian Duke; an animal
Sculpture: *The Thinker* by Auguste Rodin (France 1880)	Human form, representation of what it's like to think deeply
Music: *The Flight of the Bumblebee* by Rimsky Korsakov; played by Wynton Marsalis (Russia 1900)	Sounds which represent bumblebees
Opera: *Rinaldo* by George Frederic Handel (England 1711)	Christian crusade of 1099; battles, love affairs, an enchanted palace and spirits

KNOWLEDGE QUESTION

The scope of the arts ranges through many of the other AOKs. Does the same thing happen in history or the human sciences?

This very small collection of ten artworks in eight different media from eight different countries and four different centuries shows us that the subjects of artworks range across many different topics and experiences. This little collection includes art about war, religion, mathematics, human relationships, insects, politics, human psychology and cats.

ACTIVITY

1. Looking at the list of artworks in Table 12.2, could the subject of all of those be explored in other genres? Could, for example, an exploration of mathematics such as the one that Wislawa Szymborska did in her poem 'Pi' be done in music or sculpture?
2. Are there some subjects which can only be explored through a particular kind of art?

Artists make art about things that they observe and things that they experience. The movie *American Beauty* features an artist, a young moviemaker, who makes a film of a plastic bag blowing in the wind. He describes his observation as the 'the most beautiful thing I ever filmed' and says it is the moment at which he realized that '… there was this entire life behind things, and this incredibly benevolent force that wanted me to know there was no reason to be afraid'

ACTIVITY

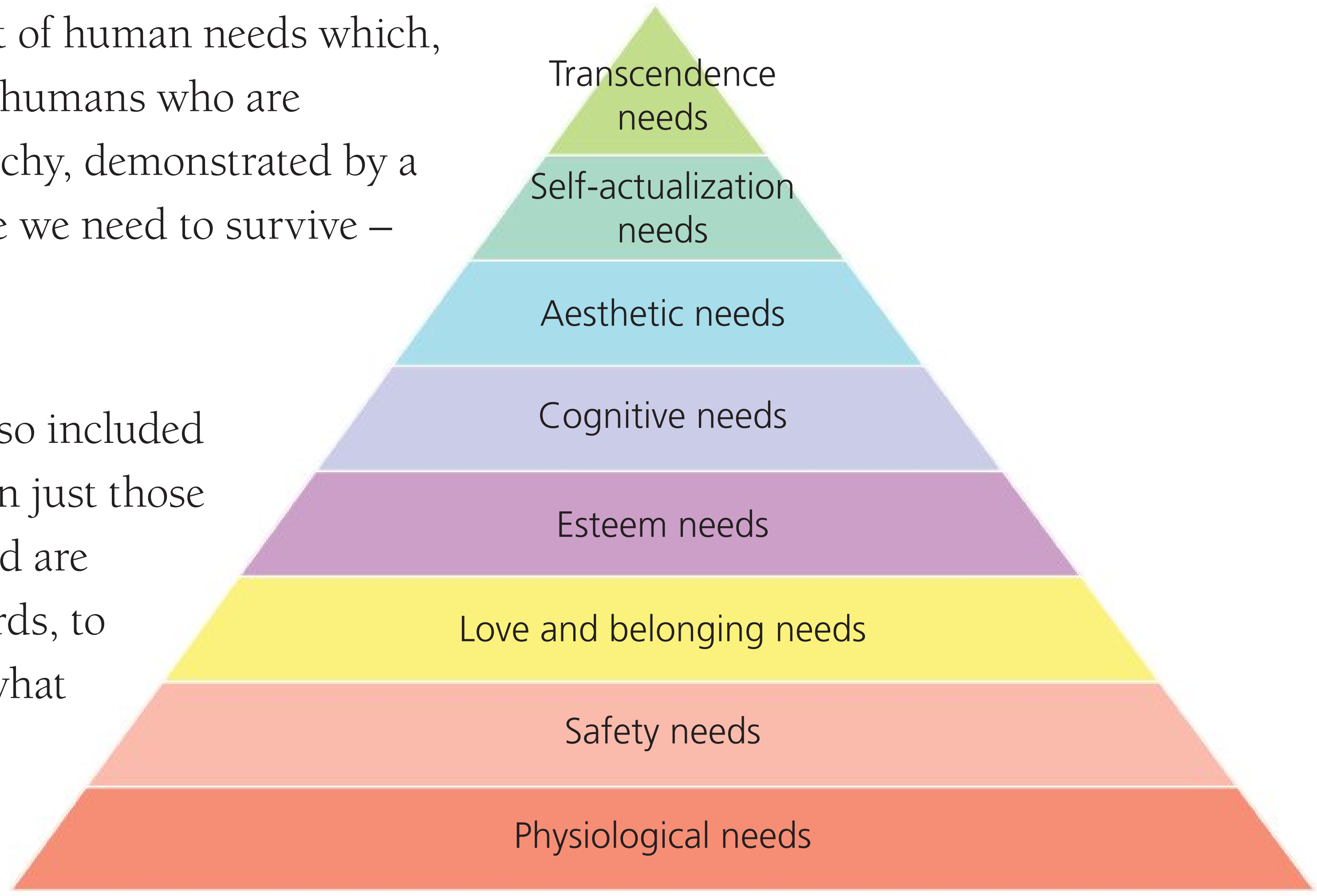
Can you think of any object, experience, emotion or other element of our internal and external experience which an artist could not use as an inspiration for a work of art?

(*American Beauty*). The scope of art, it would seem, then, includes anything that it is possible for an artist to observe or experience.

Why do we need art?

In 1943, psychologist Abraham Maslow proposed a set of human needs which, he claimed, described the needs which are fulfilled in humans who are psychologically healthy. He presented them in a hierarchy, demonstrated by a pyramid, in which he put the most basic needs – those we need to survive – at the bottom. We touched on the hierarchy briefly in Chapter 1 (page 8).

As you go up the pyramid, you can see that Maslow also included the kinds of needs that make people happy, rather than just those which help people survive. Near the top of the pyramid are the aesthetic needs. Humans have a need, in other words, to pursue sensory stimulation and an understanding of what beauty is and means. Engagement with the arts comes under that heading. Another relevant step on the hierarchy is what Maslow called 'self-actualization' needs – the need each individual has to fulfill his or her unique potential (Vinney).



Maslow's hierarchy of needs

Artists pursue art because of their unique personal desire and ability to produce art. But people who do not themselves create art can also be seen to pursue engagement with the arts as part of fulfilling their own unique potential. The arts stimulate the intellect, the imagination and the emotions, and many people find that complex response to be exciting, energizing and fulfilling. Although the arts are not necessary for what Maslow identified as being the most basic needs for survival – biological and physiological needs and safety needs – we can see how much time, money and effort is expended in pursuit of artistic experience. Let's consider music as an example.

As reflected by the amount of money they spend on it, fans in North America and the United Kingdom appear to place a high value on live music. In 2015, music fans in the UK spent more than £2 billion (approximately US $3.1 billion) on concerts and music festivals (Sayid). Concert ticket revenues in the US and Canada have risen from approximately $1 billion in 1996 to $8 billion in 2017 (Watson 2018). A Taylor Swift tour in North America earned $277 million in 2018 (Watson 2019). In Canada, more than half of all music spending in 2016 was for live music events (IQ Live Music Intelligence). In 2019, English songwriter Ed Sheeran's *Divide* tour broke the all-time record for earnings on a music tour, making a total of $776.2 million. More than 8.5 million people saw him perform, across 258 shows (nypapers.com).

In Japan, music also generates tremendous revenues, but in that country, most of the money spent is on physical media – CDs and vinyl. There are 6000 music stores in Japan, as opposed to only about 1900 in the United States, and only 700 in Germany, which has the third-largest number in the world. Nearly 80 per cent of music sales in Japan are for physical media; in 2016, Japanese music consumers purchased approximately ¥254 billion ($2.44 billion) worth of music a year – most of it in the form of CDs (Looi). This makes the Japanese music market the second biggest in the world, after the US.

In Brazil, music streaming services have brought Brazil back to the top ten in music expenditure, after a decade of decline (Darlington). In that country, 70 per cent of music sales goes to streaming services.

Learner profile

Reflective

How do both artists and audiences use art to help them reflect on their lives and beliefs?

KNOWLEDGE QUESTION

Does the amount of money spent in the arts relate to the knowledge which is made in the arts in the same way that the amount of money spent in the sciences does? Why or why not?

ACTIVITY

1. Do you think that the amount of money spent on music and musical experiences is a good indicator of the importance of music in our lives?
2. What do you think accounts for people's desire for engagement with music?
3. Do you and your friends spend a significant amount of time and/or money on music or other art forms? What do you personally get from your engagement with the arts?

CONCEPT CONNECTION

Culture

One important aspect of the scope of art is that it is a reflection of culture. The kind of art which is created and loved reflects the features and values of the culture in which it is created. Art very often plays an important role in cultural rituals such as weddings, festivals, holidays, religious services and other cultural ceremonies. Art can also become a historical record of events that occurred in a particular culture. In 1941, painter Jacob Lawrence, for example, painted a series of 60 paintings which illustrate the experience of what was known in the United States as the Great Migration – the moving of a million African Americans from the deep south to the industrial north after the start of the First World War. Use the QR code to view the series. Be sure to hover your cursor over the introduction to read about the collection.


A painting from Jacob Lawrence's *Migration Series*

South African playwright Athol Fugard wrote a play in 1982 called '*Master Harold'… and the boys* which is set in South Africa during apartheid. Apartheid was a legal system of racial separation which lasted from 1948 to 1994, and by which the majority population of black Africans was controlled economically and physically by the minority white population, descended from the seventeenth-century Dutch settlers. The play has a very strong personal focus: it explores deeply the effect of this inherited power on 16-year-old Hally – on his judgment, his emotions and his best relationships – but it also serves as a powerful condemnation of the institution of apartheid and provides viewers with a rich insight into what it was like to live with those restrictions.

Preserving the historical record is not, of course, the only cultural function of art. Much art contributes to celebration and to the binding of people together.

What can we know through art?

We have seen, now, that art can explore and represent many different objects, ideas and experiences. This leads us to the question of what those explorations and representations mean in terms of knowledge.

Artists aim to share their worldview and to shape the worldviews of others. In the Methods and tools section, we will explore in more detail how this happens. For now, we can just consider that a work of art is the product of an artist – or, in some cases, a group of artists. That product is shaped by the artist's personal experiences and worldview, and by their values, beliefs, ideals, and hopes. Some kinds of art convey a message, an idea which can be put into words. Other works of art create a feeling which is harder to put into words.

Use the QR code to listen to poet Clint Smith perform his poem 'A letter to five of the presidents who owned slaves while they were in office'. The text of the poem is also on the webpage. This work of art has a specific purpose: it challenges the version of US history which has been taught

KNOWLEDGE QUESTION

Can art change the way we interpret the world?

to children for the past 200 years. Smith explains his view of his purpose at the end of the performance when he says, 'And this is my Brief But Spectacular take on complicating the history of the United States' (PBS NewsHour). In the poem, we can see how the poet's own life experience has shaped his ideas about the history of the United States and how it is badly taught and how it ought to be taught better. We can consider this poem in terms of what the author intended for us to think about and even, possibly, in terms of what he would like his audience to do as a result of reading or listening to his poem.

Not all art has such a clear purpose, however. Consider the photograph below.

■ *Portrait of a Young Woman With Cage* by George Mayer

It is difficult to say what this photograph might 'mean'. We don't have a story to consider. We just have two familiar things – a bird cage and a woman – which are presented in a completely unexpected way. The woman is not entirely caged, and we don't know whether the cage is coming on or coming off, or whether she has put herself in the cage and is holding it on deliberately, or whether she is trying to remove it. The knowledge that we can get from such a work is probably going to be knowledge in the form of an emotional reaction, more than it is going to be knowledge in an intellectual form which we can express in words. Perhaps this image makes you feel uncomfortable, because the woman seems trapped. Perhaps it makes you feel hopeful – maybe she is escaping from the cage, rather than going into it. Whichever of those beliefs you have depends largely on you and your past experience, and whether you tend to be more hopeful or more pessimistic. The interpretation of this photograph is quite a different process from interpreting Clint Smith's poem.

KNOWLEDGE QUESTION

Interpretation is an important concept in the process of making knowledge in the arts; how does interpretation function similarly and differently in history and the natural sciences?

Danish-Icelandic artist Olafur Eliasson describes the importance of art in an article entitled 'Why art has the power to change the world'. He contrasts the effect of art on viewers with the effect of a lot of data and statistics. He suggests that statistics and data can overwhelm us, making us less able to process what is happing around the world – even with regard to big problems like global warming. He says that art, on the other hand, has the capacity to help us understand the world better:

> Giving people access to data most often leaves them feeling overwhelmed and disconnected, not empowered and poised for action. This is where art can make a difference. Art does not show people what to do, yet engaging with a good work of art can connect you to your senses, body, and mind. It can make the world **felt**. And this felt feeling may spur thinking, engagement, and even action. (Eliasson)

This description of the power of art is very similar to what we saw with Tom Robbins' definition of art. Both suggest that one kind of knowledge that we can get from art, in other words, is **visceral**, a sensual understanding of the reality of the world around us. Eliasson says that what artists strive for is to touch the emotions of the audience. We often use the term 'moved' to describe the effect of something which touched our emotions deeply. Eliasson suggests that that term can be seen as literal as well as metaphorical: we can be moved to an understanding that we have not ever had before. Art, he says, is a transformative experience (Eliasson).

◆ **Visceral:** An adjective which describes a kind of knowledge which is felt, rather than understood in your mind. The word 'visceral' relates to the word 'viscera' which is the name for all of your internal organs. The suggestion that you know something viscerally is the suggestion that you feel it, as you sometimes feel something in the pit of your stomach.

Art as social commentary

So far, we have seen that some of the knowledge we can get from art is intellectual – ideas about the world around us – and some of the knowledge we can get from art is emotional, as with the intuitive reactions we might have to a photo such as Mayer's *Portrait of a Young Woman with Cage*, and as described by Olafur Eliasson. That consideration of what kind of knowledge we can get from the arts focused on the personal – what an individual might get from the arts. We can also consider what kind of knowledge a group or a society might get from a work of art. One very common feature of art is social commentary. If art creates a comment on society, that comment is usually to some degree critical, and the desire of the artist is very often to encourage change for the better.

Eliasson's idea that art can change the world focuses on the effect that art can have when it changes one person at a time, making each member of the audience more aware of the world and more aware of his or her feelings. Many works of art, however, seem to have a more direct desire to change the world – not just the feelings of an individual viewer, but the actual conditions of a given society or culture.

KNOWLEDGE QUESTION

Does the role of art in making social commentary relate to the kind of social role of natural science that we saw in Chapter 9?

In 1910, British playwright John Galsworthy wrote a play called *Justice,* which depicted the cruelty of the penal system and the effect it had on prisoners who were completely broken down by that system. Home Secretary Winston Churchill and Sir Evelyn Ruggles-Brise, then Chairman of the Prison Commission, attended the opening night of the play, and the play influenced their decision to reduce the amount of time prisoners could be made to spend in solitary confinement (Nellis 61). This event provides us with a rather striking instance of the power of art to cause social change. Interestingly, though, the changes that resulted from the play occurred because it reached two influential men. The art gave two individuals insight into a truth about the society in which they lived, and those two men had the power to make a change. The play did not necessarily have to reach a wide audience or to change the minds of many people in order for it to have a social effect. Had Churchill and Ruggles-Brise not seen the play, perhaps no change would have come about, even if many audience members felt empathy for the plight of prisoners. It is more difficult to come up with examples of artworks which first affected many members of a society who then, as a result of their exposure to the art, agitated for change and put pressure on those in power to effect those changes.

That does not, however, mean that art cannot have an effect on a society at large.

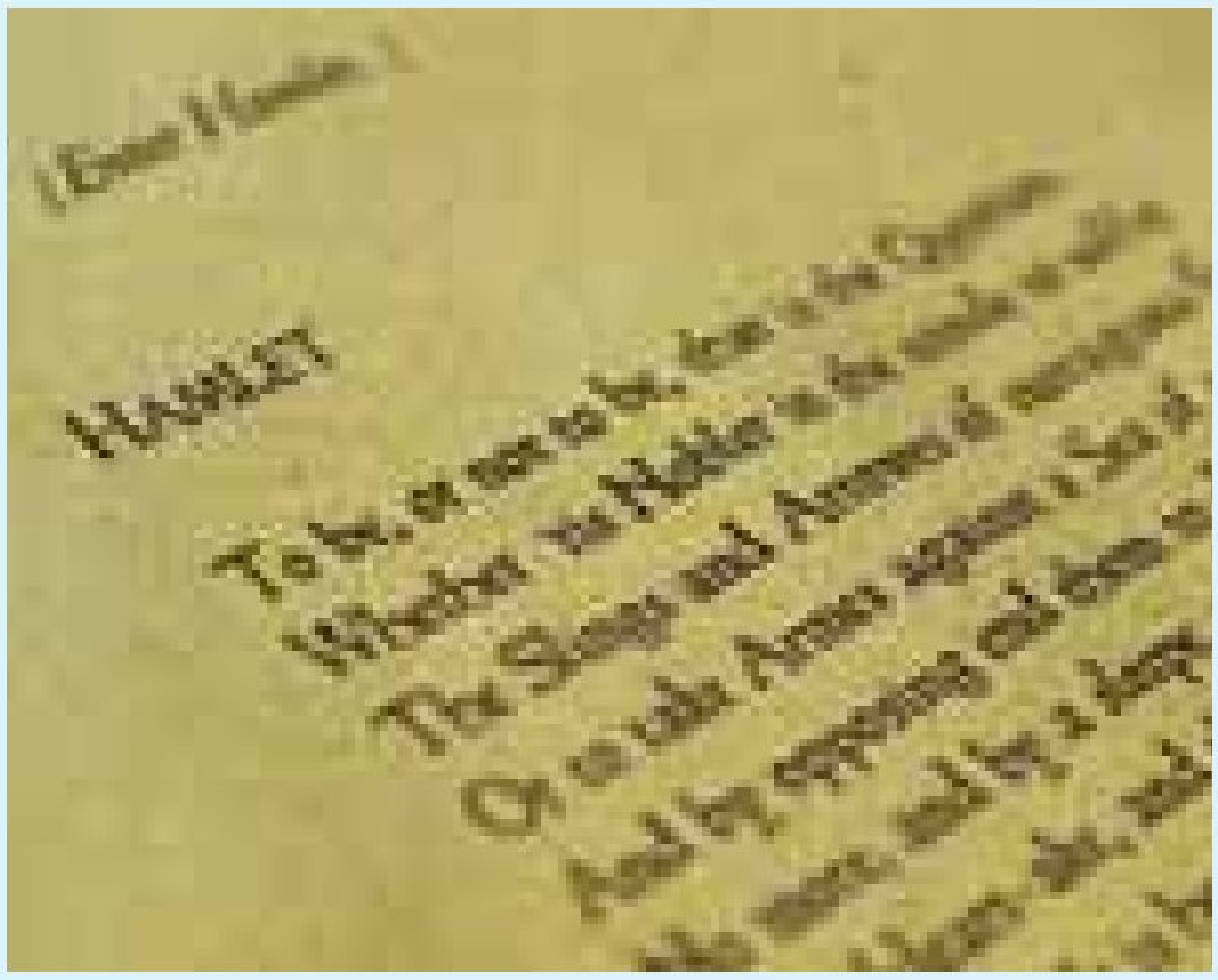
CASE STUDY

Hamlet in the Soviet Union

Hamlet is the story of a young man whose father was murdered and whose right to the throne was usurped by the murderer – his uncle. Hamlet spends the play observing what is going on in the court, seeing what others apparently either do not see, or do not want to acknowledge. He is also famously indecisive – trying to figure out what is real and what is right before he acts. In the end, of course, he overthrows the usurper – although with tragic results all around.

Artists in the Soviet era saw much opportunity in this story to comment, subtly, on the authoritarian rule in the Soviet Union. Boris Pasternak, who translated most of Shakespeare's work into Russian, saw Hamlet as a Christ figure. His translation emphasizes Hamlet as the person who challenged those in power, and his assassination as a politically motivated murder which made Hamlet a martyr (Conroy 25). Stage productions could be understood to be equating Stalin with Claudius, usurping Lenin's role and eliminating rivals such as Leon Trotsky (Sillito). Audiences could attend performances of *Hamlet* and see in them their own feelings about the oppressive government, sharing their fears and frustrations silently, without having to risk saying anything publicly which could bring down retribution. There was a long history of this kind of communication between authors, directors, performers and audiences, known as 'Aesopian language' in Russia. 'Aesopian language' is the use of allegory, allusion or satire as a means of avoiding direct social criticism (Carmeli).

The state of affairs with *Hamlet* as a sort of communal silent protest did not last, however. In 1941, an 'offhand remark' by Stalin about a rehearsal of *Hamlet* was enough to shut down that production altogether: 'the very idea of showing on the stage a thoughtful, reflective hero who took nothing on faith, who scrutinized intently the life around him in an effort to discover for himself, without outside "prompting", the reasons for its defects, separating truth from falsehood, the very idea seemed almost "criminal"' (Mendel 733–4). Stalin's 'remark' led to a 12-year hiatus during which *Hamlet* was not performed – though not officially banned – until Stalin's death in 1953 (Pitzer). Following his death, productions of *Hamlet* flourished. 'After Stalin's death, there was a veritable "*Hamlet*-mania" in the USSR and productions sprang up making pointed comparisons between the "prison" of Denmark and the Soviet Union and between Claudius and Stalin' (Conroy 28). Between 1954 and 1957, there were 300 productions of Shakespeare's plays in the Soviet Union (Samarin, *et al*). Many of these productions also used allegory or satire to comment on the state of the government: for example, a 1954 production of *Hamlet* in Moscow directed by Nicolai Okhlopkov depicted Denmark as a prison behind an iron curtain. The stage set consisted of eight massive iron boxes with gates which could be opened or closed (Kennedy 191–2). When the gates were closed they would look like a solid iron curtain. The eight boxes or segments represented the eight satellites of the Soviet Union.



Can a piece of art function as social commentary, even when the artist died hundreds of years ago?

Hamlet did not cause any social change in the Soviet Union, but Stalin was uncomfortable enough with it that he caused it to be banned in a **de facto** way, if not formally. Perhaps he was afraid that it might have the power to influence people to rise up against his rule. Although it did not lead to a revolution, the play did help people to form a bond of shared experience. In the years after Stalin's death, the near universal love of Shakespeare's work and *Hamlet* in particular could be seen in the many productions, as mentioned previously, but also in people's names.

In Armenia, many people have the first name Shakespeare. A famous Armenian football player is named Henrikh Hamlet Mkhitaryan. In Lithuania, rock star Andrius Mamontovas played Hamlet from 1996 until at least 2012 (Sillito). Shakespeare's work is beloved throughout the former Soviet Union. In part, Stalin's failure to ban it outright sent a message to the people that Shakespeare could not be banned – he was bigger than Stalin, a symbol of freedom. That love continues today.

The question remains: can art ever change the world through a sort of mass movement in response to an artwork? Or is art inherently personal, changing minds one at a time? At the very least, we can see that art can serve as a cultural icon, and the knowledge it can give people in a whole society is the knowledge that there is always hope.

◆ **De facto**: A Latin phrase meaning 'in effect'. In this case, although there was no official ban on performances of *Hamlet*, Stalin's dislike was enough to cause people to choose not to produce it for fear of angering him, so in effect there was a ban on *Hamlet* for the remainder of Stalin's life.

EE links

The exploration of the function of artists in the Soviet Union could be a good research study for an extended essay. You could develop a question such as: 'How and why did Stalin control the output of artists during his reign in the Soviet Union?'

We have seen, now, that the scope of the arts is both broad and deep. Art can take many different forms, and it can encompass any subject. It serves both cultural and historical purposes, and it plays a significant role in helping people achieve emotional and psychological health. In the next section, we will consider different perspectives on art, in terms of what counts as art and what counts as good art, as well as in terms of what individual works of art mean.

KNOWLEDGE QUESTIONS

Is knowledge in the arts useful in the same way that knowledge in the sciences or mathematics can be seen to be useful?

Is the role that having or not having background knowledge plays in making knowledge in history similar to or different from the role it plays in the arts? Why?

Perspectives

Artist and audience

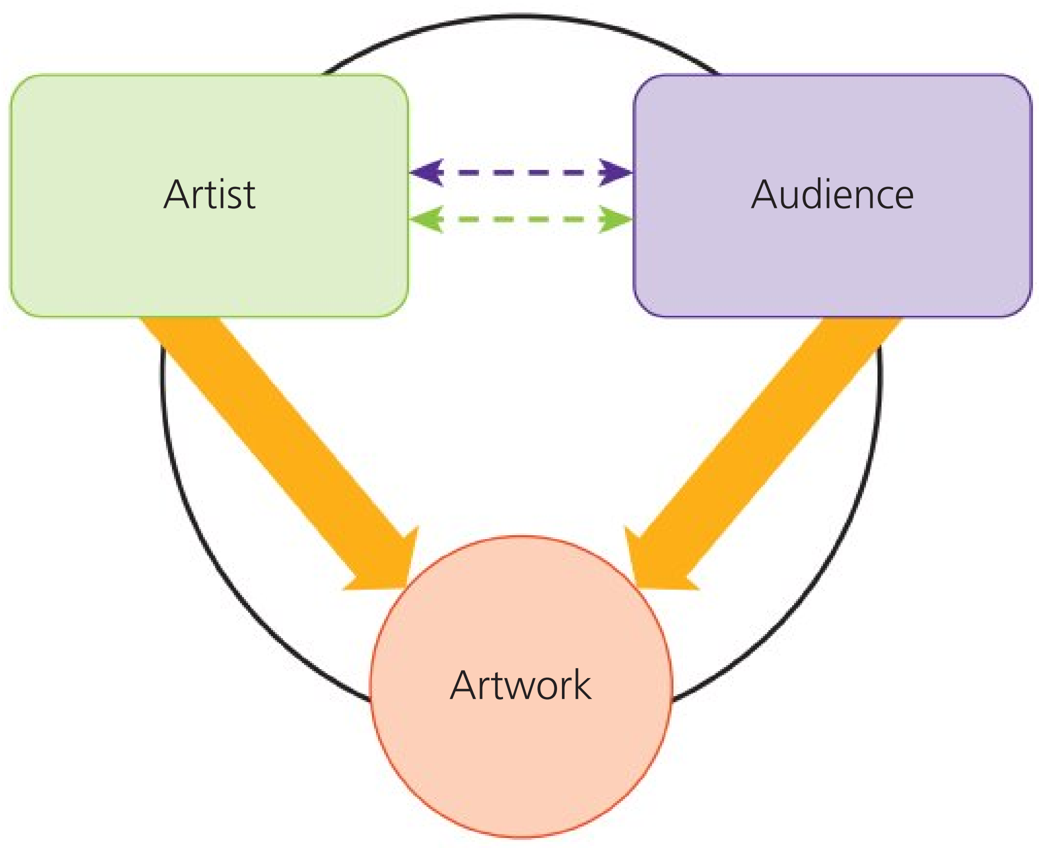
Two important perspectives in terms of making knowledge in the arts are those of the artist and the audience. You may have learned in your Language A class that making knowledge in the arts is an indirect process. You almost never have access to the actual artist to speak to or ask questions of; you have to try to discern their meaning through the work of art itself. The meaning of a work of art is constructed by the audience of that artwork (we will examine this process in much more depth in the next section), who tries to work out what the artist intended. Importantly, though, the meaning that you get from a work of art may or may not be close to what the artist intended – and you will have no way of knowing how close your understanding is to the artist's.

In the arts, the knowledge that is attained by the audience is a matter of interpretation: it is a blending of what the artist knew and wished to convey and of what the audience members can understand, based on what they bring to the interpretation of the work. The audience, in other words, actively helps to create meaning, which is not what happens with, say, natural science, or history, or mathematics.

In the arts, as in no other area of knowledge, this dynamic is perfectly acceptable, so long as you, as an audience member, do not distort the artwork by ignoring parts of it or by deliberately misinterpreting what it says, looks like or sounds like.

The diagram on the right illustrates the relationships between the artist, the audience and the artwork. The dotted lines indicate the fact that the artist and audience endeavour to communicate with each other but cannot do so directly. The solid arrows indicate that there is a direct connection between artist and the artwork that they created and between the audience and the artwork which they can experience directly. The artwork is the representation of whatever was in the mind – and maybe heart – of the artist when they created it. We receive the artwork and accept it as representative of the artist's thinking and feeling.

As an example of how this dynamic results in knowledge, let's take a look at a poem by WD Snodgrass: 'Returned to Frisco, 1946'.



■ The relationship between artist, audience and artwork

Returned to Frisco, 1946

by WD Snodgrass

We shouldered like pigs along the rail to try
And catch that first grey outline of the shore
Of our first life. A plane hung in the sky
From which a girl's voice sang: ' ... you're home once more'.

Then, in that moment, we were dulled and shaken
With fear. What still could catch us by surprise?
We had known all along we would be taken
By hawkers, known what authoritative lies

Would plan us as the old lives had been planned.
We had stood years and, then, scrambled like rabbits
Up hostile beaches; why should we fear this land
Swaddled in luxuries and its old habits?

A seagull shrieked for garbage. The Bay Bridge,
Busy with noontime traffic, rose ahead.
We would have liberty, the privilege
Of lingering over steak and white, soft bread

Served by women, free to get drunk or fight,
Free, if we chose, to blow in our back pay
On smart girls or trinkets, free to prowl all night
Down streets giddy with lights, to sleep all day,

To pay our own way, make our own selections,
Free to choose just what they'd said we should,
Turning, at last, back to the old affections,
Ties that had lasted and which must be good.

Off the port side, through haze, we could discern
The Rock, all lavender with flowers. Barred,
The Golden Gate, fading away astern,
Stood like the closed gate of your own backyard.

On first reading, it seems that the speaker of the poem must be a soldier coming home from war to San Francisco. The title, 'Returned to Frisco', indicates that he is coming back. The reference to 'our first life' in line 3 and the girl's voice singing 'you're home once more', certainly seem to back up such an interpretation.

For someone who did actually grow up in San Francisco, however, there is a problem with this interpretation. San Franciscans do not call San Francisco 'Frisco'. To them 'Frisco' is an insult. This poem was published in 1957, and in those days, when you wanted to call someone and

KNOWLEDGE QUESTION

How does this relationship between art, artist and audience contrast to the relationship of the general public to scientists and scientific knowledge or mathematicians and mathematics?

didn't know the number, there was no internet to use as a resource. You dialed 411, which was the number for directory assistance, and a live operator looked the number up for you. If, in those days, you called 411 and asked for a number in Frisco, the operators, perfectly seriously, gave you the area code for Frisco, Texas. San Franciscans did not have a sense of humour about – or a lot of patience for – people calling their city 'Frisco'.

You may very well not have known that about San Francisco before you read that last paragraph. For you, then, as a reader of 'Returned to Frisco', an interpretation of a soldier from that city being returned there after the war would make good sense and would be a valid interpretation that took into account the words of the poem. Now, however, you have new knowledge. You are, in effect, a new reader of this poem. Now you have to work out what to do with the fact that this soldier is being 'returned' to a city whose proper name he does not know. Maybe he is not from there, and when he says he is being returned, he means more generally that he is being returned to the US, and that 'Frisco', which is the slang name he knows for it, is the place he happens to be dropped off. Maybe he is from there, and the use of the term Frisco suggests that the city he is coming back to is not the city he left – or that he returns to his home a stranger. Possibly you can think of other explanations for why the speaker uses the term 'Frisco' in the title.

What is interesting, though, is that our interpretation of the text based on our knowledge that 'Frisco' is a term that only a non-native of the San Francisco Bay Area would use, does not depend on what Snodgrass meant. Maybe Snodgrass didn't know that San Franciscans don't call it Frisco. Snodgrass himself was born in Pennsylvania, 3000 miles from San Francisco. He served in the Navy, and earned a Masters degree from a university in Iowa. After that, he lived, and died, in New York ('WD Snodgrass'). He might not have realized, then, that this city in which he never lived, would not be called Frisco by locals. Maybe he did know, however, and wanted his readers to wrestle with that idea of a stranger being sent back – or sent home. We have no way of knowing what Snodgrass actually knew when he wrote the poem. We can only interpret the poem based on what we know about the meaning and implications of the words in it. Our interpretation is valid, regardless of what Snodgrass knew. The only way we might have to call our interpretation invalid would be if we knew that 'Frisco' is not the proper name for San Francisco and then we decided just to ignore that fact and treat 'Frisco' as the name that natives would use. That would be a denial of knowledge, and any interpretation of any artwork based on a denial of knowledge or a willful refusal to take into account all the facts is a failed interpretation.

KNOWLEDGE QUESTION

Can a work of art have meaning of which the artist themselves is unaware?

ACTIVITY

How has your personal knowledge shaped your understanding of art? Discuss at least three different examples.

In Shakespeare's *Henry IV Part 1,* Lady Percy speaks to her husband, Hotspur, asking him why he has been acting so strangely. Hotspur is one of a trio of rebels who are plotting to overthrow the king and seize the crown. His wife is unaware of this plot at this point in the play. Let's read the speech first, imagining that our perspective as a reader is a woman whose husband is in the military and is scheduled to go to a conflict zone such as Afghanistan or Iraq very soon. What would most strike such a reader? How would she interpret the implications of Lady Percy's speech?

O my good lord, why are you thus alone?
For what offense have I this fortnight been
A banished woman from my Harry's bed?
Tell me, sweet lord, what is 't that takes from thee
Thy stomach, pleasure, and thy golden sleep?
Why dost thou bend thine eyes upon the earth
And start so often when thou sit'st alone?
Why hast thou lost the fresh blood in thy cheeks
And given my treasures and my rights of thee
To thick-eyed musing and curst melancholy?
In thy faint slumbers I by thee have watched,
And heard thee murmur tales of iron wars,
Speak terms of manage to thy bounding steed,
Cry 'Courage! To the field!' And thou hast talked
Of sallies and retires, of trenches, tents,
Of palisadoes, frontiers, parapets,
Of basilisks, of cannon, culverin,
Of prisoners' ransom, and of soldiers slain,
And all the currents of a heady fight.
Thy spirit within thee hath been so at war,
And thus hath so bestirred thee in thy sleep,
That beads of sweat have stood upon thy brow
Like bubbles in a late-disturbèd stream,
And in thy face strange motions have appeared,
Such as we see when men restrain their breath
On some great sudden hest. O, what portents are these?
Some heavy business hath my lord in hand,
And I must know it, else he loves me not. (Act II scene iii 37–64)

A reader such as the one we have imagined might be most struck by all of the signs that Hotspur is worrying about going to war. Lines 11–24 describe what Hotspur has talked of in his sleep, and they are filled with details of a battle. Such a reader might connect strongly to Lady Percy's concern for her husband, and she might interpret the speech as a declaration of fear – Hotspur's fear associated with the coming battle, maybe, and Lady Percy's fear for him, both now and then.

Now let's read it again and imagine that the reader is someone who has dealt with post-traumatic stress disorder (PTSD), either themselves or because someone in their family or a friend has suffered from it. Which lines would jump off the page for that reader?

Such a reader might be expected to be most struck by the description of Hotspur's physical and mental condition. In recent years, some significant critical work has been done analysing the portrayal of soldiers in Shakespeare's work, and this speech is one which has been shown to contain a constellation of symptoms which together constitute the medical standard for PTSD (Bennet). Jonathan Shay, in his book, *Achilles and Vietnam,* has taken Lady Percy's speech line-by-line and identified the official medical term that we now use for the symptom she describes. Table 12.3 shows a few examples (Shay 165–6).

Table 12.3 Links between the language in Shakespeare's *Henry IV Part 1* and symptoms of PTSD

Line	Language	Medical term
1	'… why are you thus alone?'	Social withdrawal and isolation
4–5	'… what is't that takes from thee/Thy stomach, pleasure'	Somatic disturbances; loss of ability to experience pleasure. ('Somatic' is an adjective that relates to sleep. The phrase 'somatic disturbances' means that Hotspur's sleep is restless and interrupted. A few lines later, we find that he also sometimes suffers from insomnia – he can't sleep at all)
8	'Why has thou lost the fresh blood in thy cheeks?'	Peripheral vasoconstriction ('Peripheral vasoconstriction' means that the blood vessels are constricted and so not sending blood normally to Hotspur's face)
22–23	'That beads of sweat have stood upon thy brow/Like bubbles in a late-disturbed stream …'	Night sweats

Shay identifies several more descriptions in the speech which align with what, today, we know as symptoms of PTSD.

Several points can be made about differing perspectives with regard to this example from *Henry IV Part 1*. Firstly, we have seen how the life experiences of two very different readers would shape the understanding that those readers might have of this speech. Both readers took the text as it is, but they thought differently about what was important. One thought about the speech from the perspective of its speaker, Lady Percy, while the other thought about the speech from the perspective of the man it describes: Hotspur. Both of those interpretations are rational and reasonable.

Secondly, we have taken the trouble to consider the speech from two different perspectives. We have therefore gained a more complex understanding of the meaning of the speech than we would have been likely to get had we considered only one perspective – or if our own perspective, being different from either of the two we considered here, led us to see the speech in yet another way. This shows us that having different perspectives on a work of art can increase our understanding and appreciation of the richness of that art – and can increase the knowledge that we gain from it.

Thirdly, what we have understood from the speech is not likely to match exactly what Shakespeare intended when he wrote it. For one thing, Shakespeare, of course, could never have heard of post-traumatic stress disorder. In fact, the psychological sense did not come into use until 1955 (Etymonline). We can, however, consider that we share Shakespeare's perspective this far: it seems quite clear that he knew soldiers who had suffered trauma in battles – or in repeated battles –

KNOWLEDGE QUESTIONS

How does this artistic knowledge of PTSD compare and contrast with the knowledge of PTSD that has been made by natural and human scientists? Is this artistic knowledge the same as knowledge a historian might make?

because he recognized the symptoms that he saw those soldiers exhibit clearly enough to be able to describe them accurately and in detail. Our knowledge and Shakespeare's knowledge, then, do not match, but they do intersect.

Let's look at one more example in a different art form.

ACTIVITY

After you have completed this activity you can check your answers by using the QR code.

Examine the photograph of the pomegranates. Make a list of the details that you notice.

1 What do you think these details suggest in terms of the meaning of the image?
2 Do you think there is a meaning of the sort which you could explain in words, or is the image one which can better be understood just as a sensory experience?

Once you have answered these questions, use the QR code to carry out some research on the different symbolic significances of the pomegranate. Then come back and answer the questions again.

We have considered how the background experience and knowledge of the different audience members for a work of art affect the kind of knowledge that each person can get from it. In the next section, we will be looking at the methods and tools that are used to create and interpret art. One important tool that every person engaging with art has for developing knowledge from that work of art is their personal knowledge and experience. As your knowledge and experience continue to change and grow over the course of your life, you will find that your understanding of many works of art will also change and grow. This is one reason that we can revisit the same work of art again and again over the course of our lives and still enjoy it – a sophisticated work of art allows for new understanding over time.

KNOWLEDGE QUESTION

Is the knowledge made in the arts more open to interpretation than the knowledge made in mathematics or history? Why or why not?

Perspectives on the quality of art

There are at least three different perspectives for judging what counts as good art: the judgment of individuals, the judgments of experts and the judgments of society. Let's look at an example.

If you are the parent of the child who made this image on the right, you are very likely to love it. Looking at it could fill you with feelings of love for your child and a kind of nostalgia for the idea that their hand is small now but will not always be so. You are likely to be impressed by the fact that they managed to use so many colours. You may treasure this painting and frame it to hang on your wall or keep by your bedside or in your office by your desk where you can look at it often.

An art expert is not likely to be impressed by the finger paint handprint. This is a kind of art that every human being is capable of making – and which many thousands (maybe millions) will make sometime in their early childhood. It has little originality and requires little skill, design or craft.

Society as a whole is unlikely to consider the handprint to be high quality art for much the same reason that the experts are unlikely to consider it so. It is too common, and strangers feel little or no emotional connection to the paint handprint of someone else's child. The handprint isn't likely to move many members of society in important ways, and so is not likely to generate acclaim.

The reason for the differences in these judgments is that each of those different kinds of audience cares about different things.

Child's multi-coloured handprint

Individual judgments

For individuals, 'is this a quality piece of art?' is a question for which opinion is the appropriate and effective means of determining the answer. If you, as an individual, are moved in some memorable way by a work of art, then you, individually, will experience it as being of high quality. It doesn't matter if no one else does; the individual experience with art is an important one, and your personal judgment is valid because it is personal.

Expert judgments

Experts have a completely different perspective on the kind of art for which they have developed expertise. One becomes an expert only after long study and many years' experience with something. Through long exposure, experts simply learn more about their subject than people who don't have that kind of exposure possibly can. Consider this painting, *Basket of Fruit*, by Italian painter Michelangelo Merisi da Caravaggio (commonly known as Caravaggio).

Caravaggio's *Basket of Fruit* (c.1599)

Many individuals won't know much about this painting, or still life paintings in general, and won't know what to look for in terms of symbols which might convey meaning. Some people will like it because they find the colours pleasing or they appreciate the composition of the fruit basket taking up the bottom half of the painting. Maybe some individuals will like the painting because it makes them appreciate the bounty of nature. There might, of course, be many other reasons that individuals can appreciate this work of art.

Experts in still life and the Renaissance will see the painting from an entirely different perspective to that which most individuals who are not experts will have. With regard to this painting, experts in the art of still life agree that it is indicative of Caravaggio's characteristic desire to see reality as it is (AHA). The painting, at first glance, looks like a beautiful display of fruit, but if we look more closely, the arrangement is much more complex, revealing a cycle from fresh, living fruits and leaves to those which are decaying. It is a portrait of the processes, rather than just the products, of the natural world. You can use the QR code to read a more detailed analysis of the elements of this painting. Interestingly, the analysis appears in a journal of infectious disease, and the analysis of the painting reveals its relationship to that topic. The expert opinions help us literally to see things in the painting that we might not have noticed on their own, and they help us to understand and appreciate better Caravaggio's effort.

Experts bring a perspective to the appreciation of art which can help us to know more than we can know on our own. As we saw with the discussion of 'Returned to Frisco, 1946' and the speech from *Henry IV Part 1*, we can gain a deeper appreciation for the meaning and value of a work of art – our knowledge of any given work can be better – if we are willing to share ideas and listen to the perspectives of others. Holding doggedly to the idea that 'it's only good art if I like it' is an attitude which is likely to keep us from expanding our ability to gain all the kinds of insights into the world which can be gained from engaging with art. There is certainly no reason that you should allow experts to convince you that the painting your child made for you in their first year in school is not quality art. That painting has deep emotional significance for you, and always will. But there is equally no good reason that we should reject the opinions of experts out of hand; they have studied art in ways that we have not, and so they have perspectives to offer which can help us expand our experience with art.

KNOWLEDGE QUESTIONS

Who determines what art is valued, and on what criteria?

Should your judgments about art be given the same weight as those of an expert?

CAS links

You could develop a CAS activity by contacting a local art museum and arranging for you and some classmates to visit, or to have one of their experts come to your school, to talk to you about the meaning of some of the artworks in the museum's collection. Ask the person who will act as your guide to choose works of art that are difficult to understand or which are often misunderstood.

ACTIVITY

Many experts go to university in order to become experts in their field, but we all develop a certain amount of expertise about things we are interested in because we engage with them frequently over a period of years. You may have already developed some significant expertise with an art form if you have exposed yourself to it over a long period of time. Think of the music that you like to listen to, for example.

1. Is there a kind of music which you enjoy and appreciate but which your parents or teachers cannot understand and so think is not of value?
2. What could you explain about that music to help those people without your level of expertise to understand and appreciate it better?

KNOWLEDGE QUESTION

Can we individually develop expertise in other areas of knowledge the way we can in some branches of the arts, just from personal experience? Why or why not?

Societal judgments

Selections of what objects go into art museums tend to be made by experts who work for the museums. Your child's handprint painting is not going to be chosen for such a purpose, and you don't have the ability to be able to ensure that their painting ends up in a museum – unless you are wealthy enough to create your own museum without needing outside funding and without needing visitors to pay entrance fees!

However, a lot of art becomes part of a culture – and part of a cultural heritage – simply by widespread acclaim of the people in that culture. This art doesn't necessarily go into museums (though some of it may be in museums), but it is studied and enjoyed and remembered and, very often, is passed on from generation to generation. These large-group judgments perpetuate traditional dances and music, for example.

Often these judgments are signaled by the willingness of many people to pay to experience the art. In August 2019, the Eagles' *Greatest Hits* album surpassed Michael Jackson's album *Thriller,* as the best-selling album of all time, with 36 million copies sold (Clark and Lynch). Earlier in the chapter we considered Ed Sheeran's phenomenal *Divide* tour. We can say with confidence that the quality of his art has been attested to by widespread acclaim. Sometimes that kind of acclaim leads to art being valued over many decades or centuries. The Beatles caused a sensation when they came to the attention of the international music scene with their first studio contract in 1962, and their music is still widely loved, although the group had broken up for good by early 1970 – nearly 50 years ago. At the time of writing this book (2019), the Beatles have sold more than 600 million records, tapes, and CDs (Hotten) – the greatest number by any group ever. Beethoven's music is still beloved by millions of people around the world, although the composer died in 1827, nearly 200 years ago. On the assumption that the reason people pay for music is that they find it to be of high quality, all these examples show how people from around the world make a combined judgment about what makes quality art.

Other examples of art which has have valued by widespread popular acclaim are the works of Shakespeare, the street art of Banksy and the 'Despacito' music video by Puerto Rican singers Luis Fonsi and Daddy Yankee. It premiered on YouTube in January 2017, and at the time of writing, has garnered more than 6 billion views, making it the most-viewed video on the platform (Lacoma and Martindale). While expert judgments may play a role in promoting these artists, in that individuals

ACTIVITY

1. What artworks do you personally consider to be of high quality?
2. What artworks in your community or country have achieved widespread acclaim?
3. Do you agree with the cultural judgment that these are quality works?
4. Which contemporary artists or works of art from your culture do you think are most likely to prove to transcend time? Why?

may have their attention drawn to the art by experts who help them understand it, very often love of the particular artwork is passed from individual to individual. Certainly, experts alone cannot ensure that any given artist or work of art can continue to be seen as quality work for hundreds of years.

CASE STUDY

Salvator Mundi by Leonardo da Vinci

The most expensive painting ever sold is *Salvator Mundi*, which has been attributed to Leonardo da Vinci.

The painting sold at auction in November 2017 for $415.3 million (Jacobs). Amazingly, the same painting sold in 1958 for only $60 (Weaver). The reason for this incredible change in the value of the painting is that for centuries it was believed that the painting was by Bernardino Luini, one member of the large group of artists who worked in da Vinci's studio (Weaver). In fact, there are fewer than 20 paintings which have been confirmed to have been painted by da Vinci's own hand, including the *Mona Lisa* and *The Last Supper.*

Salvator Mundi (c.1500), attributed to Leonardo da Vinci

The sale price of *Salvator Mundi* raises an interesting and somewhat thorny question about the value of art. Certainly, the quality of the painting itself didn't change between 1958 and 2017, but in that 50-year period, the experts changed their minds about who painted it. The simple fact that it is now attributed to da Vinci himself is responsible for the change in value. The judgment that this painting is high quality art is not an individual judgment. It is the judgment of experts, but it is also a judgment based on societal agreement. Society – and the market – supports the idea that work by Leonardo da Vinci himself is more worthy than an equally well-crafted painting by someone else.

CONCEPT CONNECTION

Truth

As we noted early in the chapter, the word 'art' is related to the word 'artificial'. Art is a creation of humankind and there are many different perspectives when it comes to interpreting art. Any given piece of art could mean something different to different viewers, and if meaning in the arts lies at the intersection of the artist's intentions and the audience's experience and knowledge, and if some art is overtly called 'fiction', then what can be said about the role of truth in the arts?

For an answer to that question, we have to go back to the important aims of the arts. Any work of art is the reflection of the thoughts, understanding, feelings and worldview of the artist. The aim of the arts is for the artist to be able to express those insights and then to be able to share them with an audience. One of the most important kinds of knowledge that an audience gets from art is insight into the mind of the artist. As viewers of or listeners to art, we connect with the artist – even if that artist lived centuries before us or continents away. One kind of truth that we get from the arts, then, is the recognition and experience of shared humanity.

Beyond that fundamental kind of truth about human connection, art must convey some kind of truth, or we can't respond to it.

Methods and tools

Methods and tools of the artist

Art can be created with and out of an enormous variety of materials. Paintings can be made using brushes of many sizes, trowels, sticks and even hair as means of applying the paint. Visual artists can use paint, chalk, charcoal, ink, pencil and pastels, among other things. Sculptures can be made out of clay, marble, iron, steel, copper and wood. Sculptures can even be created out of existing objects. In 1917, Marcel Duchamp made a found-art sculpture he called *Fountain* out of a urinal. Italian artist Marco Evaristti created a display of live goldfish in blenders. Even the human body has been made into art: Canadian artist Rick Gibson made a pair of earrings out of freeze-dried human fetuses, which he acquired from a British anatomy professor (Gibson), and Andrew Krasnow, an artist from the United States, has used skin from men who donated their bodies to science to create a variety of sculptures, including a map of the United States (Johnson). Music has been made with traditional musical instruments from every culture, as well as from buckets, washboards, blades of grass and the edges of wine glasses.

A fundamental feature of the arts is that they are creative. They are bounded only by the imaginations of the world's artists, which means that the materials and methods used in the creation of art are also bounded only by those very same imaginations.

Methods and tools for interpreting art

Fountain is a famous sculpture by Marcel Duchamp and is an example of a 'found' sculpture. Duchamp purchased a urinal from a sanitary supply company, added a signature to it, as by an artist, and submitted it to the Society of Independent Artists, which he himself helped to found (Tate). The artwork generated tremendous consternation on the part of the art world. The board of the Society of Independent Artists first barred the work from being exhibited, despite the society's avowed policy of open-mindedness and lack of judgment, and then, when there was an uproar over that, defended its decision by issuing this statement: 'The *Fountain* may be a very useful object in its place, but its place is not in an art exhibition and it is, by no definition, a work of art' (Tate). By the definition of art which we have proposed in this chapter, *Fountain* is a work of art, because the artist intended it to be a work of art and because the urinal was not being used for its function as a urinal, but as a provocation to the aesthetic.

In the century which has passed since its initial introduction to the art world, *Fountain* has become an icon of modern art. It continues to generate a tremendous amount of controversy – which also means that it generates a tremendous amount of reaction. People feel strongly about the work, but they *feel something* about it. The question remains, then: how are we to interpret this work of art? What methods and tools are available to us?

One important method for making knowledge in the arts is discussion with other people with different perspectives, as we have seen in the section above. Just such a discussion was organized by the Tate. You can watch a video of the discussion by using the QR code here on the right.

If you watch the video, you will see that the meaning the group is finding in the piece is less in the piece itself than in the reaction it generates. *Fountain* does seem to have resulted, just in those three minutes, in a lot of ideas about what art is, about who gets to decide what is good art, and about the difference between personal judgments and the judgments of experts – many of the ideas that we have explored in this chapter.

ACTIVITY

Earlier in the chapter, we asked you to consider whether there was anything at all which could not be the subject of a work of art. Now we would like you to consider whether there is anything at all which could not be used as part of the materials in the creation of a work of art.

KNOWLEDGE QUESTION

How does the role of imagination in the arts compare and contrast to the role of imagination in mathematics?

Fountain (1917) by Marcel Duchamp

ACTIVITY

The Tate museum, which owns one of 12 replicas which Duchamp made in 1964, has on its website a lengthy article about *Fountain*. The article discusses the history of the piece, its effect on the art world and its meaning, and what might be seen in it by the careful viewer.

In this article, you will see that another important method for interpreting art is the careful observation of the details of the work itself and the consideration of what those details might mean, literally or symbolically. It turns out that there is a whole history behind the name of the fake artist that Duchamp chose for *Fountain*. He had some specific ideas in mind about why 'R Mutt' was the right name. There is also consideration of the significance of the fact that the urinal, when displayed as art, has been rotated onto its back, rather than being displayed hung on a wall, as it would be in an actual bathroom. A third element which contributes to the interpretation of this work is that its shape resembles some familiar forms. The analysis also finds some symbolic meaning in the fact that the artwork has been replicated and is no longer unique.

Before you use the QR code to read the article, answer these questions:

1. What does the name 'R Mutt' suggest to you?
2. Does the shape of the artwork remind you of anything with which you are familiar? If so, how might that similarity contribute to the meaning of the work?
3. What do you think it might mean that the artwork is oriented differently from the way the urinal would be? Is there any symbolic significance to this shift?
4. Usually we think of art as needing to be unique. What comment do you think Duchamp might have been making by recreating not one but 12 *Fountains* nearly 50 years after the original disappeared?

Careful observation of the details of a work of art is a second important method for engaging with any artwork, not just for sculpture. Rap is a form of music which has often generated as much controversy as *Fountain* does. Many people will argue that rap is not music – claiming that it is just an excuse to use a lot of profanity. Others say that rap is just noise. People who know rap music well, however, are able to see the complexities of the music and to appreciate the talent of the artists for language use, expert use of their voice and a deep understanding of rhythm, all in addition to the ideas which are expressed in the lyrics. One example of an extremely detailed analysis of a rap song by Eminem can be found using the QR code on the right.

The analysis reveals the complexity and subtlety of the way the song has been constructed and demonstrates the kind of close, careful observation that people who don't like rap have likely not undertaken.

You have probably had some experience with interpreting literature from your Group A course in Studies in Language and Literature, and your other literature courses from previous years, so you will know that literature, too, can be interpreted by close observation of detail. We'll explore, by way of example, 'Nothing Gold Can Stay', by Robert Frost, a poet from the United States:

Nothing Gold Can Stay

by Robert Frost

Nature's first green is gold,
Her hardest hue to hold.
Her early leaf's a flower;
But only so an hour.
Then leaf subsides to leaf.
So Eden sank to grief,
So dawn goes down to day.
Nothing gold can stay.

Learner profile

Thinkers

Is it fair to say that the arts engage our critical thinking skills as much as they engage our creative thinking?

KNOWLEDGE QUESTION

Is the kind of observation needed to make knowledge about a piece of art more similar to or more different from the kind of observation necessary in the natural sciences and the human sciences?

KNOWLEDGE QUESTIONS

How are the justifications for claims in the arts similar to and different from justifications in other areas of knowledge?

Does our knowledge of the arts depend on our interactions with other knowers more than it does in other areas, such as history? Why or why not?

If we look closely, we can see a good many literary techniques at work, even in such a short poem. Table 12.4 provides a list of some of them.

Table 12.4 Literary techniques in the poem 'Nothing Gold Can Stay' by Robert Frost

Line	Literary element
1	Paradox: 'green is gold'
1	Imagery: nature's first green is literally gold: if you observe a plant when it just comes out of the ground, it is yellow. It has not been exposed to sunlight, and sunlight is what is needed for photosynthesis to take place
1	Metaphor: we often use the word 'gold' to indicate something of great value. In this case, valuable because it is very rare
1–2	Rhyme
3	Paradox: 'leaf's a flower'
3	Metaphor: the leaf (which will be green after photosynthesis takes hold) is gold, like a flower is
4	Description: 'only so an hour'. This is likely also literally true; it probably takes an hour or less for the sunlight to do its work and the pale golden plant to turn green
3–4	Rhyme
5	Paradox: 'leaf subsides to leaf' – if it is already a leaf, how can it sink back into being a leaf? The answer, of course, is that it is a leaf when it is gold, and then, when it turns green, it sinks back into being a regular leaf. The implication of 'subside' is a sinking back, so that the green is not as special as the gold
6	Religious allusion to the Garden of Eden; this gives us something to think about, because we don't necessarily think of Eden lasting only an hour, and we don't think of Eden sinking into grief because of sunlight. The comparison, however, is interesting because in cosmic terms, Eden only lasted an hour – or even less. And what put an end to Adam and Eve's life in Eden was the gaining of knowledge, which is very often symbolized by light
5–6	Rhyme
7	Comparison: the turning of the leaf from gold to green is now compared to the dawn turning into morning
8	Extrapolation: the poet draws a conclusion here, based on the three things he has now compared to each other. His conclusion is that we must always lose that which is gold. We might see this as a rather depressing conclusion, or we might see it as an observation that one of the reasons that we see things as golden – special – is that they are rare and fleeting
7–8	Rhyme

KNOWLEDGE QUESTION

Do literary concepts such as metaphor, paradox, comparison and extrapolation function as tools to help make knowledge in other areas such as the human sciences or mathematics?

In general, then, when we engage with a work of art in order to try to understand its meaning, we must observe closely, consider the potential significance of the details that we observe and then draw conclusions. We are accustomed to thinking of the making of art as a creative act, but we can now see that the interpretation of art is a creative act as well.

It is not our aim, in this book, to teach you all of the literary or visual techniques that are used in works of art, and which, if you know about them, can help you to interpret artworks in a more sophisticated way. If you are interested in a more detailed look at how to analyse, you may wish to read *Textual Analysis for English Language and Literature* and *Literary Analysis for English Literature*, both by Angela Stancar Johnson and Carolyn Henly and published by Hodder Education. The first of those books includes good advice on how to interpret artworks which are not text-based, such as advertisements, propaganda posters, photographs, political cartoons and paintings.

Finally, in an earlier section of this chapter, we explored the way in which our personal knowledge and background shapes how we interpret art. It is worth realizing that what that means is that all of our personal experience and knowledge are

ACTIVITY

After you have completed this activity you can check your answers by using the QR code.

Examine the painting below and try to interpret it using your own existing knowledge. Note the details. Which ones seem to you to be the most important? If you have an opportunity to do so, speak to a classmate about their ideas after you have developed some of your own, and see if together you can strengthen your interpretation.

tools to help us interpret. When you come to try to understand a work of art, you have to bring everything you know to the table. We saw, for example, that a poem can be about mathematics. A number of years ago, the IB Literature exam in English included a poem whose central metaphor was the double helix of DNA, and so rich understanding of the poem required knowledge of biology. 'Nothing Gold Can Stay' required us to know about plants just coming out of the ground – photosynthesis – and the biblical story of the Garden of Eden.

Notice how all three of these methods come together: which details we notice and how we can interpret their significance will depend on our knowledge and worldview, and speaking to others about an artwork will give us access to more knowledge and perspectives. All of these methods will help us to make knowledge in the arts.

KNOWLEDGE QUESTION

How does knowing more about the social, cultural or historical context of a work of art have an impact on our knowledge of the work itself?

CONCEPT CONNECTION

Evidence and objectivity

Throughout this section, we have looked at the methods for interpreting art. Interpretation is another of the 12 central course concepts, and an important point about the interpretation of art is that, although differing interpretations are possible, not just anything goes. Art works do not just mean whatever the audience wants them to mean. Artists made choices, and we are bound by those choices. We cannot just look at a painting or sculpture, or listen to a song, or read a poem and then say 'it means whatever I want it to mean'. If you want some particular meaning based on your own personal wishes, then you don't need a work of art; you can just go off on your own and contemplate the ideas you wish to contemplate. The act of interpreting a work of art is, to the degree that it is possible, a joint effort between artist and audience. As a member of the audience, when you offer an interpretation of a work of art, you must provide evidence for your interpretation. The evidence comes *from* the work of art.

If the work is visual, a painting or sculpture, for instance, your evidence will be physical features of the work of art – colours or placement on a canvas or the shape of the lines in a sculpture. If the work is a song, the evidence will come from the words, notes and rhythms. If you read the analysis of the Eminem rap song, you saw that that person gave us a great deal of evidence in the form of the rhymes being used, the instances of assonance, and the use of rhythm. If the artwork is a piece of literature, then, the evidence comes from the words in the text. Accurate identification of the evidence in a piece of art requires you to be objective.

When it comes to art, whether the work appeals to you or not is a matter of your opinion. However, when it comes to developing an interpretation – an argument as to what the artwork means – reasoned justification is required. There may be multiple reasonable interpretations, but there are wrong interpretations. It would not be rational for someone to read 'Nothing Gold Can Stay' and claim that it is a poem about slavery in the United States before the Civil War. There just is no way to make the poem mean that without ignoring what it really does say. Such an interpretation would be entirely subjective (and irrational, in that it ignores what words mean). Interpretation of a work of art, then, requires imagination, but also objectivity.

Ethics

The ethics of making art

In most areas of knowledge, ethical practice is shaped by the aim of the endeavour, as well as by the nature of the materials under study. In science, for instance, the aim is to understand the physical nature of the Universe, and, among many other things, one object of study is the human body. Ethical standards related to human rights and dignity forbid scientists from extraordinary experiments on living humans. Scientists could not, for instance, chop off people's arms to see what happens in the body as a result of the physical shock to the system.

The aim of the arts is not as easy to define as the aim of the natural sciences is; however, we can safely say that one aim is for artists to be able to express a personal vision of some truth about human life and experience through a medium other than objective proposition. The material that

KNOWLEDGE QUESTION

Does the aim of the arts shape the ethical obligations of artists and users of art in the same way that the aim of the sciences shapes the ethical obligation of scientists? Of historians or mathematicians?

artists work with is not circumscribed as is the material with which scientists work: where the latter must focus on physical objects in nature, the former can focus attention on literally anything that interests them. As we have seen, art can be about physical objects, mental abstractions, maths, history, religion, personal relationships and much more.

KNOWLEDGE QUESTION

Do the arts have the power to challenge established moral values?

We have also seen that the mechanisms artists employ are similarly unlimited. Dancers use their physical bodies to make art, musicians use sound, either from vocal chords or from physical objects, visual artists use just about anything from paint, clay, chalk or pencil to old tin cans, bicycle tyres or a urinal, and they use these materials in a whole range of ever-expanding ways. Anything an artist can think of can be rendered into a work of art, and anything an artist can use to convey their thoughts can be used in whatever way the artist devises. Given the virtually unlimited materials and methods open to the artist, one might think that the aims and materials do not constrain the artists by imposing ethical standards as they do in the natural sciences. Artists, are, nevertheless, constrained in significant ways.

First of all, the arts are deeply, essentially, personal. Any work of art is a reflection of the individual vision and viewpoint of the artist. When art has a powerful effect on an audience, it is because that person experiences a mental and emotional connection to another human being: the artist. Hisham Matar describes the moment of discovery: 'the most magical moments in reading occur not when I encounter something unknown but when I happen upon myself, when I read a sentence that perfectly describes something I have known or felt all along. I am reminded, then, that I am really no different from anyone else' (Matar). Matar uses literature as his example, but the point applies to all art. We respond to art which reveals to us in a visceral way that another human being is fundamentally like us in some, perhaps unexpected, way. Art must, therefore, be original. Forgery is unethical, in part, because forgeries decrease the artist's financial reward for their work; however, the more significant reason that forgery is wrong is that it **appropriates** the personal discovery and creation of the artist. It betrays both artist and audience by making a mockery of that human bond.

◆ **Appropriate**: To take something for your own use without permission. We do not generally use the term to apply to theft, which is illegal. Appropriation is not necessarily illegal, but it is highly questionable and sometimes downright unethical.

The recognition that to share and shape worldview is inherent in the aim of art is behind the argument over whether 'artists' which are not human can truly make art. In Thailand, for example, paintings made by elephants are sold to tourists who are amazed at the sight of elephants apparently drawing recognizable objects – such as elephants (UK/Scotland). Zoologist Desmond Morris explains what really happens: '… you will notice that, with each mark, the mahout tugs at his elephant's ear. He nudges it up and down to get the animal to make a vertical line, or pulls it sideways to get a horizontal one … So, very sadly, the design the elephant is making is not hers but his. There is no elephantine invention, no creativity, just slavish copying' (Desmond Morris). You can use the QR code in the margin to view a video of an elephant 'painting'. You will be able to notice that the keeper, who we know is present, as he gives the elephant the brush, is carefully hidden from the sight of the camera and of the tourists.

While such endeavours are not as obviously unethical as forgery, they nevertheless violate the aims of art because they lack the individual insight into the world. The 'art' thus created is purely mechanical. We might enjoy the novelty of the process and we might marvel at how similar the actual product is to objects created by great human artists; however, there is no possibility of our experiencing that powerful moment of connection to another mind. (The buyers of the art are, of course, also being cheated because they are being lied to about how the painting is made.) Perhaps one day elephants will be shown to be sentient and able deliberately to express an idea or emotion in a work of art, at which time, we can talk about elephants as artists. Until then, however, without the potential for the meeting of minds between artist and audience, knowledge cannot be made from the art.

KNOWLEDGE QUESTION

Is the production and enjoyment of art subject to ethical constraints?

One ethical principle at work in the arts, then, is the value that it matters *which* mind generated the art. This principle is what ultimately accounts for the fact that the da Vinci painting, *Salvator*

Mundi, is worth so much more now than it was when it was not known who really painted it. The world has, since the fifteenth century, placed a very high value on da Vinci's particular genius and creativity. The fact that the same painting painted by someone else does not hold the same value as when we know it was painted by da Vinci reflects the fact that one of the very significant functions of art is to connect the audience to the artist in a very personal way. Anything which interferes with or distorts that process is unethical.

A final consideration is that social and ethical mores also constrain the making of knowledge, and practitioners can be punished or even imprisoned for art or science which too far transgresses social codes of ethics. Legal constraints limit how scientists can use animals in their work. Rick Gibson was famously arrested and fined for offending public decency with his work 'Fetus Earrings' (Dow). The director of a museum in Denmark was fined 2000 kroner for cruelty to animals after displaying Evaristti's exhibit of fish in blenders, though the fine was later overturned in court ('Liquidising Goldfish'). No society would stand for the actual murder of a person for the sake of pursuing knowledge in either the arts or the sciences. (Consider the controversy that still exists over the scientific knowledge gained by the Nazis during the Second World War.)

The ethical constraints imposed by societal values on the making of knowledge in all areas of knowledge are real and significant. They provide the most obvious ways in which ethics shape knowledge-making; however, the constraints imposed on methods by the nature of the areas of knowledge themselves are equally real and significant. The practitioners of each area of knowledge have a set of standards to which they must adhere if the knowledge generated is to be considered viable. That which is ethical in the areas of knowledge, in other words, is that which allows for the aims to be met. In the arts, that primarily means that that which is unethical is that which interferes with the artist's proper right of ownership of their creative and intellectual work and the ability of the artist to communicate with an audience.

Cultural appropriation

We have considered that literally anything could be the subject of or inspiration for a work of art. Just because something *can* be the subject of art doesn't necessarily mean that it *should* be. One contemporary ethical problem that arises with regard to the arts is the problem of cultural appropriation. Cultural appropriation in the arts occurs when an artist of one culture produces art in the style of, or using the materials or instruments of, another culture but without having sufficient knowledge of or right to that culture's traditions. Usually the idea of cultural appropriation is only relevant and offensive when majority members of a society usurp aspects of the culture of minority members.

KNOWLEDGE QUESTION

What moral responsibilities do we have regarding art that has been created or published by other people?

One fairly well-known example of a figure who has spawned a lot of controversy over cultural appropriation is rapper Iggy Azalea. She is a white singer born in Australia who has made a huge success of rapping. She has become one in a long line of musicians – including Elvis Presley – who have appropriated music from the African American musical tradition in the southern United States. The problem is that historically, white singers have taken the music and then effectively erased the history, leaving the originators with no credit while the white singers become famous (Zimmerman). Iggy Azalea has been accused of fitting right into this historical trend:

> Iggy's alleged crime is twofold: she gets to profit off of her white appeal while simultaneously selling a black sound. She is making a huge career for herself by mimicking the vocal patterns and phrases of a southern black girl – in effect … stealing that nameless black girl's own success in the process. (Zimmerman)

Learner profile

Principled

What principles are the most important ones in helping to determine what constitutes the ethical practice of art?

Many white artists have been accused of the cultural appropriation of African American music

Another example comes from the Indigenous people of Australia. Christopher Sainsbury, a Dhurang composer working in Sydney, writes about the problem of non-Indigenous composers borrowing elements of Indigenous music 'Without appropriate engagements with Indigenous peoples'. Sainsbury argues when non-Indigenous composers 'reference' Indigenous music without interacting with, or giving credit to, the source of the music, those composers **disenfranchise** the Indigenous composers.

This problem is very similar to the problem of the white artists in America usurping the music of African American artists and taking credit for the work at the expense of the original artists. Sainsbury argues for genuine collaborations between Indigenous and non-Indigenous composers, as well as true cultural support – including funding – for Indigenous composers, so that they are treated just as the non-Indigenous musicians are. 'And of course we recommend hanging out with Indigenous people. I worked at the Eora Centre for Aboriginal Visual and Performing Arts Sydney for about 25 years, and noted that no composer from the Sydney University Music Department, which was 300 metres away, ever visited us' (Sainsbury). Sainsbury has founded the Ngarra-burria First Peoples Composers programme to pursue genuine appreciation of and recognition for the music of Indigenous people.

◆ **Disenfranchise**: To take power away from people by depriving them of rights.

ACTIVITY

How can we know when a work of art is an example of cultural appropriation and when it is an example of paying homage to other artists' work?

The moral character of the artist

In October 2017, Hollywood producer Harvey Weinstein was accused by multiple women of rape and sexual assault. He was fired, and in the months that followed, a great many other public figures, including some working in artistic fields, were similarly accused. Some had to resign or were fired, and in some cases, their work was pulled from broadcast. These include a director of opera, an orchestra conductor, a ballet dancer, a creator of a famous radio programme, a television director and writer, five actors and a circus clown (Almukhtar, *et al*). Perhaps the most famous of these is Kevin Spacey, arguably one of the finest actors of his generation, who starred in such roles as Dave Harken in *Horrible Bosses,* Lex Luther in *Superman Returns*, Prot in *K-Pax*, Jack Vincennes in *L.A. Confidential,* and Keyser Söze in *The Usual Suspects*. Spacey has nearly 130 credits as an actor, director or producer. When the allegations came out – more than 30 different accusations over several decades (Romano) – Spacey was fired from his current show, *House of Cards,* and was released from several other projects in the works (Almukhtar, *et al*). At the time of writing (2019), he has been formally charged and arraigned on at least one count of sexual assault (Romano).

This kind of immoral behaviour is not limited to Hollywood or film actors. Pablo Picasso appears to have been a cruel **misogynist**. His granddaughter wrote of him, in a memoir: 'He submitted them [women] to his animal sexuality, tamed them, bewitched them, ingested them, and crushed them onto his canvas. After he had spent many nights extracting their essence, once they were bled dry, he would dispose of them' (Lee). Some of Picasso's art depicted the Minotaur,

KNOWLEDGE QUESTION

Does the problem of knowledge appropriation occur in other areas of knowledge such as the natural sciences and history?

KNOWLEDGE QUESTION

Can we separate the moral character of the artist from the value of the artwork?

◆ **Misogynist**: Someone who hates women.

a mythological creature half-man and half-bull, which can, from one perspective, be seen as preparing to assault a woman. From another perspective, the art world has praised these drawings as being symbols of virility and power (Lee). Bad behaviour, of course, can extend well beyond misogyny and sexual misconduct. Ernest Hemingway – among many others – was a well-known anti-Semite. He was also a womanizer who, after his first wife confronted him about having an affair admitted to it and then blamed her for damaging their marriage by trying to discuss it. He was called, by various people who knew him, selfish, **callous** and cruel (Kogan). TS Eliot was another writer known to be anti-Semitic, and Theodore Geisel – Dr Seuss – was a well-known bigot (Morris). A little research would turn up many more examples.

◆ **Callous**: Unfeeling.

This leaves us with an ethical dilemma: do we discount the artwork of artists who have shown themselves to be, to a greater or lesser degree, unethical, immoral or evil?

In the contemporary crisis of the series of revelations of sexual misconduct, the employers of many of the men who have been accused have demonstrated their answer to the question by firing the men. Whether those employers are truly outraged by the behaviour, or whether they are just worried that the public will boycott any movie, play, opera or television series in which those men appear is unknown, and ultimately, irrelevant. The market has spoken: a judgment by society has been made, at least in the short term.

A number of difficult questions remain: if these men are bad enough people that their work is tainted beyond repair, then why isn't the work of men from earlier times equally shunned? Is it a matter of knowledge? In the twenty-first century, knowledge of such charges can be disseminated around the world instantaneously. In the 1920s, when Hemingway was writing and Picasso painting, news did not travel so far or so quickly. Are the moral standards of the twenty-first century significantly different from the moral standards of the early twentieth century? Perhaps what we now believe, culturally, sets a higher standard for the modern artist than artists used to have to meet. If that is the case, however, should modern readers not reject Hemingway's work, and modern viewers of art, Picasso's?

■ Pablo Picasso and Ernest Hemingway. Do we hold artists from the past to the same ethical standards as those alive today?

What about artists whose bad behaviour and objectionable opinions are simply not known? Do we have a responsibility, as consumers of art, to find out which artists have sufficiently good character for their art to be recognized and valued? Jim Morris, an advertising executive and self-styled crusader against intellectual laziness argues that if we really knew about the lives and feelings of artists, few would escape our condemnation on some offence – even if minor. He states that to claim that we can reject those artists who deserve rejection is hypocritical, when we aren't willing to do the work to find out about the rest. He also argues that to reject all art that was created by people who have done some wrong is to impoverish our experience in an important way (Morris). He calls on us to consider that the arts should not be treated any differently from any other field:

> Not that you asked, but for me, a work of art is great or not, the political achievement or technological innovation or scientific discovery is great or not, entirely separate of whether it was produced by a saint, a despicable human being, a robot or a hippo. I don't need to know anything about the creator of the work to be affected by that work and make my own judgment of its value or worth. (Morris)

KNOWLEDGE QUESTION

Does the same question about the relationship between the moral character of the artist and his or her work arise in other AOKs?

The opposing argument is that if art is indeed a reflection of the artist, and if part of the purpose and the wonder of art is our ability to connect mentally and emotionally with an artist, then it does matter who makes the work – a position that we have argued earlier in this chapter.

It seems quite obvious that a good person can create a bad piece of art, but can a bad person create a good work of art? We have no answer to this thorny question. Ultimately, it will be answered by individuals and by society at large. If you are uncomfortable enough with the person, once you know the ways in which their character has been demonstrated by behaviour, to be uncomfortable with their art, then you will reject the art. Perhaps, even if you feel that the art does stand separately from the artist, when you try to watch *The Usual Suspects* again, you will find that it is tinged with the revelations of Kevin Spacey's off-screen life, or that if you look at Picasso's portraits of women, they are now shadowed by the painter's real-life cruelties. If society at large speaks by boycotting the work of artists who have become notorious for their immoral behaviour, then that work will not be shared and passed along for future generations. In either case, the opinion of experts will not decide this question. Like the judgment of art itself, judgment of the artist will occur on many different fronts.

KNOWLEDGE QUESTION

Does the character of knowledge-makers in other areas of knowledge raise similar questions as to the value of the knowledge they create?

Art's influence on ethics

We saw in Chapter 11 that one role that history can play in a community is to provide a set of values and goals common to the community. Historians do that indirectly by documenting events and their causes and effects, which then allow us to see where we fit in the historical traditions of our culture, as well as to understand how we might do things better than they have been done in the past. The arts can play a similar role in helping to develop our sense of right and wrong.

Some works of art are overtly moral, with an intentional aim of helping the audience recognize right from wrong. Shakespeare's *Hamlet* played just this role in the former Soviet Union, where the play helped to bind the people together in an understanding of their shared struggles. Photographs, such as the one below, are meant to cause us to feel empathy and both to encourage us to do something about this situation or similar ones, and to discourage us from ever treating animals in this way.

KNOWLEDGE QUESTIONS

Do the arts play a role in the development of our personal value systems?

How important is the study of literature in our individual ethical development?

Folk singer Joni Mitchell's 1970 song 'Big Yellow Taxi' is a powerful criticism of the destruction of nature, which is still relevant today. You can use the QR code on the right to listen to the song.

Images such as this, it is hoped, will discourage us from treating animals badly

Do we have the power to make a better, cleaner world?

The arts also have the capacity to inspire us to have faith in the goodness and beauty around us, and any move away from cynicism can be seen as a move toward a higher moral purpose: if we believe in a better world, we can help to achieve a better world. The image above, for instance, suggests just this.

Love poems, such as 'I loved you first: but afterwards your love' written by nineteenth-century English poet Christina Rossetti, have the power to make us believe in the possibility that relationships can sustain us and bring us happiness:

I loved you first: but afterwards your love

by Christina Rossetti

Poca favilla gran fiamma seconda. – Dante

Ogni altra cosa, ogni pensier va fore,
E sol ivi con voi rimansi amore. – Petrarca

I loved you first: but afterwards your love
Outsoaring mine, sang such a loftier song
As drowned the friendly cooings of my dove.
Which owes the other most? my love was long,
And yours one moment seemed to wax more strong;
I loved and guessed at you, you construed me
And loved me for what might or might not be –
Nay, weights and measures do us both a wrong.
For verily love knows not 'mine' or 'thine';
With separate 'I' and 'thou' free love has done,
For one is both and both are one in love:
Rich love knows nought of 'thine that is not mine';
Both have the strength and both the length thereof,
Both of us, of the love which makes us one.

A dancer, such as Polina Semiova, can make us appreciate beauty – not just physical beauty, but the beauty of movement and the capacity of the body to interpret music. Use the first QR code on the right to see some of her work with the Staatsballett Berlin.

An impeccably rehearsed troupe using brooms can inspire us to believe in the capacity of humans to achieve perfection through hard work and true collaborative effort. Use the second QR code on the right to watch a clip from *Stomp Live!* Be sure to turn up the volume.

All of these are examples of artworks which have the power to affect the way we see the world in terms of what is right and what is wrong, and to inspire us to believe in and to reach for what is good. When we asked the question, earlier in this chapter, of whether art has the power to cause change, we were asking an ethical question. The answer would appear to be that, at least one mind at a time, it does, indeed, have that power.

Conclusion

We hope that, having completed this chapter, you can now appreciate the ways in which the arts, as an area of knowledge, are similar to and different from the other areas of knowledge studied in the Theory of Knowledge course. The kind of knowledge that we can gain from the arts is fundamentally different from the kind of knowledge that we can gain from, say mathematics or the natural sciences, in that it is much less objective. The arts aim, in fact, to provide us with a subjective view of the world – with many subjective views of the world – and in so doing they have the power to connect us to people across barriers of time and space, and to help us understand our fundamental humanity.

CONNECTIONS TO OTHER AOKs

- **Scope:** The scope of the arts is virtually unlimited, taking in all that exists and has existed, and all that might exist, though it does not exist now and never has. How does this contrast with the scope of other AOKs? What is it about the purpose of the arts which means the arts can include in their range so much more than other AOKs can?
- **Perspectives:** We see that in the case of the arts, it is possible for individuals to have knowledge about an individual work of art which diverges from the knowledge that experts have or that are the result of societal judgments. Is the distinction between individual judgments and expert judgments a functional one in any AOK other than the arts? Could we, for example, say that it's fine for an individual to have a personal opinion about events in history which differs from expert judgment?
- **Methods and tools:** In the arts, the methods and tools are limited only by what artists can imagine could be used as a method or tool. The methods and tools have expanded over time to include processes and items that were not imaginable in past centuries. Is that process of change fundamentally different from the way that methods and tools develop in other AOKs? Or is the telescope, for example, in some way related to the electric keyboard as an agent of changing ability to make knowledge?
- **Ethics:** The personal lives of artists seem to carry greater significance in terms of the degree to which their art is taken seriously than the personal lives of practitioners of other AOKs – psychologists or mathematicians or historians, for example. Although Jim Morris makes the claim that the arts should be treated the same as the sciences or politics or technology in this regard (see page 432), the personal nature of the arts seems to leave us with greater attention to the person who makes the art and who, therefore, conveyed to us some knowledge of the world. Do you think that this differentiation is real, or is it just a matter of unfair focus on one kind of knowledge-maker over another?

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Acknowledgements

The Publishers wish to thank Anita Bjelke for her valuable comments and review of the manuscript.

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