CHAPTER

1

Science and pseudoscience in psychology

SKILLS FOR THINKING SCIENTIFICALLY IN EVERYDAY LIFE

LEARNING OBJECTIVES

LO 1.1 Define psychology.
LO 1.2 Explain how science can safeguard against the major fallacies of human thinking.
LO 1.3 Describe the features of psychological pseudoscience, and distinguish it from psychological science.
LO 1.4 Identify reasons we are drawn to pseudoscience.
LO 1.5 Identify the key features of scientific scepticism.
LO 1.6 Explain the basic principles of scientific thinking.
LO 1.7 Identify and outline the major theoretical frameworks of psychology.
LO 1.8 Describe different types of psychologists and outline their roles.
LO 1.9 Describe the two great debates that have shaped the field of psychology.
LO 1.10 Describe how psychological research applies to our daily lives.
LO 1.11 Explain how evidence-based practice can help bridge the scientist–practitioner gap.

THINK: PREVIEW

First, think about these questions. Then, as you read, think again …

- Is psychology mostly just commonsense?
- How should we judge what we read in self-help books?
- Is psychology really a science?
- Are we good at evaluating evidence that contradicts our views?
- Are claims that cannot be tested by observation unscientific?
- Is anecdotal evidence that a treatment works good evidence for its effectiveness?
- Is the number of people who share a belief a dependable guide to its accuracy?

For most of you reading this book, this is your first or second psychology unit. But it is a safe bet that you have learned an awful lot of beliefs about psychology already. Pause for a moment and ask yourself these questions: Where have I learned my beliefs about psychology? How do I know whether they are true?

If you are like most beginning psychology students, you have gleaned much of what you know about psychology from watching television programmes and movies, listening to talkback radio shows, reading self-help books and popular magazines, surfing the internet and talking to friends. In short, most of your psychology knowledge probably derives from the **popular psychology industry**: a sprawling network of everyday sources of information about human behaviour.

TEST OF POPULAR PSYCHOLOGY KNOWLEDGE		
true	false	1. Most people use only about 10 per cent of their brain capacity.
true	false	2. Newborn babies are virtually blind and deaf.
true	false	3. Hypnosis enhances the accuracy of our memories.
true	false	4. All people with dyslexia see words backwards (for example, 'tac' instead of 'cat').
true	false	5. In general, it is better to express anger than to hold it in.
true	false	6. The lie-detector (polygraph) test is 90 to 95 per cent accurate at detecting falsehoods.
true	false	7. People tend to be romantically attracted to individuals who are the opposite to them in personality and attitudes.
true	false	8. The more people present at an emergency, the more likely it is that at least one of them will help.
true	false	9. Schizophrenics have more than one personality.
true	false	10. All effective psychotherapies require clients to get to the root of their problems in childhood.

Take a moment to review the preceding 10 questions. Beginning psychology students typically assume that they know the answers to most of them. That's hardly surprising, as these assertions have become part of popular psychology lore. Yet most students are surprised to learn that *all* 10 of these statements are false! This little exercise illustrates a take-home message we will emphasise throughout the text: *Although commonsense can be enormously useful for some purposes, it's sometimes completely wrong* (Chabris & Simons, 2010). This can be especially true in psychology, a field that strikes many of us as self-evident, even obvious. In a sense, we are *all* psychologists, because we deal with psychological phenomena such as love, friendship, anger, stress, happiness, sleep, memory and language in our daily lives (Lilienfeld, Ammirati & Landfield, 2009). As we will discover, everyday experience can often be helpful in allowing us to navigate the psychological world, but it doesn't necessarily make us an expert (Kahneman & Klein, 2009).

What is psychology? Science versus intuition

LO 1.1 Define psychology.

LO 1.2 Explain how science can safeguard against the major fallacies of human thinking.

William James (1842–1910), one of the great pioneers in psychology, once described psychology as a 'nasty little subject'. As James noted, psychology is difficult to study, and simple explanations of behaviour are few and far between. If you enrolled in this unit expecting cut-and-dried answers to psychological questions, such as why you become angry or fall in love, you might emerge disappointed. But if you enrolled in the hopes of acquiring more insight into the hows and whys of human behaviour, stay tuned, because a host of delightful surprises are in store. When reading this textbook, prepare to find many of your preconceptions about psychology challenged; to encounter new ways of thinking about the causes of your everyday thoughts, feelings and actions; and to apply these ways of thinking to evaluating psychological claims in everyday life.

popular psychology industry
sprawling network of everyday sources of information about human behaviour

Psychology and levels of analysis

The first question often posed in introductory psychology textbooks could hardly seem simpler: What is psychology? Although psychologists disagree about many things, they agree on one thing: psychology isn't easy to define (Henriques, 2004; Lilienfeld, 2004). For the purposes of this text, though, we will simply refer to **psychology** as the scientific study of the mind, brain and behaviour.

Psychology is a discipline that spans multiple **levels of analysis**. We can think of levels of analysis as rungs on a ladder, with the lower rungs tied most closely to biological influences and the higher rungs tied most closely to social influences (Ilardi & Feldman, 2001; Kendler, 2005). The levels of analysis in psychology stretch all the way from molecules to brain structures on the low rungs to thoughts, feelings and emotions, and to social and cultural influences on the high rungs, with many levels in between (Cacioppo et al., 2000; Satel & Lilienfeld, 2013) (see Figure 1.1). The lower rungs are more closely tied to what we traditionally call 'the brain'; the higher rungs to what we traditionally call 'the mind'. It is crucial to understand that 'brain' and 'mind' can be complementary ways of describing and analysing the same underlying psychological processes. Although psychologists may choose to investigate different rungs, they are united by a shared commitment to understanding the causes of human and animal behaviour.

We will cover all of these levels of analysis in coming chapters. When doing so, we will keep one crucial guideline in mind: *To fully understand psychology, we must consider multiple levels of analysis*. That's because each level tells us something different, and we gain new knowledge from each vantage point. Some psychologists believe that biological factors—like the actions of the brain and its billions of nerve cells—are most critical for understanding the causes of behaviour. Others believe that social factors—like parenting practices, peer influences and culture—are most critical for understanding the causes of behaviour (Meehl, 1972). In this text, we will steer away from these two extremes, because both biological and social factors are essential for a complete understanding of psychology (Kendler, 2005).

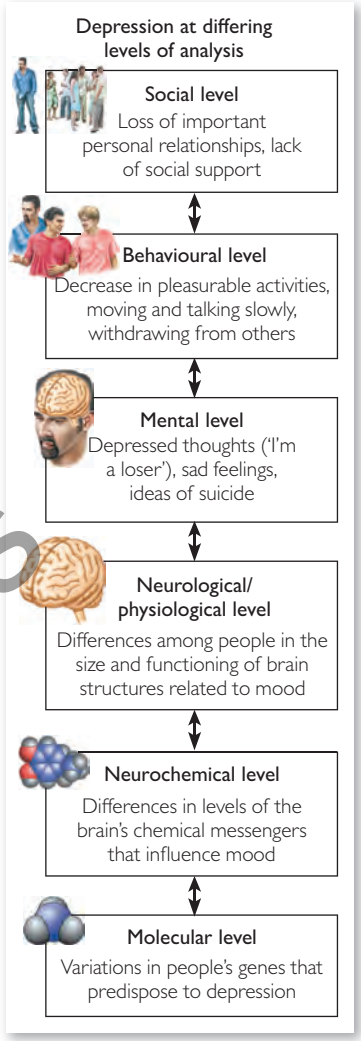


FIGURE 1.1 Levels of analysis in depression. We can view psychological phenomena, in this case the disorder of depression, at multiple levels of analysis, with lower levels being more biological and higher levels being more social. Each level provides unique information and offers a distinctive view of the phenomenon at hand. (*Source:* Based on data from Ilardi, Rand & Karwoski, 2007.)

What makes psychology distinctive—and fascinating

A key theme of this textbook is that we can approach psychological questions scientifically, with important similarities to how we approach questions in biology, chemistry and physics. Yet each of these sciences is also unique in its own way, and importantly, psychology is also unique and distinct from the other sciences. A host of challenges make the study of mind, brain and behaviour especially complex; yet it is precisely these challenges that also make psychology fascinating, because they contribute to scientific mysteries that psychologists have yet to solve. Here, we will touch briefly on five especially intriguing challenges that we will be revisiting throughout the text.

First, human behaviour is difficult to predict, in part because almost all actions are **multiply determined**—that is, they are produced by many factors. That is why we need to be sceptical of *single-variable explanations* of behaviour, which are widespread in popular psychology. Although it is tempting to explain complex human behaviours like violence in terms of a single causal factor such as poverty, bad upbringing or genes, these behaviours are almost surely due to the interplay of an enormous array of factors (Stern, 2002).

Second, psychological influences are rarely independent of each other, making it difficult to pin down which cause or causes are operating. Imagine you are a scientist attempting to explain why some women develop anorexia nervosa, a severe eating disorder that we will discuss in Chapter 12. You could start by identifying several factors that might contribute to anorexia nervosa, such as anxiety-proneness, compulsive exercise, perfectionism, excessive concern with body image, and exposure to television programmes that feature thin models. Let's say that you want to focus on just one of these potential influences, such as perfectionism. Here is the problem: women who are perfectionists also tend to be anxious, to exercise a lot, to be overly concerned with their body image, to watch television programmes that feature thin models, and so on (Egan et al., 2013). The fact that

psychology
the study of the mind and brain

multiply determined
caused by many factors

all of these factors tend to be interrelated makes it tricky to pinpoint which one actually contributes to anorexia nervosa. The odds are high that they all play at least some role.

Third, people differ from each other in thinking, emotion, personality and behaviour. These **individual differences** help to explain why each person responds in different ways to the same objective situation, such as an insulting comment from a boss (Harkness & Lilienfeld, 1997). Entire fields of psychology—such as the study of intelligence, interests, personality and mental illness—focus on individual differences (Lubinski, 2000). Individual differences make psychology challenging because they make it difficult to come up with explanations of behaviour that apply to everyone; at the same time, they make psychology exciting, because people we might assume we understand well often surprise us in their reactions to life events.

Fourth, people often influence each other, often making it difficult to pin down what causes what (Wachtel, 1973). For example, if you are an extraverted person, you are likely to make the people around you more outgoing. In turn, their outgoing behaviour may 'feed back' to make you even more extraverted, and so on. This is an example of what Albert Bandura (1973) called *reciprocal determinism*—the fact that we mutually influence each other's behaviour (see Chapter 15). Reciprocal determinism can make it challenging to isolate the causes of human behaviour.

Fifth, people's behaviour is often shaped by culture. Cultural differences, such as individual differences, place limits on the generalisations that psychologists can draw about human nature (Henrich, Heine & Norenzayan, 2010). To take one example, Richard Nisbett and his colleagues found that European Americans and Asian Americans often pay attention to strikingly different things in pictures (Chua, Boland & Nisbett, 2005). In one case, the researchers showed people a photograph of a tiger walking on rocks next to a river. Using eye-tracking technology, which allows researchers to determine where people are moving their eyes, they found that European Americans tend to look mostly at the tiger, whereas Asian Americans tend to look mostly at the plants and rocks surrounding it. This finding dovetails with evidence that European Americans tend to focus on central details, whereas Asian Americans tend to focus on peripheral or incidental details (Nisbett, 2003; Nisbett et al., 2001).

All five of these challenges are worth bearing in mind as we move on to later chapters. The good news is that psychologists have made substantial progress toward solving all of them, and that a deeper and richer appreciation of these challenges helps us to better predict—and in some cases understand—behaviour.

Why we can't always trust our commonsense

To understand why others act as they do, most of us trust our commonsense—our gut intuitions about how the social world works. Yet, as we have already discovered, our intuitive understanding of ourselves and the world is frequently mistaken (Cacioppo, 2004; van Hecke, 2007). As the quiz at the start of this chapter showed us, sometimes our commonsensical understanding of psychology isn't merely incorrect but entirely back-to-front. For example, although many people believe the old adage 'There's safety in numbers' (statement 8 in the quiz above), psychological research actually shows that the more people present at an emergency, the less likely it is that at least one of them will help (Darley & Latané, 1968; Latané & Nida, 1981; see also Chapter 13).

Here is another illustration of why we cannot always trust our commonsense. Read the following 10 well-known proverbs, expressing commonsense or popular beliefs about human behaviour, and ask yourself whether you agree with them.

1. Birds of a feather flock together.	6. Opposites attract.
2. Absence makes the heart grow fonder.	7. Out of sight, out of mind.
3. Better safe than sorry.	8. Nothing ventured, nothing gained.
4. Two heads are better than one.	9. Too many cooks spoil the broth.
5. Actions speak louder than words.	10. The pen is mightier than the sword.

individual differences
variations among people in their thinking, emotion and behaviour

These proverbs similarly ring true, do they not? Yet each one contradicts the proverb across from it. So our commonsense can lead us to believe two things that cannot both be true simultaneously, or at least that are largely at odds with each other. Strangely enough, in most cases we never notice the contradictions until other people, such as the authors of an introductory psychology textbook, point them out to us. This example reminds us of why scientific psychology doesn't rely exclusively on intuition, speculation or commonsense.

NAIVE REALISM: SEEING IS BELIEVING—OR IS IT? We trust our commonsense largely because we are prone to **naive realism**: the belief that we see the world precisely as it is (Lilienfeld, Lohr & Olatunji, 2008; Ross & Ward, 1996). We assume that 'seeing is believing' and trust our intuitive perceptions of the world and ourselves. In daily life, naive realism often serves us well. If you are driving down a one-lane road and see a tractor-trailer barrelling towards you at 120 kilometres per hour, it is a wise idea to get out of the way. Much of the time, we *should* trust our perceptions.

Yet appearances can sometimes be deceptive. The Earth seems flat. The sun seems to revolve around the Earth. Yet in both cases, our intuitions are wrong. Sometimes, what appears to be obvious can trip us up when it comes to evaluating ourselves and others. Our commonsense tells us that our memories accurately capture virtually everything we have seen, although scientific research demonstrates otherwise (Loftus, 1997; see Chapter 7). Our commonsense also assures us that people who do not share our political views are biased, but that we are objective. Yet psychological research demonstrates that we are all susceptible to evaluating political issues in a biased fashion (Pronin, Gilovich & Ross, 2004). So our tendencies to believe appearances can lead us to draw erroneous conclusions about human nature. In many cases, 'believing is seeing' rather than the reverse: our beliefs shape our perceptions of the world (Gilovich, 1991).

WHEN OUR COMMONSENSE IS RIGHT. That is not to say that our commonsense is always wrong. Our intuition comes in handy in many situations, and sometimes guides us to the truth (Gigerenzer, 2007; Gladwell, 2005; Myers, 2002). For example, our snap (five-second) judgements about whether someone we have just watched on a videotape is trustworthy or untrustworthy tend to be right more often than would be expected by chance (Fowler, Lilienfeld & Patrick, 2007). Commonsense can also be a helpful guide for generating hypotheses that scientists can later test in rigorous investigations (Redding, 1998). Moreover, some everyday psychological notions are indeed correct. For example, most people believe that happy employees tend to be more productive on the job than unhappy employees, and research indicates that they are right (Kluger & Tikochinsky, 2001).

To think like scientific psychologists, we must learn to test our 'commonsense' beliefs before we accept them. Doing so will help us become more informed consumers of popular psychology and make better real-world decisions. One of our major goals in this text is to provide you with thinking tools for making this crucial distinction. These thinking tools should help you to better evaluate psychological claims in everyday life.

Here is another case in which our naïve realism can trick us. Take a look at these two upside-down photos. They look quite similar, if not identical. Now turn your book upside-down. (*Source:* Warren Goldswain/ Shutterstock.)

Psychology as a science

A few years ago, one of our academic colleagues was advising a psychology major about his career plans. Out of curiosity, our colleague asked him, 'So why did you decide to go into psychology?' He responded, 'Well, I took a lot of science courses and realised I didn't like science, so I picked psychology instead'.

We hope to persuade you that this student was wrong—not about selecting a psychology major, that is, but about psychology not being a science. A central theme of this text is that modern psychology, or at least hefty chunks of it, is scientific. But what does the word 'science' really mean, anyway?

naive realism
belief that we see the world precisely as it is

WHAT'S SCIENCE, ANYWAY? Most students think that 'science' is just a word for all of that really complicated stuff they learn in their biology, chemistry and physics classes. But science is not a body of knowledge. Instead, it is an approach to evidence and explanations of the world around and in us (Chalmers, 1999). Science is not a single method but rather a toolbox of knowledge skills designed to prevent us from fooling ourselves. As Nobel Prize–winning physicist Richard Feynman (1985) put it, doing science means bending over backwards to see whether you are wrong.

SCIENTIFIC ATTITUDES: AN ETHIC OF KNOWLEDGE. Science carries with it a profoundly ethical attitude towards knowledge. Foremost is what philosopher Karl Popper (1979) described as the public nature of scientific knowledge. The commitment to **public knowledge** means a willingness by scientists to share their methods and findings with others. The public nature of scientific knowledge underscores the point that scientists are part of a community of scholars who work together. Without such open access, the scientific enterprise grinds to a screeching halt, because research progress hinges on the ability of the scientific community to independently evaluate other investigators' findings.

Another crucial scientific attitude is that scientists should try their best to be objective when evaluating evidence. That is, scientists should try not to allow personal or financial investments in their research to influence their conclusions. **Objectivity** is easier to say than to achieve, because scientists are human and therefore almost inevitably biased to some degree. The ethics of knowledge on which science is founded have always been, and continue to be, profoundly challenged by the legal, commercial and social frameworks in which scientists, as human beings, must operate.

psychomythology

WHAT IS SCIENTIFIC THEORY?

Few terms in science have generated more confusion than the deceptively simple term *theory*. Some of this confusion has contributed to serious misunderstandings about how science works. We will first examine what a scientific theory is, and then address two misconceptions that show what a scientific theory is not.

A **scientific theory** is an explanation for a large number of findings in the natural world, including the psychological world. A scientific theory offers an account that ties multiple findings together into one conceptual package.

But good scientific theories do more than account for existing data. They generate predictions regarding new data we haven't yet observed. For a theory to be scientific, it must generate novel predictions that researchers can test. Scientists call a testable prediction a **hypothesis**. In other words, theories are general explanations, whereas hypotheses are specific predictions derived from those explanations (Bolles, 1962; Meehl, 1967). Based on their tests of hypotheses, scientists can provisionally accept the theory that generated these hypotheses, reject the theory outright, or revise it (Proctor & Capaldi, 2006).

Misconception 1: *A theory explains one specific event.* The first misunderstanding is that a theory is a specific explanation for an event. The popular media get this distinction wrong much of the time. We often hear television reporters say something such as, 'The most likely theory for the robbery at the downtown bank is that it was committed by two former bank employees who dressed up as armed guards'. But this isn't a 'theory' of the robbery. For one thing, it attempts to explain only one event rather than a variety of diverse observations and, for another, it doesn't generate testable predictions.

Misconception 2: *A theory is just an educated guess.* A second myth is that a scientific theory is merely a guess about how the world works. People often dismiss a theoretical explanation on these grounds, arguing that it's 'just a theory'.

public knowledge
willingness to share our findings with others

objectivity
attempt to set aside personal interests when evaluating the evidence for a scientific claim

scientific theory
explanation for a large number of findings in the natural world

hypothesis
testable prediction derived from a theory

In fact, *all* general scientific explanations about how the world works are theories. A few theories are extremely well supported by multiple lines of evidence; for example, the Big Bang theory, which proposes that the universe we see today began in a gigantic explosion about 14 billion years ago, helps scientists to explain a diverse array of observations. They include the findings that: (1) galaxies are rushing away from each other at remarkable speeds; (2) the universe exhibits a background radiation suggestive of the remnants of a tremendous explosion; and (3) powerful telescopes reveal that the oldest galaxies originated shortly after 14 billion years ago, right around the time predicted by the Big Bang theory. Like all scientific theories, the Big Bang theory can never be 'proved' because it is always conceivable that a better explanation might come along one day. Nevertheless, because this theory is consistent with many differing lines of evidence, the overwhelming majority of scientists accept it as a good explanation. Darwinian evolution, the Big Bang, and other well-established theories aren't just guesses about how the world works, because very many of their predictions have been substantiated over and over again by independent investigators. In contrast, many other scientific theories are only moderately well supported, and still others are questionable or entirely discredited. Not all theories are created equal.

So, when we hear that a scientific explanation is 'just a theory', we should remember that theories aren't just guesses. Some theories have survived repeated efforts to test them and are well-confirmed models of how the world works (Kitcher, 2009).

SCIENCE AS A SAFEGUARD AGAINST BIAS: PROTECTING US FROM OURSELVES. Some people assume that, because scientists strive for objective knowledge, scientists themselves are free of biases. Yet scientists are only human and so they have their biases, too (Mahoney & DeMonbreun, 1977). However, the best scientists try to be aware of their biases and try to find ways of compensating for them. This principle applies to all scientists, including psychological scientists—those who study mind, brain and behaviour. In particular, the best scientists realise that they *want* their pet theories to turn out to be correct. After all, they have invested months or even years in designing and running a study to test a theory, sometimes a theory they have developed. If the results of the study are negative, they will often be bitterly disappointed. They also know that because of this deep personal investment, they may bias the results unintentionally to obtain the ones they want (Greenwald et al., 1986). Scientists are prone to self-deception, just like the rest of us. There are several traps into which scientists can fall unless they are careful. We will discuss two of the most crucial next.

Confirmation bias. To protect themselves against bias, good scientists adopt procedural safeguards against errors, especially errors that could work in their favour (see Chapter 2). In other words, science contains powerful tools for overcoming **confirmation bias**—the tendency to seek out evidence that supports our hypotheses, and neglect or distort evidence that contradicts them (Nickerson, 1998; Risen & Gilovich, 2007). We can sum up confirmation bias in five words: *Seek and ye shall find.*

Because of confirmation bias, our preconceptions often lead us to focus on evidence that supports our beliefs, resulting in psychological tunnel vision. One of the simplest demonstrations of confirmation bias comes from research on the Wason selection task (Wason, 1966), an example of which is shown in Figure 1.2. There you will see four cards, each of which has a number on one side and a letter on the other. Your task is to determine whether the following hypothesis is correct: *all cards that have a vowel on one side have an odd number on the other.* To test this hypothesis, you need to select two cards to turn over. Which two will you pick? Decide on your two cards before reading further.

Most people pick the cards showing E and 5. If you selected E, you were right, so give yourself one point there. But if you selected 5, you have fallen prey to confirmation bias, although you would be in good company because most people make this mistake. Although 5 seems to be a correct choice, it can only confirm the hypothesis, not disconfirm it. Think of it this way: if there is a vowel on the other side of the 5 card, this does

Here are four cards. Each of them has a letter on one side and a number on the other side. Two of these cards are shown with the letter side up, and two with the number side up.

E C 5 4

Indicate which of these cards you have to turn over in order to determine whether the following claim is true:

If a card has a vowel on one side, then it has an odd number on the other side.

FIGURE 1.2 Diagram of Wason selection task. In the Wason selection task, you must pick two cards to test the hypothesis that all cards that have a vowel on one side have an odd number on the other. Which two will you select?

confirmation bias
tendency to seek out evidence that supports our hypotheses and neglect or distort evidence that contradicts them

Most of us believe that we evaluate political information objectively. Yet psychological research suggests that when our favourite candidates contradict themselves, we quickly forgive them and explain away the inconsistency. But when candidates we do not like contradict themselves, we criticise them as being hypocritical. (*Source:* AAP Image/Alan Porritt.)

not rule out the possibility that the 4 card has a vowel on the other side, which would disconfirm the hypothesis. So the 4 card is actually the other card to turn over, as that is the only other card that could disconfirm the hypothesis.

Confirmation bias would not be especially interesting if it were limited to cards with numbers and letters. What makes confirmation bias so important is that it extends to many areas of daily life, including friendship, romance and politics (Nickerson, 1998; Rassin, Eerland & Kuijpers, 2010). For example, research shows that confirmation bias affects how we evaluate candidates for political office—including those on both the left and right sides of the political spectrum. Research shows that if we agree with a candidate's political views, we quickly forgive the candidate for contradicting himself or herself, but if we disagree with a candidate's views, we criticise him or her as a 'flip-flopper' (Tavris & Aronson, 2007; Westen et al., 2006). When it comes to judging right and wrong, our side almost always seems to be in the right; the other side, in the wrong.

Although you will be encountering a variety of biases in this text, we can think of confirmation bias as the 'mother of all biases'. That is because it is the bias that can most easily fool us into seeing what we want to see. For that reason, it is also the most crucial bias that scientists need to counteract. Incidentally, scientists are probably just as prone to confirmation bias as everyone else (Meehl, 1993). For example, research shows that academic psychologists are more likely to recommend an article for publication if the findings are consistent with their favourite theory of behaviour than if they are not (Mahoney, 1977). What distinguishes scientists from non-scientists is that the former adopt systematic safeguards to protect against confirmation bias, whereas the latter do not. You will learn about these safeguards in Chapter 2.

Belief perseverance: it's my story and I'm sticking to it. Confirmation bias can predispose us to another shortcoming to which we are all prone: **belief perseverance**. Belief perseverance refers to the tendency to stick to our initial beliefs even when evidence contradicts them. In everyday parlance, belief perseverance is the 'do not confuse me with the facts' effect. Because none of us wants to believe we are wrong, we are usually reluctant to give up our cherished notions. Indeed, as evidence against our deep-seated beliefs mounts, we often search desperately for evidence that confirms them. More often than not, we will manage to find it.

In a striking demonstration of belief perseverance, Lee Ross and his colleagues asked students to inspect 50 suicide notes and determine which were genuine and which were fake (in reality, half were genuine, half fake). They then gave the students feedback on how well they did. Unbeknownst to students, this feedback bore no relation to their actual performance. Instead, the researchers randomly told some students that they were good at detecting real suicide notes and others that they were bad at it. Even after investigators told the students that their feedback was completely bogus—which it was—the students based their estimates of ability on the feedback they had received. That is, students told that they were good at detecting real suicide notes were convinced that they were better at it than those students told that they were bad at it. In contrast to the second group of students, the first group even predicted they would do well on a similar task in the future (Ross, Lepper & Hubbard, 1975).

Beliefs endure. Even when informed we are wrong, we do not completely wipe our mental slates clean and start from scratch.

The boundaries of science

It is essential to distinguish pseudoscience (claims that pretend to be science) from the **non-scientific knowledge** that comes from domains of inquiry which lie outside the scope of science. Disciplines such as mathematics, ethics, history, art, music, literature, poetry, religion, law and politics (to name some key examples) pursue vital questions that are not addressed by the methods of science. These fields have developed their own critical

belief perseverance
tendency to stick to our initial beliefs even when evidence contradicts them

non-scientific knowledge
assertions about aspects of reality that are not experimentally testable

methods suited to pursue their particular aims. That is not to say that science has nothing to contribute to inquiry in these domains—far from it. But it is to say that there are important questions that are not resolvable within science. Take, for example, the question: 'Why is there something rather than nothing?' Or consider this statement: *The desire for hope is an entirely legitimate human need which must be respected*. Is this true or false? How will you decide this by scientific experiments? There are many important questions that lie outside the scope of science. However, psychology is a discipline that seeks to understand that which can be known about the human condition through the methods of scientific inquiry.

In most major bookstores, the self-help section is larger than the psychology section. Although studies show that many self-help books can be helpful, only a small fraction of them have ever been tested in scientific studies. (*Source:* Monkey Business Images/Dreamstime.)

Assess your knowledge — FACT or FICTION?

1. Psychology involves studying the mind at one specific level of explanation. **(True/False)**
2. Science is a body of knowledge consisting of all of the findings that scientists have discovered. **(True/False)**
3. Scientific experiments work by trying to test the predictions of researchers' theories. **(True/False)**
4. In general, scientists are just as prone to confirmation bias as non-scientists. **(True/False)**
5. A scientific hypothesis is essentially the same thing as a scientific theory, only more specific in its predictions. **(True/False)**

Answers: (1) F (p. 5); (2) F (p. 8); (3) F (p. 8); (4) T (p. 9); (5) F (p. 8)

Psychological pseudoscience: imposters of science

LO 1.3 Describe the features of psychological pseudoscience, and distinguish it from psychological science.

LO 1.4 Identify reasons we are drawn to pseudoscience.

Of course, you might have enrolled in this course to understand yourself, your friends or a boyfriend or girlfriend. If so, you might well be thinking, 'But I don't want to become a scientist. In fact, I'm not even interested in research. I just want to understand people.'

Actually, we are not trying to persuade you to become a scientist. Instead, our goal is to persuade you to *think scientifically*: to become aware of your biases and to avail yourself of some of the methods scientists use to try to overcome them. In this way, you will become better at making educated choices in your everyday life, like what weight loss plan to choose, what psychotherapy to recommend to a friend, or even what potential romantic partner is a better long-term bet. Not everyone can become a scientist, but just about everyone can learn to think like one.

The amazing growth of popular psychology

The popular psychology industry is expanding rapidly. On the positive side, this means that the Australian public has unprecedented access to psychological knowledge. On the negative side, the remarkable growth of popular psychology has led not only to an information explosion but also to a *misinformation explosion* because there is scant quality control over what this industry produces.

To take just one example, about 3500 self-help books are published every year (Arkowitz & Lilienfeld, 2006), although only a handful are written or even screened by scientific experts. Investigators have found some of these books to be effective for treating depression, anxiety and other psychological problems, but about 95 per cent of them remain untested (Gould & Clum, 1993; Gregory et al., 2004; Rosen, 1993). Still other self-help books may actually make certain psychological conditions worse (Rosen, Glasgow & Moore, 2003). And although some self-help books contain high-quality and scientifically supported information, others are misleading or even dangerous. For example, some of these books encourage readers who suspect they might have been

sexually abused in childhood to try hard to 'remember' the abuse. Yet this procedure may increase many readers' risk for false memories of abuse (McConkey & Sheehan, 1995).

Coinciding with the rapid expansion of the popular psychology industry is the enormous growth of treatments and products that purport to cure almost every imaginable psychological ailment. There are more than 500 'brands' of psychotherapy (Eisner, 2000), with new ones being added every year. Fortunately, as you will learn in Chapter 17, research shows that some of these treatments are clearly helpful for depression, anxiety disorders, eating disorders, sleep difficulties and a host of other psychological problems. Yet the substantial majority of psychotherapies remain untested, so we do not know whether they help. Some may even be harmful (Lilienfeld, 2007).

Some self-help books base their recommendations on solid research about psychological problems and their treatment. We can often find excellent articles and programmes in Australian and international media outlets that present high-quality information regarding the science of psychology. In addition, hundreds of websites provide remarkably helpful information and advice concerning a host of psychological topics, like memory, personality testing, and psychological disorders and their treatment (see Table 1.1). In contrast, many other websites contain misleading or erroneous information, so we need to be armed with accurate knowledge to evaluate them.

TABLE 1.1 Some websites for scientific psychology and mental health

ORGANISATION/URL
Association for the Scientific Study of Consciousness http://theassc.org
Australian Association for Cognitive and Behaviour Therapy www.aacbtwa.org.au
Australian Neuroscience Society www.ans.org.au
Australian Psychological Society www.psychology.org.au
Australian Psychoanalytical Society www.psychoanalysis.asn.au
Australian Society of Hypnosis www.ozhypnosis.com.au
Australian Society for Psychophysiology, Inc. www.asp.org.au
Brain Foundation (Australia) http://brainfoundation.org.au
Evidence-Based Mental Health Treatment for Children and Adolescents www.abct.org/sccap
Koestler Parapsychology Unit www.koestler-parapsychology.psy.ed.ac.uk
Society for Personality and Social Psychology www.spsp.org
Society of Clinical Psychology www.psychology.sunysb.edu/eklonsky-/division12
Scientific Review of Mental Health Practice www.srmhp.org
Psychological Medicine New York University http://psych.med.nyu.edu/patient-care/a-z-diseases-conditions

Subliminal self-help tapes supposedly influence behaviour by means of messages delivered to the unconscious. But do they really work?

What is pseudoscience?

These facts highlight a crucial point: we need to distinguish claims that are genuinely scientific from those that are merely imposters of science. An imposter of science is a **pseudoscience**: a set of claims that seems scientific but is not. In particular, pseudoscience

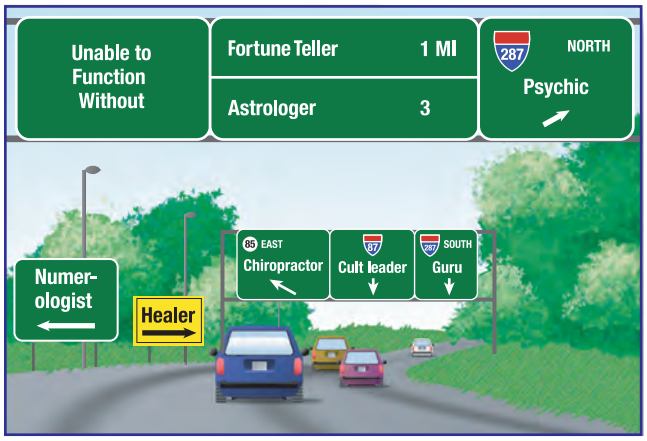
pseudoscience
set of claims that seems scientific but is not

lacks the safeguards against confirmation bias and belief perseverance that characterise science.

As we have discussed, popular psychology is a mix of high-quality science and pseudoscience (as well as a great deal in between). The problem is that unless we are careful, we can be easily duped into confusing these two sorts of evidence and accepting impressive-sounding claims that are devoid of scientific substance.

You will find throughout this text that some popular psychology claims are largely or entirely pseudoscientific. That is not to say that all of these claims are entirely false. In fact, at least a few of them possess a core of truth. Still others might be shown to be true in future research. Yet the proponents of these claims do not typically 'play by the rules' of science.

Science is a process and not a set of beliefs, so the difference between science and pseudoscience is not always clear-cut. Some psychological products and treatments are based mostly on science but partly on pseudoscience, and vice versa. Still, we can pinpoint a number of helpful distinctions between science and pseudoscience, even if the boundaries between them become fuzzy around the edges (Leahey & Leahey, 1983; Lindeman, 1998).



Pseudoscientific and otherwise questionable claims have increasingly altered the landscape of modern life.

WARNING SIGNS OF PSEUDOSCIENCE. Numerous warning signs can help us distinguish science from pseudoscience; we have listed some of the most useful ones in Table 1.2. They are extremely helpful rules of thumb, so useful in fact that we will draw on many of them in later chapters to help us become more informed consumers of psychological claims. We can—and should—also use them in everyday life. None of these signs is by itself proof positive that a set of claims is pseudoscientific. Nevertheless, the more of these signs we see, the more sceptical of these claims we should become. Here, we will discuss three of the most crucial of these warning signs.

TABLE 1.2 Some warning signs that can help us recognise pseudoscience

SIGN OF PSEUDOSCIENCE	EXAMPLE
Overuse of ad hoc immunising hypotheses	The psychic who claimed to predict the future failed all controlled tests in the lab, but said it was because the experimenters inhibited his extrasensory powers.
Exaggerated claims	Three simple steps will change your love life forever!
Overreliance on anecdotes	This woman practised yoga daily for three weeks and hasn't had a day of depression since.
Absence of connectivity to other research	Amazing new innovations in research have shown that eye massage results in reading speeds 10 times faster than average!
Lack of review by other scholars (called 'peer review') or replication by independent labs	Fifty studies conducted by the company all show overwhelming success!
Lack of self-correction when contrary evidence is published	Although some scientists say that we use almost all our brains, we have found a way to harness additional brain power previously undiscovered.
Meaningless 'psychobabble' that uses fancy scientific-sounding terms that don't make sense	Sine-wave filtered auditory stimulation is carefully designed to encourage maximal orbitofrontal dendritic development.
Talk of 'proof' instead of 'evidence'	Our new programme is proven to reduce social anxiety by at least 50 per cent!

Overuse of ad hoc immunising hypotheses. Yes, we know this one is a mouthful. But it is actually not as complicated as it appears, because an **ad hoc immunising hypothesis** is just an escape hatch that defenders of a theory use to protect their theory from being contradicted by evidence. When proponents of a theory come across negative evidence, they often try to explain it away by invoking loopholes (excuses for the negative results). Sometimes these excuses can be shown to be correct, but in other cases excuses are simply added upon excuses until there is no longer any possibility for evidence to contradict the theory. For example, some psychics have claimed to perform remarkable feats of **extrasensory perception (ESP)** in the real world, such

ad hoc immunising hypothesis
escape hatch or loophole that defenders of a theory use to protect their theory from being contradicted by evidence

extrasensory perception (ESP)
perception of events outside the recognised channels of sensory information

as reading others' minds or forecasting the future. But when brought into the laboratory and tested under tightly controlled conditions, most have bombed, performing no better than chance. Some of these psychics and their proponents have invoked an ad hoc immunising hypothesis to explain away these failures: the sceptical attitudes of the experimenters are somehow interfering with psychic powers (Carroll, 2003). Although this hypothesis is not necessarily wrong, it makes the psychics' claims essentially impossible to test by sceptical experimenters. In such cases, good scientists will seek to test the ad hoc hypothesis itself, but the continuing addition of ad hoc hypotheses can render any theory immune to scientific tests (Lakatos, 1974).

Lack of self-correction. As you have learned, many scientific claims turn out to be wrong. In science, incorrect claims tend to be weeded out eventually, even though it often takes a while. By contrast, in pseudosciences incorrect claims never go away, because their proponents cling to them stubbornly despite all contrary evidence. In the case of speed-reading courses, the claims of most advocates have not been changed one bit by the overwhelmingly negative findings.

Factoid

Astrology, which has been around for almost 5000 years, is a striking example of the absence of self-correction found in many pseudosciences. Some of the star charts used by modern astrologers are virtually identical to those used thousands of years ago (Hines, 2003). This is in spite of a phenomenon known as precession, a gradual shift in the Earth's axis, rendering the appearance of the stars in the night sky substantially different from what it was thousands of years ago.

Overreliance on anecdotes. There is an old saying that the 'plural of anecdote is not data'. A mountain of numerous anecdotes may seem impressive, but it should not persuade us to put much stock in others' claims. Anecdotes are 'I know a person who' assertions (Nisbett & Ross, 1980; Stanovich, 2004). This kind of second-hand evidence—'I know a person who says his self-esteem skyrocketed after receiving hypnosis', 'I know a person who tried to commit suicide after taking an antidepressant'—is commonplace in everyday life. However, anecdotes should not be confused with testimony, which is a basic form of evidence in the law courts and for historians. These fields have their own critical standards for assessing the credibility of such testimony.

Pseudosciences tend to rely heavily on anecdotal evidence. In many cases, they base claims on the dramatic reports of one or two individuals: 'I lost 30 kilos in three weeks on the Matzo Ball Soup Weight-Loss Programme.' Compelling as this anecdote may appear, it doesn't constitute good scientific evidence (Davison & Lazarus, 2007; Loftus & Guyer, 2002). For one thing, anecdotes don't tell us anything about cause and effect. Maybe the Matzo Ball Soup Weight-Loss Programme caused the person to lose 30 kilos, but maybe other factors were responsible. Perhaps he went on an additional diet or started to exercise frantically during that time. Or perhaps he underwent drastic weight-loss surgery during this time but didn't bother to mention it. Anecdotes also don't tell us anything about how representative the cases are. Perhaps most people who went on the Matzo Ball Soup Weight-Loss Programme gained weight, but we never heard from them. Finally, anecdotes are often difficult to verify. Do we really know for sure that he lost 30 kilos? We're taking his word for it, which is a risky idea.

Simply put, most anecdotes are extremely difficult to interpret as evidence. As clinical psychologist Paul Meehl (1995) put it: 'The clear message of history is that the anecdotal method delivers both wheat and chaff, but it does not enable us to tell which is which' (p. 1019).

WHY ARE WE DRAWN TO PSEUDOSCIENCE? There are a host of reasons why so many of us are drawn to pseudoscientific beliefs. Perhaps the central reason stems from the way our brains work. Our brains are predisposed to make order out of disorder and find sense in nonsense. This tendency is generally adaptive, as it helps us to simplify the often bewildering world in which we live (Alcock, 1995; Pinker, 1997; Shermer, 2011). Without it, we would be constantly overwhelmed by endless streams of information we don't have the time or ability to process. Yet this adaptive tendency can sometimes lead us astray, because it can cause us to perceive meaningful patterns even when they are not there (Carroll, 2003; Davis, 2009).

astrology
pseudoscience that claims to predict people's personalities and futures from the precise date and time of their birth

Finding comfort in our beliefs. Another reason for the popularity of pseudoscience is motivational: we believe in part because we want to believe. As the old saying goes, 'hope springs eternal'. Many pseudoscientific claims, such as **astrology**, may give us

from inquiry to understanding

WHY DO WE PERCEIVE PATTERNS EVEN WHEN THEY DON'T EXIST?

Our tendency to see patterns in meaningless data is so profound that one science writer, Michael Shermer (2008), gave it a name: *patternicity*. Although patternicity can lead to errors, it probably stems from an evolutionarily adaptive tendency (Reich, 2010). If we eat a specific food, say a bacon cheeseburger, for lunch tomorrow and become violently ill soon afterward, we will tend to avoid bacon cheeseburgers for a while (see Chapter 6). We will do so even though there is a very good chance that the link between the cheeseburger and our becoming ill was purely coincidental. No matter—our brains tend to seek out patterns and connections among events, because of a basic evolutionary principle: 'better safe than sorry'. All things being equal, it is usually better to assume that a connection between two events exists than to assume that it doesn't, especially when one of the events is physically dangerous. We all fall prey to patternicity from time to time. If we think of a friend with whom we haven't spoken in a few months and immediately afterward receive a phone call from him or her, we may jump to the conclusion that this striking co-occurrence stems from ESP. Well, it *might*. But it is also entirely possible, if not likely, that these two events happened at about the same time by chance alone. For a moment, think of the number of times one of your old friends comes to mind and then think of the number of phone calls you receive each month. You will realise that the laws of probability make it likely that at least once over the next few years, you will be thinking of an old friend at about the same time he or she calls.

Another manifestation of patternicity is our tendency to see meaningful images in meaningless visual stimuli. Any of us who has looked at a cloud and perceived the vague shape of an animal has experienced this version of patternicity, as has any of us who has seen the oddly misshapen face of a 'man' in the moon. A more stunning example comes from the photograph in Figure 1.3a. In 1976, the *Mars Viking Orbiter* snapped an image of a set of features on the Martian surface. As we can see, these features bear an eerie resemblance to a human face. So eerie, in fact, that some individuals maintained that the 'Face on Mars' offered conclusive proof of intelligent life on the Red Planet (Hoagland, 1987). In 2001, during a mission of a different spacecraft, the *Mars Global Surveyor*, the National Aeronautics and Space Administration (NASA) decided to adopt a scientific approach to the face on Mars. NASA was open-minded but demanded evidence. It swooped down much closer to the face and pointed the *Surveyor*'s cameras directly at it. If we look at Figure 1.3b, we will see what NASA found: absolutely nothing. The patternicity in this instance was a consequence of a peculiar configuration of rocks and shadows present at the angle at which the photographs were taken in 1976, a camera artefact in the original photograph that just happened to place a black dot where a nostril should be, and perhaps most importantly, of our innate tendency to perceive meaningful faces in what are basically random visual stimuli (see Chapter 11).

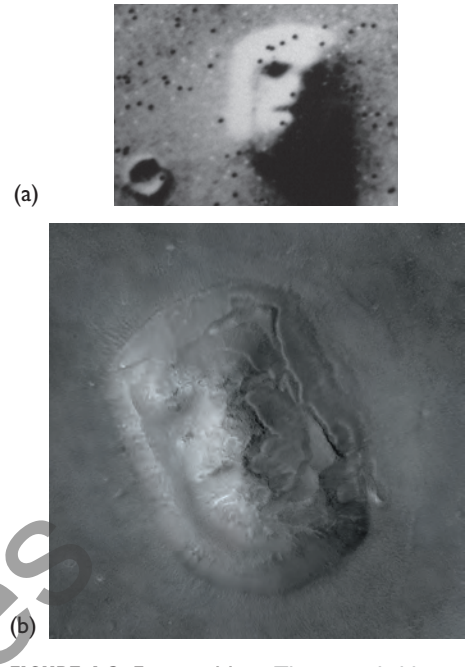


FIGURE 1.3 Face on Mars. The remarkable 'Face on Mars' photo taken by the *Mars Viking Orbiter* in 1976. Some argued that this face provides conclusive proof of intelligent life away from Earth. A more detailed photograph, taken in 2001, revealed that this 'face' was just an illusion. (*Source:* NASA/courtesy of nasaimages.org.)

comfort because they seem to offer us a sense of control over an often unpredictable world (Shermer, 2002). Research suggests that we are especially prone to patternicity when we experience a loss of control over our surroundings. Jennifer Whitson and Adam Galinsky (2008) deprived some participants of a sense of control—for example, by having them try to solve an unsolvable puzzle or recall a life experience in which they lacked control—and found that they were more likely than other participants to perceive conspiracies, embrace superstitious beliefs, and detect patterns in meaningless visual stimuli (see Figure 1.4). These results may help to explain why so many of us believe in astrology, ESP and other belief systems that claim to foretell the future: they lend us a sense of control over the uncontrollable (Wang, Whitson & Menon, 2012).

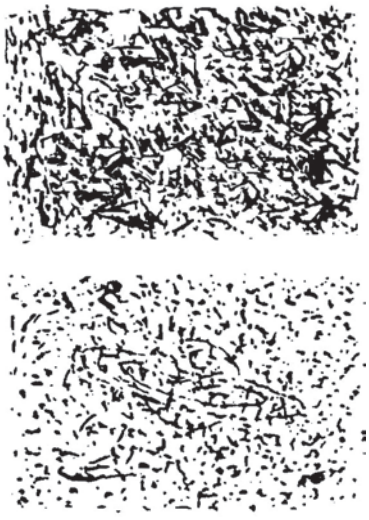


FIGURE 1.4 Regaining control. Do you see an image in either of these pictures? Participants in Whitson and Galinsky's (2008) study who were deprived of a sense of control were more likely than other participants to see images in both pictures, even though only the picture on the bottom contains an image (a faint drawing of the planet Saturn).

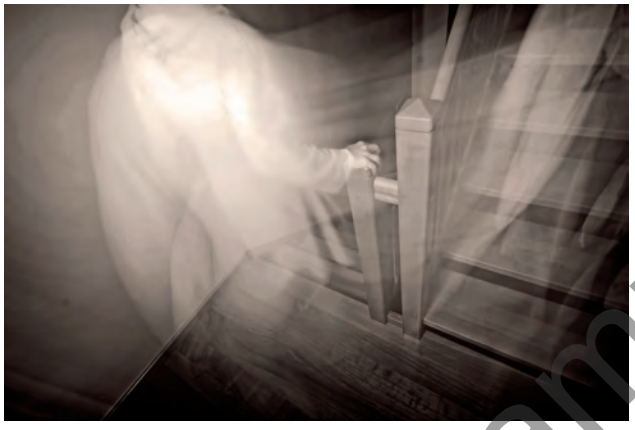
Factoid

'Streaks' of several consecutive heads (H) or tails (T) in a row when flipping a coin, like HTTTHTTTHTTHHHTHHTTHH, are more common than we believe. Moreover they are inevitable, in lengthy random sequences. Indeed, the sequence above is almost perfectly random (Gilovich, 1991). Because we usually underestimate the likelihood of consecutive sequences, we may be prone to attributing more significance to these sequences than they deserve ('Wow … I must be on a winning streak!').

According to **terror management theory** our awareness of our own inevitable death leaves many of us with an underlying sense of fear (Solomon, Greenberg & Pyszczynski, 2000; Vail et al., 2010). We cope with these feelings of terror, advocates of this theory propose, by adopting cultural worldviews that reassure us that our lives possess a broader meaning and purpose—one that extends well beyond our vanishingly brief existence on this planet.

Can terror management theory help to explain the popularity of certain paranormal beliefs, such as astrology, ESP and communication with the dead? Perhaps. Our society's widespread beliefs in life after death and reincarnation may stem in part from the terror that stems from knowing we will eventually die (Lindeman, 1998; Norenzayan & Hansen, 2006). Two researchers (Morier & Podlipentseva, 1997) found that compared with other participants, participants who were asked to contemplate death reported higher levels of beliefs in the paranormal, such as ESP, ghosts, reincarnation and astrology, than did other participants. It is likely that such beliefs are comforting to many of us, especially when confronted with reminders of our demise, because they imply the existence of a dimension beyond our own.

Terror management theory doesn't demonstrate that paranormal claims are false; we still need to evaluate these claims on their own merits. Instead, this theory suggests that we are likely to hold many paranormal beliefs regardless of whether they are correct.



According to terror management theory, reminders of our death can lead us to adopt comforting worldviews—perhaps, in some cases, belief in the paranormal. (*Source:* Michal Bednarek/Dreamstime.)

THINKING CLEARLY: AN ANTIDOTE AGAINST PSEUDOSCIENCE. Both to avoid being seduced by the charms of pseudoscience, and simply to do good science, we must learn to avoid commonplace pitfalls in reasoning. Students new to psychology commonly fall prey to **logical fallacies**: traps in thinking that can lead to mistaken conclusions. It is easy for us to make these errors, because they seem to make intuitive sense. We should remember that scientific thinking often requires us to cast aside our beloved intuitions, although doing so can be extremely difficult.

Here we will examine three especially important logical fallacies that are essential to bear in mind when evaluating psychological claims. Learning to avoid these and other logical fallacies (see Table 1.3) takes considerable time and effort. To do so, you must unlearn deeply entrenched habits of thinking. Nevertheless, if you bear these fallacies in mind when evaluating scientific evidence, you will find yourself becoming a better critical thinker in everyday life.

Emotional reasoning fallacy. 'The idea that daycare might have negative emotional effects on children gets me really upset, so I refuse to believe it.'

The **emotional reasoning fallacy** is the error of using our emotions as guides for evaluating the validity of a claim (some psychologists also refer to this error as the *affect heuristic*; Kahneman, 2011; Slovic & Peters, 2006). If we are honest with ourselves, we will realise that findings that challenge our pre-existing beliefs often make us angry, whereas findings that confirm these beliefs often make us happy or at least relieved. We shouldn't make the mistake of assuming that because a scientific claim makes us feel uncomfortable or indignant, it must be wrong. In the case of scientific questions concerning the psychological effects of daycare, which are scientifically controversial (Belsky, 1988; Hunt, 1999), we need to keep an open mind to the data, regardless of whether they confirm or disconfirm our preconceptions.

Bandwagon fallacy. 'A lot of people I know believe in astrology, so there's got to be something to it.'

The **bandwagon fallacy** is the error of assuming that a claim is correct just because many people believe it. It is an error, because popular opinion is not a dependable guide to the accuracy of an assertion. Before 1500, almost everyone believed the sun revolved around the Earth, rather than vice versa, but they were woefully mistaken.

terror management theory
theory proposing that our awareness of our death leaves us with an underlying sense of terror with which we cope by adopting reassuring cultural worldviews

logical fallacies
traps in thinking that can lead to mistaken conclusions

emotional reasoning fallacy
error of using our emotions as guides for evaluating the validity of a claim

bandwagon fallacy
error of assuming that a claim is correct just because many people believe it

TABLE 1.3 Other logical fallacies to remember when evaluating psychological claims

NAME	DEFINITION	EXAMPLE OF THE FALLACY
Appeal to authority fallacy	Error of accepting a claim merely because an authority figure endorses it	'My professor says that psychotherapy is worthless; because I trust my professor, she must be right.'
Genetic fallacy	Error of confusing the correctness of a belief with its origins (genesis)	'Freud's views about personality development can't be right, because Freud's thinking was shaped by sexist views popular at the time.'
Argument from antiquity fallacy	Error of assuming that a belief must be valid just because it has been around a long time	'There must be something to the Rorschach Inkblot Test, because psychologists have been using it for decades.'
Argument from adverse consequences fallacy	Error of confusing the validity of an idea with its potential real-world consequences	'IQ can't be influenced by genetic factors, because if that were true it would give the government an excuse to prevent low-IQ individuals from reproducing.'
Appeal to ignorance fallacy	Error of assuming that a claim must be true because no one has shown it to be false	'No scientist has been able to explain away every reported case of ESP, so ESP probably exists.'
Naturalistic fallacy	Error of inferring a moral judgement from a scientific fact	'Evolutionary psychologists say that sexual infidelity is a product of natural selection. Therefore, sexual infidelity is ethically justifiable.'
Hasty generalisation fallacy	Error of drawing a conclusion on the basis of insufficient evidence	'All three people I know who are severely depressed had strict fathers, so severe depression is clearly associated with having a strict father.'
Circular reasoning fallacy	Error of basing a claim on the same claim reworded in slightly different terms	'Dr Smith's theory of personality is the best, because it seems to have the most evidence supporting it.'

Factoid

Nobel Prize–winning physicist Luis Alvarez once had an eerie experience: while reading the newspaper, he came across a phrase that reminded him of an old childhood friend he had not thought about for decades. A few pages later, he came upon his friend's obituary! Initially stunned, Alvarez (1965) performed some calculations and determined that given the number of people on Earth and the number of people who die every day, this kind of strange coincidence probably occurs about 3000 times across the world each year.

Not me fallacy. 'My psychology professor keeps talking about how the scientific method is important for overcoming biases. But these biases do not apply to me, because I'm objective.'

The **not me fallacy** may be the most widespread and dangerous of all logical fallacies. It is the error of believing we are immune from errors in thinking that afflict other people. This fallacy can get us into deep trouble, because it can lead us to conclude mistakenly that we do not require the safeguards of the scientific method. When scientists fall into this trap (as proponents on both sides of the global warming debate have claimed about each other), they join the ranks of the pseudoscientists. They become so certain that their claims are right—and uncontaminated by mistakes in their thinking—that they do not bother to conduct scientific studies to back up their claims.

The bandwagon fallacy reminds us that the number of people who hold a belief is not a dependable barometer of its accuracy. (*Source:* Paul Kane/Getty Images.)

Bias blind spot. Social psychologists have recently uncovered a fascinating phenomenon called the **bias blind spot**, which means that most people are unaware of their biases but are keenly aware of them in others (Pronin, Gilovich & Ross, 2004; van Hecke, 2007). None of us believes we have an accent because we live with our accent all of the time. Similarly, few of us believe we have biases, because we have grown accustomed to seeing the world through our own psychological lenses. To see the not me fallacy at work, watch a debate between two intelligent people who hold extremely polarised views on a political issue. More likely than not, you will see that the debate participants are quite adept at pointing out biases in their opponents, but are often oblivious of their own equally glaring biases.

not me fallacy
error of believing we are immune from thinking errors that afflict others

bias blind spot
lack of awareness of our biases, coupled with an awareness of others' biases

The dangers of pseudoscience: why should we care?

Up to this point, we have been making a big deal about pseudoscience. But why should we care about it? After all, isn't a great deal of pseudoscience, like astrology, pretty harmless? In fact, pseudoscience can be dangerous, even deadly. There are three major reasons why we should all be concerned about pseudoscience.

Candace Newmaker was a tragic victim of what science writer Michael Shermer (2002) aptly called 'death by theory'. The rebirthing therapists who smothered her to death were convinced that she needed to re-enact the birth trauma to eliminate her psychological problems. (*Source:* AP Photo.)

Stem cell research is controversial on both scientific and ethical grounds. To evaluate this and other controversies properly, we need to be able to think critically about the potential costs and benefits of such research. (*Source*: Australian Associated Press Pty Ltd.)

- **Opportunity cost: what we give up.** Pseudoscientific treatments for mental disorders can lead people to forgo effective treatments. As a consequence, even treatments that are themselves harmless can cause harm indirectly. This phenomenon is called **opportunity cost**: people who invest time, effort and energy in obtaining a questionable treatment may forfeit the chance to obtain a treatment that works. For example, a major community survey (Kessler et al., 2001) revealed that people with histories of severe depression or anxiety attacks more often received scientifically unsupported treatments than scientifically supported treatments, like cognitive-behavioural therapy (see Chapter 17). The unsupported treatments included: acupuncture, which has never been shown to work for depression despite a few scattered positive findings; laughter therapy, which is based on the untested notion that laughing can cure depression; and energy therapy, which is based on the untested notion that all people possess invisible energy fields that influence their moods (see Chapter 17). Although some of these treatments may be shown to be helpful in future studies (and all new approaches must begin as untested ideas), consumers who seek them out should be aware that there are empirically supported alternatives.
- **Direct harm.** Pseudoscientific treatments occasionally do dreadful harm to those who receive them. Take the tragic case of Candace Newmaker, a 10-year-old girl who in 2000 underwent pseudoscientific treatment for behavioural problems (Mercer, Sarner & Rosa, 2003). Candace received a treatment called *rebirthing therapy*, which is premised on the scientifically doubtful notion that children's behavioural problems are attributable to difficulties in forming attachments to their parents stemming from birth—in some cases, even before birth (see Chapter 17). Despite the confusingly similar terminology (and appeals to genuine scientific work in promotional material), this therapy should not be confused with the attachment theory findings of developmental psychologists. During rebirthing, children or adolescents re-enact the trauma of birth with the 'assistance' of one or more therapists. Hundreds of therapists practise this treatment even though there is no evidence that it works (Mercer, 2002). During Candace's rebirthing session, two therapists wrapped her in a flannel blanket, sat on her and squeezed her repeatedly in an effort to simulate birth contractions. During the 40-minute session, Candace vomited several times and begged the therapists for air, complaining desperately that she could not breathe and felt as though she were going to die. When Candace was unwrapped from her symbolic 'birth canal', she was dead (Mercer, Sarner & Rosa, 2003).
- **An inability to think critically as citizens.** We may be tempted to pass off beliefs in astrology, unidentified flying saucers, crystal healing and unknown energy fields as innocuous. But in our increasingly complex scientific and technological society, we all need critical thinking skills to reach educated decisions about global warming, toxic waste dumps, cloning, genetic engineering, stem cell research, novel medical treatments, and parenting and teaching practices. Some of these decisions will take place in the voting booth, and others will take place in our communities, homes and schools. If we are not careful, an inability to think critically about a seemingly unimportant domain, like astrology, can easily spill over into an inability to think critically about issues that can crucially affect our planet's future, not to mention our own futures and those of our children.

opportunity cost
investment of time, energy and effort in a questionable treatment that can lead people to forfeit the chance to obtain an effective treatment

The take-home message is clear: pseudoscience matters. That is what makes scientific thinking so critical: although far from foolproof, it is our best safeguard against errors to which we are all prone.

Assess your knowledge **FACT or FICTION?**

1. Most forms of psychotherapy have been tested. **(True/False)**
2. According to terror management theory, our fears of death are an important reason for pseudoscientific beliefs. **(True/False)**
3. Humans' tendency to see patterns in random data is entirely maladaptive. **(True/False)**
4. A logical fallacy has occurred whenever we arrive at false conclusions. **(True/False)**
5. Research on the bias blind spot implies that we often do not perceive biases in people to whom we are emotionally close. **(True/False)**

Answers: (1) F (p. 11); (2) T (p. 16); (3) F (p. 15); (4) F (p. 16); (5) F (p. 17)

Science as critical thinking: distinguishing fact from fiction

LO 1.5 Identify the key features of scientific scepticism.

LO 1.6 Explain the basic principles of scientific thinking.

Given that the world of popular psychology is chock-full of remarkable claims, how can we distinguish psychological fact—that is, the body of psychological findings that are so dependable we can safely regard them as true—from psychological fiction?

Scientific scepticism

The approach we emphasise throughout this text is **scientific scepticism**. To many people, the term 'scepticism' implies closed-mindedness, but nothing could be further from the truth. The term *scepticism* actually derives from the Greek word *skeptikos*, which means 'to consider carefully' (Shermer, 2002). The scientific sceptic evaluates all claims with an open mind, but insists on persuasive evidence before accepting them.

As astronomer Carl Sagan (1995) noted, to be a scientific sceptic we must adopt two attitudes that may seem contradictory but are not: first, a willingness to keep an open mind to all claims; and second, a willingness to accept these claims only after researchers have subjected them to careful scientific tests. Scientific sceptics are willing to change their minds when confronted with evidence that challenges their preconceptions. At the same time, they change their minds only when this evidence is persuasive. The motto of the scientific sceptic is 'Show me'. Scientific sceptics require proponents of claims to provide evidence for these claims, and they are willing to revise their beliefs if this evidence is sufficiently convincing. A closed-minded scientist is not a good scientist.

Closed-mindedness is marked by a tendency to dismiss any claims that contradict our beliefs. The closed-minded sceptic (or 'scoffer') is just as problematic as the gullible individual who accepts all claims at face value. Both uncritically accept the beliefs that please them, only the content of the beliefs themselves is different.

Another key feature of scientific scepticism is an unwillingness to accept claims on the basis of authority alone. Scientific sceptics evaluate claims on their own merits, and refuse to accept them until they meet a high standard of evidence. Of course, in everyday life we are often forced to accept the word of authorities simply because we do not possess the expertise, time or resources to evaluate every claim on our own. Most of us are willing to accept the claim that our local governments keep our drinking water safe without conducting our own chemical tests. While reading this chapter, you are also placing trust in us—the authors, that is—to provide you with accurate information

scientific scepticism
approach of evaluating all claims with an open mind, but insisting on persuasive evidence before accepting them

about psychology. Still, this does not mean you should blindly accept everything we have written here. Consider what you are reading with an open mind, but evaluate it critically. If you disagree with something we have written, be sure to investigate further.

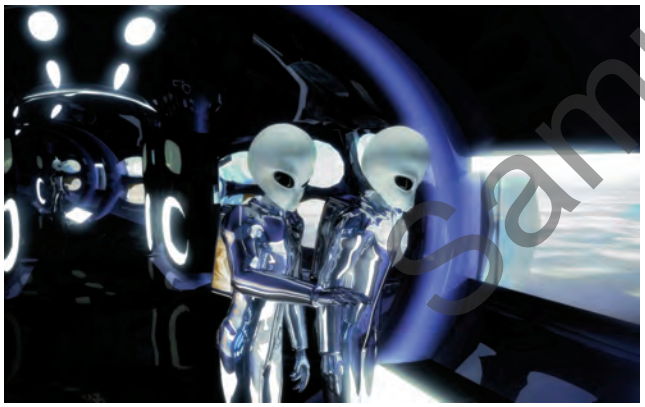
A basic framework for scientific thinking

The hallmark of scientific scepticism is **critical thinking**. Many students misunderstand the word 'critical' in *critical thinking,* assuming incorrectly that it entails a tendency to attack all claims. In fact, critical thinking is a set of skills for evaluating all claims in an open-minded and careful fashion. We can also think of critical thinking in psychology as *scientific thinking,* as it is the form of thinking that allows us to evaluate scientific claims not only in the laboratory, but also in everyday life (Willingham, 2007).

Just as important, scientific thinking is a set of skills for overcoming our own biases, especially confirmation bias, which, as we have learned, can blind us to evidence we would prefer to ignore (Alcock, 1995). In particular, in this text, we will be emphasising six principles of scientific thinking (Bartz, 2002; Lett, 1990). We should bear this framework of principles in mind when evaluating all psychological claims, including claims in the media, in self-help books, on the internet, in your introductory psychology course, and, yes, most definitely in this textbook.

These six scientific thinking principles are so crucial that, beginning in Chapter 2 and continuing throughout the text, we will indicate each of them with a different-coloured arrow. Whenever one of these principles arises in our discussion, we will display that arrow in the margin to remind you of the principle that goes along with it (see Figure 1.5).

SCIENTIFIC THINKING PRINCIPLE #1: EXTRAORDINARY CLAIMS REQUIRE EXTRAORDINARY EVIDENCE. (Throughout the book, we will abbreviate this principle as 'extraordinary claims'.) This principle was proposed in slightly different terms by eighteenth-century Scottish philosopher David Hume (Sagan, 1995; Truzzi, 1978). According to Hume, the more a claim contradicts what we already know, the more persuasive (that is, objectively validated) the evidence for this claim must be before we should accept it.



According to a few researchers, tens of thousands of people have been abducted by aliens and brought aboard spaceships to be experimented on. Could it really be happening, and how would we know? (*Source:* Luca Oleastri/Dreamstime.)

For example, a handful of researchers believe that every night hundreds or even thousands of people are being lifted from their beds, brought aboard flying saucers and experimented on by aliens, only to be returned safely to their beds hours later (Clancy, 2005; see Chapter 5). As Carl Sagan (1995) commented, it is a wonder the neighbours have not noticed. Psychiatrist John Mack of Harvard University was foremost among alien-abduction proponents. Based largely on the reports of individuals who had been hypnotised, Mack concluded that the claims of alien-abductees (he called them 'experiencers') are genuine (Mack, 2000).

Of course, alien-abduction proponents *might* be right, and we should not dismiss their claims out of hand. But their claims are pretty darned extraordinary, especially because they imply that tens of thousands of invading flying saucers from other solar systems have inexplicably managed to escape detection by astronomers, not to mention air traffic controllers and radar operators. Scientific sceptics—who point out that hypnosis can sometimes create vivid memories of bizarre events that never occurred (Blackmore, 1998; Lynn, Lock, Myers & Payne, 1997; see Chapters 5 and 7)—have challenged alien-abduction proponents to provide even a shred of concrete evidence that supposed abductees have actually encountered extraterrestrials—say, a convincing photograph of an alien, a tiny piece of a metal probe inserted by an alien, or even a strand of hair or shred of skin from an authentic alien. Thus far, all that alien-abduction proponents have to show for their claims are the self-reports of supposed abductees (which are likely sincere), but which have mostly been elicited by hypnotic suggestion. Extraordinary claims, without objectively verified (extraordinary) evidence.

critical thinking
set of skills for evaluating all claims in an open-minded and careful fashion

Name of principle	Explanation	Example	
EXTRAORDINARY CLAIMS — IS THE EVIDENCE AS STRONG AS THE CLAIM?	The more a claim contradicts what we already know, the more persuasive the evidence for this claim must be before we should accept it.	The claim that a monster, like Bigfoot, has been living in the American Northwest for decades without being discovered by researchers requires more rigorous evidence than the claim that people remember more words from the beginning than from the end of a list.	
TESTABILITY — CAN THE CLAIM BE DISPROVED?	Scientists try to test the novel predictions of their (and rival) theories in order to find out if the theory really describes the world.	If your friend predicted the Broncos and the Storm will both win tomorrow but the Roosters and the Knights will lose and this prediction came true, you might think it could be due to chance. But if he instead predicted the Broncos will win by seven points and the Storm by one but the Roosters and the Knights will both lose by nine points and this came true, you might consider placing bets.	
OCCAM'S RAZOR — DOES A SIMPLER EXPLANATION FIT THE DATA JUST AS WELL?	If two hypotheses explain a phenomenon equally well, we should generally select the simpler one.	If a person with poor vision claims to spot a flying saucer during a Frisbee tournament taking place on a foggy day, it's more likely that his UFO report is due to a simpler explanation—his mistaking a Frisbee for a UFO—than to alien visitation.	
REPLICABILITY — CAN THE RESULTS BE DUPLICATED IN OTHER STUDIES?	A finding must be capable of being duplicated by independent researchers following the same 'recipe.'	If a researcher finds that people who practise meditation score 50 points higher on an intelligence test than people who don't but no one else can duplicate this finding, we should be sceptical of it.	
RULING OUT RIVAL HYPOTHESES — HAVE IMPORTANT ALTERNATIVE EXPLANATIONS FOR THE FINDINGS BEEN EXCLUDED?	Findings consistent with several hypotheses require additional research to eliminate these hypotheses.	If an investigator finds that depressed people who receive a new medication improve more than do equally depressed people who receive nothing, this difference may be due to the fact that the people who received the medication expected to improve.	
CORRELATION VS CAUSATION — CAN WE BE SURE THAT A CAUSES B?	The fact that two things are associated with each other doesn't mean that one causes the other.	The finding that people eat more ice-cream on days when many crimes are committed doesn't mean that eating ice-cream causes crime; both could be due to a third variable, such as higher temperatures.	

FIGURE 1.5 The six flags of scientific thinking that are used throughout this textbook.

EXTRAORDINARY CLAIMS ▶
Is the evidence as strong as the claim?

The bottom line: whenever we evaluate a psychological claim, we should ask ourselves whether this claim runs counter to many things we know already, and, if it does, whether the evidence is strong enough to warrant the claim.

SCIENTIFIC THINKING PRINCIPLE #2: TESTABILITY. Scientific theories try to explain what we observe in the world around us. That is, they have implications for how the world actually is. Scientists try to test the novel predictions of their (and rival) theories in order to find out whether the theory really describes the world.

A key implication of the testability principle is that a theory that explains everything—that is, a theory that can account for every conceivable outcome—in effect explains nothing. That is because a genuinely informative theory must predict only certain outcomes, but not others. If a friend told you he had a master theory for sports forecasting and predicted with great confidence, 'Tomorrow, all of the football teams that are playing a game will either win or lose', you would probably start laughing. By predicting every potential outcome, your friend has not really predicted anything.

According to philosopher of science Imre Lakatos (1974), to gain acceptance scientific theories must take the risk of making novel predictions. By a 'novel prediction', Lakatos meant a forecast that no one would expect were it not for that particular theory. The better a theory emerges from testing such risky novel predictions (theories do not usually emerge completely unscathed), the more other scientists will accept it. Like most of us, scientists do not usually give up because of a single failure. Instead, they try to modify their theories to explain what went wrong, and then make new novel predictions from the modified theory to test in further experiments. This pattern is common in the history of science (Chalmers, 1999). If scientists succeed, the theory grows. However, if adherents simply keep adding modification upon modification to reconcile the theory with continuing failures, the theory becomes more and more insulated from reality and the scientific community moves on to consider more fruitful alternatives.

Theories that do not (or will not) risk novel predictions are not interesting in science because they do not tell us anything new about the world. If your sports-forecasting friend predicted, 'The Broncos and the Storm will both win tomorrow, but the Roosters and the Knights will lose', and this prediction came true, you might think, 'Well, that's sort of interesting, but it still could be due to chance'. But if he instead predicted, 'Tomorrow, the Broncos will win by seven points and the Storm will win by only one point, but the Roosters and the Knights will both lose by nine points', and this prediction came true, you might start to consider placing some bets. Only the last of these predictions was especially risky—it stood an excellent chance of being wrong—and it survived this risk with flying colours. Thus, your friend's theory of forecasting sporting (or at least football) matches is in good shape, although it still has not been 'proved', because it is always possible that some other theory we had not considered could give a better account of future football results.

As you will discover in Chapter 15, one major criticism levelled at Sigmund Freud's theory of psychoanalysis is that it is impossible to test (Cioffi, 1998). For example, Freud believed that all young boys (around age 3–6 years) pass through a developmental phase, the Oedipus complex, during which they are intensely attracted to their mother and resent their father as a rival for their mother's affection, but then repress these feelings in order to identify with their father. According to Freud, failure to resolve this early conflict is a major source of psychological problems in adulthood. How could we try to test this claim? Does Freud's theory of the Oedipus complex make risky (novel) predictions that can in principle be put to the test?

TESTABILITY ▶
Can the claim be tested scientifically?

The bottom line: whenever we evaluate a psychological claim, we should ask ourselves how in principle we could test it. What novel predictions does it make that differentiate it from other theories?

SCIENTIFIC THINKING PRINCIPLE #3: OCCAM'S RAZOR. Occam's razor, named after fourteenth-century British philosopher and monk Sir William of Occam, is also called the 'principle of parsimony' (*parsimony* is a synonym for 'simplicity'). According to Occam's razor, if two explanations account equally well for a phenomenon, we should

generally select the more parsimonious one. Good researchers use Occam's razor to 'shave off' needlessly complicated explanations to arrive at the simplest explanation that does a good job of accounting for the evidence. Scientists of a romantic persuasion refer to Occam's razor as the principle of KISS: keep it simple, stupid.

Occam's razor is only a guideline, not a hard-and-fast rule (Uttal, 2003). Every once in a while the best explanation for a phenomenon is not the simplest. But Occam's razor is a helpful rule of thumb, as it is right far more often than it is wrong.

During the late 1970s and 1980s, hundreds of mysterious designs, called crop circles, began appearing in wheat fields in England. Most of these designs were remarkably intricate, even beautiful. How on Earth (pun intended) can we explain these designs? Many believers in the paranormal concluded that these designs originated not on Earth, but on distant worlds. The crop circles, they concluded, are proof positive of alien visitations to our world. One crop circle even featured the message 'We are not alone' (which would have been more convincing had it read 'You are not alone'; Sagan, 1995). In response to the growing excitement, believers launched an entire journal devoted to the study of crop circles called the *Journal of Cereology* (the name derives from the same word root as 'cereal', which is made from wheat).

There are two explanations for crop circles, one terrestrial and the other extraterrestrial. Which should we believe? (*Source:* Luca Oleastri/Dreamstime.)

The crop circle hysteria came crashing down in 1991, when two British men, David Bower and Doug Chorley, confessed to creating the crop circles as a prank intended to poke fun at uncritical believers in extraterrestrials. They even demonstrated on camera how they used wooden planks and rope to stomp through tall fields of wheat and craft the complex designs. Many of these designs, incidentally, had been signed with two Ds (for 'David' and 'Doug'), which true believers in crop circles had interpreted as an encoded message from aliens.

Following David and Doug's 1991 confession, a few committed cereologists (crop circle experts) still were not convinced. After all, David and Doug could not demonstrate that they had created every crop circle. Moreover, after David and Doug revealed their hoax on television, additional crop circles began to materialise, some in England and others in the United States. How can we know for sure that these crop circles weren't the products of extraterrestrial intelligence or perhaps a bored extraterrestrial artist? We cannot. But Occam's razor reminds us that when confronted with two explanations that fit the evidence equally well, we should generally select the simpler one. In this way, Occam's razor helps us to sort out the wheat (we couldn't resist the pun) from the chaff. Which explanation is more plausible: that crop circles are the products of (a) hoaxers who have demonstrated beyond a shadow of a doubt that they possess the means to create such designs or (b) undetected extraterrestrials who have travelled trillions of miles through space to inscribe hidden messages to earthlings in wheat fields?

Occam's razor implies that we should generally select the simplest of two explanations when both account equally well for the data. Is the object in this photograph more likely to be a cloud or a flying saucer? In fact, it is what meteorologists call a 'lenticular cloud formation', a common source of mistaken flying saucer sightings. (*Source:* Joseph Fuller/Dreamstime.)

However, as former US Secretary of State Colin Powell argued at the United Nations Security Council, the simplest explanation for the mass of intelligence data before the 2003 Iraq War was that Saddam Hussein possessed weapons of mass destruction. As Albert Einstein famously remarked: 'Everything should be made as simple as possible, but not simpler.'

The bottom line: whenever we evaluate a psychological claim, we should ask ourselves whether it is the simplest explanation that accounts for the data, or whether simpler explanations can account for the data equally well.

OCCAM'S RAZOR
Does a simpler explanation fit the data just as well?

SCIENTIFIC THINKING PRINCIPLE #4: REPLICABILITY. Barely a week goes by without us hearing about another stunning psychological finding on the evening news: 'Researchers at Cupcake State University detect a new gene linked to excessive shopping'; 'Investigators at the University of Antarctica at Igloo report that alcoholism is associated with a heightened risk of murdering one's spouse'; 'Nobel Prize–winning professor at Cucumber University isolates brain area responsible for the enjoyment of popcorn'. One major problem with these conclusions, in addition to the fact that the news media often tell us nothing about the

In ESP research, researchers often ask subjects to predict the outcomes of random events. Yet ESP findings have proven difficult to replicate. (*Source:* Studio 8/Pearson Education Ltd.)

design of the studies on which they are based, is that the findings often have not yet been replicated. Replicability means that a study's findings can be duplicated consistently. If they cannot be duplicated, then researchers simply cannot conduct experiments into what may have caused the reported findings. In reality, most findings are not replicated because they are unremarkable. But when a finding is important, scientists need to conduct further experiments in order to understand what produced it. *Without being able to replicate a reported finding, further scientific experiments to understand that finding are impossible.*

We should bear in mind that the media (and regrettably many scientific journals) are far more likely to report initial positive findings than failures to replicate. The initial findings may be especially fascinating or sensational, whereas replication failures are often disappointing. They rarely make for thrilling news headlines, so we may never hear about them. It is especially important that investigators other than the original researchers replicate the results, because this increases our confidence in them. If I tell you that I have created a recipe for the world's most delicious veal parmigiana, but it turns out that every chef who follows my recipe ends up with a meal that tastes like an old piece of cardboard smothered in a putrid mixture of rotten cheese and six-month-old tomato sauce, you would be justifiably sceptical of my claim. Maybe I flat-out lied about my recipe. Or perhaps I was not actually following the recipe very closely, and was instead tossing in ingredients that were not even in the recipe. Or perhaps I am such an extraordinary Italian chef that nobody else can come close to duplicating my miraculous culinary feat. In any case, you would have every right to doubt my recipe until someone else replicated it. The same goes for psychological research.

The literature on ESP offers an excellent example of why replicability is so essential (see Chapter 4). Many successful ESP experiments have been reported (so have many unsuccessful experiments), but successful replications are far fewer (Irwin & Watt, 2007). So far, no one has come up with an ESP experiment with positive results that can be readily replicated by other researchers (or even the same researcher). This lack of replicability does not necessarily mean that ESP is not real. Still, the absence of a readily reproducible 'experimental recipe' for ESP has left most psychological scientists doubtful of its existence.

Not all replications are created equal. Just because a finding has been replicated does not necessarily mean it is believable; this is because we still need to make sure that the

HEALTH BENEFITS OF FRUITS AND VEGETABLES — evaluating CLAIMS

We all know the importance of eating a balanced diet with plenty of fruits and vegetables. Yet many popular media sources exaggerate the health benefits of fruits and vegetables and even make dangerous claims about their ability to cure serious illnesses such as diabetes or cancer. Let's evaluate some of these claims, which are modelled after actual advertisements.

'*Studies show* that eating walnuts *may* reduce your risk and delay the onset of Alzheimer's.'

The use of the qualifying word 'may' renders the claim difficult or impossible to test. What would we need to know about how these studies were conducted to validate the claim?

'Eating peaches gives you energy and makes you feel *light and fresh* throughout the year.'

This claim is vague and difficult to test. How would you define or measure 'light and fresh'?

(*Source:* Viktor1/Shutterstock.)

'Avoid drugs or surgery and find a *completely natural* cure for your disease.'

The phrase 'completely natural' implies that the cure is safer than drugs or surgery. Can you think of any natural substances (including fruits and vegetables) that are dangerous or even fatal?

'These natural cures come from *ancient cultures* and have been handed down for thousands of years.'

Does the fact that something has been around for a long time mean it is trustworthy? What logical fallacy does this ad commit?

studies are well conducted. If an investigator performs a flawed study, and a second investigator replicates her findings while repeating the same mistakes, we should disregard this replication. Similarly, not all replication failures are created equal. A second investigator could fail to replicate a previous investigator's findings because she did not conduct the study properly. So before deciding how much weight to place on either a replication or a replication failure, we must first evaluate the study's quality.

The bottom line: whenever we evaluate a psychological claim, we should ask ourselves whether independent investigators have replicated the findings that support this claim; otherwise, the findings might be a fluke.

REPLICABILITY
Can the results be duplicated in other studies?

SCIENTIFIC THINKING PRINCIPLE #5: RULING OUT RIVAL HYPOTHESES. Most psychological findings we hear about on television or read about on the internet lend themselves to multiple explanations. Yet, more often than not, the media report only one explanation. We should not automatically assume that it is the correct one. Instead, we should ask ourselves: *Is this the only good explanation for this finding? Have we ruled out all important competing explanations* (Platt, 1964)?

Take a popular treatment for anxiety disorders, eye movement desensitisation and reprocessing (EMDR; see Chapter 17). Introduced in the late 1980s by Francine Shapiro (1989), EMDR asks clients to track the therapist's back-and-forth finger movements with their eyes while imagining distressing memories that are the source of their anxiety, such as the memory of seeing someone being killed. More than 60 000 therapists have received formal training in EMDR. Proponents of EMDR have consistently maintained that it is far more effective and efficient than other treatments for anxiety disorders. Many have even hailed it as a 'breakthrough' (Shapiro & Forrest, 1997) or 'miracle cure'. In addition, they have claimed that the eye movements of EMDR are a uniquely effective feature of the treatment. For example, some have suggested that these eye movements somehow synchronise the brain's two hemispheres—although why that would reduce anxiety is not exactly clear—or stimulate brain mechanisms that speed up the processing of emotional memories.

Yet there is a problem. A slew of well-controlled studies show that the eye movements of EMDR do not contribute to its effectiveness. EMDR works just as well when people stare straight ahead at an immobile dot as when they move their eyes back and forth (Devilly, 2002). Moreover, most EMDR advocates neglect to consider a rival explanation for EMDR's success: like a wide variety of other effective treatments, EMDR asks patients to expose themselves to anxiety-provoking imagery. Researchers and therapists alike have long known that prolonged exposure itself can be therapeutic (Lohr et al., 2003; see Chapter 17). By not excluding the rival hypothesis that EMDR's effectiveness stemmed from exposure rather than eye movements, EMDR advocates made claims that ran well ahead of the data.

The bottom line: whenever we evaluate a psychological claim, we should ask ourselves whether we have excluded other plausible explanations for it.

RULING OUT RIVAL HYPOTHESES
Have important alternative explanations for the findings been excluded?

SCIENTIFIC THINKING PRINCIPLE #6: CORRELATION IS NOT NECESSARILY CAUSATION. Perhaps the most common mistake beginning psychology students make when interpreting studies is to conclude that when two things are associated with each other—or what psychologists call 'correlated' with each other—one thing must cause the other. This point leads us to one of the most crucial principles in this book (get your highlighters out for this one): correlations by themselves do not permit causal inferences, or, putting it less formally, correlation is not always causation. When we mistakenly conclude that a correlation must mean causation, we have committed the **correlation–causation fallacy**. This conclusion is a fallacy because the fact that two variables are correlated does not necessarily mean that one causes the other (see Chapter 2). Incidentally, a **variable** is anything that can vary, such as height, IQ or extraversion. Let's see why correlation is not always causation.

If we start with two variables, *A* and *B*, which are correlated, there are three major explanations for this correlation.

correlation–causation fallacy
error of assuming that because one thing is associated with another, it must cause the other

variable
anything that can vary

1. $A \rightarrow B$. First, it is possible that variable *A* causes variable *B*.
2. $B \rightarrow A$. Second, it is possible that variable *B* causes variable *A*. Here the 'causal arrow' (the arrow is reversed between *A* and *B*) connects the variables in the opposite order, with *B* coming before *A*.

So far, so good. But many people forget about a third possibility, namely:

3. $C \nearrow A$, $C \searrow B$

In this third scenario, there is a third variable, *C*, which causes both *A* and *B*. This scenario is known as the **third variable problem**. It is a 'problem' because it can lead us to conclude mistakenly that *A* and *B* are causally related to each other when they are not.

Making matters worse, we may never have thought to measure the third variable, *C*, in our study. Indeed, we might not even know that this variable exists. So, we can fool ourselves into concluding that a causal relationship between *A* and *B* exists when it does not. *Correlation is not necessarily causation.*

This point is so crucial that we will come back to it and discuss it in more depth in Chapter 2. For now, we will give you just one example of how we can confuse correlation with causation. In one recent study, researchers found that teenagers who listened to music with a lot of sexual lyrics had sexual intercourse considerably more often than teenagers who listened to music with far tamer lyrics (Martino et al., 2006). That is, they found that listening to sexual lyrics is *correlated* with sexual behaviour. One newspaper summarised the findings with an attention-grabbing headline: 'Sexual lyrics prompt teens to have sex' (Tanner, 2006). But like many headlines, this one went well beyond the data. It is indeed possible that music with sexual lyrics (*A*) causes sexual behaviour (*B*). But it is also possible that sexual behaviour (*B*) causes teens to listen to music with sexual lyrics (*A*), or that a third variable, such as impulsivity (*C*), causes teens to both listen to music with sexual lyrics and engage in sexual behaviour. Given the data reported by the authors, there is no way to know.

CORRELATION VS CAUSATION ▶
Can we be sure that *A* causes *B*?

The bottom line: we should remember that a correlation between two things does not necessarily demonstrate that there is a causal connection between them.

Assess your knowledge — FACT or FICTION?

1. Scientific scepticism requires a willingness to keep an open mind to all claims. **(True/False)**
2. When evaluating a psychological claim, we should keep in mind other possible explanations for it. **(True/False)**
3. Occam's razor implies that the simpler of two explanations is the true one. **(True/False)**
4. A risky prediction is one that stands a good chance of being wrong if the theory generating it is also wrong. **(True/False)**
5. When psychological findings are replicated, it is especially important that the replications be conducted by the same team of investigators. **(True/False)**

Answers: (1) T (p. 19); (2) T (p. 20); (3) F (p. 23); (4) T (p. 22); (5) F (p. 24)

third variable problem
case in which a third variable causes the correlation between two other variables

LO 1.7 Identify and outline the major theoretical frameworks of psychology.

LO 1.8 Describe different types of psychologists and outline their roles.

LO 1.9 Describe the two great debates that have shaped the field of psychology.

LO 1.10 Describe how psychological research applies to our daily lives.

LO 1.11 Explain how evidence-based practice can help bridge the scientist–practitioner gap.

Psychology's past and present: what a long, strange trip it's been

How did psychology emerge as a discipline, and has it always been plagued by pseudoscience? The scientific approach to the study of the mind, brain and behaviour emerged slowly, and the field's initial attempts displayed many of the weaknesses that pseudoscientific approaches possess today. Informal attempts to study and explain how our minds work have been with us for thousands of years. But psychology as a science has existed for only about 130 years, and many of those years were spent refining techniques to develop methods to safeguard research against inevitable human bias (Coon, 1992).

Throughout its history, psychology has struggled with many of the same challenges that we confront today when reasoning about psychological research. So, it is important to understand how psychology evolved as a scientific discipline—that is, a discipline that relies on systematic research methods to avoid being fooled.

Psychology's early history

We start our journey with a summary of psychology's bumpy road from non-science to science. (A timeline of significant events in the evolution of scientific psychology can be seen in Figure 1.6.)

For many centuries, the questions of psychology were pursued as a field of inquiry within philosophy. Most academic psychologists held positions in departments of philosophy or sometimes physiology. (Psychology departments did not exist until Wilhelm Wundt's time—see below.) However, systematic experimental research on psychological matters was being conducted by many individuals even in the eighteenth century. Yet even by 1808, Carus had published his *History of Psychology*, a review of more than 120 quantitative studies from the previous century. In the 1850s, Fechner developed experimental methods to investigate the mathematical relationship between perceptual sensations and physical stimulation (Fechner, 1860). In 1879, Wilhelm Wundt (1832–1920) developed the first fully fledged psychological laboratory in Leipzig, Germany, four years after William James had founded a less formal laboratory at Harvard University.

Most of Wundt's investigations and those of his students focused on basic questions concerning our mental experiences: How different must two colours be for us to tell them apart? How long does it take us to react to a sound? What thoughts come to mind when we solve a maths problem? Wundt used a combination of experimental methods, including reaction time equipment, and a technique called **introspection**, which required trained observers to carefully reflect and report on their mental experiences. The pioneering work of researchers such as Fechner and Wundt marked the beginnings of psychology as a science, because they demonstrated that mental events *could* be quantified and then studied mathematically, just as Galileo (1564–1642) had studied the motion of falling bodies. Soon, psychologists elsewhere around the world followed Wundt's bold lead and opened laboratories in departments of psychology.

Before becoming a science, psychology also needed to break free from another influence: spiritualism. The term *psychology* literally means the study of the *psyche*—that is, the spirit or soul. In the mid- and late 1800s, Europeans and Americans became fascinated with *spirit mediums*, people who claimed to contact the dead, often during séances (Blum, 2006). Séances were group sessions that took place in darkened rooms, in which mediums attempted to 'channel' the spirits of deceased individuals. Harvard University's William James spent much of his spare time investigating self-professed spirit mediums and psychics. In so doing, he hoped to uncover definitive scientific evidence for the validity of their claims (Benjamin & Baker, 2004).

Despite their concerted efforts, James and his fellow psychic inquirers never obtained compelling evidence for the existence of discarnate spirits (Blum, 2006), and psychology eventually distanced itself from spiritualism. In doing so it forged a new field: the psychology of human error and self-deception. Rather than focusing on the extrasensory powers of mediums, a growing number of psychologists in the late 1800s began asking an equally interesting question: *How can people fool themselves into believing things for which there isn't solid evidence?*

The great theoretical frameworks of psychology

Almost since its inception, psychological science has confronted a thorny question: what unifying theoretical perspective best explains behaviour?

Five major theoretical perspectives—structuralism, functionalism, behaviourism, cognitivism and psychoanalysis—have played pivotal roles in shaping contemporary psychological thought. Many beginning psychology students understandably ask:

introspection
method by which trained observers carefully reflect and report on their mental experiences

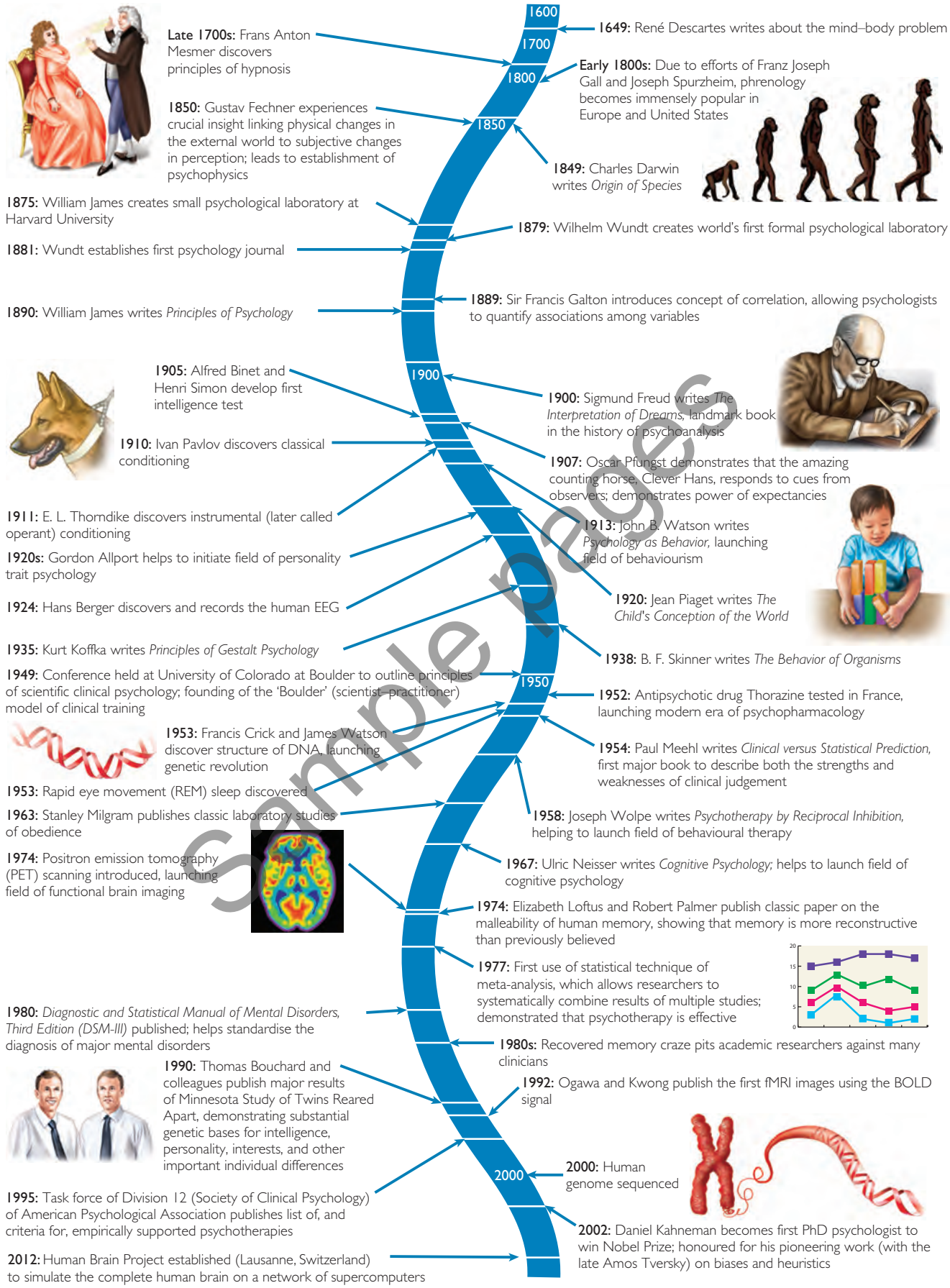
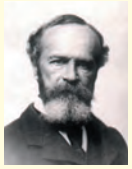
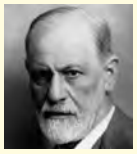


FIGURE 1.6 A timeline of major events in scientific psychology.

TABLE 1.4 The theoretical perspectives that shaped psychology

PERSPECTIVE		LEADING FIGURES	SCIENTIFIC GOAL	LASTING SCIENTIFIC INFLUENCE
	Structuralism	E. B. Titchener	Uses introspection to identify basic elements or 'structures' of experience	Emphasis on the importance of systematic observation to the study of conscious experience
	Functionalism	William James; influenced by Charles Darwin	To understand the functions or adaptive purposes of our thoughts, feelings and behaviours	Has been absorbed into psychology and continues to influence it indirectly in many ways
	Behaviourism	Ivan Pavlov; John B. Watson; B. F. Skinner	To uncover the general principles of learning that explain all behaviours; focus is largely on observable behaviour	Influential in models of human and animal learning, and among the first to focus on need for objective research
	Cognitivism	Jean Piaget; Ulric Neisser	To examine the role of mental processes on behaviour	Influential in many areas, such as language, problem-solving, concept formation, intelligence, memory, and psychotherapy
	Psychoanalysis	Sigmund Freud	To uncover the role of unconscious psychological processes and early life experiences in behaviour	Understanding that much of our mental processing goes on outside of conscious awareness

(*Sources*: Archives of the History of American Psychology—The University of Akron; Picture History/Newscom; Omrikon/Science Source/Photoresearchers; Bettman/Corbis Australia Pty Ltd; Library of Congress.)

'Which of these perspectives is the right one?' As it turns out, each theoretical viewpoint has something valuable to contribute to scientific psychology, but each has its limitations (see Table 1.4). As we wend our way through these five frameworks, you will discover that psychology's view of what constitutes a scientific approach to behaviour has changed over time. Indeed, it continues to change even today.

STRUCTURALISM: THE ELEMENTS OF THE MIND. Edward Bradford Titchener (1867–1927), a British student of Wundt who emigrated to the United States to teach at Cornell University, founded the field of structuralism. (Titchener donated his brain to science, so you can see his preserved brain in a jar in Cornell's psychology department.) **Structuralism** aimed to identify the basic elements, or 'structures', of psychological experience. Adopting Wundt's method of introspection, structuralists dreamed of creating a comprehensive 'map' of the elements of consciousness—which they believed consisted of sensations, images and feelings—much like the periodic table of elements found in every chemistry classroom (Evans, 1972).

Nevertheless, structuralism eventually ran out of steam. At least two major problems eventually led to its demise. First, even highly trained introspectionists often disagreed on their subjective reports. Because science depends on the ability to duplicate findings across different laboratories (refer back to Scientific thinking principle #4: Replicability), this lack of consensus proved to be an embarrassment. Secondly, German psychologist Oswald Kulpe (1862–1915) showed that participants asked to solve certain mental problems engage in *imageless thought*: thinking unaccompanied by conscious experience. If we ask an introspecting participant to add 10 and 5, she will quickly respond '15', but she will usually be unable to report what came to her mind when performing this calculation (Hergenhahn, 2000). The phenomenon of imageless thought dealt a serious body blow to structuralism,

structuralism
school of psychology that aimed to identify the basic structures of psychological experience

because it demonstrated that some important aspects of human mental processes lie outside of conscious awareness. This point was also to become central to Freud's subsequent development of psychoanalysis. Today, methods closely related to structuralism are making a decisive contribution in conjunction with modern neuroscience in the scientific search for the neural correlates of consciousness (Jamieson, 2007).

Structuralism underscored the importance of *systematic observation* to the study of conscious experience. Structuralists emphasised that to become a science, psychology must rely on rigorous and carefully standardised reports, not on casual or informal impressions. Nevertheless, the early structuralists went astray by assuming that a single method, introspection—with its inherent strengths and weaknesses—could provide all of the information needed for a complete science of psychology. (In many respects behaviourism and cognitivism were soon to make similar errors by placing their scientific faith in highly restricted methodological baskets.)

FUNCTIONALISM: PSYCHOLOGY MEETS DARWIN. Proponents of **functionalism** (inspired by the American philosophical school known as 'pragmatism') hoped to understand the adaptive purposes, or functions, of psychological characteristics, such as thoughts, feelings and behaviours (Hunt, 1993). Whereas structuralists asked 'what' questions (such as 'What is conscious thought like?'), functionalists asked 'why' questions (such as 'Why do we sometimes forget things?'). The founder of functionalism, William James, rejected structuralists' approach and methods, arguing that careful introspection yields not a fixed number of static structures comprising consciousness, but rather an ever-changing 'stream of consciousness', a famous phrase he coined. Consciousness, functionalists asserted, is more akin to a flowing river than the objects found in a dried-out riverbed.

The functionalists of the late 1800s were influenced substantially by biologist Charles Darwin's (1809–1882) still-young theory of natural selection, which emphasised that many physical characteristics evolved because they were useful for organisms in the struggle to survive and reproduce. The functionalists believed that Darwin's theory applied to psychological characteristics, too. Just as the trunk of an elephant serves useful functions for survival, such as snaring distant water and food, the human memory system, for example, must similarly serve a purpose.

Many contemporary functionalists maintain that it is the job of psychology researchers to act as 'detectives', figuring out the evolved functions that psychological characteristics serve for organisms. An increasing number of psychologists are attempting to use evolutionary theory to understand: the nature of romantic attraction; the functions of jealousy, anger and other emotions; the origins of human personality; and even the causes of mental illness. These psychologists owe a great debt of gratitude to William James and his fellow functionalists.

BEHAVIOURISM: THE LAWS OF LEARNING. In the early twentieth century, American psychologists in particular were growing impatient with the methods and questions of Titchener and other introspectionists. For these critics, the study of consciousness was a waste of time, because researchers could never verify conclusively the existence of the basic elements of psychological experience. Psychological science, they contended, must be objective, not subjective.

Foremost among these critics was a flamboyant American psychologist, John B. Watson (1878–1958). Watson founded the still-influential school of **behaviourism**, which focuses on uncovering the general principles of learning underlying human and animal behaviour. For Watson (1913), the proper subject matter of psychology was nothing but the prediction and control of observable behaviour. Subjective reports of conscious experience should play no part in psychology. If psychology followed his brave lead, Watson proclaimed, it could become just as scientific as physics, chemistry and other 'hard' sciences. Watson's view of science was based on the positivist philosophy of Comte and Mach, who dismissed all unobservable entities (including, problematically, atoms and electrons) from the domain of meaningful scientific discourse (Leahey, 2004).

functionalism
school of psychology that aimed to understand the adaptive purposes of psychological characteristics

behaviourism
school of psychology that focuses on uncovering the general laws of learning by looking outside the organism

Watson further insisted that psychology should aspire to uncover the general laws of learning that explain all behaviours, whether they be riding a bicycle, eating a sandwich or becoming depressed. All of these behaviours, Watson proposed, were products of a handful of basic learning principles (see Chapter 6). Moreover, according to Watson, we do not need to peer 'inside' the organism to grasp these principles. We can comprehend human behaviour exclusively by looking *outside* the organism, to rewards and punishments delivered by the environment. For traditional behaviourists, the human mind (and the human brain) is a **black box**: we know what goes into it and what comes out of it, but we need not worry about what happens between the inputs and outputs. For this reason, psychologists sometimes call behaviourism 'black box psychology'.

Some of Watson's followers, especially the Harvard psychologist Burrhus Frederick (B. F.) Skinner (1904–1990), agreed that psychology should focus on basic laws of learning, but disagreed with Watson that psychology should focus exclusively on observable behaviours. For Skinner (1953), thoughts, feelings and observable behaviours all fall within the province of scientific psychology. According to Skinner, thoughts and feelings *are* behaviours; they just happen to be unobservable. Moreover, according to Skinner, the causes of our thoughts and feelings are no different from the causes of our observable behaviours. They, too, are the products of rewards and punishments originating in the environment.

Behaviourism has left a stamp on scientific psychology that continues to be felt today. By seeking to identify the fundamental laws of learning that help to explain human and animal behaviour, behaviourists placed psychology on firmer scientific footing. Behaviourist philosophy was never adopted by biologists studying animal behaviour (called 'ethologists'), who continued to emphasise the importance of internal (and thus unseen) biological drive states in mediating the response of organisms to their environment (Tinbergen, 1951). However, the early behaviourist psychologists properly warned us of the hazards of relying too heavily on reports that we cannot verify objectively.

COGNITIVISM: OPENING THE BLACK BOX. Beginning in the 1950s and 1960s, growing numbers of psychologists grew disillusioned with behaviourists' neglect of **cognition**, the term psychologists use to describe the mental processes involved in different aspects of thinking. Although Skinner and his followers acknowledged that humans and even many intelligent animals do think, they viewed thinking as merely another form of behaviour. The cognitivists, in contrast, argued that our thinking affects our behaviour in powerful ways. For example, Swiss psychologist Jean Piaget (1896–1980) argued compellingly that children conceptualise the world in markedly different ways than do adults (see Chapter 10). Later, led by Ulric Neisser (1928– 2012), cognitivists argued that thinking is so central to psychology that it merits a separate discipline in its own right (Neisser, 1967; see Chapter 8).

According to cognitivists, predictions of behaviour based solely on rewards and punishments from the environment will never be adequate, because our *interpretation* of rewards and punishments is a crucial determinant of our behaviour. Take a student who receives a distinction on his first psychology exam. A student accustomed to getting credits on his tests might regard this grade as a reward, whereas a student accustomed to getting high distinctions might view it as a punishment. Without understanding how people evaluate information, cognitivists maintain, we will never fully grasp the causes of their behaviour. Moreover, according to cognitivists, we often learn not merely by rewards and punishments but by *insight*—that is, by grasping the underlying nature of problems (see Chapter 6).

Cognitive psychology remains enormously influential today, and its influence has spread to such diverse domains as language, problem-solving, concept formation, intelligence, memory and psychotherapy. By focusing not merely on rewards and punishments but also on organisms' interpretation of them, cognitivism has encouraged psychologists to peek inside the black box to examine the connections between inputs and outputs. Moreover, like the other major schools of psychological inquiry, cognitivism has increasingly established strong linkages to the study of brain functioning, allowing psychologists

black box
term sometimes used to describe behaviourists' view of the mind—namely, an unknown entity that we do not need to understand to explain behaviour

cognition
mental processes involved in different aspects of thinking

The couch that Sigmund Freud used to psychoanalyse his patients is now located in the Freud museum in London. Contrary to popular stereotypes, most psychologists are not psychotherapists, and most psychotherapists are not psychoanalysts. Nor do most modern therapists (including psychoanalysts) ask patients to recline on couches. (*Source:* Peter Aprahamian/Corbis Australia.)

to better understand the physiological bases of thinking, memory and other key mental functions (Ilardi & Feldman, 2001). A burgeoning field, **cognitive neuroscience**, which examines the relation between brain functioning and thinking, has come to the fore over the past decade or so (Gazzaniga, Ivry & Mangun, 2002). Cognitive neuroscience and the allied field of affective neuroscience (Panksepp, 2004), which examines the relation between brain functioning and emotion, hold out the promise of allowing us to better understand the biological processes associated with thinking and feeling.

PSYCHOANALYSIS: THE DEPTHS OF THE UNCONSCIOUS. Around the time that behaviourism was becoming dominant in the United States, a parallel movement was gathering momentum in Europe. This field, **psychoanalysis**, was founded by the Viennese neurologist Sigmund Freud (1856–1939). In sharp contrast to behaviourism, psychoanalysis focused on internal psychological processes in mediating the inevitable conflicts between biological drives pressing for expression and the demands to restrict and control them required for adaptation to society. According to Freud (1900) and other psychoanalysts, the function of the conscious self is to mediate the demands of inner and outer reality, and many psychological illnesses result from a disruption of this adaptive function. A key Freudian idea is that our conscious experiences can sometimes be motivated by ideas and feelings of which we are not aware.

The goal of traditional psychoanalysis (many contemporary psychoanalysts have departed significantly from this model) is to help their clients to become more aware of these unconscious processes and thereby to gain greater control over them, enlarging their freedom to make fully conscious choices. Psychoanalysts also place considerably more emphasis than do behavioural and cognitive psychotherapists on the role of early experience in laying the foundation for later (adaptive and maladaptive) patterns of behaviour. For Freud and later attachment theorists (see Chapter 10), the core structure of the self is moulded in the early years of life.

The major influence of psychoanalysis on contemporary psychology has been in the area of psychotherapy, particularly in the field of personality disorders (Beck et al., 1990; Linehan, 1993), in the development of attachment theory, and in the investigation of infant–caregiver relationships and the development of self-regulation (Fonagy, Gergely & Target, 2008).

Critics insist that psychoanalysis retarded the development of scientific approaches to psychotherapy, because it focuses on unconscious processes that are difficult or impossible to verify. As we explain in Chapter 15, these critics probably have a point (Crews, 2005; Esterson, 1993). The psychoanalytic claim that a great deal of mental processing goes on outside of conscious awareness has held up well in scientific research (Westen, 1998; Wilson, 2002). However, Freud's view of the unconscious is rooted in the neurophysiology of his teacher Helmholtz, which is based on the thermodynamic concepts of the flow of energy, and is quite unlike contemporary cognitive views of unconscious processing (Carhart-Harris & Friston, 2010; Kihlstrom, 1987; Turnbull & Solms, 2007).

cognitive neuroscience
study of how mental processes are related to activity in the brain

psychoanalysis
school of psychotherapy, founded by Sigmund Freud, which focuses on internal drives and conflicts that shape the relationship between conscious and unconscious mental processes

convergent inquiry
approach of using many different methods in concert

The multifaceted world of modern psychology

Psychology is not just one discipline, but rather an assortment of many subdisciplines. In most major psychology departments, you can find researchers examining areas as varied as the brain bases of visual perception, the mechanisms of memory, the causes of prejudice, and the treatment of depression. Modern psychologists have adopted an enormous variety of methods to help them understand behaviour, such as questionnaires, interviews, laboratory studies and observation of real-world events. No method is perfect, but each can provide valuable information. By using many different methods in concert—an approach termed **convergent inquiry** (Sheehan &

Perry, 1976)—psychologists are arriving slowly but surely at a more complete understanding of human behaviour.

TYPES OF PSYCHOLOGISTS: FACT AND FICTION. Figure 1.7 shows a breakdown of the settings in Australia in which psychologists work. As we can see, some work primarily in research settings; others, primarily in practice settings. Table 1.5 describes a few of the most important types of psychologists whose work we will encounter in this book. It also dispels common misconceptions about what each type of psychologist does, pairing each misconception with accurate information (Rosenthal et al., 2004).

To learn more about other fields of psychology, as well as other career options for psychology graduates, visit www.psychology.org.au/study/careers. By now, we hope we have persuaded you that the field of psychology is remarkably diverse. Moreover, the face of psychology is changing, with more women and minorities entering many of its subfields. Despite their differences in content, all of these areas of psychology have one thing in common: most of the psychologists who specialise in them rely on scientific methods. Specifically, they use scientific methods to generate new findings about human or animal behaviour, or use existing findings to enhance human welfare.

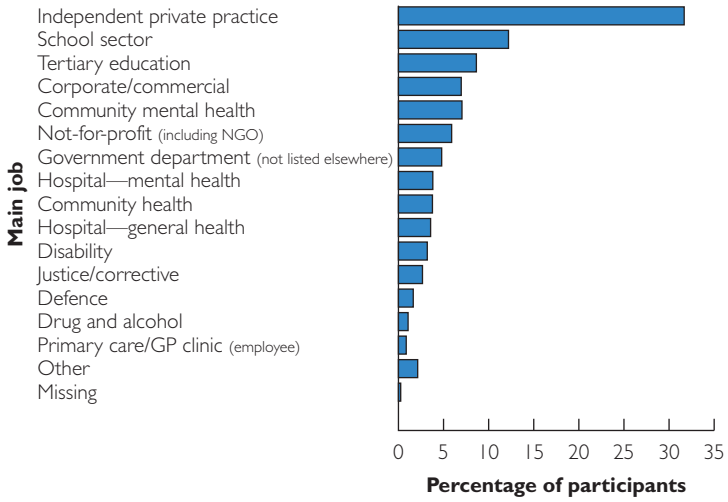


FIGURE 1.7 Approximate distribution of psychologists in different settings in Australia. Psychologists are employed in a diverse array of settings.

TABLE 1.5 Types of psychologists, what they do, what they don't do

TYPE OF PSYCHOLOGIST	WHAT DO THEY DO?	FREQUENT MISCONCEPTION AND TRUTH
Clinical psychologist	• Perform assessment, diagnosis and treatment of mental disorders • Conduct research on people with mental disorders • Work in colleges and universities, mental health centres and private practice	*Misconception: If you want to become a therapist, you need to earn a PhD in psychology.* • **Truth:** Most (but not all) psychology PhD programmes are entirely research-oriented. To become a therapist, you will need to undertake postgraduate study in a recognised clinical psychology programme.
Counselling psychologist	• Work with people experiencing temporary or relatively self-contained life problems, like marital conflict, sexual difficulties, occupational stressors, or career uncertainty • Work in counselling centres, hospitals and private practice (although some work in academic and research settings)	*Misconception: Counselling psychology is pretty much the same thing as clinical psychology.* • **Truth:** Whereas clinical psychologists often work with people with serious mental disorders, most counselling psychologists don't. While non-accredited degree programmes may lead to practice as a counsellor, but they do not provide a pathway to registration as a counselling psychologist.
School psychologist	• Work with teachers, parents and children to remedy students' behavioural, emotional and learning difficulties	*Misconception: School psychology is another term for 'educational psychology'.* • **Truth:** Educational psychology is a substantially different discipline that focuses on helping instructors identify better methods for teaching and evaluating learning.
Developmental psychologist	• Study how and why people change over time • Conduct research on infants', children's, and sometimes adults' and elderly people's emotional, physiological and cognitive processes, and how these change with age	*Misconception: Developmental psychologists spend most of their time on their hands and knees playing with children.* • **Truth:** Most spend their time in the laboratory, collecting and analysing data.
Experimental psychologist	• Use research methods to study the memory, language, thinking and social behaviours of humans • Work primarily in research settings	*Misconception: Experimental psychologists do all of their work in psychological laboratories.* • **Truth:** Many conduct research in real-world settings, examining how people acquire language, remember events, apply mental concepts, and the like, in everyday life.

continued

TYPE OF PSYCHOLOGIST	WHAT DO THEY DO?	FREQUENT MISCONCEPTION AND TRUTH
Biological psychologist	• Examine the physiological bases of behaviour in animals and humans • Most work in research settings	*Misconception: All biological psychologists use invasive methods in their research.* • **Truth:** Although many biological psychologists create brain lesions in animals to examine their effects on behaviour, others use brain imaging methods that don't require investigators to damage organisms' nervous systems.
Forensic psychologist	• Work in prisons, jails, and other settings to assess and diagnose inmates, and assist with their rehabilitation and treatment • Others conduct research on eyewitness testimony or jury decision-making • Typically hold degrees in clinical or counselling psychology	*Misconception: Most forensic psychologists are criminal profilers, like those portrayed in popular television series and movies.* • **Truth:** Criminal profiling is a small and controversial (as you will learn in Chapter 15) subspecialty within forensic psychology.
Industrial organisational psychologists	• Work in companies and businesses to help select productive employees, evaluate performance, and examine the effects of different working and living conditions on people's behaviour (called *environmental psychologists*) • Design equipment to maximise employee performance and minimise accidents (called *human factors* or *engineering psychologists*)	*Misconception: Most industrial/organisational psychologists work on a one-to-one basis with employees to increase their motivation and productivity.* • **Truth:** Most spend their time constructing tests and selection procedures or implementing organisational changes to improve worker productivity and satisfaction.

Great debates of psychology

Before embarking on our journey through psychology, we need to set the stage for things to come. To do so, we introduce two of the Great Debates that have shaped the field of psychology since its inception. Because these debates are alive and well, you will find traces of them in virtually every chapter of this book.

THE NATURE–NURTURE DEBATE. The nature–nurture debate poses the following question: *Are our behaviours attributable mostly to our genes (nature) or to our rearing environments (nurture)?* As you will discover later in this text, this debate has proven especially controversial in the domains of intelligence, personality and psychopathology (mental illness). Many early thinkers, such as British philosopher John Locke (1632–1704), likened the human mind at birth to white paper that had not been written on. Others after him referred to the mind as a *tabula rasa* ('blank slate'). For Locke and his followers, we enter the world with no genetic preconceptions or preconceived ideas: we are shaped exclusively by our environments (Pinker, 2002).

For much of the twentieth century, most psychologists assumed that virtually all human behaviour was exclusively a product of learning. Nevertheless, the tide has been turning for many decades now. Research conducted by *behaviour geneticists*, who use sophisticated designs such as twin and adoption studies (see Chapter 3), shows that most important psychological traits, including intelligence, interests, personality and many mental illnesses, are influenced substantially by genes. Increasingly, modern psychologists have come to recognise that human behaviour is attributable not only to our environments but also to our genes and their interaction with their environments (Bouchard, 2004; Harris, 2002; Pinker, 2002).

One domain of psychology that has shed light on the nature–nurture debate is **evolutionary psychology**, which applies Darwin's theory of natural selection to human and animal behaviour (Barkow, Cosmides & Tooby, 1992; Dennett, 1995; Tooby & Cosmides, 1989). It begins with the assumption, shared by William James and other functionalists, that many human psychological systems—such as memory, emotion and personality—serve key adaptive functions: they help organisms to survive and reproduce. Darwin and his followers suggested that natural (and sexual) selection favoured certain

evolutionary psychology
discipline that applies Darwin's theory of natural selection to human and animal behaviour

kinds of brain-behaviour characteristics (such as maternal care), just as it did physical ones (such as claws, feathers or fur, which also carry their own behavioural implications). The precise pattern of the selective forces that drive the evolution of some body-behaviour attributes is in turn determined by the unique environment and lifestyle of the organism.

Biologists refer to *fitness* as the extent to which a trait increases the chances that organisms that possess this trait will survive and reproduce at a higher rate than competitors who lack it (see Chapter 3). Fitness has nothing to do with how strong or powerful an organism is. By surviving and reproducing at higher rates than other organisms, more fit organisms pass on their genes more successfully to later generations. For example, humans who had at least some degree of anxiety probably survived at higher rates than humans who lacked it, because anxiety serves an essential function: it prompts us to avoid impending danger (Barlow, 2000; Damasio & Carvalho, 2013). An evolutionary perspective helps us to realise that, while to a certain extent structure and function can be studied separately, in reality they are never separated.

The fact that men spend billions of dollars per year on hair replacement treatments is difficult to square with evolutionary hypotheses suggesting that women prefer bald men. The bottom line: beware of untestable evolutionary explanations.

Some approaches to evolutionary psychology have been highly criticised (de Waal, 2002; Kitcher, 1985; Panksepp & Panksepp, 2000). Many of its predictions are extremely difficult to test. In part, that is because behaviour—unlike the bones of dinosaurs, early humans and other animals—does not leave fossils. As a consequence, it is far more challenging to determine the evolutionary history of anxiety or depression than the functions of birds' wings. For example, two researchers speculated that male baldness serves an evolutionary function, because women supposedly perceive a receding hairline as a sign of maturity (Muscarella & Cunningham, 1996). This conjecture seems difficult to square with the fact that male hair replacement is a multi-billion-dollar-a-year industry (de Waal, 2002). Moreover, if it turned out that women preferred men with lots of hair to bald men, it would be just as easy to cook up an after-the-fact explanation for that finding ('Women perceive men with a full head of hair as stronger and more athletic'). Evolutionary psychology may one day prove to be an important unifying framework for psychology (Buss, 1995), but we should beware of evolutionary explanations that can fit almost any piece of evidence after the fact (de Waal, 2002).

THE FREE WILL–DETERMINISM DEBATE. The free will–determinism debate poses the following question: *To what extent are our behavioural choices able to be freely selected rather than mechanically determined by relevant causal factors?* Most of us experience ourselves as free to select between alternative courses of action. Fewer truths seem more self-evident than the fact that we are free to choose between different courses of action at each moment. For example, 'Shall I order the steak and salad or the vegetarian moussaka?' The conscious sense of freedom is inescapable even for the most hardened determinist. Indeed, our legal system is premised on the concept of free will. We punish criminals because they are supposedly free to abide by the law, but choose otherwise. One major exception, of course, is the insanity defence (see Chapter 16), in which the legal system assumes that severe mental illness can interfere with people's free will (Hoffman & Morse, 2006; Stone, 1982). Some prominent psychologists agree that we all possess free will (Baumeister, 2008). Yet many others maintain that free will is actually an illusion (Wegner, 2002; Bayne, 2006; Bargh, 2008).

In an astonishing experimental investigation of willed action, neuroscientist Benjamin Libet (1985) asked participants to lift a finger whenever they wished. He also asked them to note (and later report) using a specially devised electronic clock (called a Wundt clock) the time at which they became consciously aware of forming their intention to move. At the same time, Libet used electrodes (small devices that can be attached to the surface of the scalp, about which you will learn in Chapter 3) to measure a brain wave known as the *readiness potential*, which is most prominent at the vertex (top) of the head. This brain wave measures preparation in the premotor cortex for the impending execution of a motor command (action). Remarkably, Libet found that the readiness potential starts up about 300 milliseconds (about a third of a second) before our self-reported conscious awareness of the intention to move our finger. If you move

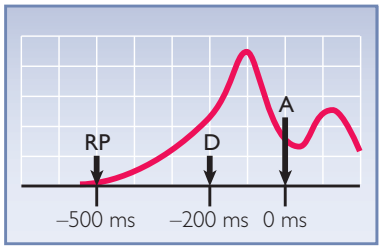


FIGURE 1.8 Is free will imaginary? The work of Benjamin Libet shows that our brain begins to ready itself to perform a movement about a third of a second—note the difference between 500 and 200 milliseconds (ms)—before we are even aware of our intention to do so. 'RP' stands for readiness potential; 'D' for the conscious decision to perform an action, in this case, lifting our finger; and 'A' for the action itself. (*Source*: Adapted from Libet, 1985.)

the index finger of your right hand right now (go ahead, try it), you will almost certainly perceive that movement as (freely) initiated by your conscious intention. Yet Libet's work strongly suggests that unconscious neurophysiological processes in the brain have begun preparing for this action before you are aware of your conscious intention to act (see Figure 1.8).

Libet interpreted his results as showing that the role of consciousness in regulating action was not to initiate behaviour but to monitor behaviour and veto actions that contravened consciously held goals and values. He jokingly called his position a 'theory of free won't' as opposed to a 'theory of free will' (Libet, 2004). Recently, the New Zealand philosopher of mind Tim Bayne has drawn on the latest neuroscience research on the experience of volition to propose (echoing Libet) that our sense of volition is a perception of action rather than a cause of our actions (Bayne, 2011). Bayne proposes that, like any perception, our sense of volition can sometimes be faulty, but argues that on some if not most occasions it can be an accurate representation of our internal states (that is, our intentions actually did cause our actions).

How psychology affects our lives

As we will discover throughout this text, psychological science and scientific thinking offer important applications for a variety of aspects of everyday life. Psychological scientists often distinguish basic research from applied research. **Basic research** examines how the mind works, whereas **applied research** examines how we can use basic research to solve real-world problems (Nickerson, 1999). Within most large psychology departments, we find a healthy mix of people conducting basic research, such as investigators who study the laws of learning, and applied research, such as investigators who study how to help people cope with the psychological burden of cancer.

APPLICATIONS OF PSYCHOLOGICAL RESEARCH. Examples abound of how psychological research has affected our everyday lives. Many of us have encountered these applications in our lives, although we may not realise that they emanated from psychological research. Below, we look at a sampling of them; you can discover more about these and other examples on the American Psychological Association website at www.psychologymatters.org.

- As a car driver, have you ever had to slam on your brakes to avoid hitting a driver directly in front of you who stopped short suddenly? If so, and if you managed to avoid a bad accident, you may have John Voevodsky to thank. For decades, cars had only two brake lights. In the early 1970s, Voevodsky hit on the idea of placing a third brake light at the base of cars' back windshields. He reasoned that this additional visual information would decrease the risk of rear-end collisions. He conducted a 10-month study of taxis with and without the new brake lights, and found a 61 per cent lower rate of rear-end accidents in the first group (Voevodsky, 1974). As a result of his research, all new cars now have three brake lights (www.apa.org/research/action/brake.aspx).
- To get into university, you probably had to take one or more tests, like the HSC (Higher School Certificate) or VCE (Victorian Certificate of Education). If so, you can thank—or blame—psychologists with expertise in measuring academic achievement and knowledge, who were primarily responsible for developing these measures (Zimbardo, 2004). Although these tests are far from perfect predictors of academic performance, they do significantly better than chance in forecasting how students perform at university (Geiser & Studley, 2002).
- If you are anything like the average person in modern economies, you see more than 100 commercial messages every day. The chances are high that psychologists had a hand in crafting many of them. The founder of behaviourism, John B. Watson, pioneered the application of psychology to advertising in the 1920s and 1930s. Today, psychological researchers still contribute to the

basic research
research examining how the mind works

applied research
research examining how we can use basic research to solve real-world problems

marketing success of companies. For example, psychologists who study magazine advertisements have discovered that human faces on the left side of pages better capture readers' attention than on the right side of pages. Written text, in contrast, better captures readers' attention on the right side of pages rather than the left (Clay, 2002).

- Hopefully, you will not be a victim of a violent crime, although you may know someone who has been. Police officers often ask victims of such crimes to select a suspect from a line-up. When doing so, they have traditionally used *simultaneous line-ups*, in which one or more suspects and several decoys (people who are not really suspects) are lined up in a row, often of five to eight individuals (see Chapter 7). These are the kinds of line-ups most often seen on television crime shows. Yet psychological research generally shows that *sequential line-ups*—those in which victims view each person individually and then decide whether he or she was the perpetrator of the crime—are more accurate than simultaneous line-ups (Steblay et al., 2003; Wells, Memon & Penrod, 2006; Wells & Olson, 2003). As a result of this research, police departments around Australia (and throughout the world) now use sequential rather than simultaneous line-up methods.

A classic simultaneous eyewitness line-up. Although police previously used such line-ups, research demonstrated that they are more prone to error than sequential line-ups, leading to their widespread replacement by sequential line-ups. (*Source:* Fat Chance Productions/ Corbis.)

- The odds are high that you at least know someone who is in psychotherapy. Perhaps you have received psychotherapy at some point in your life. If so, you are far from alone. About one in five adults has sought treatment for an emotional problem over the past year (Kessler et al., 2005). Psychologists have played a pivotal role in developing and testing most forms of psychotherapy (see Chapter 17). Moreover, well-conducted studies consistently demonstrate that psychotherapy can be effective for treating a wide range of psychological difficulties, including depression, anxiety, eating problems, insomnia and sexual disturbances (Chambless & Ollendick, 2001).

So, far more than most people realise, the fruits of psychological research are all around us. Psychology has dramatically altered the landscape of everyday life.

Evidence-based practice

The central controversy in the profession of psychology today lies in the domain of clinical practice. The principal fault line is between psychologists who believe that clinical practice should base itself on scientific findings and seek evidence for the effectiveness of chosen interventions, and those who believe that clinical practice should primarily reflect the unique experience of the individual clinician and client (Dawes, 1994; Lilienfeld, Lynn & Lohr, 2003; McFall, 1991). The historical cleft between these two groups of psychologists is sometimes called the **scientist–practitioner gap** (Fox, 1996). In contrast, the scientist–practitioner model, which is the foundation of this book, sets out to bridge this gap by developing practice grounded in knowledge and practitioners able to contribute to psychological knowledge through a scientific approach to their professional experience.

Psychology and psychologists in Australia

The Australian Psychological Society (APS) was founded to represent the interests of the profession in 1944. Initially a branch of the British Psychological Society, the APS became an independent society in 1966. Today, there are about 25 000 registered psychologists practising in Australia (MHWAC, 2008). To give you a sense of how much the field has grown, there were only 54 APS members in 1945, of whom 10 were women (Cooke, 2000). Current members are spread across nine professional college divisions, spanning neuropsychology, clinical psychology, community psychology and

Factoid

The first female president of the Australian Psychological Society (then a branch of the British Psychological Society) was Constance Muriel Davey OBE (1882–1963), who served in 1947. Schooled in her native South Australia, she was an outstanding student and won a scholarship to University College London, from which she took a PhD in 1924. Davey made significant contributions to the assessment and establishment of remedial education classes for 'slow learners' and to the standardised testing of scholars throughout Australia. She was the founder of psychological services for children in South Australia, and later taught at the University of Adelaide.

scientist–practitioner gap
divide between psychologists (predominantly academic) who believe that clinical practice should primarily be a science, and those clinicians who believe that clinical practice should primarily be an 'art'

Constance Muriel Davey OBE was the first female president of the Australian Psychological Society. (*Source:* State Library of South Australia. SLSA: B 11227.)

Some therapeutic techniques are premised on dubious scientific principles. For example, some proponents of the use of hypnotic age regression claim to be able to recover repressed memories by 'returning' individuals psychologically to an earlier age using hypnosis; here, a therapist regresses a hypnotic participant to 3 years of age. Research suggests that genuinely deluded age-regressed participants are hallucinating in accord with their expectations of how a child of that age should respond rather than actually returning to an earlier age (Nash, 1987; see Chapter 5). (*Source:* Michael Newman/PhotoEdit.)

APS Australian Psychological Society

In the APS-adopted scientist–practitioner model, education for professional practice requires a thorough knowledge of the core theories, findings and research methods that constitute the science of psychology. (*Source:* Courtesy of APS.)

counselling psychology, as well as educational psychology, developmental psychology, forensic psychology, organisational psychology and sports psychology (see www.groups.psychology.org.au/colleges). In addition, the APS currently has 40 special-interest groups operating across diverse areas of psychological practice. People with degrees in psychology work in a remarkably diverse array of settings, and the profession of psychology is making a vital contribution to Australian society.

In Australia the APS has adopted the scientist–practitioner model as the basis of psychological research, professional training and professional practice. In this model each component is a part of an integrated profession, with responsibility towards the profession as a whole falling upon all who work in its component parts. Thus education for professional practice requires a thorough knowledge of the core theories, findings and research methods that constitute the science of psychology. It is this conceptual foundation that the student later learns to apply to the practical problems of psychological practice. Finally, the student is taught the specific procedures and techniques developed and tested within the science of psychology for effective practical intervention in their area of professional specialisation.

This structure is followed by all degree progressions (programmes) that are accredited to lead to registration to work as a psychologist in Australia. For those considering a professional career in psychology, this book seeks to provide a secure foundation for the first rung of the ladder of scientific and professional development based on the scientist–practitioner model. Along with a foundation in scientific psychology, this book aims to develop the mindset that is central to the scientist–practitioner model. This includes: a commitment to testing ideas and practices against the best available evidence; continuous critical appraisal of one's own ideas and beliefs; and a ceaseless effort to increase the sphere of psychological practice based on scientific knowledge and evidence. It is our hope that readers of this book will develop a critical perspective towards both the foundations of psychological science and the professional practice of psychology.

What is psychology? Science versus intuition 4–11

LO 1.1 DEFINE PSYCHOLOGY.

Psychology is the scientific study of the mind, brain and behaviour. Although we often rely on our commonsense to understand the psychological world, our intuitive understanding of ourselves and others is often mistaken. Naive realism is the error of believing that we see the world precisely as it is. It can lead us to false beliefs about ourselves and our world, such as believing that our perceptions and memories are always accurate.

1. Which would be a better description of naive realism: 'seeing is believing' or 'believing is seeing'?
2. How does our commonsense evaluate the fairness of the political views of people with very different beliefs to our own?
3. Our commonsense (is/isn't) always wrong.

LO 1.2 EXPLAIN HOW SCIENCE CAN SAFEGUARD AGAINST THE MAJOR FALLACIES OF HUMAN THINKING.

Confirmation bias is the tendency to seek out evidence that supports our hypotheses and deny, dismiss or distort evidence that doesn't. Belief perseverance is the tendency to cling to our beliefs despite contrary evidence. The scientific method is a set of safeguards against such errors.

4. Science is a(n) _____ to evidence.
5. A scientific model such as the Big Bang theory, which provides an explanation for a large number of findings in the natural world, is known as a _____ _____.
6. In scientific research, _____ are general explanations, whereas _____ are specific predictions derived from those explanations.
7. Review each of the statements in the table and identify whether each is a theory (T) or hypothesis (H).

T OR H	EXPLANATION
1. _____	Sarah's motivation for cheating on the test was fear of failure.
2. _____	Darwin's evolutionary model explains the changes in species over time.
3. _____	The universe began in a gigantic explosion about 14 billion years ago.
4. _____	Our motivation to help a stranger in need is influenced by the number of people present.
5. _____	Crime rates in Darwin increase as the temperature rises.

8. When presented with both contradictory and supportive evidence regarding a hypothesis we are researching, our tendency to disregard the contradictory evidence is our _____ _____.
9. Our _____ _____ kicks in when we refuse to admit our beliefs may be incorrect in the face of evidence that contradicts them.
10. Knowledge claims from disciplines outside the sciences (such music, history, philosophy, mathematics) differ from pseudoscientific claims in that they aren't _____.

Psychological pseudoscience: imposters of science 11–19

LO 1.3 DESCRIBE THE FEATURES OF PSYCHOLOGICAL PSEUDOSCIENCE, AND DISTINGUISH IT FROM PSYCHOLOGICAL SCIENCE.

Pseudoscientific claims appear scientific but don't play by the rules of science. In particular, pseudoscience lacks the safeguards against confirmation bias and belief perseverance that characterise science.

11. The growth of popular psychology has led to a(n) _____ explosion.
12. About _____ per cent of self-help books are untested.
13. There are more than 500 'brands' of _____, with new ones being added every year.
14. Pseudoscience is an _____ of real science because it seeks to appear scientific while it is not.
15. Match the warning signs of pseudoscience with the examples shown.

EXAMPLE	SIGN OF PSEUDOSCIENCE
1. ____ Three simple steps will change your love life forever!	a. Meaningless 'psychobabble' that uses fancy scientific-sounding terms that don't make sense
2. ____ This woman practised yoga daily for three weeks and hasn't had a day of depression since.	b. Exaggerated claims
3. ____ Amazing new innovations in research have shown that eye massage results in reading speeds 10 times faster than average!	c. Overreliance on anecdotes
4. ____ Fifty studies conducted by the company all show overwhelming success!	d. Lack of self-correction when contrary evidence is published
5. ____ Although some scientists say that we use almost all of our brain, we have found a way to harness additional brain power previously undiscovered.	e. Absence of connectivity to other research
6. ____ Sine-wave filtered auditory stimulation is carefully designed to encourage maximal orbitofrontal dendritic development.	f. Talk of 'proof' instead of 'evidence'
7. ____ Our new programme is proven to reduce social anxiety by at least 50 per cent!	g. Overuse of ad hoc immunising tactics
8. ____ A self-proclaimed 'psychic' who fails controlled tests in the laboratory claims that the sceptical experimenters are interfering with his psychic powers.	h. Lack of review by other scholars (called *peer review*) or replication by independent labs