1

PSYCHOLOGY AND SCIENTIFIC THINKING

a framework for everyday life

THINK ABOUT IT

IS PSYCHOLOGY MOSTLY JUST COMMON SENSE?

SHOULD WE TRUST MOST SELF-HELP BOOKS?

IS PSYCHOLOGY REALLY A SCIENCE?

ARE CLAIMS THAT CAN'T BE PROVEN WRONG SCIENTIFIC?

ARE ALL CLINICAL PSYCHOLOGISTS PSYCHOTHERAPISTS?

test of popular psychology knowledge

1. Most people use only about 10 percent 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 (like *tac* instead of *cat*). **True / False**
5. In general, it's better to express anger than to hold it in. **True / False**
6. The lie-detector (polygraph) test is 90 to 95 percent accurate at detecting falsehoods. **True / False**
7. People tend to be romantically attracted to individuals who are 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. People with schizophrenia have more than one personality. **True / False**
10. All effective psychotherapies require clients to get to the root of their problems in childhood. **True / False**

For most of you reading this text, this is your first psychology course. But you may believe you've learned a lot about psychology already from watching television programs and movies, listening to radio call-in 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.

Take a moment to review the ten test questions above. Beginning psychology students typically assume 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* ten of these statements are false! This exercise illustrates a take-home message we'll emphasize throughout the text: *Although common sense 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're *all* psychologists, because we deal with psychological phenomena, like love, friendship, anger, stress, happiness, sleep, memory, and language, in our daily lives (Lilienfeld et al., 2009). But as we'll soon discover, everyday experience doesn't necessarily make us experts (Kahneman & Klein, 2009).

Watch IT-Video: Psychology on **mypsychlab.com**

Watch Thinking Like A Psychologist: Debunking Myths on **mypsychlab.com**

WHAT IS PSYCHOLOGY? SCIENCE VERSUS INTUITION

LO 1.1 Explain why psychology is more than just common sense.

LO 1.2 Explain the importance of science as a set of safeguards against biases.

William James (1842–1910), often regarded as the founder of American psychology, once described psychology as a "nasty little subject." As James noted, psychology is difficult to study, and simple explanations are few and far between. If you enrolled in this course expecting simple answers to psychological questions, like why you become angry or fall in love, you may be 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 text, prepare to find many of your preconceptions about psychology challenged; to learn

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 your everyday life.

Psychology and Levels of Analysis

The first question often posed in introductory psychology texts 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, we'll simply refer to **psychology** as the scientific study of the mind, brain, and behaviour.

Another way of making this point is to describe psychology as 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). 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 at the high rungs, with many levels in between (Cacioppo et al., 2000) (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." But it's crucial to understand that "brain" and "mind" are just different ways of describing the same "stuff," but at different levels of analysis: As we'll learn in Chapter 3, the "mind" is just the brain in action. Although scientific psychologists may differ in which rungs they choose to investigate, they're united by a shared commitment to understanding the causes of human and animal behaviour.

We'll cover all of these levels of analysis in coming chapters. When doing so, we'll keep one crucial guideline in mind: *We can't understand psychology by focusing on only one level 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'll steer away from these two extremes, because both biological and social factors are essential for a complete understanding of psychology (Kendler, 2005).

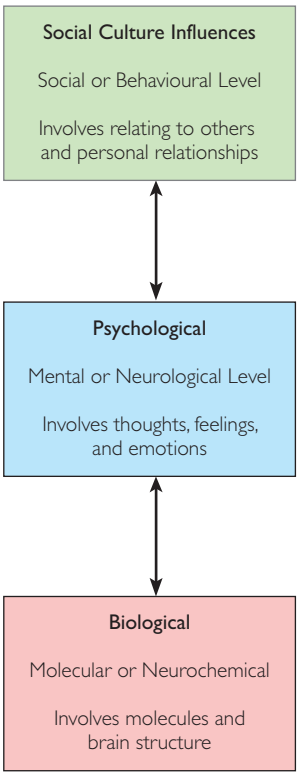


FIGURE 1.1 Levels of Psychological Analysis. We can view psychological phenomena at multiple levels of analysis, with lower levels being more biological and higher levels being more social. Each level provides us with unique information and offers us a distinctive view of the phenomenon at hand.

What Makes Psychology Challenging—and Fascinating

A host of challenges make psychology complicated; it's precisely these challenges that also make psychology fascinating, because each challenge contributes to scientific mysteries that psychologists have yet to solve. Here, we'll touch briefly on five challenges that we'll be revisiting throughout the text.

First, human behaviour is difficult to predict, in part because almost all actions are **multiply determined**—that is, produced by many factors. That's why we need to be profoundly skeptical of *single-variable explanations* of behaviour, which are widespread in popular psychology. We may be tempted to explain complex human behaviours, like violence, in terms of a single causal factor, like either poverty or genes, but we'd almost surely be wrong because such behaviours are due to the interplay of an enormous array of factors.

Second, psychological influences are rarely independent of each other, making it difficult to pin down which cause or causes are operating. Imagine yourself a scientist attempting to explain why some women develop *anorexia nervosa*, a severe eating disorder we'll discuss in Chapter 11. You could start by identifying several factors that might contribute to anorexia nervosa, like anxiety-proneness, compulsive exercise, perfectionism, excessive concern with body image, and exposure to television programs that feature thin models. Let's say that you now want to focus on just one of these potential influences, like perfectionism. Here's 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 programs that feature thin models, and so on. The fact that all of these factors tend to be interrelated makes it tricky to pinpoint which actually contributes to anorexia nervosa. They could all be playing a role, but it's hard to know for sure.

Psychology may not be one of the traditional "hard sciences," like chemistry, but many of its fundamental questions are even harder to answer.

psychology
the scientific study of the mind, brain, and behaviour

levels of analysis
rungs on a ladder of analysis, with lower levels tied most closely to biological influences and higher levels tied most closely to social influences

multiply determined
caused by many factors

Each of these panels from everyday life poses a different psychological question: (1) Why do some of us become depressed for no apparent reason? (2) What makes us angry? Although the science of psychology doesn't provide easy answers to any of these questions, it does offer valuable insights into them. (3) Why do we fall in love?

Explore Diversity in Psychological Inquiry on **mypsychlab.com**

Third, people differ from each other in thinking, emotion, personality, and behaviour. These **individual differences** help to explain why we each respond 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 studies 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.

Fourth, people often influence each other, making psychology unimaginably more complicated than disciplines like chemistry, in which we can isolate substances in test tubes (Wachtel, 1973). For example, if you're an extroverted person, you're likely to make the people around you more outgoing. In turn, their outgoing behaviour may "feed back" to make you even more extroverted, 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 14). Reciprocal determinism makes it difficult to know what's causing what.

Fifth, people's behaviour is often shaped by culture. Cultural differences, like individual differences, place limits on the generalizations that psychologists can draw about human nature (Henrich, Heine, & Norenzayan, 2010). To take one example, University of Alberta researcher Takahiko Masuda and his colleagues found that Westerners and Japanese participants often attend to different things in pictures (Masuda et al., 2008). In one case, the researchers showed participants cartoons that had a person with a happy, sad, angry, or neutral expression, surrounded by people who had either a similar or a different expression. The researchers found that the expression of the people surrounding the target person influenced Japanese participants, but not Western ones. Using eye-tracking technology, which allows researchers to determine where subjects are moving their eyes, they found that Westerners tended to look mostly at the target person, whereas Japanese participants tended to look more at the people surrounding the target person. This research supports previous findings that indicate Westerners view emotion as stemming from the individual, whereas Easterners see an individual's emotional state as being highly tied to the emotional state of the group (e.g., Markus & Kitayama, 1991; Chua, Boland, & Nisbett, 2005). This interesting work dovetails with evidence that people from a Western culture tend to focus on central details, whereas people from an Eastern culture tend to focus on peripheral or incidental details (Nisbett, 2003; Nisbett, Peng, Choi, & Norenzayan, 2001). Cultural differences place further limits on the broad generalizations about human nature that psychologists can draw.

Social scientists sometimes distinguish between emic and etic approaches to cross-cultural psychology. In an *emic* approach, investigators study the behaviour of a culture from the perspective of a "native" or insider, whereas in an *etic* approach, they study the behaviour of a culture from the perspective of an outsider (Harris, 1976). A researcher using an emic approach studying the personality of inhabitants of an isolated Pacific island would probably rely on personality terms used by members of that culture. In contrast, a researcher using an etic approach would probably adapt and translate personality terms used by Western culture, like shyness and extroversion, to that culture. Each approach has its pluses and minuses. Investigators who adopt an emic approach may better understand the unique characteristics of a culture, but they may overlook characteristics that this culture shares with others. In contrast, investigators who adopt an etic approach may be better able to view this culture within the broader perspective of other cultures, but they may unintentionally impose perspectives from their own culture onto others.

Why We Can't Always Trust Our Common Sense

To understand why others act as they do, most of us trust our common sense—our gut intuitions about how the social world works. This reliance is tempting, because children and adults alike tend to regard psychology as "easier" and more self-evident than physics, chemistry, biology, and most other sciences (Keil, Lockhart, & Schlegel, 2010). Yet, as we've already discovered, our intuitive understanding of ourselves and the world is frequently mistaken (Cacioppo, 2004; van Hecke, 2007). In fact, as the quiz at the start

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

of this chapter showed us, sometimes our commonsensical understanding of psychology isn't merely incorrect but entirely backwards. For example, although many people believe the old adage "There's safety in numbers," 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, 1968a; Latané & Nida, 1981; see Chapter 13).

Here's another illustration of why we can't always trust our common sense. Read the following well-known proverbs, most of which deal with human behaviour, and ask yourself whether you agree with them:

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

These proverbs all ring true, don't they? Yet each proverb contradicts the proverb across from it! So our common sense can lead us to believe two things that can't 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, like the authors of an introductory psychology text, point them out to us. This example reminds us of why scientific psychology doesn't rely exclusively on intuition, speculation, or common sense.

NAIVE REALISM: IS SEEING BELIEVING? We trust our common sense largely because we're 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 we're driving down a one-lane road and see a tractor trailer barrelling toward us at 135 kilometres per hour, it's a wise idea to get out of the way. Much of the time, we *should* trust our perceptions.

Yet appearances can sometimes be deceiving. The Earth *seems* flat. The sun *seems* to revolve around the Earth (see **FIGURE 1.2** for another example of deceptive appearances). Yet in both cases, our intuitions are wrong. Similarly, naive realism can trip us up when it comes to evaluating ourselves and others. Our common sense assures us that people who don't share our political views are biased but that we're objective. Yet psychological research demonstrates that just about all of us tend to evaluate political issues in a biased fashion (Pronin, Gilovich, & Ross, 2004). So our tendencies toward naive realism can lead us to draw incorrect 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 COMMON SENSE IS RIGHT. That's not to say that our common sense 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) judgments about whether someone we've just watched on a videotape is trustworthy or untrustworthy tend to be right more often than we'd expect by chance (Fowler, Lilienfeld, & Patrick, 2009). Common sense 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 shows that they're right (Kluger & Tikochinsky, 2001).

But to think scientifically, we must learn when—and when not—to trust our common sense. 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

In the Masuda et al. (2008) study, the researchers found that Westerners tend to focus on the emotion of the central person in the cartoons, whereas Easterners tend to focus more on the people in the surrounding area.

In the museum of everyday life, causation isn't a one-way street. In conversations, one person influences a second person, who in turn influences the first person, who in turn influences the second person, and so on. This principle, called *reciprocal determinism*, makes it challenging to pinpoint the causes of behaviour.

Many people say that they know of a happy couple who are opposites. Yet psychological research shows that such relationships are marked exceptions. People are generally drawn to others who are similar to them in beliefs and values.

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

A classic example of when our naive realism can trick us can be found in what's known as the Thatcher Illusion. Take a look at these two upside-down photos of former British Prime Minister Margaret Thatcher. They look quite similar. Now turn your text upside down.

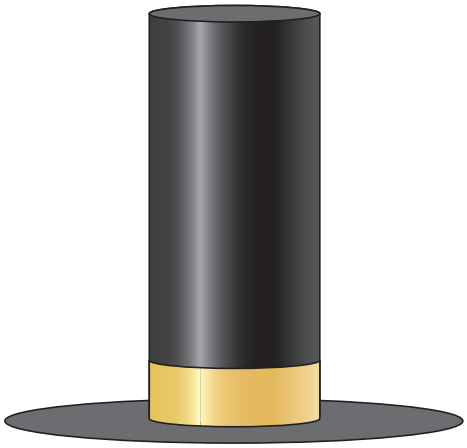


FIGURE 1.2 Naive Realism Can Fool Us. Even though our perceptions are often accurate, we can't always trust them to provide us with an error-free picture of the world. In this case, take a look at this top hat. Believe it or not, the distance from the brim to the top is actually shorter than the distance from edge to edge of the brim. Get out a ruler if you don't believe us!

a framework of scientific thinking tools for making this crucial distinction. This thinking framework can help you to better evaluate psychological claims in everyday life.

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, he asked the student, "So why did you decide to go into psychology?" The student responded, "Well, I took a lot of science courses and realized I didn't like science, so I picked psychology instead."

We're going to try to persuade you that the 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, are scientific. But what does the word *science* really mean, 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 isn't a body of knowledge. Instead, it's an *approach* to evidence (Bunge, 1998). Specifically, science consists of a set of attitudes and skills designed to prevent us from fooling ourselves. Science begins with *empiricism*, the premise that knowledge should initially be acquired through observation. Yet such observation is only a rough starting point for obtaining psychological knowledge. As the phenomenon of naive realism reminds us, it isn't sufficient by itself, because our observations can fool us. So science refines our initial observations, subjecting them to stringent tests to determine whether they are accurate. The observations that stand up to rigorous examination are retained; those that don't are revised or discarded.

You may have heard the humorous saying: "Everyone is entitled to my opinion." In everyday life, this saying can be helpful in a pinch, especially when we're in the midst of an argument. Yet in science, this saying doesn't pass muster. Many people believe they don't need science to get them closer to the truth, because they assume that psychology is just a matter of opinion. "If it seems true to me," they assume, "it probably is." Yet adopting a scientific mindset requires us to abandon this comforting way of thinking. Psychology is more than a matter of opinion: It's a matter of finding out which explanations best fit the data about how our minds work. Hard-nosed as it may sound, some psychological explanations are just plain better than others.

WHAT IS A 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'll first examine what a scientific theory is, and then address two misconceptions about what a scientific theory *isn't*.

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 pretty 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 these explanations (Bolles, 1962; Meehl, 1967). Based on their tests of hypotheses, scientists can provisionally accept the theory that generated these hypotheses, reject this 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'll often hear television reporters say something like, "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. It also doesn't generate testable predictions. In contrast, *forensic psychologists*—those who study the causes and treatment of criminal behaviour—have constructed general theories that attempt to explain why certain people steal and to forecast when people are most likely to steal (Katz, 1988).

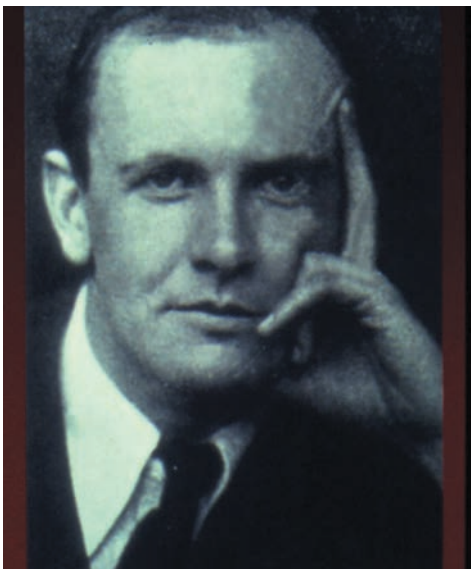
Misconception 2: *A theory is just an educated guess.* A second myth is that a scientific theory is merely a guess about how the world works. For example, some creationists who've demanded that creationism be granted equal time with evolutionary theory in biology classes argue that evolution is "just a theory." In fact, until recently some counties' high schools in the United States, like those in Cobb County, Georgia, have periodically required high school biology textbooks to carry stickers featuring the disclaimer that Darwinian evolution is "only" a theory (Pinker, 2002). In Canada, a recent poll indicated that 22 percent of our population believes that God created humans within the past 10 000 years (Angus Reid, 2008).

People will often dismiss a theoretical explanation on these grounds, arguing that it's "just a theory." This mistakenly implies that some explanations about the natural world are "more than theories." 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 began in a gigantic explosion about 14 billion years ago, helps scientists to explain a diverse array of observations. They include the findings that (a) galaxies are rushing away from each other at remarkable speeds, (b) the universe exhibits a background radiation suggestive of the remnants of a tremendous explosion, and (c) powerful telescopes reveal that the oldest galaxies originated about 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 "proven" because it's 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 guesses about how the world works, because they've 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 refute 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 incorrectly that scientists are objective and free of biases. Yet scientists are human and have their biases, too (Mahoney & DeMonbreun, 1977). The best scientists are aware of their biases and try to find ways of compensating for them. This principle

Several years ago, Stockwell Day, who in 2008 became Minister of International Trade and Minister for the Asia-Pacific Gateway, said that there was "scientific proof" that humans coexisted with dinosaurs.



Arthur Darbishire (1879–1915), a British geneticist and mathematician. Darbishire's favourite saying was that the attitude of the scientist should be "one of continual, unceasing, and active distrust of oneself."

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

hypothesis
testable prediction derived from a scientific theory

FICTOID

MYTH: Physicists and other "hard" scientists are more skeptical about most extraordinary claims, like extrasensory perception, than psychologists are.

REALITY: Academic psychologists are more skeptical of many controversial claims than their colleagues in more traditional sciences are, perhaps because psychologists are aware of how biases can influence the interpretation of data. For example, psychologists are considerably less likely to believe that extrasensory perception is an established scientific fact than are physicists, chemists, and biologists (Wagner & Monnet, 1979).

Explore Confirmation Bias on **mypsychlab.com**

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 1.3 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 deny, dismiss, or distort evidence that contradicts them

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

applies to all scientists, including psychological scientists—those who study mind, brain, and behaviour. In particular, the best scientists realize that they *want* their pet theories to turn out to be correct. After all, they've invested months or even years in designing and running a study to test a theory, sometimes a theory they've developed. If the results of the study are negative, they'll often be bitterly disappointed. They also know that because of this deep personal investment, they may bias the results unintentionally to make them turn out the way 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're careful. We'll 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, scientific methods are tools for overcoming **confirmation bias:** the tendency to seek out evidence that supports our beliefs and deny, dismiss, or distort evidence that contradicts them (Nickerson, 1998; Risen & Gilovich, 2007). We can sum up confirmation bias by saying this: *You will see what you are looking for.*

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 we can find in **FIGURE 1.3**. You'll 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 on.

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've fallen prey to confirmation bias, although you'd 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's a vowel on the other side of the 5 card, that doesn't rule out the possibility that the 4 card also 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's the only other card that could demonstrate that the hypothesis is wrong.

Confirmation bias wouldn't be especially interesting if it were limited to cards. What makes confirmation bias so important is that it extends to many areas of our daily lives (Nickerson, 1998). For example, research shows that confirmation bias affects how we evaluate candidates for political office—including those on both the left and the right sides of the political spectrum. Research shows that if we agree with a candidate's political views, we quickly forgive her for contradicting herself, but if we disagree with a candidate's views, we criticize her as a "flip-flopper" (Tavris & Aronson, 2007; Westen et al., 2006). Similarly, in a classic study of a hotly contested football game, Dartmouth fans saw Princeton players as "dirty" and as committing many penalties, while Princeton fans saw Dartmouth players in exactly the same light (Hastorf & Cantril, 1954). When it comes to judging right and wrong, our side almost always seems to be in the right, and the other side in the wrong.

Although we'll be encountering a variety of biases in this text, we can think of confirmation bias as the "mother of all biases." That's because it's the bias that can most easily fool us into seeing what we want to see. For that reason, it's the most crucial bias that psychologists need to counteract. What distinguishes psychological scientists from nonscientists is that the former adopt systematic safeguards to protect against confirmation bias, whereas the latter don't (Lilienfeld, Ammirati, & Landfield, 2009). We'll learn about these safeguards in Chapter 2.

Belief Perseverance. Confirmation bias predisposes us to another shortcoming to which we're all prone: **belief perseverance.** Belief perseverance refers to the tendency to stick to our initial beliefs even when evidence contradicts them. In everyday language,

belief perseverance is the "don't confuse me with the facts" effect. Because none of us wants to think we're wrong, we're usually reluctant to give up our cherished notions. In a striking demonstration of belief perseverance, Lee Ross and his colleagues asked students to inspect 50 suicide notes and determine which were real and which were fake (in reality, half were real, half fake). They then gave students feedback on how well they'd done—they told some students they were usually right, others they were usually wrong. Unbeknownst to the students, this feedback was unrelated to their actual performance. Yet even after the researchers informed the students that the feedback was bogus, students based their estimates of ability on the feedback they'd received. Students told they were good at detecting real suicide notes were convinced they were better at it than students told they were bad at it (Ross, Lepper, & Hubbard, 1975).

Beliefs endure. Even when informed that we're wrong, we don't completely wipe our mental slates clean and start from scratch.

Metaphysical Claims: The Boundaries of Science

It's essential to distinguish scientific claims from **metaphysical claims:** assertions about the world that we can't test (Popper, 1965). Metaphysical claims include assertions about the existence of God, the soul, and the afterlife. These claims differ from scientific claims in that we could never test them using scientific methods. (How could we design a scientific test to conclusively disprove the existence of God?).

This point doesn't mean that metaphysical claims are wrong, let alone unimportant. To the contrary, many thoughtful scholars would contend that questions concerning the existence of God are even more significant and profound than scientific questions. Moreover, regardless of our beliefs about religion, we need to treat these questions with the profound respect they deserve. But it's crucial to understand that there are certain questions about the world that science can—and can't—answer (Gould, 1997). Science has its limits. It needs to respect the boundaries of religion and other metaphysical domains. Testable claims fall within the province of science; untestable claims don't (see **FIGURE 1.4**). Moreover, according to many (although admittedly not all) scholars, there's no inherent conflict between science and the vast majority of religious claims (Dean, 2005). One can quite comfortably adhere to one's religious views while embracing psychology's scientific tools (see Chapter 2) and findings.

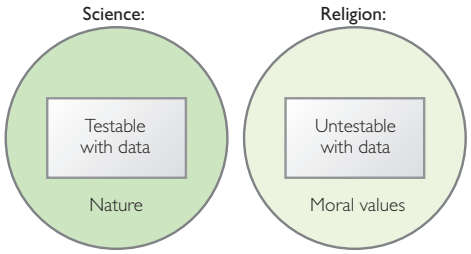
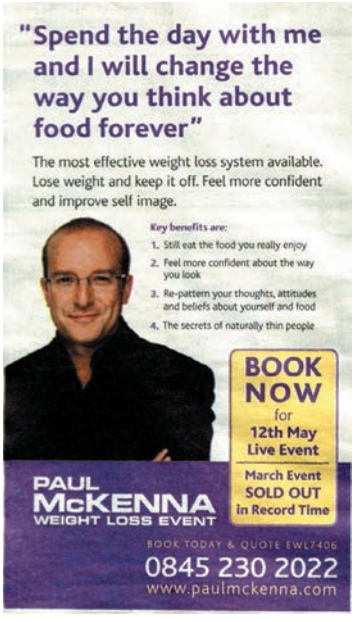
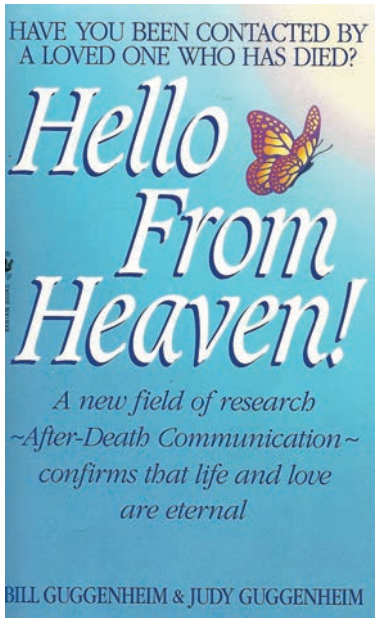


FIGURE 1.4 Nonoverlapping Realms. Scientist Stephen Jay Gould (1997) argued that science and religion are entirely different and nonoverlapping realms of understanding the world. Science deals with testable claims about the natural world that can be answered with data, whereas religion deals with untestable claims about moral values that can't be answered with data. Although not all scientists and theologists accept Gould's model, we adopt it for the purposes of this textbook. (*Source:* Gould, S. J. (1997). Nonoverlapping magisteria. Natural History, 106, 16–22. Reprinted by permission of Rhonda Shearer.)

Watch Cold Reading: Talking to Heaven on **mypsychlab.com**

metaphysical claim
assertion about the world that is not testable





? Which of these claims is metaphysical and which is probably pseudoscientific? (See answer upside down on bottom of page.)

Answer: Image on left is probably pseudoscientific, because it makes extreme claims that aren't supported by evidence; image on right is metaphysical because it makes a claim that science cannot test.

Some newspapers present headlines that may be inaccurate or misleading. How can we know how much trust to place in them?

Recognizing That We Might Be Wrong

Good scientists are keenly aware they might be mistaken (Sagan, 1995). In fact, initial scientific conclusions are often wrong or at least partly off base. Medical findings are prime examples. Eating a lot of chocolate reduces your risk for heart disease; oops, no, it doesn't (I'd bet you were disappointed to learn that). Drinking a little red wine now and then is good for you; no, actually, it's bad for you. And on and on it goes. It's no wonder that many people just throw up their hands and give up reading medical reports altogether. One researcher (Ioannidis, 2005) found that about a third of findings from published medical studies don't hold up in later studies (of course, we have to wonder: Do we know that the results of *this* analysis will hold up?). But the beauty of this messy process is that scientific knowledge is almost always tentative and potentially open to revision. The fact that science is a process of continually revising and updating findings lends it strength as a method of inquiry. It does mean, though, that we usually acquire knowledge slowly and in small bits and pieces.

One way of characterizing this process is to describe science, including psychological science, as a *prescription for humility* (McFall, 2006). Good scientists never claim to "prove" their theories and try to avoid committing to definitive conclusions unless the evidence supports them overwhelmingly. Such phrases as "suggests," "appears," and "raises the possibility that" are widespread in scientific writing and allow scientists to remain tentative in their interpretations of findings. Many beginning students understandably find this hemming and hawing frustrating.

Yet as Carl Sagan (1995) observed, the best scientists hear a little voice in their heads that keeps repeating the same words: "But I might be wrong." Science forces us to question our findings and conclusions, and encourages us to ferret out mistakes in our belief systems (O'Donohue, Lilienfeld, & Fowler, 2007). Science also forces us to attend to data that aren't to our liking, whether or not we want to—and often we don't. In this respect, good scientists differ from politicians, who rarely admit when they've made a mistake and are often punished when they do.

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 theories are general explanations and hypotheses are specific predictions derived from these explanations. **True / False**
4. Good scientists are confident they're right, so they don't need to protect themselves against confirmation bias. **True / False**
5. Metaphysical claims are not testable. **True / False**

Answers: 1. F (p. 5); 2. F (p. 8); 3. T (p. 9); 4. F (p. 10); 5. T (p. 11)

PSYCHOLOGICAL PSEUDOSCIENCE: IMPOSTERS OF SCIENCE

LO 1.3 Describe 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're 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 take advantage of the tools of the scientific method to try to overcome them. By acquiring these skills, you'll

Listen Science and Pseudoscience on **mypsychlab.com**

make better educated choices in your everyday life, such as what weight loss plan to choose, what psychotherapy to recommend to a friend, or maybe even what potential romantic partner is a better long-term bet. You'll also learn how to avoid being tricked by bogus claims. Not everyone needs to become a scientist, but just about everyone can learn to think like one.

The Amazing Growth of Popular Psychology

Distinguishing real from bogus claims is crucial, because the popular psychology industry is huge and growing rapidly. On the positive side, this fact means that the 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 to a *misinformation explosion* because there's scant quality control over what this industry produces.

For example, about 3500 self-help books are published every year (Arkowitz & Lilienfeld, 2006; see Chapter 16). Some of these books are effective for treating depression, anxiety, and other psychological problems, but about 95 percent of all self-help books are untested (Gould & Clum, 1993; Gregory et al., 2004; Rosen, 1993) and recent evidence suggests that a few may even make people worse (Haeffel, 2010; Rosen, 1993; Salerno, 2005).

Coinciding with the rapid expansion of the popular psychology industry is the enormous growth of treatments and products that claim to cure almost every imaginable psychological ailment. There are well over 500 "brands" of psychotherapy (Eisner, 2000), with new ones being added every year. Fortunately, as we'll learn in Chapter 16, research shows that some of these treatments are clearly helpful for numerous psychological problems. Yet the substantial majority of psychotherapies remain untested, so we don't know whether they help (Baker, McFall, & Shoham, 2009). 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 in *Scientific American Mind* and *Discover* magazines and other media outlets that present high-quality information regarding scientific psychology. In addition, hundreds of websites provide helpful information and advice concerning numerous psychological topics, like memory, personality testing, and psychological disorders and their treatment (see **TABLE 1.1** on page 14). Yet other websites contain misleading or erroneous information, so we need to be armed with accurate knowledge to evaluate them.

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 **pseudoscience:** a set of claims that seems scientific but isn't. In particular, *pseudoscience lacks the safeguards against confirmation bias and belief perseverance that characterize science.* We must be careful to distinguish pseudoscientific claims from metaphysical claims, which as we've seen are untestable and therefore lie outside the realm of science. In principle, at least, we can test pseudoscientific claims, although the proponents of these claims often avoid subjecting them to rigorous examination.

Pseudoscientific and other questionable beliefs are widespread. Let's look at **TABLE 1.2** on page 14, which displays findings from a large survey of Canadians (Leger Marketing, 2001). As we can see, about a third believe in the existence of aliens, in haunted houses and ghosts, or in reincarnation.

The fact that many Canadians *entertain* the possibility of such beliefs isn't by itself worrisome, because a certain amount of open-mindedness is essential for scientific thinking. Instead, what's troubling is that many people appear convinced that such claims are correct even though the scientific evidence for them is either weak, as in the case of extrasensory perception (ESP), or essentially nonexistent, as in the case of astrology. Moreover, it's troubling that many poorly supported beliefs are more popular, or at least more widespread, than well-supported beliefs. For example, there are about 20 times more astrologers than astronomers in the United States (Gilovich, 1991), and in most major

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

pseudoscience
set of claims that seems scientific but isn't

TABLE 1.1 Some Trustworthy Websites for Scientific Psychology.

ORGANIZATION / URL	
American Psychological Association www.apa.org	Society for Research in Child Development www.srcd.org
Association for Psychological Science www.psychologicalscience.org	Society for Personality and Social Psychology www.spsp.org
Canadian Psychological Association www.cpa.ca	Society for Research in Psychopathology www.psychopathology.org
Canadian Society for Brain, Behaviour and Cognitive Science www.csbbcs.org	American Psychiatric Association www.psych.org
Society for a Science of Clinical Psychology www.sscpweb.org	The Society for General Psychology www.apa.org/about/division/div1.aspx
The Scientific Review of Mental Health Practice www.srmhp.org	Canadian Psychological Association www.cpa.ca
American Psychological Association www.apa.org	Center for Evidence-Based Mental Health http://cebmh.warne.ox.ac.uk/cebmh
The Psychonomic Society www.psychonomic.org	Empirically Supported Treatments for Psychological Disorders www.apa.org/divisions/div12/cppi.html
Association for Behavior Analysis International www.abainternational.org	National Institute of Mental Health www.nimh.nih.gov
Skeptical Inquirer magazine www.csicop.org/si	*Skeptic* magazine www.skeptic.com

Explore The Pseudoscience of Astrology on **mypsychlab.com**

TABLE 1.2 Survey of Selected Beliefs of Average Canadians.

BELIEF	PERCENTAGE WHO BELIEVE IN
Ghosts	30%
Reincarnation	30%
Angels	57%
Aliens	32%
Witches	15%

(*Source:* Leger Marketing, 2001)

bookstores the New Age and occult sections are substantially larger than the psychology section (Lilienfeld, 1999a).

WARNING SIGNS OF PSEUDOSCIENCE. Numerous warning signs can help us distinguish science from pseudoscience; we've listed some of the most useful ones in **TABLE 1.3**. They're extremely helpful rules of thumb, so useful in fact that we'll 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 skeptical of them we should become.

Here, we'll discuss three of the most crucial of these warning signs.

Overuse of ad hoc immunizing hypotheses: Yes, we know this one is a mouthful. But it's actually not as complicated as it appears, because an **ad hoc immunizing hypothesis** is just an escape hatch or loophole that defenders of a theory use to protect this theory from being disproven. For example, some psychics have claimed to perform remarkable feats of ESP, like reading others' minds or forecasting the future, in the real world. 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 immunizing hypothesis to explain away these failures: The skeptical "vibes" of the experimenters are somehow interfering with psychic powers (Carroll, 2003; Lilienfeld, 1999c). Although this hypothesis isn't necessarily wrong, it makes the psychics' claims essentially impossible to test.

Lack of self-correction: As we've learned, many scientific claims turn out to be wrong. That may seem like a weakness of science, but it's actually a strength. That's because in science, wrong claims tend to be weeded out eventually, even though it often takes a while.

ad hoc immunizing hypothesis
escape hatch or loophole that defenders of a theory use to protect their theory from falsification

TABLE 1.3 Some Warning Signs That Can Help Us Recognize Pseudoscience.

SIGNS OF PSEUDOSCIENCE	EXAMPLE
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 ten 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 of our brains, we've 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 program is proven to reduce social anxiety by at least 50 percent!

In contrast, in most pseudosciences, wrong claims never seem to go away, because their proponents fall prey to belief perseverance, clinging to them stubbornly despite contrary evidence. Moreover, pseudoscientific claims are rarely updated in light of new data. Most forms of astrology have remained almost identical for about 4000 years (Hines, 2003) despite the discovery of outer planets in the solar system (Uranus and Neptune) that were unknown in ancient times.

Overreliance on anecdotes: There's an old saying that "the plural of anecdote isn't fact" (Park, 2003). A mountain of numerous anecdotes may seem impressive, but it shouldn't persuade us to put much stock in others' claims. Most anecdotes are *I know a person who* assertions (Nisbett & Ross, 1980; Stanovich, 2009). This kind of secondhand evidence—"I know a person who says his self-esteem skyrocketed after receiving hypnosis," "I know someone who tried to commit suicide after taking an antidepressant"—is commonplace in everyday life. So is firsthand evidence—"I felt less depressed after taking this herbal remedy"—that's based on subjective impressions.

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 85 pounds in three weeks on the Matzo Ball Soup Weight Loss Program." 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 Program caused the person to lose 85 pounds, 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 Program gained weight, but we never heard from them. Finally, anecdotes are often difficult to verify. Do we really know for sure that he lost 85 pounds? We're taking his word for it, which is a risky idea.

Simply put, most anecdotes are extremely difficult to interpret as evidence. As 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).

Explore The Secret ABC on **mypsychlab.com**

Pareidolia can lead us to perceive meaningful people or objects in largely random stimuli. The "nun bun," a cinnamon roll resembling the face of nun Mother Teresa, was discovered in 1996 in a Nashville, Tennessee, coffee shop.

FACTOID

The Nobel Prize–winning physicist Luis Alvarez once had an eerie experience: While reading the newspaper, he encountered a phrase that reminded him of an old childhood friend he had not thought about for decades. A few pages later, he came upon that person'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.

apophenia
tendency to perceive meaningful connections among unrelated phenomena

pareidolia
tendency to perceive meaningful images in meaningless visual stimuli

WHY ARE WE DRAWN TO PSEUDOSCIENCE? Hundreds of thousands of copies of the book and film *The Secret* have been sold in North America. The proponents of *The Secret* propose that by focusing on positive thoughts, we are able to control and change our destiny (Byrne, 2006). The supporters of *The Secret* claim that "*The Secret* gives you anything you want: happiness, health and wealth." For example, Dr. Joe Vitale, who earned his Ph.D from the nonaccredited University of Metaphysics, claims that to gain wealth, you merely need to believe that wealth will come your way. Vitale says that you should declare what it is that you want and focus your thoughts and believe that it will come to you. For example, "I would like to have $25 000, unexpected income, within the next 30 days." Could it be true? If we want money, all we have to do is think about it? Well, not exactly. Vitale and other proponents of *The Secret* say that you have to remain positive all the time, and that you cannot allow a negative thought to disrupt your goals. In fact, Vitale states that "if your thoughts contain noticing you do not have it yet, you will continue to attract not having it." Is this claim falsifiable? Can anyone really have focused, positive thought all the time? Could this be tested using the scientific method? The answer to all of these questions is a resounding no, yet *The Secret* is very popular. Why?

There are a host of reasons why so many of us are drawn to pseudoscientific beliefs like those found in *The Secret*. 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). Without it, we'd 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're not there (Davis, 2009; Shermer, 2008).

The Search for Meaningful Connections. Our tendency to seek out patterns sometimes goes too far, leading us to experience **apophenia:** perceiving meaningful connections among unrelated and even random phenomena (Carroll, 2003). We all fall victim to apophenia 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 her, we may jump to the conclusion that this striking co-occurrence stems from ESP. Well, it *might*.

After all, it's 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'll realize that the laws of probability make it likely that at least once over the next few years, you'll be thinking of an old friend at about the same time she calls. As Greek philosopher Aristotle said, time converts the improbable into the inevitable. We'll learn in Chapter 2 that one reason for apophenia in this instance is that we don't bother to keep track of all of the times we think of old friends when they *don't* call, and of all of the times we don't think of old friends when they *do* call.

Another example of our tendency to find patterns is the phenomenon of **pareidolia:** seeing meaningful images in meaningless visual stimuli. Any of us who's looked at a cloud and perceived the vague shape of an animal has experienced pareidolia, as has any of us who's seen the oddly misshapen face of a "man" in the moon. A more stunning example comes from the photograph in **FIGURE 1.5a**. 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. They were open-minded but demanded evidence. They swooped down much closer to the face, and pointed the *Surveyor*'s cameras directly at it. If we look at **FIGURE 1.5b**, we'll see what they found: absolutely nothing. The pareidolia in

psychomythology

THE HOT HAND: REALITY OR ILLUSION?

Because we're meaning-seeking organisms, we find it almost impossible *not* to detect patterns in random data. If we flip a coin four times and it comes up heads all four times, we may begin to think we're on a streak. Instead, we're probably just being fooled by randomness (Mlodinow, 2008; Taleb, 2004). The same phenomenon extends to sports.

Basketball players, coaches, and fans are fond of talking about the "hot hand." Once a player has made three or four shots in a row, he's "hot," "in the zone," and "on a roll." One television basketball announcer, former star centre Bill Walton, once criticized a team's players for not getting the ball to a fellow player who'd just made several consecutive baskets ("He's got the hot hand—get him the ball!"). It certainly *seems* as though basketball players go on streaks. Do they?

To find out, Thomas Gilovich and his colleagues got hold of the shooting records of the 1980–1981 Philadelphia 76ers, then the only basketball team to keep precise records of which player made which shot in which order (Gilovich, Vallone, & Tversky, 1985).The researchers looked at the probability of a successful shot (a hit) following three misses, then the probability of a successful shot following two misses, all the way to the probability of a successful shot following three successful shots.

If the hot hand is real, the researchers should have found that the probability of a successful shot would increase after a basket has been made. That is, once a player has made a few shots in a row, he should be more likely to make another. Instead, Gilovich and his colleagues found that the likelihood of a made basket did not change if the previous shot was a hit or miss. In fact, the proportions of makes don't go up after a basket is scored, rather, they go down slightly (perhaps we should call this the "cool hand"?). Gilovich and his colleagues found the same pattern for all players (including Dr. J for you basketball fans out there) on the 76ers' roster.

Perhaps the absence of a hot hand is due to the fact that once a player has made several shots in a row, the defensive team makes adjustments, making it tougher for him to make another shot. To rule out this possibility, Gilovich and his colleagues examined foul shots, which are immune from this problem because players attempt these shots without any interference from the defensive team. Once again, they found no hint of "streaky" shooting.

Later researchers have similarly found little or no evidence for "streaky performance" in other sports, including golf and baseball (Bar-Eli, Avugos, & Raab, 2006; Clark, 2005; Mlodinow, 2008). Still, belief perseverance makes it unlikely that these findings will shake the convictions of dyed-in-the-wool hot-hand believers. When told about the results of the Gilovich hot-hand study, late Hall of Fame basketball coach Red Auerbach replied, "Who is this guy? So he makes a study. I couldn't care less." The hot hand may be an illusion, but it's a remarkably stubborn one.

(a)

(b)

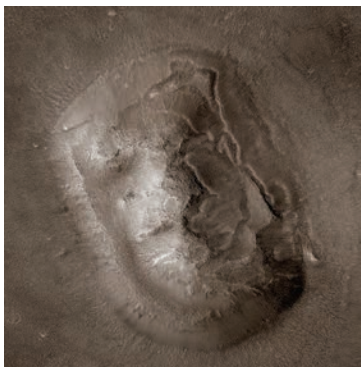


FIGURE 1.5 Face on Mars. At the top (a) is the remarkable "Face on Mars" photo taken by the *Mars Viking Orbiter* in 1976. Some argued that this face provided conclusive proof of intelligent life on other planets. Below (b) is a more detailed photograph of the Face on Mars taken in 2001, which revealed that this "face" was just an illusion.

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 artifact in the original photograph that just happened to place a black dot where a nostril should be, and perhaps most important, our innate tendency to perceive meaningful faces in what are basically random visual stimuli (see Chapter 11).

Finding Comfort in Our Beliefs. Another reason for the popularity of pseudoscience is motivational: We believe because we want to believe. As the old saying goes, "hope springs eternal": Many pseudoscientific claims, such as astrology, may give us comfort because they seem to offer us a sense of control over an often unpredictable world (Shermer, 2002). Research suggests that we're especially likely to seek out and find patterns when we feel a loss of control over our surroundings. Jennifer Whitson and Adam Galinsky

FICTOID

MYTH: "Streaks" of several consecutive heads (H) or tails (T) in a row when flipping a coin, like HTTHTTTTTHHHTHHTTHH, are evidence of a nonrandom sequence.

REALITY: Streaks like this are both widespread and inevitable in long random sequences. Indeed, the sequence above is almost perfectly random (Gilovich, 1991). Because we tend to underestimate the probability of consecutive sequences, we're prone to attributing more significance to these sequences than they deserve ("Wow…I'm on a winning streak!").

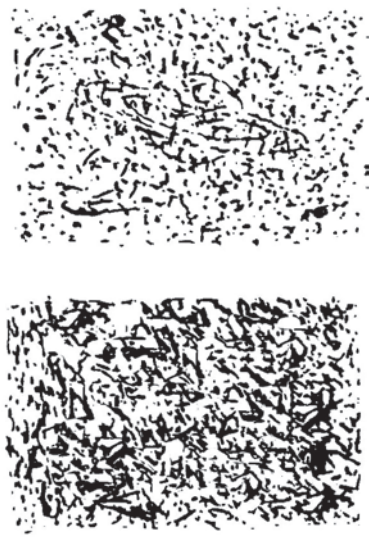


FIGURE 1.6 Regaining Control. Do you see an image in either of these pictures? Participants in Whitson and Galinsky's (2008) study who were deprived of a sense of control were more likely than other participants to see images in both pictures, even though only the picture on the top contains an image (a faint drawing of the planet Saturn).

(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 1.6**). Whitson and Galinsky's 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 a sense of control over the uncontrollable.

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

Terror management researchers typically test this model by manipulating *mortality salience:* the extent to which thoughts of death are foremost in our minds. They may ask participants to think about the emotions they experience when contemplating their deaths or to imagine themselves dying (Friedman & Arndt, 2005). Numerous studies demonstrate that manipulating mortality salience makes many people more likely to adopt certain reassuring cultural perspectives (Pyszczynski, Solomon, & Greenberg, 2003).

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 comes from knowing we'll eventually die (Lindeman, 1998; Norenzayan & Hansen, 2006). Two researchers (Morier & Podlipentseva, 1997) found that compared with other participants, participants who underwent a mortality salience manipulation reported higher levels of beliefs in the paranormal, such as ESP, ghosts, reincarnation, and astrology. It's 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.

Of course, 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're likely to hold many paranormal beliefs regardless of whether they're correct.

According to terror management theory, reminders of our death can lead us to adopt comforting world views—perhaps, in some cases, beliefs in the paranormal.

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 world views

THINKING CLEARLY: AN ANTIDOTE AGAINST PSEUDOSCIENCE. To avoid being seduced by the charms of pseudoscience, 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's easy for all of 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'll examine three especially important logical fallacies that are essential to bear in mind when evaluating psychological claims; we can find other useful fallacies in **TABLE 1.4.** All of them can help us to separate science from pseudoscience.

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*; Slovic & Peters, 2006). If we're honest with ourselves, we'll realize that findings that challenge our preexisting 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

TABLE 1.4 Logical Fallacies to Avoid When Evaluating Psychological Claims.

LOGICAL FALLACY	EXAMPLE OF THE FALLACY
Error of using our emotions as guides for evaluating the validity of a claim (*emotional reasoning fallacy*)	"The idea that daycare might have negative emotional effects on children gets me really upset, so I refuse to believe it."
Error of assuming that a claim is correct just because many people believe it (*bandwagon fallacy*)	"Lots of people I know believe in astrology, so there's got to be something to it."
Error of framing a question as though we can answer it in only one of two extreme ways (*either–or fallacy*)	"I just read in my psychology textbook that some people with schizophrenia were treated extremely well by their parents when they were growing up. This means that schizophrenia can't be due to environmental factors and therefore must be completely genetic."
Error of believing we're immune from errors in thinking that afflict other people (*not me fallacy*)	"My psychology professor keeps talking about how the scientific method is important for overcoming biases. But these biases don't apply to me, because *I'm* objective."
Error of accepting a claim merely because an authority figure endorses it (*appeal to authority fallacy*)	"My professor says that psychotherapy is worthless; because I trust my professor, she must be right."
Error of confusing the correctness of a belief with its origins or genesis (*genetic fallacy*)	"Freud's views about personality development can't be right, because Freud's thinking was shaped by sexist views popular at the time."
Error of assuming that a belief must be valid just because it's been around for a long time (*argument from antiquity fallacy*)	"There must be something to the Rorschach Inkblot Test, because psychologists have been using it for decades."
Error of confusing the validity of an idea with its potential real-world consequences (*argument from adverse consequences fallacy*)	"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."
Error of assuming that a claim must be true because no one has shown it to be false (*appeal to ignorance fallacy*)	"No scientist has been able to explain away every reported case of ESP, so ESP probably exists."
Error of inferring a moral judgment from a scientific fact (*naturalistic fallacy*)	"Evolutionary psychologists say that sexual infidelity is a product of natural selection. Therefore, sexual infidelity is ethically justifiable."
Error of drawing a conclusion on the basis of insufficient evidence (*hasty generalization fallacy*)	"All three people I know who are severely depressed had strict fathers, so severe depression is clearly associated with having a strict father."
Error of basing a claim on the same claim reworded in slightly different terms (*circular reasoning fallacy*)	"Dr. Smith's theory of personality is the best, because it seems to have the most evidence supporting it."

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.

The bandwagon fallacy reminds us that the number of people who hold a belief isn't a dependable barometer of its accuracy.

Bandwagon Fallacy. "Lots 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's an error because popular opinion isn't a dependable guide to the accuracy of an assertion. Prior to 1500, almost everyone believed that the sun revolved around Earth, rather than vice versa, but they were woefully mistaken.

Not Me Fallacy. "My psychology professor keeps talking about how the scientific method is important for overcoming biases. But these biases don't apply to me, because *I'm* objective."

The *not me fallacy* is the error of believing that we're 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 don't require the safeguards of the scientific method. Many pseudoscientists fall into this trap: They're so certain their claims are right—and uncontaminated by mistakes in their thinking—that they don't bother to conduct scientific studies to test these claims. Social psychologists have recently uncovered a fascinating phenomenon called *bias blind spot,* which means that most people are unaware of their biases but keenly aware of them in others (Pronin, Gilovich, & Ross, 2004). None of us believes we have an accent because we live with our accents all of the time. Similarly, few of us believe that we have biases, because we've 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 polarized views on a political issue. More likely than not, you'll see that the debate participants are quite adept at pointing out biases in their opponents, but entirely oblivious of their own equally glaring biases.

The Dangers of Pseudoscience: Why Should We Care?

Up to this point, we've 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. This point applies to a variety of questionable claims that we encounter in everyday life. There are three major reasons why we should all be concerned about pseudoscience.

Candace Newmaker was a tragic victim of a pseudoscientific treatment called rebirthing therapy. She died of suffocation at age ten after her therapists wrapped her in a flannel blanket and squeezed her to simulate birth contractions.

Opportunity Cost: What We Give Up. Pseudoscientific treatments for mental disorders can lead people to forgo opportunities to seek effective treatments. As a consequence, even treatments that are themselves harmless can cause harm indirectly by causing people to forfeit the chance to obtain a treatment that works. For example, a major community survey (Kessler et al., 2001) revealed that people with severe depression or anxiety attacks more often received scientifically unsupported treatments than scientifically supported treatments, like cognitive-behavioural therapy (see Chapter 16). The unsupported treatments included acupuncture, which hasn't 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 untestable notion that all people possess invisible energy fields that influence their moods. Although some future research might reveal some of these treatments to be helpful in certain cases, consumers who seek them out are rolling the dice with their mental health.

Direct Harm. Pseudoscientific treatments sometimes do dreadful harm to those who receive them, causing psychological or physical damage—occasionally even death. The tragic case of Candace Newmaker, a ten-year-old child who received treatment for her behavioural problems in Evergreen, Colorado, in 2000, illustrates this point (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 that stem from birth—in some cases, even before birth. During rebirthing, children or adolescents reenact the trauma of birth with the "assistance" of one or more therapists (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 couldn't breathe and felt as though she was going to die. When Candace was unwrapped from her symbolic "birth canal," she was dead (Mercer, Sarner, & Rosa, 2003).

AN INABILITY TO THINK SCIENTIFICALLY AS CITIZENS. Scientific thinking skills aren't just important for evaluating psychological claims—we can apply them to all aspects of our lives. In our increasingly complex scientific and technological society, we need scientific thinking skills to reach educated decisions about global warming, genetic engineering, stem cell research, novel medical treatments, and parenting and teaching practices, among dozens of other claims.

The take-home message is clear: Pseudoscience matters. That's what makes scientific thinking so critical: Although far from foolproof, it's our best safeguard against human error.

assess your knowledge FACT OR FICTION?

1. Most self-help books and psychotherapies have been tested. **True / False**
2. Humans' tendency to see patterns in random data is entirely maladaptive. **True / False**
3. According to terror management theory, our fears of death are an important reason for pseudoscientific beliefs. **True / False**
4. The fact that many people believe in a claim is a good indicator of its validity. **True / False**
5. Pseudoscientific treatments can cause both direct and indirect harm. **True / False**

Answers: 1. F (p. 13); 2. F (p. 16); 3. T (p. 18); 4. F (p. 20); 5. T (p. 20)

SCIENTIFIC THINKING: DISTINGUISHING FACT FROM FICTION

LO 1.5 Identify the key features of scientific skepticism.

LO 1.6 Identify and explain the text's six 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 Skepticism

The approach we'll emphasize throughout this text is **scientific skepticism**. To many people, *skepticism* implies closed-mindedness, but nothing could be further from the truth. The term *skepticism* derives from the Greek word *skeptikos*, meaning "to consider carefully" (Shermer, 2002). The scientific skeptic 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 skeptic, we must adopt two attitudes that may seem contradictory but aren't: first, a willingness to keep an open mind to all claims and, second, a willingness to accept claims only after researchers have subjected them to careful scientific tests. Scientific skeptics are

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.

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

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.

Another feature of scientific skepticism is an unwillingness to accept claims on the basis of authority alone. Scientific skeptics 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're often forced to accept the word of authorities simply because we don't 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're also placing trust in us—the authors, that is—to provide you with accurate information about psychology. Still, this doesn't mean you should blindly accept everything we've written hook, line, and sinker. Consider what we've written with an open mind but evaluate it skeptically. If you disagree with something we've said, be sure to get a second opinion by asking your instructor.

A Basic Framework for Scientific Thinking

The hallmark of scientific skepticism 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's the form of thinking that allows us to evaluate scientific claims, not only in the laboratory but 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've learned can blind us to evidence we'd prefer to ignore (Alcock, 1995). In particular, in this text we'll be emphasizing *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, self-help books, the Internet, your introductory psychology course, and, yes, even this textbook.

These six scientific thinking principles are so crucial that, beginning in Chapter 2, we'll indicate each of them with a different-coloured icon you'll see throughout the text. Whenever one of these principles arises in our discussion, we'll display that icon in the margin to remind you of the principle that goes along with it (see **FIGURE 1.7**).

? Scientific thinking involves ruling out rival hypotheses. In this case, do we know that this woman's weight loss was due to a specific diet plan? What might be some alternative explanations for her weight loss? (See answer upside down at bottom of page.)

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SCIENTIFIC THINKING PRINCIPLE #1: *RULING OUT RIVAL HYPOTHESES.* Most psychological findings we'll hear about on television or read about online lend themselves to multiple explanations. Yet, more often than not, the media report only one explanation. We shouldn't automatically assume it's correct. Instead, we should ask ourselves: Is this the only good explanation for this finding? Have we ruled out other important competing explanations (Huck & Sandler, 1979; Platt, 1964)?

Let's take a popular treatment for anxiety disorders: eye movement desensitization and reprocessing (EMDR; see Chapter 16). Introduced 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 recollection of seeing someone being killed. Proponents of EMDR have consistently maintained that it's far more effective and efficient than other treatments for anxiety disorders. Some have claimed that these eye movements somehow synchronize the brain's two hemispheres or stimulate brain mechanisms that speed up the processing of emotional memories.

Here's the problem: A slew of well-controlled studies show that the eye movements of EMDR don't contribute to its effectiveness. EMDR works just as well when people stare straight ahead at an immobile dot while thinking about the source of their anxiety (Davidson & Parker, 2001; Lohr, Tolin, & Lilienfeld, 1998). Most EMDR advocates neglected to consider a rival explanation for EMDR's success: EMDR asks patients to expose themselves to

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

Answer: During this time, she might have exercised or used another diet plan. Or perhaps, the larger pants she's holding up were never hers to begin with.

What Scientific Thinking Principle Should We Use?	When Might We Use It?	How Do We Use It?
ruling out rival hypotheses HAVE IMPORTANT ALTERNATIVE EXPLANATIONS FOR THE FINDINGS BEEN EXCLUDED?	You're reading the newspaper and come across the headline: "Study shows depressed people who receive a new medication improve more than equally depressed people who receive nothing."	The results of the study could be due to the fact that people who received the medication expected to improve. 
correlation vs. causation CAN WE BE SURE THAT A CAUSES B?	A researcher finds that people eat more ice cream on days when crimes are committed than when they aren't, and concludes that eating ice cream causes crime.	Eating ice cream (A) might not cause crime (B). Both could be due to a third factor (C), such as higher temperatures. 
falsifiability CAN THE CLAIM BE DISPROVED?	A self-help book claims that all human beings have an invisible energy field surrounding them that influences their moods and well-being.	We can't design a study to disprove this claim. 
replicability CAN THE RESULTS BE DUPLICATED IN OTHER STUDIES?	A magazine article highlights a study that shows people who practise meditation score 50 points higher on an intelligence test than those who don't.	We should be skeptical if no other scientific studies have reported the same findings. 
extraordinary claims IS THE EVIDENCE AS STRONG AS THE CLAIM?	You come across a website that claims that a monster, like Bigfoot, has been living in the American Northwest for decades without being discovered by researchers.	This extraordinary claim requires more rigorous evidence than a less remarkable claim, such as the assertion that people remember more words from the beginning than from the end of a list. 
occam's razor DOES A SIMPLER EXPLANATION FIT THE DATA JUST AS WELL?	Your friend, who has poor vision, claims that he spotted a UFO while attending a Frisbee tournament.	Is it more likely that your friend's report is due to a simpler explanation—his mistaking a Frisbee for a UFO—than to alien visitation? 

FIGURE 1.7 The Six Principles of Scientific Thinking That Are Used Throughout This Textbook.

anxiety-provoking imagery. Researchers and therapists alike have long known that prolonged exposure itself can be therapeutic (Bisson, 2007; Lohr et al., 2003; see Chapter 16). 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've excluded other plausible explanations for it.

SCIENTIFIC THINKING PRINCIPLE #2: *CORRELATION ISN'T CAUSATION.* Perhaps the most common mistake 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): *Correlational designs don't permit causal inferences*, or, putting it less formally, *correlation isn't causation.* When we conclude that a correlation means causation, we've committed the **correlation–causation fallacy.** This conclusion is a fallacy because the fact that two variables are correlated doesn't necessarily mean that one causes the other (see Chapter 2). Incidentally, a **variable** is anything that can *vary,* like height, intelligence quotient (IQ), or extroversion. Let's see why correlation isn't causation.

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

1. A → B. It's possible that variable A causes variable B.
2. B → A. It's possible that variable B causes variable A.

So far, so good. But many people forget that there's also a third possibility—namely, that:

3. 

In this third scenario, there's a third variable, C, that causes *both* A and B. This scenario is known as the *third variable problem*. It's a problem because it can lead us to conclude mistakenly that A and B are causally related to each other when they're not. For example, researchers found that teenagers who listen to music with a lot of sexual lyrics have sexual intercourse more often than teenagers who listen to music with tamer lyrics (Martino et al., 2006). So listening to sexual lyrics is *correlated* with sexual behaviour. One newspaper summarized the findings of this study with an attention-grabbing headline: "Sexual lyrics prompt teens to have sex" (Tanner, 2006). Like many headlines, this one went well beyond the data. It's indeed possible that music with sexual lyrics (A) causes sexual behaviour (B). But it's also possible that sexual behaviour (B) causes teens to listen to music with sexual lyrics (A), or that a third variable, like impulsivity (C), causes teens both to listen to music with sexual lyrics *and* to engage in sexual behaviour. Given the data reported by the authors, there's no way to know. *Correlation isn't causation.* This point is so crucial that we'll revisit it in Chapter 2.

The bottom line: We should remember that a correlation between two things doesn't demonstrate a causal connection between them.

Some television shows, like *Medium*, feature "psychic detectives," people with supposed extrasensory powers who can help police to locate missing people. Yet psychic detectives' predictions are typically so vague—"I see a body near water," "The body is near a wooded area"—that they're virtually impossible to falsify.

SCIENTIFIC THINKING PRINCIPLE #3: *FALSIFIABILITY*. Philosopher of science Sir Karl Popper (1965) observed that for a claim to be meaningful, it must be **falsifiable**—that is, capable of being disproven. If a theory isn't falsifiable, we can't test it. Some students misunderstand this point, confusing the question of whether a theory is *falsifiable* with whether it's *false*. The principle of falsifiability doesn't mean that a theory must be false to be meaningful. Instead, it means that for a theory to be meaningful, it *could* be proven wrong if there were certain types of evidence against it. For a claim to be falsifiable, its proponent must state clearly *in advance,* not after the fact, which findings would count as evidence for and against the claim (Dienes, 2008; Proctor & Capaldi, 2006).

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

variable
anything that can vary

falsifiable
capable of being disproved

A key implication of the falsifiability principle is that a theory that explains everything—a theory that can account for every conceivable outcome—in effect explains nothing. That's because a good scientific theory must predict only certain outcomes, but not others. If a friend told you he was a master "psychic sports forecaster" and predicted with great confidence that "Tomorrow, all of the national hockey league teams that are playing a game will either win or lose," you'd probably start giggling. By predicting every potential outcome, your friend hasn't really predicted anything.

According to Popper, good scientific theories take risks. By a **risky prediction,** Popper meant a forecast that stands a decent chance of being wrong. The best theories make risky predictions and emerge unscathed. Most bad theories don't take such risks. If, as a psychic sports forecaster, your friend instead predicted, "The Edmonton Oilers and Toronto Maple Leafs will both win tomorrow, but the Ottawa Senators and Vancouver Canucks will lose," and this prediction came true, you might say to yourself, "Well, that's sort of interesting, but it still could be due to chance." But if he predicted, "Tomorrow, the Oilers will win by three goals and the Leafs will win by only one goal, but the Senators and Canucks will both lose by two goals," and this prediction came true, you'd be mightily impressed (Meehl, 1978). 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 hockey is in good shape, although it still hasn't been "proven," because it's always possible that some other theory we hadn't considered could account for our hockey findings.

The bottom line: Whenever we evaluate a psychological claim, we should ask ourselves whether one could in principle disprove it or whether it's consistent with any conceivable body of evidence.

SCIENTIFIC THINKING PRINCIPLE #4: *REPLICABILITY.* Rarely a week goes by that we don't hear about another stunning psychological finding on the evening news: "Researchers at Cupcake 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 College isolates brain area responsible for the enjoyment of popcorn." One problem with these conclusions, in addition to the fact that the news media often tell us nothing about the design of the studies on which they're based, is that the findings often haven't been replicated. **Replicability** means that a study's findings can be duplicated consistently. If they can't be duplicated, it increases the odds that the original findings were due to chance. *We shouldn't place too much stock in a psychological finding until it's been replicated.*

ESP researchers often ask subjects to predict the outcomes of random events. Yet ESP findings have proven difficult to replicate.

Most replications aren't exact duplications of the original researchers' methods. Most involve minor variations in the original design, or extending this design to different participants, including those in different cultures, races, or geographical locations. The more we can replicate our findings using different subjects in different settings, the more confidence we can place in them (Schmidt, 2009; Shadish, Cook, & Campbell, 2002).

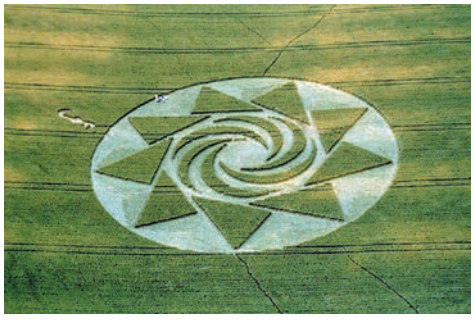
We should bear in mind that the media are far more likely to report initial positive findings than failures to replicate. The initial findings may be especially fascinating or sensational, whereas replication failures are often disappointing: They don't make for juicy news stories. It's especially crucial that investigators other than the original researchers replicate the results because this increases our confidence in them. If I tell you that I've created a recipe for the world's most delicious veal parmigiana, but it turns out that every other chef who follows my recipe ends up with a meal that tastes like an old piece of cardboard smothered in rotten cheese and six-month-old tomato sauce, you'd be justifiably skeptical. Maybe I flat-out lied about my recipe. Or perhaps I wasn't actually following the recipe very closely and was instead tossing in ingredients that weren't even in the recipe.

risky prediction
forecast that stands a good chance of being wrong

replicability
when a study's findings are able to be duplicated, ideally by independent investigators

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?

Occam chooses a razor



There are two explanations for crop circles, one supernatural and the other natural. Which should we believe?

Or perhaps I'm such an extraordinary chef that nobody else can come close to replicating my miraculous culinary feats. In any case, you'd 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). Every once in a blue moon, a researcher reports a striking new finding that seemingly confirms the existence of ESP. Yet time and again, independent researchers haven't been able to replicate these tantalizing results (Gilovich, 1991; Hyman, 1989; Lilienfeld, 1999c), which might lead a skeptical observer to wonder if many of the initial positive findings were due to chance.

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 one-time-only fluke.

SCIENTIFIC THINKING PRINCIPLE #5: *EXTRAORDINARY CLAIMS REQUIRE EXTRAORDINARY EVIDENCE.* (Throughout the book, we'll be abbreviating 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 the evidence for this claim must be before we accept it.

Approximately 30 percent of Canadians believe that aliens exist (Leger Marketing, 2001); however, less than 1 percent claim to have seen an alien. In North America, a handful of researchers believe that every night hundreds or even thousands of people are being magically lifted out of 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). According to some alien abduction advocates, aliens are extracting semen from human males to impregnate female aliens in an effort to create a race of alien–human hybrids.

Of course, alien abduction proponents *might* be right, and we shouldn't 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 hundreds of astronomers, not to mention air traffic controllers and radar operators. Alien abduction proponents have been unable 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 alien. Thus far, all that alien abduction proponents have to show for their claims are the self-reports of supposed abductees. Extraordinary claims, but decidedly ordinary evidence.

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 as extraordinary as the claim.

SCIENTIFIC THINKING PRINCIPLE #6: *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* means "logical 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 the most complex, not the simplest. But Occam's razor is a helpful rule of thumb, as it's right far more often than 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. 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 planets. The crop circles, they concluded, are proof positive of alien visitations to our world.

The crop circle excitement came crashing down in 1991, when two British men, David Bower and Doug Chorley, confessed to creating the crop circles as a barroom 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. 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 case, human pranksters.

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

Answers are located at the end of the text.

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 like 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 falsify. What would we need to know about how these studies were conducted to validate the claim?

"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?

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

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

assess your knowledge FACT OR FICTION?

1. Scientific skepticism requires a willingness to keep an open mind to all claims. **True / False**
2. When evaluating a psychological claim, we should consider other plausible explanations for it. **True / False**
3. The fact that two things are related doesn't mean that one directly influences the other. **True / False**
4. Falsifiability means that a theory must be false to be meaningful. **True / False**
5. When psychological findings are replicated, it's especially important that the replications be conducted by the same team of investigators. **True / False**

Answers: 1. T (p. 21); 2. T (p. 22); 3. T (p. 24); 4. F (p. 24); 5. F (p. 25)

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PSYCHOLOGY'S PAST AND PRESENT: WHAT A LONG, STRANGE TRIP IT'S BEEN

LO 1.7 Identify the major theoretical frameworks of psychology.

LO 1.8 Describe different types of psychologists and identify what each of them does.

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

LO 1.10 Describe how psychological research affects our daily lives.

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 research methods that were free from bias (Coon, 1992). Throughout its history, psychology has struggled with many of the same challenges that we confront today when reasoning about psychological research. It's 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'll start our journey with a capsule 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 1.8**).

For many centuries, the field of psychology was difficult to distinguish from philosophy. Most academic psychologists held positions in departments of philosophy (psychology departments didn't even exist back then) and didn't conduct experimental research. Instead, they mostly sat and contemplated the human mind from the armchair. In essence, they relied on common sense.

Yet beginning in the late 1800s, the landscape of psychology changed dramatically. In 1879, Wilhelm Wundt (1832–1920) developed the first full-fledged psychological laboratory in Leipzig, Germany. 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 math problem? Wundt used a combination of experimental methods, including reaction time procedures, and a technique called **introspection,** which required trained observers to carefully reflect and report on their mental experiences. Introspectionists might ask participants to look at an object—say, an apple—and carefully report everything they see. In many respects, the pioneering work of Wundt marked the beginnings of psychology as a science. 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 middle and late 1800s, many were fascinated with spirit mediums, people who claimed to contact the dead, often during seances (Blum, 2006). These were group sessions that took place in darkened rooms, in which mediums attempted to "channel" the spirits of deceased individuals. People were equally enchanted with psychics, individuals who claimed to possess powers of mind reading and other extrasensory abilities (see Chapter 2). Many famous psychologists of the day invested a great deal of time and effort in the search for these paranormal capacities (Benjamin & Baker, 2004; Blum, 2006).

They ultimately failed, and psychology eventually developed a respectful distance from spiritualism. It did so largely by creating a new field: the psychology of human error and self-deception. Rather than asking whether extrasensory powers exist, a growing number of psychologists in the late 1800s began to ask the equally fascinating question of how people can fool themselves into believing things that aren't supported by evidence (Coon, 1992)—a central theme of this book.

Wilhelm Wundt is generally credited with launching psychology as a laboratory science in 1879.

FICTOID

MYTH: Some psychics can "channel" messages from dead people to their loved ones and friends.

REALITY: Maybe, but unlikely. No psychic channeller has ever passed a carefully controlled scientific test (Hyman, 2003).

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

Late 1700s: Frans Anton Mesmer discovers principles of hypnosis

1838: Dalhousie College in Halifax hosts the first Canadian psychology course

1850: Gustav Fechner experiences crucial insight linking physical changes in the external world to subjective changes in perception; leads to establishment of psychophysics

1875: William James creates small psychological laboratory at Harvard University

1881: Wundt establishes first psychology journal

1885: The first psychology text written in Canada is published

1890: William James writes *Principles of Psychology*

1896: Lightmer Witmer creates first psychological clinic at the University of Pennsylvania, launching field of clinical psychology

1904: Mary Calkins is first woman elected president of the American Psychological Association

1905: Alfred Binet and Henri Simon develop first intelligence test

1910: Ivan Pavlov discovers classical conditioning

1911: E. L. Thorndike discovers instrumental (later called operant) conditioning

1920s: Gordon Allport helps to initiate field of personality trait psychology

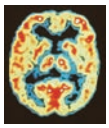
1935: Kurt Koffka writes *Principles of Gestalt Psychology*

1937: Donald Hebb begins his groundbreaking research in neuropsychology with Walter Penfield at the Montreal Neurological Institute

1953: Francis Crick and James Watson discover structure of DNA, launching genetic revolution

1953: Rapid eye movement (REM) sleep discovered

1963: Stanley Milgram publishes classic laboratory studies of obedience



1974: Positron emission tomography (PET) scanning introduced, launching field of functional brain imaging

1976: Founding of Committee for the Scientific Investigation of Claims of the Paranormal, first major organization to apply scientific skepticism to paranormal claims

1980: *Diagnostic and Statistical Manual of Mental Disorders, Third Edition (DSM-III)* published; helps standardize the diagnosis of major mental disorders

1990: Thomas Bouchard and colleagues publish major results of Minnesota Study of Twins Reared Apart, demonstrating substantial genetic bases for intelligence, personality, interests, and other important individual differences

1991: The Canadian Society for Brain, Behaviour and Cognitive Science holds its first general meeting

1995: Task force of Division 12 (Society of Clinical Psychology) of American Psychological Association publishes list of, and criteria for, empirically supported psychotherapies

2004: APS members vote to change name to Association for Psychological Science

1600

1700

1800

1850

1900

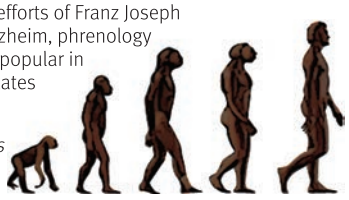
1950

2000

1649: René Descartes writes about the mind–body problem

Early 1800s: Due to efforts of Franz Joseph Gall and Joseph Spurzheim, phrenology becomes immensely popular in Europe and United States

1849: Charles Darwin writes *Origin of Species*

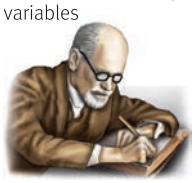


1879: Wilhelm Wundt creates world's first formal psychological laboratory, launching psychology as an experimental science

1889: Sir Francis Galton introduces concept of correlation, allowing psychologists to quantify associations among variables

1892: American Psychological Association (APA) founded

1900: Sigmund Freud writes *The Interpretation of Dreams,* landmark book in the history of psychoanalysis



1907: Oscar Pfungst demonstrates that the amazing counting horse, Clever Hans, responds to cues from observers; demonstrates power of expectancies

1913: John B. Watson writes *Psychology as Behavior,* launching field of behaviourism

1920: Jean Piaget writes *The Child's Conception of the World*

1938: B. F. Skinner writes *The Behavior of Organisms*

1939: The Canadian Psychological Association is established

1941: The University of Ottawa establishes the first bilingual program in psychology

1942: The University of Montreal introduces the first French-language program in psychology

1952: Antipsychotic drug Thorazine tested in France, launching modern era of psychopharmacology

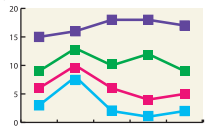
1954: Paul Meehl writes *Clinical versus Statistical Prediction,* first major book to describe both the strengths and weaknesses of clinical judgment

1958: Joseph Wolpe writes *Psychotherapy by Reciprocal Inhibition,* helping to launch field of behavioural therapy

1962: Brenda Milner begins her research with H.M.

1967: Ulric Neisser writes *Cognitive Psychology;* helps to launch field of cognitive psychology

1974: Elizabeth Loftus and Robert Palmer publish classic paper on the malleability of human memory, showing that memory is more reconstructive than previously believed



1977: First use of statistical technique of meta-analysis, which allows researchers to systematically combine results of multiple studies; demonstrated that psychotherapy is effective

1980s: Recovered memory craze sweeps across North America; pits academic researchers against many clinicians

1988: Many scientifically oriented psychologists break off from American Psychological Association to found American Psychological Society (APS)

2000: Human genome sequenced

2002: Daniel Kahneman becomes first Ph.D. psychologist to win Nobel Prize; honoured for his pioneering work (with the late Amos Tversky) on biases and heuristics

FIGURE 1.8 Timeline of Major Events in Scientific Psychology.

The Great Theoretical Frameworks of Psychology

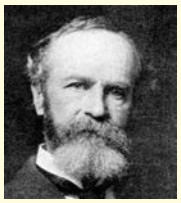
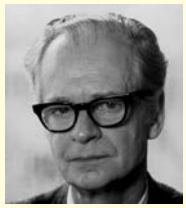
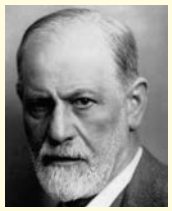
Almost since its inception, psychological science has confronted a thorny question: What unifying theoretical perspective best explains behaviour?

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, "Which of these perspectives is the right one?" As it turns out, the answer isn't entirely clear. Each theoretical viewpoint has something valuable to contribute to scientific psychology, but each has its limitations (see **TABLE 1.5**). In some cases, these differing viewpoints may not be contradictory, as they may be explaining behaviour at different levels of analysis. As we wind our way through these five frameworks, we'll discover that psychology's view of what constitutes a scientific approach to behaviour has changed over time. Indeed, it continues to evolve even today.

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

STRUCTURALISM: THE ELEMENTS OF THE MIND. Edward Bradford Titchener (1867–1927), a British student of Wundt who emigrated to the United States, founded the field of structuralism. **Structuralism** aimed to identify the basic elements, or "structures,"

TABLE 1.5 The Theoretical Perspectives That Shaped Psychology.

PERSPECTIVE		LEADING FIGURES	SCIENTIFIC GOAL	LASTING SCIENTIFIC INFLUENCE
	Structuralism ◀ E.B. Titchener	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	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 ◀ B.F. Skinner	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 the need for objective research
	Cognitivism ◀ Jean Piaget	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	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

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 the elements we can find in every chemistry classroom (Evans, 1972).

Structuralism eventually ran out of steam. At least two major problems eventually did it in. First, even highly trained introspectionists often disagreed on their subjective reports. Second, German psychologist Oswald Kulpe (1862–1915) showed that subjects asked to solve certain mental problems engage in *imageless thought*: thinking unaccompanied by conscious experience. If we ask an introspecting subject to add ten and five, she'll quickly respond "15," but she'll 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 because it demonstrated that some important aspects of human psychology lie outside of conscious awareness.

Structuralism correctly emphasized the importance of *systematic observation* to the study of conscious experience. Nevertheless, structuralists went astray by assuming that a single, imperfect method—introspection—could provide all of the information needed for a complete science of psychology. In the time since introspectionism came and went, psychologists have learned that multiple methods are almost always needed to understand complex psychological phenomena (Cook, 1985; Figueredo, 1993).

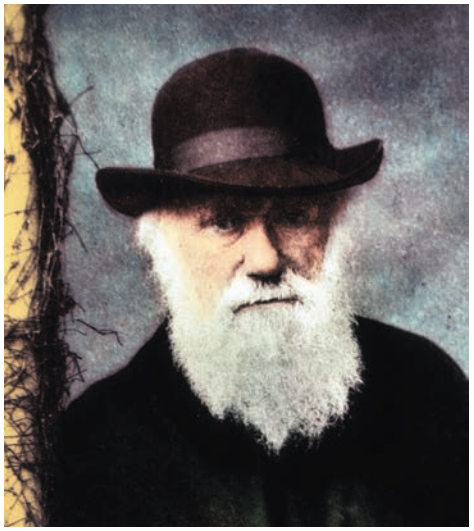
FACTOID

One of James's Ph.D students was Mary Whiton Calkins (1863–1930), who became the first female president of the American Psychological Association in 1905. Despite being an outstanding student at Harvard University, the faculty denied her tenure because of her gender—and in spite of James's recommendation of her. Calkins made significant contributions to the study of memory, sensation, and self-concept.

FUNCTIONALISM: PSYCHOLOGY MEETS DARWIN. Proponents of **functionalism** aimed 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 doesn't yield a fixed number of static elements of consciousness but rather an ever-changing "stream of consciousness," a famous phrase he coined. James is also famous for writing the influential text *Principles of Psychology* (1890), which introduced the science of psychology to the general public.

The functionalists of the late 1800s were influenced substantially by biologist Charles Darwin's (1809–1882) still-young theory of **natural selection,** which emphasized that physical and behavioural characteristics evolved because they increased the chances of their survival and reproduction. The functionalists believed that Darwin's theory applied to psychological characteristics, too. Just as the trunk of an elephant serves useful survival functions, such as snaring distant water and food, the human memory system, for example, must similarly serve a purpose. It's the job of psychologists, functionalists maintained, to act as "detectives," figuring out the evolved functions that psychological characteristics serve for organisms.

Like structuralism, functionalism doesn't exist in its original form today. Instead, functionalism was gradually absorbed into mainstream scientific psychology and continues to influence it indirectly in many ways.



Charles Darwin's theory of evolution by natural selection was a significant influence on functionalism, which aimed to understand the adaptive purposes of psychological characteristics.

BEHAVIOURISM: THE LAWS OF LEARNING. By the early twentieth century, many psychologists were growing impatient with the touchy-feely nature of their discipline. In particular, they believed that Titchener and other introspectionists were leading psychology down a misguided path. 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 mental experience. Psychological science, they contended, must be objective, not subjective.

Foremost among these critics was the flamboyant psychologist John B. Watson (1878–1958). Watson was a founder of 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

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

natural selection
principle that organisms that possess adaptations survive and reproduce at a higher rate than other organisms

behaviourism
school of psychology that focuses on uncovering the general laws of learning by looking at observable behaviour

John B. Watson, one of the founders of behaviourism. Watson's stubborn insistence on scientific rigor made him a hero to some and an enemy to others.

Watch The Basics: Diverse Approach on mypsychlab.com

Two students may react to the same grade on a test—say, a B+—in markedly different ways. One may be pleased, the other disappointed. Cognitive psychologists would say that these differing reactions stem from the students' differing interpretations of what these grades mean to them.

cognitive psychology
school of psychology that proposes that thinking is central to understanding behaviour

cognitive neuroscience
relatively new field of psychology that examines the relation between brain functioning and thinking

was observable behaviour, plain and simple. Subjective reports of conscious experience should play no part in psychology. If it followed his brave lead, Watson proclaimed, psychology could become just as scientific as physics, chemistry, and other "hard" sciences.

Watson, like his follower Burrhus Frederic (B.F.) Skinner (1904–1990), 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, they proposed, are products of a handful of basic learning principles (see Chapter 6). Moreover, according to Watson and Skinner, we don't 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 is a black box: We know what goes into it and what comes out of it, but we needn't worry about what happens between the inputs and the outputs. For this reason, psychologists sometimes call behaviourism *black box psychology.*

Behaviourism has left a stamp on scientific psychology that continues to be felt today. By identifying the fundamental laws of learning that help to explain human and animal behaviour, behaviourists placed psychology on firmer scientific footing. Although early behaviourists' deep mistrust of subjective observations of conscious experience probably went too far, these psychologists properly warned us of the hazards of relying too heavily on reports that we can't 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 some behaviourists acknowledged that humans and even many intelligent animals do think, they viewed thinking as merely another form of behaviour. Proponents of **cognitive psychology,** in contrast, argued that our thinking affects our behaviour in powerful ways. For example, Swiss psychologist Jean Piaget (1896–1980) argued compellingly that children conceptualize the world in markedly different ways than do adults (see Chapter 10). Later, led by Ulric Neisser (1928–), 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, a psychology based solely on rewards and punishments will never be adequate because our *interpretation* of rewards and punishments is a crucial determinant of our behaviour. Take a student who receives a B+ on his first psychology exam. A student accustomed to getting Fs on his tests might regard this grade as a reward, whereas a student accustomed to As might view it as a punishment. Without understanding how people evaluate information, cognitivists maintain, we'll 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 8).

Cognitive psychology is a thriving approach today, and its tentacles have spread to such diverse domains as language, problem solving, concept formation, intelligence, memory, and even psychotherapy. By focusing not merely on rewards and punishments but on organisms' interpretation of them, cognitivism has encouraged psychologists to peek inside the black box to examine the connections between inputs and outputs. Moreover, cognitivism has increasingly established strong linkages to the study of brain functioning, allowing psychologists to better understand the physiological bases of thinking, memory, and other 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 North America, a parallel movement was gathering momentum in Europe. This field, psychoanalysis, was founded by Viennese neurologist Sigmund Freud (1856–1939). In sharp contrast to behaviourism, **psychoanalysis** focused on internal psychological processes, especially impulses, thoughts, and memories of which we're unaware. According to Freud (1900) and other psychoanalysts, the primary influences on behaviour aren't forces outside the organism, like rewards and punishments, but rather unconscious drives, especially sexuality and aggression.

Psychoanalysts maintain that much of our everyday psychological life is filled with symbols—things that represent other things (Loevinger, 1987; Moore & Fine, 1995). For example, if you refer accidentally to one of your female professors as "Mom," Freudians would be unlikely to treat this embarrassing blooper as an isolated mistake. Instead, they'd quickly suggest that your professor probably reminds you of your mother, which may be a good reason to transfer to a different course. The goal of the psychoanalyst is to decode the symbolic meaning of our slips of the tongue (or *Freudian slips*, as they're often called), dreams, and psychological symptoms. By doing so, psychoanalysts contend, they can get to the roots of our deep-seated psychological conflicts. Psychoanalysts also place considerably more emphasis than do other schools of thought on the role of infant and childhood experience. For Freud and others, the core of our personalities is moulded in the first few years of life.

The influence of Freud and psychoanalysis on scientific psychology is controversial. On the one hand, some critics insist that psychoanalysis retarded the progress of scientific psychology because it focused heavily on unconscious processes that are difficult or impossible to falsify. As we'll learn in Chapter 14, these critics probably have a point (Crews, 2005; Esterson, 1993). On the other hand, at least some psychoanalytic claims, such as the assertion that a great deal of important mental processing goes on outside of conscious awareness, have held up well in scientific research (Westen, 1998; Wilson, 2002). It's not clear, however, whether the Freudian view of the unconscious bears anything more than a superficial resemblance to more contemporary views of unconscious processing (Kihlstrom, 1987; see Chapter 14).

The couch that Sigmund Freud used to psychoanalyze his patients, now located in the Freud Museum in London, England. Contrary to popular conception, most psychologists aren't psychotherapists, and most psychotherapists aren't even psychoanalysts. Nor do most modern therapists ask patients to recline on couches.

The Multifaceted World of Modern Psychology

Psychology isn't just one discipline, but rather an assortment of many subdisciplines. These subdisciplines differ widely in their preferred level of analysis, ranging all the way from biological to cultural. In most major psychology departments, we can find researchers examining areas as varied as the neurological bases of visual perception, the mechanisms of memory, the causes of prejudice, and the treatment of depression.

THE GROWTH OF A FIELD. Today, there are about 500 000 psychologists worldwide (Kassin, 2004), with many thousands in Canada alone. The Canadian Psychological Association (CPA), founded in 1939 and now Canada's largest association of psychologists, consists of more than 6000 members. These members study such topics as addiction; art psychology; clinical psychology; law and psychology; media psychology; developmental disorders; neuroscience; sports psychology; and gay, lesbian, bisexual, and transgender issues. Moreover, people with degrees in psychology work in a remarkably diverse array of settings.

TYPES OF PSYCHOLOGISTS: FACT AND FICTION. FIGURE 1.9 shows a breakdown of the settings in which psychologists work. As we can see, some work primarily in research settings, others primarily in practice settings. **TABLE 1.6** on page 34 describes a few of the most important types of psychologists whose work we'll encounter in this book. It also dispels common misconceptions about what each type of psychologist does.

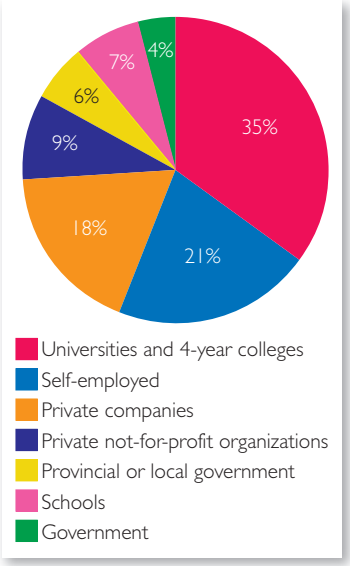


FIGURE 1.9 Approximate Distribution of Psychologists in Different Settings. Psychologists are employed in a diverse array of settings. (*Source:* Data from National Science Foundation, 2003)

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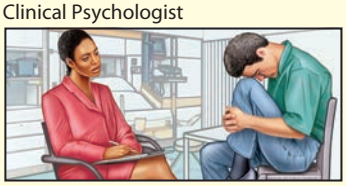
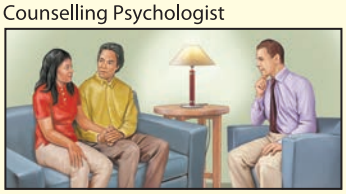
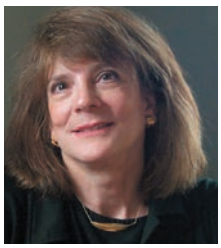
Watch The Big Picture: Asking the Tough Questions on **mypsychlab.com**

psychoanalysis
school of psychology, founded by Sigmund Freud, that focuses on internal psychological processes of which we're unaware

TABLE 1.6 Types of Psychologists, What They Do, and 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, or private practice	*Misconception: You need a Ph.D to become a therapist.* • **Truth:** Most clinical psychology Ph.D programs are highly research oriented. Other options for therapists are a Psy.D (doctor of psychology), which focuses on training therapists rather than researchers, or an M.S.W., a master's degree in social work, which also focuses on training therapists.
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, or private practice (although some work in academic and research settings)	*Misconception: Counselling psychology is pretty much the same as clinical psychology.* • **Truth:** Whereas clinical psychologists work with people with serious mental disorders like severe depression, most counselling psychologists don't.
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 analyzing data.
Experimental Psychologist 	• Use research methods to study 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.
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 employed by the FBI in the United States.* • **Truth:** Criminal profiling is a small and controversial (as we'll learn in Chapter 14) subspecialty within forensic psychology.
Industrial-Organizational Psychologists 	• Work in companies and businesses to help select productive employees, evaluate performance, examine the effects of different working or living conditions on people's behaviour (called *environmental psychologists*) • Design equipment to maximize employee performance and minimize accidents (called *human factors* or *engineering psychologists*)	*Misconception: Most industrial/organizational 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 organizational changes to improve worker productivity or satisfaction.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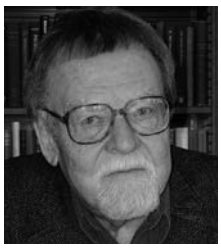
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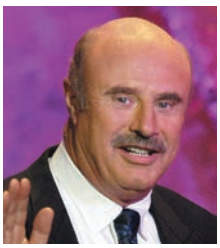

(3)


(4)

Psychologists Elizabeth Loftus (1) and Paul Meehl (2) are far less well known to the general public than psychologists Dr. Phil (3) and John Gray (4), but they've had a much greater impact on how we think about ourselves and the world.

As we can see, the field of psychology is remarkably diverse, as are the types of careers psychology majors pursue. Moreover, the face of psychology is changing, with more women and minorities entering many of its subfields (see **FIGURE 1.10**). Despite their differences in content, all of these areas of psychology have one thing in common: Most of the psychologists who specialize in them rely on scientific methods (see Chapter 2). Specifically, they use scientific methods to generate new findings about human or animal behaviour, or use existing findings to enhance human welfare. But as we've discussed, many pseudoscientists try to lead us to believe that they're using a genuinely scientific approach. Throughout this text, we'll highlight ways that pseudoscience has infiltrated popular beliefs about psychology and ways that good science has helped to guard us against pseudoscience.

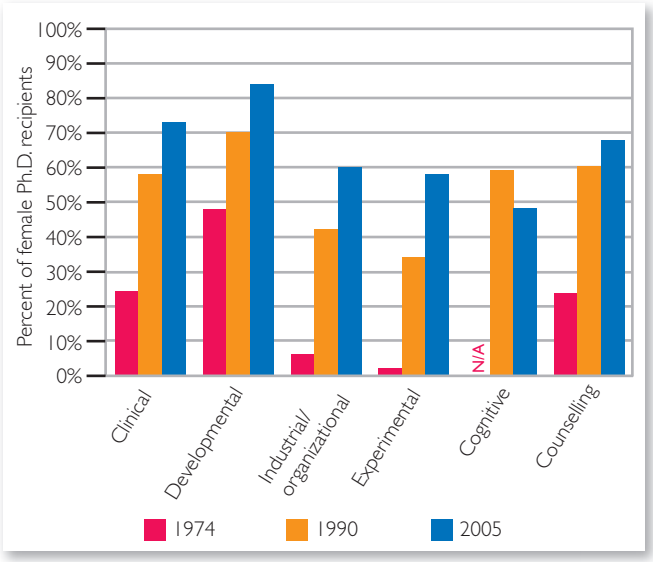


FIGURE 1.10 The Face of Psychology Has Changed Dramatically over the Past Three Decades. Across most areas, the percentage of women earning doctoral degrees has increased. In clinical and developmental psychology, women comprise three-fourths to four-fifths of those attaining Ph.Ds. (*Source:* www.apa.org/monitor/jun07/changing.html)

The Great Debates of Psychology

Now that we've learned a bit about the past and present of psychology, we need to set the stage for things to come. Two great debates have shaped the field of psychology since its inception and seem likely to continue to shape it in the future. Because these debates are alive and well, we'll find traces of them in virtually all of the chapters of this text.

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 we'll discover later in this text, the nature–nurture debate has proven especially controversial in the domains of intelligence, personality, and psychopathology (mental illness). Like most major debates in psychology, this one has a lengthy history. Many early thinkers, such as British philosopher John Locke (1632–1704), likened the human mind at birth to white paper that hadn't 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're 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. But research conducted by *behaviour geneticists,* who use sophisticated designs such as twin and adoption studies (see Chapter 3), shows that the most important psychological traits, including intelligence, interests, personality, and many mental illnesses, are influenced substantially by genes. Increasingly, modern psychologists have come to recognize that human behaviour is attributable not only to our environments but also to our genes (Bouchard, 2004; Harris, 2002; Pinker, 2002).

Current Status of the Nature–Nurture Debate. Some people have declared the nature–nurture debate dead (Ferris, 1996), because just about everyone now agrees that both genes and environment play crucial roles in most human behaviours. Yet this debate is far from dead because we still have a great deal to learn about how much nature or nurture contributes to different behaviours and how nature and nurture

FICTOID

MYTH: If you want to become a psychotherapist, you don't need to learn about research.

REALITY: The "scientist–practitioner model" of training—often called the "Boulder model" because it was formulated over 60 years ago at a conference in Boulder, Colorado—is the predominant model for educating clinical psychology Ph.D students. This model requires all graduate students, even those who intend to become therapists, to receive extensive training in how to interpret psychological research.

Listen Right Hand on **mypsychlab.com**

The fact that North American 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 unfalsifiable evolutionary stories.

work together. Indeed, we'll discover in later chapters that the old dichotomy between nature and nurture is far less clear-cut—and far more interesting—than once believed. Nature and nurture sometimes intersect in complex and surprising ways (see Chapters 6, 10, and 14).

Evolutionary Psychology. One domain of psychology that's shed light on the nature–nurture debate is **evolutionary psychology,** sometimes also called *sociobiology:* a discipline that 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, like memory, emotion, and personality, serve key adaptive functions: They help organisms survive and reproduce. Darwin and his followers suggested that natural selection favoured certain kinds of mental traits, just as it did physical ones, like our hands, livers, and hearts.

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, by the way, 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 have at least some degree of anxiety probably survived at higher rates than humans who lacked it, because anxiety serves an essential function: It warns us of impending danger (Barlow, 2000).

Still, evolutionary psychology has received more than its share of criticism (Kitcher, 1985; Panksepp & Panksepp, 2000). Many of its predictions are extremely difficult to falsify. In part, that's because behaviour, unlike the bones of dinosaurs, early humans, and other animals, doesn't leave fossils. As a consequence, it's far more challenging to determine the evolutionary functions 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). But if it turned out that women preferred men with a lot of hair to bald men, it would be easy to cook up an explanation for that finding ("Women perceive men with a full head of hair as stronger and more athletic"). Evolutionary explanations could account for either outcome. Evolutionary psychology has the potential 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 behaviours freely selected rather than caused by factors outside of our control?*

Most of us like to believe that we're free to select any course of events we wish. Fewer truths seem more self-evident than the fact that we're free to do what we want whenever we want. You may believe that at this very moment you can decide to either continue reading to the end of the chapter or take a well-deserved break to watch TV. Indeed, our legal system is premised on the concept of free will. We punish criminals because they're supposedly free to abide by the law but choose otherwise. One major exception, of course, is the insanity defence, 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 other psychologists maintain that free will is actually an illusion (Sappington, 1990; Wegner, 2002). It's such a powerful illusion, they insist, that we have a hard time imagining it could be an illusion. Some psychologists, like behaviourist

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

B.F. Skinner (1971), argue that our sense of free will stems from the fact that we aren't consciously aware of the thousands of subtle environmental influences impinging on our behaviour at any given moment. Much like puppets in a play that don't realize that actors are pulling their strings, we conclude mistakenly that we're free simply because we don't realize all of the influences acting on our behaviour. For Skinner and others, our behaviours are completely determined: caused by preceding influences.

Some psychologists argue that most or even all of our behaviours are generated *automatically*—that is, without conscious awareness (Kirsch & Lynn, 1999; Libet, 1985). We may even come to believe that something or someone else is producing behaviours we ourselves are generating. For example, people who engage in *automatic writing*—writing sentences while seemingly in a trance—typically insist they're being compelled to do so by some outside force. But there's overwhelming evidence that they're generating this behaviour themselves, although unconsciously (Wegner, 2002). According to many determinists, our everyday behaviours are produced in the same way—triggered automatically by influences of which we're unaware (Bargh & Chartrand, 1999).

FACTOID

Inducing students to believe in determinism—by having them read a scientific passage suggesting that free will is an illusion—makes them more likely to cheat on a test in the laboratory (Vohs & Schooler, 2008). So regardless of whether free will exists, belief in it may serve a useful function—inhibiting unethical behaviour.

How Psychology Affects Our Lives

As we'll 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 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. Within most large psychology departments, we'll 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. Surveys show that although most North Americans hold positive views toward psychology, few are aware of the substantial impact of psychology on their everyday lives (Wood, Jones, & Benjamin, 1986). Indeed, psychological science has found its way into far more aspects of contemporary society than most of us realize (Salzinger, 2002; Zimbardo, 2004a). To learn more about how psychology affects the lives of Canadians, check out the Canadian Psychological Association website (www.cpa.ca).

- If you live in or near a big city, you may have noticed a gradual change in the colour of fire engines. Although old fire engines were bright red, most new ones are lime-yellow. That's because psychological researchers who study perception found that lime-yellow objects are easier to detect in the dark. Indeed, lime-yellow fire trucks are only about half as likely to be involved in traffic accidents as red fire trucks (American Psychological Association, 2003; Solomon & King, 1995).
- 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 bright (pun intended) 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 ten-month study of taxis with and without the new brake lights and found a 61 percent lower rate of rear-end accidents in the first group (Voevodsky, 1974). As a result of his research, all new North American cars have three brake lights.

Increasingly, today's fire engines are lime-yellow rather than red. That's because psychological research has demonstrated that lime-yellow objects are easier to spot in the dark than red objects.

basic research
research examining how the mind works

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

Thanks to psychological research, advertisers know that placing a model's face on the left and written text on the right of an advertisement best captures readers' attention.

A classic simultaneous eyewitness lineup. Although police commonly use such lineups, most research suggests that they're more prone to error than sequential lineups.

When it comes to evaluating psychological claims in the news or entertainment media, there's a simple bottom-line message: We should always insist on rigorous research evidence.

- If you're anything like the average person, you see more than 100 commercial messages every day. The chances are 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 marketing success of companies. For instance, psychologists who study magazine advertisements have discovered that human faces better capture readers' attention on the left rather than on the right side of pages. Written text, in contrast, better captures readers' attention on the right rather than on the left side of pages (Clay, 2002).
- To get into college or university, you may have had to take a standardized test. 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, 2004a). Although these tests are far from perfect predictors of academic performance, they do significantly better than chance in forecasting how students perform in college and university (Geiser & Studley, 2002; Sackett, Borneman, & Connelly, 2008; see Chapter 9).
- Police officers often ask victims of violent crimes to select a suspect from a lineup. When doing so, they've traditionally used *simultaneous lineups,* in which one or more suspects and several decoys (people who aren't really suspects) are lined up in a row, often of five to eight individuals (see Chapter 7). These are the kinds of lineups we've most often seen on television crime shows. Yet psychological research shows that *sequential lineups*—those in which victims view each person individually and then decide whether he or she was the perpetrator of the crime—are generally more accurate than simultaneous lineups (Cutler & Wells, 2009; Steblay et al., 2003; Wells, Memon, & Penrod, 2006). As a result of this research, police departments around the world are increasingly using sequential rather than simultaneous lineups.

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

THINKING SCIENTIFICALLY: IT'S A WAY OF LIFE. As you embark on your journey to the rest of the field of psychology, we leave you with one crucial take-home point: Learning to think scientifically will help you make better decisions not only in this course and other psychology courses, but in everyday life. Each day, the news and entertainment media bombard us with confusing and contradictory claims about a host of topics: herbal remedies, weight loss plans, parenting methods, insomnia treatments, speed-reading courses, urban legends, political conspiracy theories, unidentified flying objects, and "overnight cures" for mental disorders, to name only a few. Some of these claims are at least partly true, whereas others are entirely bogus. Yet the media typically offer little guidance for sorting out which claims are scientific, pseudoscientific, or a bit of both. It's scarcely any wonder that we're often tempted to throw up our hands in despair and ask: "What I am supposed to believe?"

Fortunately, the scientific thinking skills you've encountered in this chapter—and that you'll come to know and (we hope!) love in later chapters—can assist you in successfully navigating the bewildering world of popular psychology and popular culture. The trick is to bear three words in mind throughout this text and in daily life: "Insist on evidence." By recognizing that common sense can take us only so far in evaluating claims, we can come to appreciate the need for scientific evidence to avoid being fooled—and to avoid fooling ourselves. But how do we collect this scientific evidence, and how do we evaluate it? We're about to find out in the next chapter.

assess your knowledge FACT OR FICTION?

1. Behaviourism focuses on uncovering the general laws of learning in animals, but not humans. **True / False**
2. Cognitive psychologists argue that we need to understand how organisms interpret rewards and punishments. **True / False**
3. Advocates of determinism believe that free will is an illusion. **True / False**
4. Studying colour discrimination in the lab is basic research, whereas testing which colour of fire engine results in the fewest traffic accidents is applied research. **True / False**
5. Achievement tests, such as standardized academic tests, do no better than chance at predicting how students will perform in college and university. **True / False**

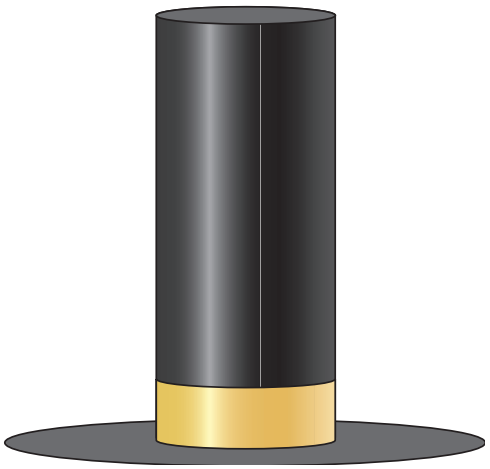
Answers: **1.** F (p. 31); **2.** T (p. 32); **3.** T (p. 36); **4.** T (p. 37); **5.** F (p. 38)

WHAT IS PSYCHOLOGY? SCIENCE VERSUS INTUITION 4–12

LO 1.1 EXPLAIN WHY PSYCHOLOGY IS MORE THAN JUST COMMON SENSE.

Psychology is the scientific study of the mind, brain, and behaviour. Although we often rely on our common sense 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"? (p. 7)
2. What does the top hat illusion tell us about our ability to trust our own intuitions and experiences? (p. 8)



3. Our common sense (is/isn't) always wrong. (p. 7)

LO 1.2 EXPLAIN THE IMPORTANCE OF SCIENCE AS A SET OF SAFEGUARDS AGAINST BIASES.

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 these two errors.

4. Science is a(n) _____ to evidence. (p. 8)
5. A scientific model like the Big Bang theory, which provides an explanation for a large number of findings in the natural world, is known as a _____ _____. (p. 9)
6. In scientific research, _____ are general explanations, whereas _____ are specific predictions derived from these explanations. (p. 9)
7. Review each of the statements in the table below and identify whether each is a theory (T) or a hypothesis (H). (p. 9)

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 Nashville, Tennessee, 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 _____ _____. (p. 10)
9. Our _____ _____ kicks in when we refuse to admit our beliefs are incorrect in the face of evidence that contradicts them. (p. 10)
10. Metaphysical claims, such as the existence of God, the soul, or the afterlife, differ from pseudoscientific claims in that they aren't _____. (p. 11)

PSYCHOLOGICAL PSEUDOSCIENCE: IMPOSTERS OF SCIENCE 12–21

LO 1.3 DESCRIBE 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 characterize science.

11. The growth of popular psychology has led to a _____ explosion. (p. 13)
12. About _____ percent of self-help books are untested. (p. 13)
13. There are over 500 "brands" of _____, with new ones being added every year. (p. 13)
14. A recent survey of the public shows that pseudoscientific and other questionable beliefs are (rare/widespread). (p. 13)
15. Match the warning signs of pseudoscience with the examples shown. (p. 15)

EXAMPLE	SIGN OF PSEUDOSCIENCE
1. _____	Three simple steps will change your love life forever!
2. _____	This woman practised yoga daily for three weeks and hasn't had a day of depression since.
3. _____	Amazing new innovations in research have shown that eye massage results in reading speeds ten times faster than average!
4. _____	Fifty studies conducted by the company all show overwhelming success!
5. _____	Although some scientists say that we use almost all of our brain, we've found a way to harness additional brain power previously undiscovered.
6. _____	Sine-wave filtered auditory stimulation is carefully designed to encourage maximal orbitofrontal dendritic development.
7. _____	Our new program is proven to reduce social anxiety by at least 50 percent!

a. Meaningless "psychobabble" that uses fancy scientific-sounding terms that don't make sense

b. Exaggerated claims

c. Overreliance on anecdotes

d. Lack of self-correction when contrary evidence is published

e. Absence of connectivity to other research

f. Talk of "proof" instead of "evidence"

g. Lack of review by other scholars (called *peer review*) or replication by independent labs

LO 1.4 IDENTIFY REASONS WE ARE DRAWN TO PSEUDOSCIENCE.

We are drawn to pseudoscientific beliefs because the human mind tends to perceive sense in nonsense and order in disorder. Although generally adaptive, this tendency can lead us to see patterns when they don't exist. Pseudoscientific claims can result in opportunity costs and direct harm due to dangerous treatments. They can also lead us to think less scientifically about other important domains of modern life.

16. Although the tendency to make order out of disorder is generally _____, it can lead us astray into pseudoscientific thinking. (p. 16)

17. Apophenia is the tendency for us to make meaningful connections among (related/unrelated) phenomena. (p. 16)

18. We may attribute paranormal significance to coincidences that are probably due to _____. (p. 16)

19. The tendency to see meaningful images in meaningless visual stimuli is called _____. (p. 16)

20. According to _____ _____ theory, our awareness of our own inevitable death leaves many of us with an underlying sense of terror. (p. 18)

SCIENTIFIC THINKING: DISTINGUISHING FACT FROM FICTION 21–27

LO 1.5 IDENTIFY THE KEY FEATURES OF SCIENTIFIC SKEPTICISM.

Scientific skepticism requires us to evaluate all claims with an open mind but to insist on compelling evidence before accepting them. Scientific skeptics evaluate claims on their own merits and are unwilling to accept them on the basis of authority alone.

21. Being open-minded but conservative about accepting claims without evidence is _____ _____. (p. 21)

LO 1.6 IDENTIFY AND EXPLAIN THE TEXT'S SIX PRINCIPLES OF SCIENTIFIC THINKING.

Six key scientific thinking principles are ruling out rival hypotheses, correlation versus causation, falsifiability, replicability, extraordinary claims, and Occam's razor.

22. The skill set for evaluating all claims in an open-minded and careful manner, both inside and outside the classroom or laboratory, is called _____ _____. (p. 22)

23. Scientific thinking (can/can't) be applied to claims in the media, Internet, self-help books, and any other information outlet outside the psychology laboratory. (p. 22)

24. When evaluating a claim, we should ask ourselves whether we've excluded other plausible _____ for it. (p. 22)

25. The assumption that because one thing is associated with another, it must cause the other is the definition of the _____ _____. (p. 24)

26. A claim is considered _____ if it could in principle be disproven. (p. 24)

27. The ability of others to consistently duplicate a study's findings is called _____. (p. 25)

28. Occam's razor is also called the principle of _____. (p. 26)

29. How would you use Occam's razor to select among different explanations for crop circles like this one? (p. 26)

Answers are located at the end of the text.

30. Match the scientific thinking principle (*left*) with the accurate description (*right*). (pp. 22–26)

NAME OF SCIENTIFIC THINKING PRINCIPLE	EXPLANATION OF SCIENTIFIC THINKING PRINCIPLE
1. ____ Ruling Out Rival Hypotheses	a. Claims must be capable of being disproven.
2. ____ Correlation versus Causation	b. If two hypotheses explain a phenomenon equally well, we should generally select the simpler one.
3. ____ Falsifiability	c. The fact that two things are associated with each other doesn't mean that one causes the other.
4. ____ Replicability	d. The more a claim contradicts what we already know, the more persuasive the evidence for this claim must be before we should accept it.
5. ____ Extraordinary Claims	e. A finding must be capable of being duplicated by independent researchers following the same "recipe."
6. ____ Occam's Razor	f. Findings consistent with several hypotheses require additional research to eliminate these hypotheses.

PSYCHOLOGY'S PAST AND PRESENT: WHAT A LONG, STRANGE TRIP IT'S BEEN 28–39

LO 1.7 IDENTIFY THE MAJOR THEORETICAL FRAMEWORKS OF PSYCHOLOGY.

Five major theoretical orientations have played key roles in shaping the field. Structuralism aimed to identify the basic elements of experience through the method of introspection. Functionalism hoped to understand the adaptive purposes of behaviour. Behaviourism grew out of the belief that psychological science must be completely objective and derived from laws of learning. The cognitive view emphasized the importance of mental processes in understanding behaviour. Psychoanalysis focused on unconscious processes and urges as causes of behaviour.

31. Structuralism aimed to identify the basic elements of thought through _____. (pp. 30–31)

32. For traditional behaviourists, the human mind is a _____ _____: We know what goes into it and what comes out of it, but we needn't worry about what happens between inputs and outputs. (p. 32)

33. Cognitivists believe our _____ of rewards and punishments is a crucial determinant of our behaviour. (p. 32)

LO 1.8 DESCRIBE DIFFERENT TYPES OF PSYCHOLOGISTS AND IDENTIFY WHAT EACH OF THEM DOES.

There are many types of psychologists. Clinical and counselling psychologists often conduct therapy. School psychologists develop intervention programs for children in school settings. Industrial-organizational psychologists often work in companies and business and are involved in maximizing employee performance. Many forensic psychologists work in prisons or court settings. Many other psychologists conduct research. For example, developmental psychologists study systematic change in individuals over time. Experimental psychologists study learning and thinking, and biological psychologists study the biological basis of behaviour.

34. You (need/don't need) a Ph.D to become a therapist. (p. 34)

35. How do developmental psychologists spend the bulk of their time? (p. 34)

Developmental Psychologist

LO 1.9 DESCRIBE THE TWO GREAT DEBATES THAT HAVE SHAPED THE FIELD OF PSYCHOLOGY.

The two great debates are the nature–nurture debate, which asks whether our behaviours are attributable mostly to our genes (nature) or to our rearing environments (nurture), and the free will–determinism debate, which asks to what extent our behaviours are freely selected rather than caused by factors outside our control. Both debates continue to shape the field of psychology.

36. _____ _____, a discipline that applies Darwin's theory of natural selection to human and animal behaviour, has shed light on the nature–nurture debate. (p. 36)

37. Many psychologists, such as B.F. Skinner, believe that free will is a(n) _____. (p. 37)

LO 1.10 DESCRIBE HOW PSYCHOLOGICAL RESEARCH AFFECTS OUR DAILY LIVES.

Psychological research has shown how psychology can be applied to such diverse fields as advertising, public safety, the criminal justice system, and education.

38. _____ research examines how the mind works, whereas _____ research examines how we use research to solve real-world problems. (p. 37)

39. What have psychologists who study magazine advertisements learned about how to best capture readers' attention? (p. 38)

40. Psychologists with expertise in measuring academic achievement and knowledge were primarily responsible for developing the _____ and _____ tests. (p. 38)

DO YOU KNOW THESE TERMS?

- psychology (p. 5)
- levels of analysis (p. 5)
- multiply determined (p. 5)
- individual differences (p. 6)
- naive realism (p. 7)
- scientific theory (p. 9)
- hypothesis (p. 9)
- confirmation bias (p. 10)
- belief perseverance (p. 10)
- metaphysical claim (p. 11)
- pseudoscience (p. 13)
- ad hoc immunizing hypothesis (p. 14)
- apophenia (p. 16)
- pareidolia (p. 16)
- terror management theory (p. 18)
- scientific skepticism (p. 21)
- critical thinking (p. 22)
- correlation–causation fallacy (p. 24)
- variable (p. 24)
- falsifiable (p. 24)
- risky prediction (p. 25)
- replicability (p. 25)
- introspection (p. 28)
- structuralism (p. 30)
- functionalism (p. 31)
- natural selection (p. 31)
- behaviourism (p. 31)
- cognitive psychology (p. 32)
- cognitive neuroscience (p. 32)
- psychoanalysis (p. 33)
- evolutionary psychology (p. 36)
- basic research (p. 37)
- applied research (p. 37)

APPLY YOUR SCIENTIFIC THINKING SKILLS

Use your scientific thinking skills to answer the following questions, referencing specific scientific thinking principles and common errors in reasoning whenever possible.

1. Psychology is a discipline that spans many levels of analysis, yet the popular media often assign only a single cause to a complex issue. Locate three media articles on an issue, such as homelessness or terrorism, and compare their views on the root causes and possible solutions to this issue. How many levels of analysis does each article consider?
2. How can our scientific thinking skills help us to evaluate the seemingly conflicting news we hear about nutrition and exercise? Choose a health topic to investigate further (for example: How much exercise do we need each day? Is drinking red wine every day healthy? Should we limit our intake of carbohydrates?) and locate three articles with conflicting views on the topic. What errors or logical fallacies do the articles commit? How can you evaluate the accuracy of the articles and the advice they provide?
3. Confirmation bias is widespread in everyday life, especially in the world of politics. Take a political issue that's been controversial recently (such as health care, approaches to terrorism, or abortion), and locate two opinion pieces that adopt opposing stances on this issue. Did each author attempt to avoid confirmation bias—for example, by acknowledging and thoughtfully discussing arguments that might challenge his or her position—or instead fall victim to confirmation bias? Did each author try to interpret contrary evidence in a fair or in a biased fashion? Explain your answer with reference to one or more specific examples in each case.