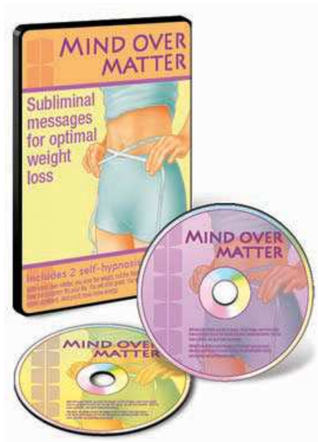
PSYCHOLOGICAL PSEUDOSCIENCE: IMPOSTERS OF SCIENCE

1.3 Describe psychological pseudoscience and distinguish it from psychological science.

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 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.



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

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 American 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 3,500 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 the *New York Times, 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 12). Yet other websites contain misleading or erroneous information, so we need to be armed with accurate knowledge to evaluate them.

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 *seem* scientific but aren'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. **Explore**

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

pseudoscience
set of claims that seems scientific but aren'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
American Psychiatric Association www.psych.org	Society for a Science of Clinical Psychology www.sscpweb.org
Society for General Psychology www.apa.org/divisions/div1/div1homepage.html	Scientific Review of Mental Health Practice www.srmhp.org
Association for Behavioral and Cognitive Therapies www.aabt.org	Center for Evidence-Based Mental Health http://cebmh.warne.ox.ac.uk/cebmh/
Psychonomic Society www.psychonomic.org	Empirically Supported Treatments for Psychological Disorders www.apa.org/divisions/div12/rev_est
Association for Behavior Analysis, Intl. www.abainternational.org	National Institute of Mental Health www.nimh.nih.gov

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

Pseudoscientific and other questionable beliefs are widespread. A recent survey of the U.S. public shows that 41 percent of us believe in extrasensory perception (ESP); over 30 percent of us in haunted houses, ghosts, and telepathy; and 25 percent of us in astrology (Musella, 2005). The fact that many Americans *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 Americans appear convinced that such claims are correct even though the scientific evidence for them is either weak, as in the case of 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. To take merely one example, there are about 20 times as many astrologers as astronomers in the United States (Gilovich, 1991).

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 1.2**. 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 these claims 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 skepti-

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

TABLE 1.2 Some Warning Signs That Can Help Us Recognize Pseudoscience.

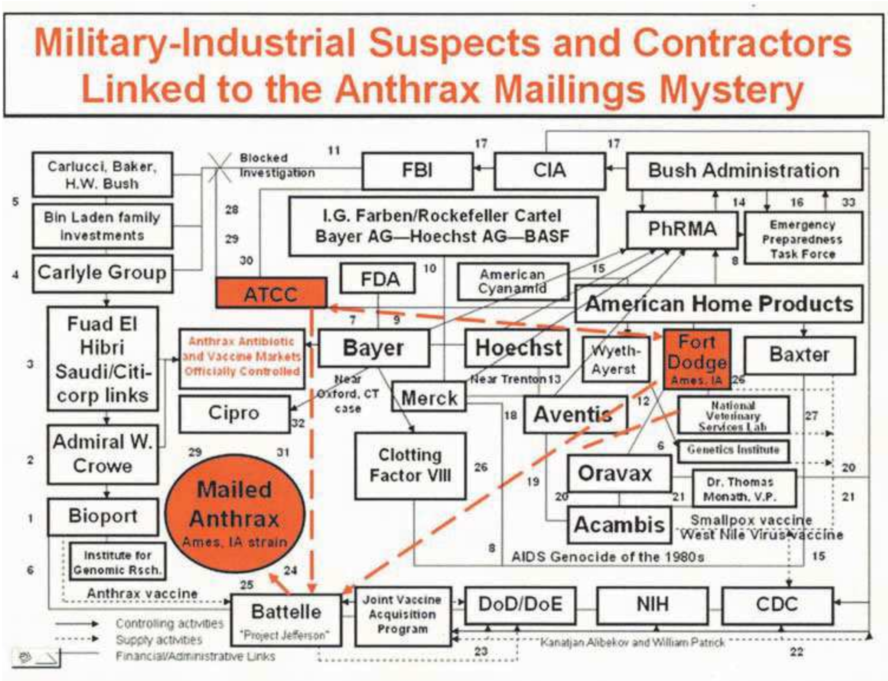
SIGN OF PSEUDOSCIENCE	EXAMPLE
Exaggerated claims	Three simple steps will change your love life forever!
Overreliance on anecdotes	This woman practiced yoga daily for three weeks and hasn't had a day of depression since.
Absence of connectivity to other research	Amazing new innovations in research have shown that eye massage results in reading speeds 10 times faster than average!
Lack of review by other scholars (called *peer review*) or replication by independent labs	Fifty studies conducted by the company all show overwhelming success!
Lack of self-correction when contrary evidence is published	Although some scientists say that we use almost all our brains, we'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!

cal "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. 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 4,000 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



Conspiracy theories are manifestations of apophenia. Believers in conspiracies often claim to detect hidden interconnections among powerful people and institutions.

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).

WHY ARE WE DRAWN TO PSEUDOSCIENCE?

There are a host of reasons why so many of us are drawn to pseudoscientific beliefs.

Perhaps the central reason stems from the way our brains work. *Our brains are predisposed to make order out of disorder and find sense in nonsense.* This tendency is generally adaptive, as it helps us to simplify the often bewildering world in which we live (Alcock, 1995; Pinker, 1997). 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*.

But it's also entirely possible, if not likely, that these two events happened at about the same time by chance alone. For a moment, think of the number of times one of your old friends comes to mind, and then think of the number of phone calls you receive each month. You'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.

Another manifestation of apophenia is our tendency to detect eerie coincidences among persons or events. To take one example, read through each of the uncanny similarities between Abraham Lincoln and John F. Kennedy, two American presidents who were the victims of assassination, listed in **TABLE 1.3**.

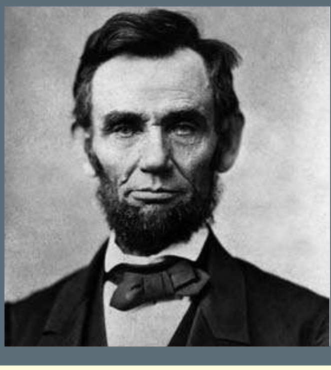
Pretty amazing stuff, isn't it? So extraordinary, in fact, that some writers have argued that Lincoln and Kennedy are somehow linked by supernatural forces (Leavy, 1992). In actuality, though, coincidences are everywhere. They're surprisingly easy to detect if we make the effort to look for them. Because of apophenia, we may attribute paranormal significance to coincidences that are due to chance. The term *paranormal* describes phenomena, like ESP, that fall outside the boundaries of traditional science. Moreover, we often fall victim to confirmation bias and neglect to consider evidence that *doesn't* support our hypothesis. Because we typically find coincidences to be far more interesting than noncoincidences, we tend to forget that Lincoln was a Republican whereas Kennedy was a Democrat; that Lincoln was shot in Washington, DC, whereas Kennedy was shot in Dallas; that Lincoln had a beard, but Kennedy didn't, and on and on. Recall that scientific thinking is designed to counteract confirmation bias. To do so, we must seek out evidence that contradicts our ideas.

FACTOID

The Nobel Prize–winning physicist Luis Alvarez once had an eerie experience: Upon reading the newspaper, he read 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 3,000 times across the world each year.

apophenia
tendency to perceive meaningful connections among unrelated phenomena

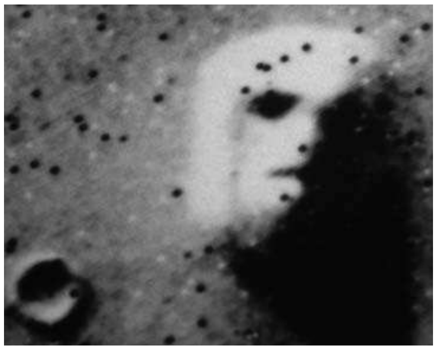
TABLE 1.3 Some Eerie Commonalities between Abraham Lincoln and John F. Kennedy.

ABRAHAM LINCOLN	JOHN F. KENNEDY
	
Was elected to Congress in 1846	Was elected to Congress in 1946
Was elected President in 1860	Was elected President in 1960
The name "Lincoln" contains seven letters	The name "Kennedy" contains seven letters
Was assassinated on a Friday	Was assassinated on a Friday
Lincoln's secretary, named Kennedy, warned him not to go to the theater, where he was shot	Kennedy's secretary, named Lincoln, warned him not to go to Dallas, where he was shot
Lincoln's wife was sitting beside him when he was shot	Kennedy's wife was sitting beside him when he was shot
John Wilkes Booth (Lincoln's assassin) was born in 1839	Lee Harvey Oswald (Kennedy's assassin) was born in 1939
Was succeeded by a president named Johnson	Was succeeded by a president named Johnson
Andrew Johnson, who succeeded Lincoln, was born in 1808	Lyndon Johnson, who succeeded Kennedy, was born in 1908
Booth fled from a theater to a warehouse	Oswald fled from a warehouse to a theater
Booth was killed before his trial	Oswald was killed before his trial

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 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).

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.

(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.

pareidolia
tendency to perceive meaningful images in meaningless visual stimuli

TABLE 1.4 Is the Hot Hand a Reality or an Illusion? Let's look at the data from these two players on the Philadelphia 76ers to help us find out.

	ERVING	TONEY
P(h/mmm)	0.52	0.52
P(h/mm)	0.51	0.53
P(h/m)	0.51	0.51
P(h/h)	0.53	0.43
P(h/hh)	0.52	0.40
P(h/hhh)	0.48	0.32

(*Source:* Gilovich, 1991)

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!").

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 center 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). Let's look at **TABLE 1.4**, which displays the results of two representative players on the 76ers (you basketball fans out there may recognize "Erving" as the famous "Dr. J," widely regarded as one of the greatest players of all time). There we can see six rows, with *h* standing for a hit, that is, a successful shot, and *m* standing for a miss, that is, an unsuccessful shot. As we move from top to bottom, we see six different probabilities (abbreviated with *P*), starting with the probability of a successful shot (a hit) following three misses, then the probability of a successful shot following two misses, all the way (in the sixth and final row) to the probability of a successful shot following three successful shots.

If the hot hand is real, we should see the probabilities of a successful shot increasing from top to bottom. Once a player has made a few shots in a row, he should be more likely to make another. But as we can see from the data on these two players, *there's no evidence for the hot hand.* The proportions don't go up and, in fact, go down slightly (perhaps we should call this the "cool hand"?). Gilovich and his colleagues found the same pattern for all the other 76ers' players.

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.

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 (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

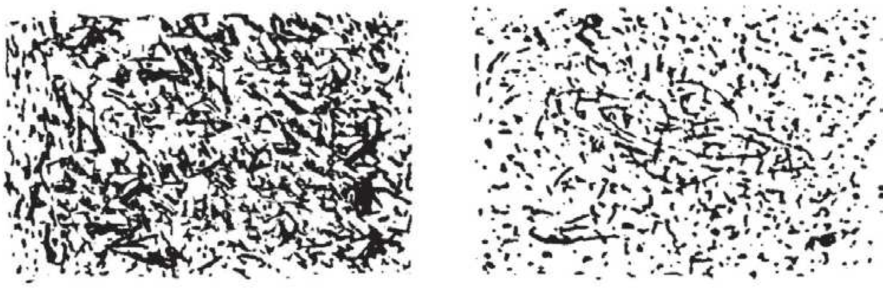


FIGURE 1.6 Regaining Control. Do you see an image in either of these pictures? Participants in Whitson and Galinsky's (2008) study who were deprived of a sense of control were more likely than other participants to see images in both pictures, even though only the picture on the right contains an image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

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 worldviews that reassure us that our lives possess a broader meaning and purpose—one that extends well beyond our vanishingly brief existence on this planet.

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

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 stems 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.

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 1.5** on page 18. All of them can help us separate science from pseudoscience.

Emotional Reasoning Fallacy. "The idea that day care 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*;

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

TABLE 1.5 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 day care 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 only answer it in 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."

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 psychological effects of day care, which are scientifically controversial (Belsky, 1988; Hunt, 1999), we need to keep an open mind to the data, regardless of whether they confirm or disconfirm our preconceptions.

Bandwagon Fallacy. "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 the sun revolved around the earth, rather than vice versa, but they were woefully mistaken.

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

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.

- **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 Americans with severe depression or anxiety attacks more often received scientifically unsupported treatments than scientifically supported treatments, like cognitive-behavioral 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 10-year-old child who received treatment for her behavioral 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 behavioral 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, 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.

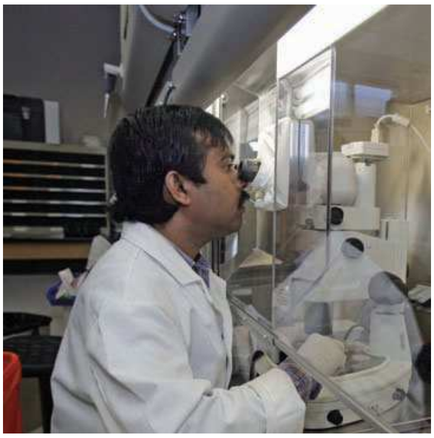
Candace Newmaker was a tragic victim of a pseudoscientific treatment called rebirthing therapy. She died of suffocation at age 10 after her therapists wrapped her in a flannel blanket and squeezed her to simulate birth contractions.

Study and Review on mypsychlab.com

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. 11); 2. F (p. 14); 3. T (p. 17); 4. F (p. 19); 5. T (p. 19)



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.

Listen to the Psychology in the News podcast on mypsychlab.com

SCIENTIFIC THINKING: DISTINGUISHING FACT FROM FICTION

1.5 Identify the key features of scientific skepticism.

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. Listen

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 willing to change their minds when confronted

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

with evidence that challenges their preconceptions. At the same time, they change their minds only when this evidence is persuasive. The motto of the scientific skeptic is the Missouri principle, which we'll find on many Missouri license plates: "Show me" (Dawes, 1994).

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 written, be sure to get a second opinion by asking your instructor.

The license plate of the state of Missouri captures the central motto of scientific skepticism.

"...and, as you go out into the world, I predict that you will, gradually and imperceptibly, forget all you ever learned at this university."

You'll probably forget many of the things you'll learn in college. But you'll be able to use the approach of scientific skepticism throughout your life to evaluate claims. (© Science CartoonsPlus.com)

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-colored 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** on page 22).

? 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.)

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

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 practice 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.

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 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, IQ, or extraversion. Let's see why correlation isn't causation.

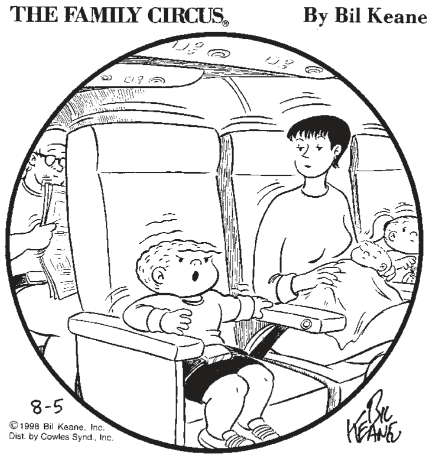
If we start with two variables, A and B, that are correlated, there are three major explanations for this correlation.

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. C ↗ A ↘ B

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 lots 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 behavior. 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 behavior (B). But it's also possible that sexual behavior (B) causes teens to listen to music with sexual lyrics (A), or that a third variable, like impulsivity (C), both causes teens to listen to music with sexual lyrics *and* engage in sexual behavior. 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.

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 disproved. 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



"I wish they didn't turn on that seatbelt sign so much! Every time they do, it gets bumpy."

Correlation isn't always causation.
(Family Circus © Bil Keane, Inc. King Features Syndicate)

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

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.

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).

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 major league baseball 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.

If your friend instead forecasted "The New York Yankees and New York Mets will both win tomorrow by three runs, but the Boston Red Sox and Los Angeles Dodgers will lose by one run," this prediction could be either correct or incorrect. There's a possibility he'll be wrong—the prediction is falsifiable. If he's right, it wouldn't prove he's psychic, of course, but it might make you at least wonder whether he has some special predictive abilities.

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.* Barely a week goes by that we don't hear about another stunning psychological finding on the evening news: "Researchers at Cupcake State University detect a new gene linked to excessive shopping"; "Investigators at the University of Antarctica at Igloo report that alcoholism is associated with a heightened risk of murdering one's spouse"; "Nobel Prize–winning professor at Cucumber State 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. 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.

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

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 18th 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.

According to a few researchers, tens of thousands of Americans have been abducted by aliens and brought aboard spaceships to be experimented on. Could it really be happening, and how would we know?

A handful of researchers believe that every night hundreds or even thousands of Americans are being lifted magically 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). 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 14th 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.

Occam chooses a razor

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.

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

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.