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## Chapter 7

# THE INTERCONNECTEDNESS OF OUR PATTERN-SEEKING HERITAGE WITH A BIASED COGNITIVE SYSTEM

*We must, however, acknowledge, as it seems to me, that man with all his noble qualities, with sympathy which feels for the most debased, with benevolence which extends not only to other men but to the humblest living creature, with his god-like intellect which has penetrated into the movements and constitution of the solar system—with all these exalted powers—Man still bears in his bodily frame the indelible stamp of his lowly origin.*

—Charles Darwin, *The Descent of Man* (1874/1998, p. 643)

Contemporary evolutionary theory within cognitive psychology hypothesizes that “cognitive errors result from *adaptive biases* that exist in the present because they led to survival and reproductive advantages for humans in the past” (Haselton and Buss 2000, 81). Thus, the cognitive biases that have evolved should produce predictable errors and still persist today. To use Darwin’s terminology, part of the “indelible stamp” in humans is our cognitive biases. Likewise for the individual, we are not typically aware that our biases may be influencing us in a particular situation. These biases, while advantageous from an evolutionary perspective, have the unwanted influence for us today of sometimes interfering with our ability to accurately perceive and objectively evaluate evidence.

As an example of a cognitive error that was adaptive from an evolutionary standpoint but currently interferes with our ability to objectively evaluate evidence, let's look at the following case. Specifically, there exists evidence that males typically over-infer sexual interest from a potential female partner (Abbey 1982). Thus, males will often over-interpret such cues from females as simple friendliness, a smile, or a touch on the shoulder as evidence of sexual interest. However, within the framework of adaptive biases, the advantage for males possessing this cognitive bias is as follows: "Ancestral men who tended to falsely infer a prospective mate's sexual intent (a false-positive error) paid the fairly low costs of failed sexual pursuit: perhaps some lost time and wasted courtship effort. In contrast, men who tended to falsely infer that a woman lacked sexual intent (a false-negative error) paid the costs of losing a sexual opportunity and hence a reproductive opportunity" (Haselton and Buss 2000, 82–83). In contrast, females have developed their own adaptive bias related to inferring cues from a potential partner. Specifically, "ancestral women suffered greater costs when they erred by falsely inferring a prospective mate's commitment" (88). Today, the persisting cognitive bias is that women tend to underestimate men's commitment. Thus, evolution has biased the cognitive system of both males and females, depending upon their reproductive roles. The important issue for further discussion, however, is that cognitive biases are still with us today. In many contexts we are not only unaware of the biases that we possess but when the biases are influencing our ability to evaluate information (remember squares A and B from the illusion in chapter 5?). In essence, human biases influence our beliefs and can interfere with our ability to objectively evaluate information.

### INTERCONNECTED: PATTERN SEEKING AND A BIASED COGNITIVE SYSTEM

The theory that pattern seeking provided an evolutionary advantage for humans should not be considered solely in isolation but needs a

larger framework to more comprehensively explain the overall implications. The beliefs derived from pattern seeking provide an evolutionary advantage because they guide actions increasing the probability of survival and reproduction. An example is the belief that hunting downwind is beneficial because it increases the probability of successfully killing prey. Confidence in individual beliefs directly influences the likelihood that the beliefs are acted upon (e.g., the gambler who has great confidence he is "due" is more likely to wager). Thus, to maximize the evolutionary advantage of pattern-seeking skills by increasing the likelihood we would capitalize on the useful information identified, humans also developed or already possessed a cognitive system that *is biased toward strengthening and maintaining beliefs*. This book theorizes that pattern seeking and a biased cognitive system became interconnected at some point, which contributed to each persisting today.

In order to explain how pattern seeking and a biased cognitive system toward strengthening and maintaining beliefs are interconnected and beneficial together within an evolutionary framework to maximize the advantages of pattern-seeking tendencies, let's look at the following example. Imagine two individuals, one with a bias to maintain beliefs, another with a lesser or no bias, who have recently correctly identified a useful pattern and ultimately developed a belief that a specific time of day is the best time to get water from rivers and streams (i.e., this time of day results in the least likelihood of running into potential life-threatening predators). Thus, they each used their pattern-seeking heritage to establish a belief that at this point results in actions that increase the likelihood of survival.

However, in nature, no pattern is perfectly predictable, as exceptions to the rule occur at various times and some disconfirming evidence can always be found (e.g., sometimes when the dark clouds roll across the sky, it does not rain), but identifying the overall pattern and acting on that information is advantageous in the long run. Subsequently, a predator is identified during the believed "safe time" (i.e., an exception to the overall pattern). In this theoretical scenario, the individual with the stronger bias to maintain beliefs is more likely to

continue the beneficial actions in the future (i.e., the next day she will go to the stream at the time of day with the least probability of encountering a predator) because the biased cognitive system is structured to maintain beliefs (i.e., confidence in the accuracy of the belief will remain high) and is resistant to inconsistent information once the belief is formed and established.

In contrast, the individual without the bias (or with a lesser bias) would be more likely to be influenced by the discrediting information and lose confidence or alter or abandon his belief, resulting in a lower probability of not continuing the beneficial action. Thus, he would be more likely to have a greater probability of meeting a predator in the future, which decreases the chances for survival. Simply put, since we are skilled pattern seekers who find important relations, a bias toward maintaining the beliefs that we have identified results in an overall benefit because it does not allow our beliefs to be easily influenced by minimal disconfirming evidence that always exists in nature (and often will be identified by us as a pattern-seeking species). While this does not mean that we cannot change our beliefs after they are formed (seeing a predator on many consecutive days during what was believed to be the "safe" time would likely result in a changing of that belief), it does imply that it can take substantial evidence to influence or ultimately change a belief.

Likewise, the amount of discrediting evidence it would ultimately take to modify or change a belief would depend upon the amount of evidence supporting the belief itself. Thus, those who possessed or had a greater bias toward strengthening current beliefs would have collected a greater body of evidence supporting and reinforcing the belief over time, making the belief more resistant to minimal disconfirming evidence. Once again, a stronger bias toward strengthening current beliefs would increase the chances of continuing the overall beneficial actions in the future. In the theoretical case presented above, this means increasing the chances of avoiding life-threatening predators.

Once we develop and reinforce a belief about how the world works, it would be counterproductive to continually challenge and change our beliefs in response to minimal disconfirming evidence (i.e., seeing the predator just one time). This would result in an inde-

cisiveness that would limit our ability to act on information, because our confidence in our beliefs and the beliefs themselves would be under constant revision. Once again, there is no evolutionary advantage for a pattern-seeking species unless information is put into action (what good is believing that hunting downwind is advantageous unless that belief is accompanied by the behavioral actions?). In some situations, our pattern-seeking tendencies would simultaneously undermine the very same beliefs that we identified and would overall serve us well. Just as a universal skepticism (i.e., being skeptical of everything) eventually becomes counterproductive, so would pattern-seeking tendencies in a completely objective cognitive system. Without a biased cognitive system toward strengthening and maintaining beliefs, the advantages of our pattern-seeking abilities are reduced because we would be less likely to act on information. Thus, the biases toward strengthening and maintaining beliefs serve as a check to keep our pattern seeking from undermining our beliefs and ultimately reducing the probability that our beliefs will be acted upon.

*Thus, we are not only the decedents of the best of the pattern seekers but the decedents of those who were biased toward strengthening and maintaining beliefs.* This increases the likelihood that we will act on information. The two are interconnected. Of course, the unwanted influence or trade-off that natural selection has left humans with today is that both true beliefs and false beliefs will be more resistant to change as the biases cannot discriminate between accurate and inaccurate reflections of reality but instead support all beliefs (overall, this was a net gain). In certain situations, some beliefs will be rigorously defended, especially those for which we have large cognitive and emotional investments to support the beliefs. This framework helps to explain why even in the face of substantial discrediting evidence people can continue to believe in very strange things (e.g., the gambler's fallacy, the accuracy of psychic predictions). Specifically, for us as critical thinkers, evolution's unwanted influence is that we have a cognitive system that is biased and can in some instances influence our critical thinking performance. In essence, the predictable error for us as critical thinkers is inconsistent critical thinking for all of us.

So, does any evidence exist to demonstrate that once we have established a belief our cognitive systems are biased toward strengthening and maintaining our current beliefs, whether true or false? Simply put, yes! While the cognitive literature is flooded with research studies that point to a wide variety of biases that exist in the human cognitive system, the three most relevant types of bias that are interconnected with our pattern-seeking tendencies for the strengthening and maintenance of beliefs will be discussed here: the confirmation bias, biased assimilation, and belief perseverance. For readers interested in how other types of biases influence our everyday judgments, Thomas Gilovich's (1993) *How We Know What Isn't So* is highly recommended.

## OUR BIASED COGNITIVE SYSTEM

### Confirmation Bias

First, humans look for evidence that is already consistent with their beliefs, including both true and false beliefs. Likewise, people typically do not seek out information that will discredit the beliefs they currently hold. Psychologists call this a confirmation bias. A useful way of conceptualizing the confirmation bias is to think of the way a prosecuting attorney puts together a case in the American justice system once the belief has been established that the defendant is guilty. The prosecutor's job is to gather and present the evidence that is consistent with "guilt" (i.e., to seek evidence to support a position), not to seek out the evidence that contradicts that belief (that is the defense attorney's job). Of course, the confirmation bias is less conscious (i.e., people are typically unaware of the bias) than in the example just given. However, the concept is correct. We attempt to establish what we already believe (i.e., our pattern-seeking heritage is biased toward collecting confirmatory evidence), which in turn strengthens our current beliefs. However, relying solely upon this style of inquiry is problematic and can lead the individual to a false

conclusion because they do not seek out discrediting evidence to complement the confirmatory evidence. Critical thinking, however, demands that we seek out all the evidence, not simply one side, but we as individual critical thinkers operate with a cognitive system that is biased toward confirmatory evidence.

An early study investigating confirmation bias in the laboratory was conducted by Peter Wason (1960). In this study, twenty-nine psychology undergraduates were given the following instructions:

You will be given three numbers which conform to a simple rule that I have in mind. This rule is concerned with a relation between any three numbers and not with their absolute magnitude, i.e. it is not a rule like all numbers above (or below) 50, etc.

Your aim is to discover this rule by writing down sets of three numbers, together with reasons for your choice of them. After you have written down each set, I shall tell you whether your numbers conform to the rule or not, and you can make a note of this outcome on the record sheet provided. There is no time limit but you should try to discover this rule by citing the minimum sets of numbers.

Remember that your aim is not simply to find numbers which conform to the rule, but to discover the rule itself. When you feel highly confident that you have discovered it, *and not before*, you are to write it down and tell me what it is. Have you any questions? (131)

On the answer sheet, participants were given the numbers 2-4-6. The experiment ended if the participant wrote down the correct rule but continued until the participant found the correct rule, wished to end the experiment, or exceeded forty-five minutes (only six of the twenty-nine participants obtained the correct rule after the first announcement). This task was chosen because there are an unlimited number of sets of numbers that are consistent with the rule of "*three numbers in increasing order of magnitude*" (130). Thus, relying solely upon confirmatory strategies is problematic. What Wason found was that when people misidentified the pattern (i.e., formed a false belief about the rule), they relied upon a strategy of searching for evidence to confirm a belief they had constructed (e.g., giving the numbers 12,

14, 16 to test the belief that the rule was counting by twos). In contrast, strategies to disconfirm the belief, which in this instance is easily done (e.g., giving the numbers 12, 17, 25 to disconfirm the counting by twos), typically is not initially done but is the more effective strategy in this circumstance (by the end of the task, twenty-one out of the twenty-nine students were able to identify the rule).

Wason's study provided empirical evidence that we are biased toward initially seeking evidence to verify our theories about the world, as opposed to seeking to disprove our beliefs. However, in the natural setting, unlike in this study, there is no experimenter providing the individual with feedback about whether or not our beliefs are correct. Thus, in everyday life, (a) we are not given feedback that confirmatory strategies alone are problematic and do not always lead to the correct answer, and (b) we can add "evidence" to confirm our misguided beliefs.

In addition, confirmation bias has been demonstrated in a wide variety of contexts. People tend to seek out and favor information that is consistent with social stereotypes and political beliefs (Johnston 1996). For example, one well-known stereotype is that of the "dumb blonde." For those that believe the stereotype, the bias is toward seeking out evidence that is consistent with the belief (i.e., a blonde entertainer not knowing if tuna, labeled "Chicken of the Sea," is actually poultry or fish). However, they will not actively seek out disconfirming evidence, such as identifying very intelligent blondes. Likewise, political beliefs lead people to seek out information and publications that are consistent with existing views (e.g., the *New York Times* and the *Wall Street Journal* have different readerships). Those who read such publications as *Skeptic* and *Skeptical Inquirer* differ in their beliefs in comparison to those who read psychical or New Age-friendly publications. The important issue, however, is that because of the bias toward gathering confirmatory evidence, the belief becomes strengthened and ultimately more resistant to change (i.e., blondes really are dumb if you only seek confirmatory evidence of that claim; of course, brunettes and redheads would also fall into that category using this strategy).

Research has shown that financial decisions are influenced by the confirmation bias (Schulz-Hardt, Frey, Lüthgens, and Moscovici 2000). The confirmation bias also plays an important role for the hypochondriac, as normal signals from the body are interpreted as confirmatory evidence of one type of illness or another (Pennebaker and Skelton 1978). Interestingly, the work of Swann (1997) indicates that people will select partners who will confirm their own views of themselves. Specifically, people with positive self-views seek relationships with those that view them positively, while people with negative self-views seek partners that provide unfavorable feedback. In a related phenomenon (i.e., another indication of a biased cognitive system), research also indicates that people are more willing to accept desirable as compared with undesirable information (Ditto and Lopez 1992). Specifically, unfavorable medical tests result in much more skepticism than favorable medical tests (i.e., how often does a person ask for a second opinion when receiving good news from the doctor even though there may have been a missed diagnosis of a real problem?). Of course, skeptics are well aware of the confirmation bias that exists among believers in psychic phenomena. One psychic prediction that comes true is latched onto (i.e., confirmatory evidence), while a thousand misses are not actively sought out. Natural selection, however, has resulted in all of us having this bias to confirm what we already believe.

Finally, let's look at the example of the individual who has developed a belief that he would be happier without his current spouse and is considering the possibility of asking for a divorce. Typically, the person will confirm the belief by seeking out and noticing all of the flaws and weaknesses of his partner (e.g., my spouse is selfish, my spouse nags me, my spouse does not help enough around the house, my spouse does not spend enough time with the children, my spouse is cheap, and so forth). Of course, since every individual has flaws and weaknesses, finding confirmatory evidence is not hard. However, in this circumstance, individuals do not typically seek out evidence of how their spouse currently contributes to their lives and how their life may be unhappier without their current spouse. Simply put, we ignore the good points and strengths of our spouse while actively seeking out

and focusing only on the bad points (Glenn 1991). Interestingly, many people (certainly not all, as some relationships are so dysfunctional that divorce is a relief) after initiating and going through with a divorce find themselves regretting the decision, likely because their evaluation of the evidence was biased (i.e., they did not consider both the confirmatory and disconfirmatory evidence).

The importance of the confirmation bias is that it generates additional collateral evidence that reinforces and strengthens the belief, making it more resistant to the influence of discrediting information. Furthermore, the belief can persist even when the initial evidence is discredited because people can draw on evidence obtained from a variety of sources. For example, let's say a football fan takes his family to the local zoo on a Saturday afternoon. While at the zoo, he notices the lion letting out a series of ferocious roars. The next day, when checking the football scores, he notices that the Detroit Lions, perennial underdogs in the game, won quite easily. A belief is developed that animals can give signals about subsequent sporting events. Of course, it is not hard to find more confirmatory evidence (e.g., your fish dies and that week the Miami Dolphins lose) while not actively seeking out disconfirming evidence and ignoring inconsistent evidence (e.g., your cat is sick, but the Carolina Panthers still win). By the time you visit the zoo the following year, the belief now has a variety of sources supporting it. Thus, if the lion roars this year, the belief will persist even if the Lions lose on Sunday.

I am hoping that at this point in the discussion the reader is wondering if the confirmation bias has been demonstrated in individuals who have been trained to think critically. This is an important issue, because this book hypothesizes that we as critical thinkers are also prone to the same biases that can mislead us in the same contexts as everyone else because the biases are part of our evolutionary heritage. Unfortunately, there is no record of research performed specifically with critical thinkers, but there is recorded research performed with scientists (i.e., individuals trained in the scientific method and many of whom are critical thinkers). So, any predictions on whether or not scientists typically show the confirmation bias?

Remember the study conducted by Peter Wason in which students were attempting to identify a simple mathematical rule? Mahoney and DeMonbreun (1977) used the same procedures, except the time limit was reduced to ten minutes, and compared fifteen PhD physical scientists (engineers and physicists), fifteen PhD academic psychologists (trained in the scientific method), and fifteen conservative religious ministers (education level ranged from high school through a bachelor's degree). Just like the psychology undergraduate students, participants relied primarily upon confirmatory strategies: over half in each group never disconfirmed, and 93 percent of the physical scientists and psychologists reconfirmed a previously falsified hypothesis compared with 53 percent of the ministers. Results showed no statistical differences between the groups in eventually obtaining the correct hypothesis: 27 percent of the physical scientists, 47 percent of the psychologists, and 40 percent of the ministers.

Although we need to treat a single small-sample study with caution, one interesting finding was "that the scientists in this study appeared to be strongly inclined toward early speculation with relatively little experimentation" (Mahoney and DeMonbreun 1977, 237). Specifically, the average number of experiments prior to announcing their first hypothesis was 1.93 for the psychologists, 1.07 for the physical scientists, and 5.40 for the ministers. Once again, caution is in order. However, this study provides no evidence that those trained in the scientific method (both the physical scientists and psychologists) possess any superior ability to control the confirmation bias.

There is a large literature consistent with the interpretation that humans have a built-in bias of verifying, as opposed to falsifying, our beliefs. As a quick test of the confirmation bias, I challenge the reader to quickly browse through your personal collection of books. Do you have an equal number of books that are inconsistent with your beliefs as those that are consistent, or are the majority consistent? At least in my case (glancing over at the bookshelves), I am guilty of the confirmation bias when it comes to the books in my personal collection, even on topics that are inherently ambiguous and where widespread disagreement exists even among the brightest scholars.

To summarize: in politics, in love relations, and in a wide variety of real-world contexts, the psychological literature clearly indicates that it is a human response to search for evidence to support what is already believed, while failing to search with equal vigor for evidence that will discredit our beliefs. There currently exists no evidence that scientists, who have been trained in the scientific method (and are the closest group to critical thinkers that I could find for comparison), control this bias. This bias, however, has the evolutionary advantage of making our accurate beliefs more resistant to change, as we add evidence to bolster the beliefs (i.e., increase our confidence). Of course, the trade-off is that it also results in making our inaccurate beliefs more resistant to change as well.

### Biased Assimilation

Prior to reviewing some of the pertinent literature on this topic, I hope the reader will indulge me in a quick anecdotal story, which is supported by the literature below. When teaching in the classroom, I typically wear dress pants, a dress shirt, a tie, and shoes. Thus, the preconceived notion my students have of me is that I wear dress clothes to work, and they can easily identify me under conditions consistent with their preconceived notion. For example, when I see students in the hallways on days that I teach, I will say "hi" and they typically respond with an appropriate greeting. What is interesting is when I come to campus on days that I do not teach. I typically wear jeans, sneakers, and so on (i.e., a casual look that is inconsistent with their preconceived notion). Of course, I will still say "hi" to my students on these days when I pass them in the hallways. However, I cannot tell the reader how many times I have been given a puzzled look (i.e., who is this guy?) instead of the usual returned greeting. I have asked students about this later (when wearing dress clothes), and the one consistent answer I receive is "That was you?" In essence, the preconceived notion (Riniolo wears dress clothes) interfered with the ability to evaluate evidence (who is that guy saying "hi" to me?).

Not only do we possess a bias toward gathering evidence already

consistent with our current beliefs, but current beliefs (i.e., preconceived notions) directly influence our ability to objectively and critically analyze evidence (i.e., biased assimilation). In one study (Rothbart and Birrell 1977), the researchers manipulated preconceptions and subsequently the ability of subjects to objectively analyze evidence. Specifically, subjects were required to evaluate the "attributes" of faces in photos as having either a cruel or kind expression. The photos were chosen because they were ambiguous and could reasonably be associated with either an unfavorable or favorable personality. Furthermore, prior to the subjects making their evaluations, character descriptions were prepared, giving the photos either a strong positive or negative bias. Specifically, the pictures were given a biographical sketch describing the person as "a German who either strongly supported or strongly opposed the genocidal policies of Hitler" (210). Likewise, a second biographical sketch described the individual in the photos as either an individual who was self-sacrificing and devoted to helping the poor or who believed the poor were socially and intellectually inferior to others. Predictably, the manipulated preconception—the person in the photograph described as either a wicked or a noble person—altered the judgments of the subjects that evaluated the photographs.

Keep in mind that critical thinking requires an objective analysis of evidence. In this example, the photos should not have been rated as cruel or kind but as ambiguous. However, our preconceived notions interfere with our ability to objectively evaluate uncertain evidence. This ultimately results in our beliefs influencing our objectivity and can result in double standards being applied to the evaluation of evidence. In this instance, the character descriptions, which served to create preconceived notions, biased the evaluation of the evidence. From an evolutionary perspective, this once again has the benefit of biasing us toward strengthening and maintaining beliefs, as even unclear evidence is interpreted as supporting our current beliefs, which ultimately makes them more resistant to change and more likely to be acted upon.

In another example, Darley and Gross (1983) demonstrated how

our preconceived notions (i.e., a stereotype) can influence our evaluations. Specifically, seventy undergraduate students viewed a videotape of a female fourth-grader. Half of the subjects viewed a sequence that showed the student in a middle-class suburban environment, while the other half viewed the student in a low-income urban environment. The preconceived notion the researchers were testing was that children from low-income schools are poorer students than children from middle-class backgrounds. Subsequently, participants from both groups were shown the same additional video of the student responding to achievement test problems, which gave no real information about the child's actual abilities. Results from the experiment demonstrated that when the student (the same child for both conditions) was believed to come from a low-income background, her abilities were rated as below average. In contrast, she was rated as well above average by those who believed she came from a middle-class background. Once again, this study indicates that prior beliefs influence our ability to objectively evaluate information. Critical thinking requires objectivity, but all individuals possess biases that interfere with an impartial appraisal.

These types of studies are important for the following reason: even ambiguous data (i.e., data that provides neither confirmatory nor discrediting evidence) is interpreted as confirmatory. Thus, beliefs are strengthened even in the absence of confirmatory evidence because we interpret information within a framework of preexisting beliefs. As a real-world example, the individual who believes in a racial or ethnic stereotype, such as that group is lazy, that group is cheap, or that group has ties to organized crime, will process any new information within a cognitive system that is biased toward the stereotype. Thus, an "average tip" (neither small nor large) left by a person from a specific ethnic group stereotyped as cheap for a waiter is not interpreted objectively but typically reinforces the stereotype (what a cheapskate), which is one of the reasons so many stereotypes persist without supporting evidence. Of course, the same tip left by another individual can be interpreted in a different way (see Hamilton and Rose 1980; Slusher and Anderson 1987; Trolier and Hamilton 1986).

Not surprisingly, strongly held beliefs also bias our ability to objectively evaluate evidence. In one study, Lord, Ross, and Lepper (1979) used subjects who had strong beliefs about the deterrent effect of capital punishment on potential murderers. One group believed capital punishment is an effective deterrent, while the other group believed it an ineffective deterrent. Subsequently, both groups were given what they believed were two genuine studies on the effectiveness of capital punishment as a deterrent. Results indicated that prior beliefs determined how subjects rated the quality of the two studies they reviewed. Furthermore, subject's beliefs on the topic became more confident after reading both reports. As the authors noted, "People who hold strong opinions on complex social issues are likely to examine relevant empirical evidence in a biased manner. They are apt to accept 'confirming' evidence at face value while subjecting 'disconfirming' evidence to critical evaluation and as a result to draw undue support for their initial positions from mixed or random empirical findings" (Lord, Ross, and Lepper 1979, 2098). Many similar studies have found consistent results; however, critical thinking requires that all evidence is subjected to an objective evaluation.

Of course, it's one thing for research subjects (typically college students) to have their preconceived notions influence their ability to objectively evaluate evidence, but do those who are trained to be dispassionate observers, such as researchers who referee manuscripts for scientific journals, overcome this shortcoming? Unfortunately, the evidence shows just the opposite (Bornstein 1990; Hojat, Gonnella, and Caelleigh 2003; Mahoney 1985, 1987). As one example, Mahoney (1977) sent manuscripts with identical introductions and experimental procedures (no discussion section) to seventy-five journal reviewers. The manuscripts varied the results of the experiment. Interestingly, "reviewers were strongly biased against manuscripts which reported results contrary to their theoretical perspective" (161). More disturbing, the experimental procedures were treated as vastly different, either excellent or poor, based upon the preconceived notions of the reviewers. As Myers (2005, 101) nicely articulates, "One reason our beliefs are so important; they shape our interpretation of everything

else." A large literature supports this assertion, and even those trained to implement the scientific method have not been demonstrated to be immune from the influence of personal beliefs. Finally, for those interested in further reading on how our thoughts and beliefs can shape our interpretations of the world, Thomas Sowell's (2002) *A Conflict of Visions* is highly recommended.

### Belief Perseverance

Research has also demonstrated that in some circumstances it can be very difficult to change a belief even when substantial discrediting information is provided. Psychologists call this belief perseverance. This is especially true when an individual has constructed a rationale supporting the belief. Let's review a few (there are many more) studies on this issue (see Jelalian and Miller 1984 for a review of the early literature). In one study (Anderson and Kellam 1992), subjects were asked to consider the following question: Does a risk-prone person or a cautious person make a better firefighter? In this study, subjects were asked to write an explanation to support their opinions. Of course, a rationale for each is theoretically justified (i.e., the risk taker is more likely to rescue people from burning buildings; the cautious individual is more likely not to make rash decisions in a dangerous situation). Interestingly, after the subjects formed their rationale (i.e., developed an explanation for their beliefs), when provided with discrediting information, subjects continued to hang onto their beliefs. In essence, once beliefs are formed, we become resistant to information that is inconsistent with them. Please note that this does not mean that we cannot change our beliefs (that, of course, can and does occur), but the evidence clearly indicates we are biased toward maintaining them. There likely exists substantial individual differences based upon the individual, the amount of evidence supporting the belief, and the specific beliefs being challenged.

My personal favorite study investigating this issue of belief perseverance was conducted by Lepper, Ross, and Lau (1986). In this study, high school students were shown either a highly effective teaching

video clip instructing them on how to solve complex problems (i.e., a success condition) or a highly ineffective teaching video that did not show them how to solve the complex problems (i.e., a failure condition). The success-condition students developed beliefs that they were highly competent, while those in the failure condition believed themselves to be incompetent and likely not to benefit from further instruction. The interesting portion of the experiment came after the beliefs were formed. Specifically, both groups were shown the other teaching video (i.e., a plausible alternative explanation for success or failure was given). However, despite the fact that students are aware that good teachers can help students learn, and poor teachers can contribute to a student not being able to master material, the students' beliefs about themselves (i.e., competent or incompetent) persisted. As the authors note, their results suggest that "the perseverance of discredited initial beliefs may occur even when subjects are demonstrably aware of the fact that their performance had been determined largely by a factor other than their own ability at the task" (489). Simply put, a bias exists toward maintaining our established beliefs, even our false beliefs.

Of course, we as critical thinkers are all too familiar with belief perseverance when dealing with a "true believer" in psychic phenomena. I personally made the mistake of trying to convince a true believer that the "psychic" demonstration they had witnessed was likely just a simple magic trick (e.g., spoon bending). I even went so far as to demonstrate how spoon bending was performed. I should have known better, because the discussion ended an hour later, with both of us equally frustrated with the other. Yet, nothing I could say or do could convince him (I'm sure he felt the same way about me) of the possibility that he only saw a magic trick, not a true psychic occurrence.

A few years back, several students and I (see Riniolo, Koledin, Drakulic, and Payne 2003) performed research that provides a nice example of the bias toward maintaining beliefs. The research was centered on the accuracy of eyewitness testimony obtained from archives from *Titanic* survivors about the ship's final plunge (the United States Senate and British Board of Trade hearings from 1912 are available at

<http://www.titanicinquiry.org/>). Specifically, we were interested in determining whether the witnesses recalled the ship as “breaking” or as being “intact” during the final plunge. With the discovery of the *Titanic* in 1985, it was subsequently possible to perform a forensic analysis that indicated there was “no doubt” (Garzke, Brown, Sandiford, Woodward, and Hsu 1996, 250) that the ship was breaking apart as it sank. Thus, it was now possible to quantify the accuracy of the eyewitness testimony on this specific aspect of the tragedy because there is a known outcome (i.e., the ship was breaking). We identified twenty eyewitnesses who directly commented on this issue, and of them, 75 percent testified that the ship had been breaking.

What is important for the current discussion is that both the US Senate and British Board of Trade concluded that the *Titanic* sank intact. Furthermore, *Titanic* historians, and virtually every author writing about the *Titanic*, concluded the ship sank intact prior to 1985. Eva Hart, who witnessed the tragedy when she was only seven years old (her father died that night), had been repeatedly told by experts that her memory of the ship’s final plunge was wrong, as she insisted over the years that *Titanic* had been breaking (she never wavered from her position).

The interesting question is why did virtually all of the evaluators ignore the only evidence (75 percent of the eyewitnesses said breaking apart) available to them at the time? Our interpretation was “that the evaluators had a preexisting bias to interpret the tragedy in the best possible light” (93). Note that it was a widely held belief at the time the *Titanic* sailed that it was “the most perfect work of naval architecture the world had ever produced” (Wood 1912, 160). Thus, the preexisting belief in the “unsinkable” ship influenced the evaluators toward belief maintenance, despite the fact that the *Titanic* had just demonstrated it clearly was not unsinkable. Thus, if the ship did sink, it must have been intact (that is closer to the initial belief than the ship crumbling apart).

Once again, the issue of whether or not those trained in the scientific method are likely to overcome this bias should be addressed. Simply put, the answer is no. In fact, one might argue that those of us

who spend decades seeking confirmatory evidence to support our beliefs, such as scientists and critical thinkers, are most resistant to change our beliefs because we have developed an enormous structure of supporting evidence. Unfortunately, the “ideal” notion of the dispassionate scientist who is influenced by data and is always open to the possibility of new discoveries often does not match reality (see Mahoney 1976; Mitroff 1974, 1974a; Sagan 1996). This helps to explain why in science a new theory (e.g., plate tectonics) is often not accepted within the scientific community until the current generation of scientists is replaced by the next generation.

The work of Ian Mitroff (1974) on this topic is most illuminating. Specifically, Mitroff intensively interviewed forty-two prestigious scientists (Nobel Prize winners were included in this group) who would eventually study the lunar rocks before the lunar landing of Apollo 11, 12, 14, and 15. These scientists were the best of the best. One of the reasons Mitroff chose the Apollo moon scientists was:

A major initial premise (later confirmed) was that the Apollo program would be an excellent contemporary setting in which to study the nature and function of the commitment of scientists to their pet hypotheses in the face of possibly disconfirming evidence. A review of the scientific and popular literature before the landing of Apollo 11 found that various scientists had strongly committed themselves in print as to what they thought the moon would be like, and in a few cases, what they ardently hoped the moon would be like. (581)

Mitroff’s interviews demonstrated that the scientists typically refused to alter their beliefs in response to new evidence (i.e., actual moon rocks), and recognized this characteristic in their peers. The following is a composite sketch of the three most dogmatic scientists, who were also judged as three of the most outstanding in this group of already elite scientists:

X is so committed to the idea that the moon is Q that you could literally take the moon apart piece by piece, ship it back to Earth, reassemble it in X’s backyard and shove the whole thing . . . and X

would still continue to believe that the moon is Q. X's belief in Q is unshakeable. He refuses to listen to reason or to evidence. (586)

Most fascinating, Mitroff notes that the composite did not change at all during the three and a half years of the study. In essence, irrefutable data, in some instances, is not enough to shake the beliefs of those trained in the scientific method. For those interested in a more detailed account, see Mitroff's (1974a) *The Subjective Side of Science*. Once again, specific research has not been conducted with critical thinkers, but I have no reason to suspect we would be immune from the biases displayed by everyone else, as we are not exempt from our evolutionary heritage (once again, I refer the reader to the illusion in chapter 5).

Finally, the research of Philip Tetlock (1998, 1999) provides some fascinating insight into the belief systems of experts. If anyone should be able to overcome our evolutionary biases, perhaps it is experts, because experts typically possess self-monitoring skills. Specifically, Tetlock has been collecting expert opinions about the future of various economic, political, and military outcomes. For example, he has had experts predict the future of the Soviet Union in 1988 and the future of Canada and South Africa in 1992. In the Soviet Union, experts were asked if they were predicting "a strengthening, a reduction, or no change in Communist Party control" (648). Experts were then asked to reflect on their predictions at both five- and ten-year intervals. This research is important not only for documenting the accuracy rates of experts, but it allowed an investigation of how the experts responded when confirming or disconfirming evidence occurred.

Interestingly, those experts who made predictions that were wrong had as much confidence in their opinions as those experts who accurately predicted the future. Most important for this discussion is that while some experts (a minority) used disconfirming evidence to moderate their views, many experts implemented cognitive strategies to "bolster their beliefs systems, both by protecting prior understandings of the past and by cushioning conditional forecasts from refutation" (651). Three such strategies that experts, who were flat-out

wrong, used to maintain belief systems included close-call counterfactuals (their predicted outcome almost occurred; "The hardliners almost succeeded in their coup attempt against Gorbachev"), off/on timing (the predicted outcome will occur in the future; communism will return), and trivializing failure (specific political events are inherently unpredictable; it's just a guessing game). Thus, experts will also go to great lengths to maintain belief systems, even in the face of strong evidence that should have forced them to reconsider their belief system in response to the outcomes that occurred. Yet, this is predictable because of the evolutionary bias toward maintaining beliefs, which is interconnected with our pattern-seeking heritage.

## SUMMARY

This chapter theorized that our pattern-seeking tendencies provide a greater evolutionary advantage when complemented by a cognitive system that is biased toward strengthening and maintaining beliefs. This chapter has documented several of the important biases that we all possess, which ultimately can interfere with our ability to think critically and objectively evaluate claims in certain situations based upon our own individual beliefs. However, even if the evolutionary explanation that is offered is wrong and our pattern-seeking heritage is not interconnected with our cognitive biases (placing things within an evolutionary context can be a speculative venture at times), it does not change the fact that humans have a biased cognitive system designed to maintain and strengthen all beliefs, even those that are false. Our biased cognitive system contributes to us all being inconsistent critical thinkers in some situations because we all are influenced by our current beliefs. An awareness of that simple fact is a necessary first step in identifying and limiting our own biases from interfering with our ability to evaluate claims in certain situations.

Finally, the reader may be wondering which came first, the pattern-seeking or the biases towards strengthening and maintaining beliefs. Within an evolutionary framework, plausible rationales can be

made that would theorize that pattern-seeking preceded, developed simultaneously, or followed the development of our biased cognitive system. I do not wish at this point to even venture a guess. The important issue for this book is not which came first (the chicken or the egg), but that at some point in our struggle for survival, pattern-seeking and our biased cognitive system became interconnected, which provided an overall benefit. This ultimately contributed to both persisting in us today.

## Chapter 8

# THE ROLE OF EMOTIONS IN BELIEF MAINTENANCE

*I would warn the critic, however, not to be led away by the sophistry that because some professional trickster, apt at the game of deception, can produce a somewhat similar effect, therefore the originals were produced in the same way.*

—Sir Arthur Conan Doyle, *The Coming of the Fairies* (1922, 3), discussing the authenticity of the Cottingley fairy photographs

**H**ave you ever been “passionately” in love with someone (e.g., high school sweethearts)? Have you ever been so angry that you could feel yourself losing control (e.g., a divorcing couple in the midst of a bitter custody dispute)? Have you ever been so scared that you lost physical control of your bodily functions and froze, unable to move (e.g., an intruder has broken into your house during the middle of the night and puts a knife to your throat)? Have you ever felt such intense happiness that you were on top of the world (e.g., a die-hard sports fan whose team finally wins the championship; as a Buffalo native, I have yet to experience this feeling, but hope springs eternal!)? Have you ever experienced such intense grief that it hurt at the gut level (e.g., parents losing a child in a drinking and driving accident)? If you have ever experienced any of these feelings, you have experienced an intense emotional response.

From an evolutionary perspective, the role of emotions is to automatically help an individual respond correctly to universal situations in which the appropriate response will increase the chances of either survival or reproduction. Let's take, for example, the universal situation of predator/prey. Imagine the prey, a bunny rabbit is hopping along, and from behind a tree leaps the predator, a wolf. The role of emotions is to trigger the automatic emotional response of fear in the rabbit, which leads to the appropriate behavioral response of running away. Note in this scenario, the rabbit has a good chance of survival because the emotional response triggers the appropriate behavioral action. Could you imagine the fate of the rabbit if it showed a different emotional response (e.g., fell in love or got angry with the wolf), or was simply indifferent to the wolf's presence? In all likelihood, that rabbit would end its days as a nice lunch for the predator.

Intense emotional responses are typically processed in the portion of the brain known as the limbic system. The limbic system, which is involved in controlling the body's hormones, is an older neural system that is involved in a variety of functions such as memory, drives (e.g., sex, food), and emotional responses. As an example, if you have ever seen a really angry cat (e.g., arched back, claws out, fur standing up, hissing), that cat is showing a limbic-driven response (specifically involving the amygdala, which influences aggression and fear responses). Also, those "passionately" in love teenage couples who can't stop thinking about each other and rush back to their lockers in between classes so they can make out for a few minutes are likewise showing emotional responses driven by the limbic system.

What is important to consider here, however, is the role of emotional responses in influencing our ability to accurately evaluate information. For example, is the passionately in love couple able to accurately evaluate the "strengths" and "weaknesses" their partner possesses while processing information from this older neural system? The answer is typically no, because our ability to critically analyze information (i.e., see our partners in a realistic light) is processed in the frontal lobes, not the limbic system. What is interesting about the "love" example is that passionate love does not continue indefinitely.

I like to think of passionate love as a cloud in your brain that limits your ability to see the weaknesses in your partner while subsequently magnifying their strengths. It is an interesting experience for some, once the cloud dissipates (i.e., the processing of information shifts from the limbic system to the frontal lobes), to have a more realistic picture of what their partner is really like (some are pleased, while others wonder what they could have possibly been thinking!). Simply put, emotions can influence our ability to accurately evaluate information. (As another example, attend a youth sporting event and try to determine if the emotional attachments that parents have to their children interfere with their ability to accurately evaluate the talent level of their child's ability to play soccer or baseball.)

Although this book focuses upon the cognitive biases that make us prone to maintain our beliefs and be inconsistent critical thinkers, the influence of emotions on our beliefs cannot be ignored. Research indicates that when beliefs were formed based primarily upon emotional input, those beliefs were subsequently more resistant to cognitive persuasion and logical arguments (Edwards 1990; Fabrigar and Petty 1999), perhaps because the beliefs were formed based upon substantial input from the limbic system. In any case, emotional beliefs are also resistant to discrediting information. For example, imagine that you take a trip to the pet store to purchase a new pet for your family (you have a spouse, a young child, and live in the city). While looking at all of the potential pets, you absolutely "fall in love" with a puppy (i.e., an emotional belief that this is the right pet for your family is formed). Let's be honest here, some dogs have temperaments that would make a much better fit for a city family with a young infant than others. Simply put, once an emotionally based belief is formed (i.e., that's the dog for me), it will be much more difficult to change the belief (i.e., information by the store clerk that that breed of dog would be much happier living in the country and is not the best choice to be around an infant).