

CHAPTER 4

BRAIN FOOD

Alvie: I didn't know there was a section of the brain just for hope.

House: It's very, very tiny.

—from Fox TV's *House*

I'm not a neurologist; I barely passed chemistry. Still, I'm fascinated with the brain's potential and its limitations. As I continue to learn more about how we process information, how we act on our impressions, and how we arrive at our most cherished beliefs, I worry. Literature on critical thinking suggests we have a difficult time changing our minds about much of anything. Developing an open mind—reviewing what we think we know, accepting what we don't, and staying as flexible as possible—turns out to be a monumental task. Most of us don't bother cross-checking our confirmation biases, as our tightly held beliefs are called. Science continues to confirm what some of us have long suspected: we are perfectly capable of feeling absolutely certain about ideas and events past, present, and future that aren't supported by fact.

We're making progress in understanding how the brain affects our well-being. Psychological studies about how the brain processes happiness have been around for decades. However, in the last fifteen years or so, neurologists have had the tools to more accurately map brain activity. Using magnetic resonance imaging (MRI) and other devices, scientists can see exactly how

our neurotransmitters respond to both physical and emotional stimuli. These images show, for example, that multiple areas of the brain are involved in transmitting the experience of pain. Altering the perception of pain may involve addressing the signals delivered by a particular neurotransmitter. This, in turn, could offer a way to treat not only side effects related to serious illness but also chronic pain itself.

MRI studies have also proven useful in learning where other feelings originate in the brain. A group of Georgetown University researchers discovered that signals are passed from the prefrontal cortex, where thinking takes place, to the nearby premotor cortex, which regulates and prepares the body to act. What the images in essence confirm is that both instinct and experience play a part in how we anticipate.¹

Almost all mammals anticipate on some level; it's a survival mechanism. MRIs have shown the degree to which memory plays a role in human anticipation. Any action we take is preceded by a quick trip through our storehouse of experiences. Animals also make associations that turn them toward or away from activities they determine are either dangerous or gratifying.

Anticipation is sometimes used interchangeably with hope. That's not quite accurate. It may explain, however, why we pet owners assume our animal companions can feel hopeful. Even if they don't look far into the future, we can't help but think there's something going on in the adorable little heads of our favorite furry or feathered buddies. When they stare at us with their soft eyes, aren't they hoping? Aren't they working off some sort of belief system that connects what they desire with a plan to achieve that desire?

Molly, my spaniel-Bichon mix, seems to behave with calculation. She clearly makes links between sights and sounds, and what might happen next, and what she should do about it. When she hears the garage door open, she reacts with excitement. She connects the sound with either my return or my departure. She always wants to go along. Molly associates the

refrigerator with a treat, since the treats are kept there. She'll run up to me and then to the refrigerator, then back to me, trying to get me to do something (get the treat out of the refrigerator and into her mouth). Most of the time, I give in to her exuberance, which is pretty hard to resist. But not always. I may open the refrigerator to get food for my lunch. I may open the garage door because I need to run an errand that doesn't include her. When I get ready to leave without her, she appears forlorn; I imagine she must be experiencing some sort of emotion (sadness or disappointment). What about just prior to that, when she still senses the possibility of an activity that includes her? Is she merely initiating an evolutionary response based on her fixed associations (garage=outside=playtime)? Or is something more going on? Is she *hoping* she'll get what she wants? Or is she instinctively reacting to external stimuli?

Measuring animal emotion is as challenging as measuring animal cognition. With the notable exception of certain primates, animals are far more limited in their ability to communicate. In the mid-sixties, a team of psychiatrists ran experiments about "learned helplessness" in dogs, suggesting the findings might serve as a model for studying and treating human depression.² The thesis—that learned helplessness was analogous to human depression—was roundly criticized, as was the cruel treatment of the experiment's canine subjects.³ (A side note: the lead psychologist on the team, Martin Seligman, was later elected president of the American Psychiatry Association. He also wrote several best-selling motivational books and became a leading proponent of research into the science of happiness.) A 2002 study by scientists with University of Stockholm's zoology department identified five personality traits among dogs.⁴ Dr. Jaak Panksepp, author of *Affective Neuroscience: The Foundations of Human and Animal Emotions*, has identified seven core emotions he believes most mammals share, based on measurable reactions.⁵ Test results published in 2008 by Dr. Friederike Range, of the University of Vienna's neurobiology department,

concluded that dogs can indeed experience more complex emotions such as jealousy, embarrassment, empathy, and guilt.⁶

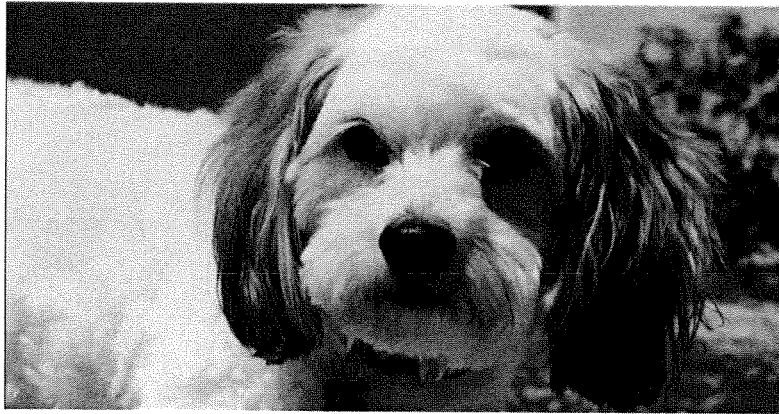
Although Molly seems more prone to jealousy than empathy, I've seen evidence of both in her. She also anticipates. She gets ready to move just before I throw the ball or runs to the refrigerator when her brain signals hunger. Some of her associations are quite sophisticated (to me), as when she stands in front of the door that opens into the garage whenever I tie up the kitchen trash. She must know I'm getting ready to take it out to the garbage can, which sits in the garage next to the place where her ball is kept. Trash=garage=ball=playtime=wait in front of the door to the garage. Impressive.

Most of Molly's associations, I'd venture to say, are happy ones; she tends to anticipate something rewarding is going to happen. Her tendency to joyful emotions is part of what makes her companionship so gratifying. Anticipation for Molly, however, doesn't always register as positive. Some activities make her excited (We're going to play ball! We're going for a ride! I'm going to get a treat!) Others make her anxious (She's taking me to the vet! She's going away without me! She's going to yell at me for ripping up the paper!) Happy, sad, joyful, angry or guilty/distressed: these emotions are available to my pet. I suspect she may even experience something related to affection.

What she doesn't feel is hope. We often use hope and anticipation interchangeably, but hope goes far beyond action or reaction. Hope involves cognition and a degree of analysis: what should I do that will give me the best chance of achieving the desired outcome? Anticipation involves preparing to act without necessarily thinking about whether the action is logical or optimal. Molly has a particular behavior that actually proves my point. She waits in front of the neighbor's house where, a year earlier, that neighbor gave all the dogs treats. Molly looks longingly at the porch in anticipation of getting a treat (so do the other dogs, by the way). She has no context for comprehending that the neighbor is no longer there to hand out treats. She may

not even remember why she sits there, only that it has to do with something pleasurable. If she sees someone with a treat, she'll react. But she won't form a plan to achieve her desires, like finding out which neighbors have treats and then walking me past their houses.

I'm actually relieved. I don't need my pet making plans without me.



To see Molly in action, visit this link:
www.xxxxxx.com

Identifying the neurological components of hope is far more complicated than working with primary emotions. We'd like to believe that "hope uses the same neurological pathways to heal as does real medication."⁷ Cognitive therapy, after all, causes far fewer side effects. But such a declaration may be jumping the gun. For all the excitement about positive thinking and our ability to alter our perceptions, such remedies are not guaranteed to tame pain, let alone illness.

Much has been made of the possibility that feelings that pain is being treated can reduce our pain experience. This is achieved through use of a placebo—a non-drug treatment that might activate the same pain-modulation networks as do conventional

drugs. Note I said *might*. The *placebo effect* is “the measurable, observable, or felt improvement in health not attributable to an actual treatment.”⁸ In research experiments conducted by Columbia University and University of Michigan doctors, patients were found to release more of a natural painkiller in anticipation of relief.⁹

Placebos work in some, but not all, cases. While doctors argue over their value, I’m inclined to think that if one’s brain chemistry can be directed to feeling better, why not? We make “subconscious associations between recovery and the experience of being treated;”¹⁰ and those can affect the manner in which our immune systems react. If we can trick ourselves into feeling less pain, I’m all for it, as long as we’re not subverting pain’s primary purpose, which is to warn us when something is wrong.

Neurologists and other science writers (who talk about an *expectation* of relief in patients taking a placebo) are observing quantifiable brain activity instigated by subliminal associations. Researchers now realize that the areas of the brain that release pain-reducing opiates in response to placebos are the same regions that help the brain anticipate the appropriate response in a given situation. What might make a placebo effective is the *anticipation*, not of pain but of relief. The release of helpful chemicals or the reduction of stress help in coping more effectively with pain.

Does it matter whether we’re hoping or anticipating the medicine (or placebo) will work? Do we need to think about automatic responses versus belief systems when all we’re doing is seeking relief? Perhaps not, but we do have to recognize what neuroscience can and can’t show us about hope on the brain, if for no other reason than to protect ourselves and our loved ones from false claims about the relationship between health and belief. While feelings of hope may be able to persuade the body that something no longer hurts, they aren’t likely to address the underlying cause of a serious illness. Hope can help, but only within reason.

Scientists don't really know what a brain on hope looks like. At least one researcher, however, has suggested we can track brain activity for signs of optimism. In *The Optimism Bias*, author Tali Sharot presents the results of several studies conducted by University College London's Wellcome Trust Centre for Neuroimaging, where she is a research fellow. Ms. Sharot, it should be noted, is occasionally confused with Tal Ben Shahar, a psychology professor and motivational lecturer who writes about positive thinking. Shahar's course on happiness was one of the most popular in Harvard University's history. His internationally best-selling books include *Being Happy* and *Happier*.

Sharot excerpted her book for a May 2011 issue of *Time Magazine* on health. I was caught by this paragraph: "After living through Sept. 11, 2001, in New York City, I had set out to investigate people's memories of the terrorist attacks. I was intrigued by the fact that people felt their memories were as accurate as a videotape, while often they were filled with errors. A survey conducted around the country showed that eleven months after the attacks, individuals' recollections of their experience that day were consistent with their initial accounts (given in September 2011) only 63% of the time. They were also poor at remembering details of the event, such as the names of the airline carriers. Where did these mistakes in memory come from?"¹¹

Well, several neurologists have written about what our brain fails to remember, which makes the case for self-assessment. Putting aside the question of 9/11 and who would want to remember what, our brains appear to store information less accurately than we'd like to believe. Ah, but Sharot is going further. We do remember, but while our neurons "faithfully encode desirable information that can enhance optimism, [they] fail at incorporating unexpectedly undesirable information." This bias towards optimism is not a flaw, but a way for our memory to produce a vision for the future. It cuts across lines of race, gender, age, culture, and ethnicity. Most of us are optimists, it would seem.

Sharot finds that “both neuroscience and social science suggest that we are more optimistic than realistic.”¹² I found it difficult to tell how much neuroscience was part of her equation, although she refers to imaging and brain tracking. At any rate, Sharot describes one experiment, in which the subjects were asked to choose between several pleasant options. They were also told to place an emotional “value” on the choices they made. When asked to narrow their choices, they kept raising the value of those choices. The subjects, we’re told, appeared to “derive heightened pleasure from choices that might actually be neutral.”¹³

I just thought they were gaming the system.

If they are, it’s because they *want* to be uplifted. Perhaps we are inclined to feeling good; it makes perfect evolutionary sense. How do we keep from floating along in a cloud of unreasonable exuberance, though, blind to any information, however helpful, that might spoil our good mood? Sharot addresses these concerns. While an optimism bias is better for our health (happy=healthy), she concedes, “Optimism is also irrational and can lead to unwanted outcomes.” What to do? “Knowledge is key,” Sharot advises. “We are not born with an innate understanding of our biases. The brain’s illusions have to be identified by careful scientific observation and controlled experiments and then communicated to the rest of us. Once we are made aware of our optimistic illusions, we can act to protect ourselves. It is possible, then, to strike a balance, to believe we will stay healthy, but get medical insurance anyway; to be certain the sun will shine, but grab an umbrella on our way out—just in case.”¹⁴

Okay, tempered optimism is what Sharot seems to be offering. Yet even if optimism is instinctive, reasonableness is not. In fact, we tend to believe irrationality is a problem that belongs to the other guy. If, on one hand, we can’t loosen our grip on our tightly held assumptions, how can we reign in unfettered optimism? Maybe the question should be: How can we reign in ir-

rational thoughts, whether optimistic or infuriated if, at the end of the day, we're slaves to our gut feelings? I appreciate Sharot's optimism about our ability to be happy and logical; I just don't know if we can pull it off.

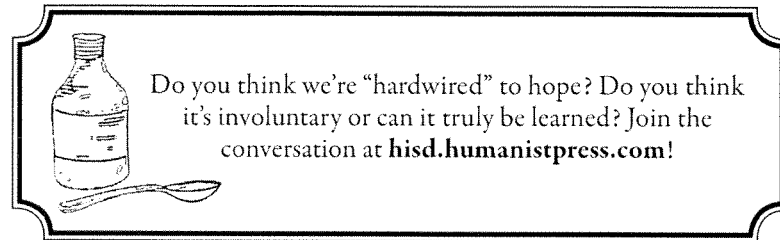
Given the tendency in all manner of communication to express outrage—amplified by mass media and unconstrained by propriety—reason of any kind might be forgiven for going to ground. For every summons to a shining city on the hill or a promise of change we can believe in, we are presented with hundreds of examples of mudslinging and appeals to mob mentality. Rudeness is recast as honesty; greed is presented as ambition, and lines in the sand blur and move.

For those without the certainty of a happy immortality, instinctive optimism seems impossible to imagine. Not only that, but summoning our inner happy person in the face of various hormones, preconditions, and learned behaviors is not quite a walk in the park.

That's where cognitive therapy is supposed to help. Psychiatry has embraced the idea of hope as an antidote to depression. Since depression is often caught in a dance involving both emotional and physical components, doctors may prescribe both talk therapy and/or medicines to combat despair. Obviously, some severe diseases that manifest themselves as mental illness, like schizophrenia, involve “structural as well as functional brain abnormalities.”¹⁵ Talk therapy alone can't help. However, some neurological researchers have concluded talk therapy *can* alter brain function because “learning [new ways to think] leads to the production of new proteins and, in turn, to the remodeling of neurons.”¹⁶

While so much of the brain is beyond our control, we know mental states can be altered. It may not be outrageous to consider hope to be in part a learned behavior. However, it matters who is doing the teaching or coaching, and what they insist their methods can and can't accomplish. Medical professionals are licensed, but not everyone who claims he or she can lift us

out of our funk adheres to standards of ethics or, for that matter, common sense. Perhaps the brain can be taught to hope; but it can just as easily be persuaded to fool itself.



Notes

- 1 Science Daily, "Wave."
- 2 Selegman and Maier, "Failure to Escape."
- 3 Hahner, "Learned Helplessness."
- 4 Svartberg, et al., "Consistency."
- 5 Paradiso, "Book Forum."
- 6 Jamieson, "Dogs."
- 7 Society for Neuroscience, "Feelings of Hope."
- 8 Eustice, "Placebo Effect."
- 9 Physorg.com, "Researchers."
- 10 Niemi, "Placebo Effect."
- 11 Sharot, "Optimism Bias."
- 12 Ibid.
- 13 Ibid.
- 14 Ibid.
- 15 Friedman, "Like Drugs."
- 16 Ibid.