

the consilient observer

applying cross-discipline frameworks to investing

con · sil · i · ence, n. [con- + salire to leap]
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interlocking explanations of cause and effect between disciplines
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Mine Your Mind

Neuroscience and Investing

There is a totally new and profoundly effective way to become a smarter investor. Suddenly, stunning investment insights are coming from the frontiers of one of the least likely fields you can imagine: neuroscience. In university and hospital laboratories around the world, researchers are using the latest breakthroughs in technology to trace the exact circuitry your brain uses to make the kinds of decisions you rely on as an investor.

Jason Zweig
*Are You Wired for Wealth?*¹

While conscious control over emotions is weak, emotions can flood consciousness. This is so because the wiring of the brain at this point in our evolutionary history is such that connections from the emotional systems to the cognitive systems are stronger than connections from the cognitive systems to the emotional systems.

Joseph LeDoux
*The Emotional Brain*²

Our modern skulls house a Stone Age mind.

Leda Cosmides and John Tooby
*Evolutionary Psychology: A Primer*³

The Train and the Brain

Consider the following problem: You observe a runaway train that will kill five people if it continues on its current course. You can save the five people, though, by hitting a switch that will divert the train to a side track where it will kill one person. Do you hit the switch, sparing the five people but at the expense of one?

Now ponder a related problem: You have the same runaway train threatening the five people. But now, you are on a bridge over the tracks next to a large stranger. Push the stranger onto the tracks, and the five people are saved but the stranger dies. Would you push?

If you are like most people, you answered yes to the first question and no to the second. Objectively, of course, the trade-off is the same: five lives versus one life. Why are we willing to trade one for five in the first instance, but not in the second?

Princeton researchers found that the first scenario—the “impersonal dilemma”—activated brain areas related to memory. In contrast, the second, more personal scenario triggered areas associated with emotion. Even those who answer yes in the second dilemma take twice as long to answer the question. The emotional brain is screaming “no,” and it takes some effort to override that response.⁴

While there are lots of unresolved questions in the investing world, perhaps none is as fascinating and relevant as the workings of human cognition. Scientists have established that distinct parts of our brains handle various problems, and that we

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cannot effectively separate emotion from the decision-making process. The evidence also shows that we all have diverse neurobiological make-ups because of hereditary and environmental differences. We all know people that are more emotional, or rational, than average and these cognitive differences undoubtedly shape investing temperaments and skills.⁵

Also critical is that our brains evolved in an environment that was very different from the one in which we find ourselves today. So some of the contemporary stimuli that trigger reactions and emotions are much different than what triggered actions in the past. While a short-term financial loss may have the same effect on you as seeing a snake, you don't want to deal with the two situations the same way.

As we learn more about our brains, we may be able to alter our investment behavior individually so as to improve our results. As neuroscientist Antonio Damasio says, "You will be much more in control if you realize how much you are not in control."⁶

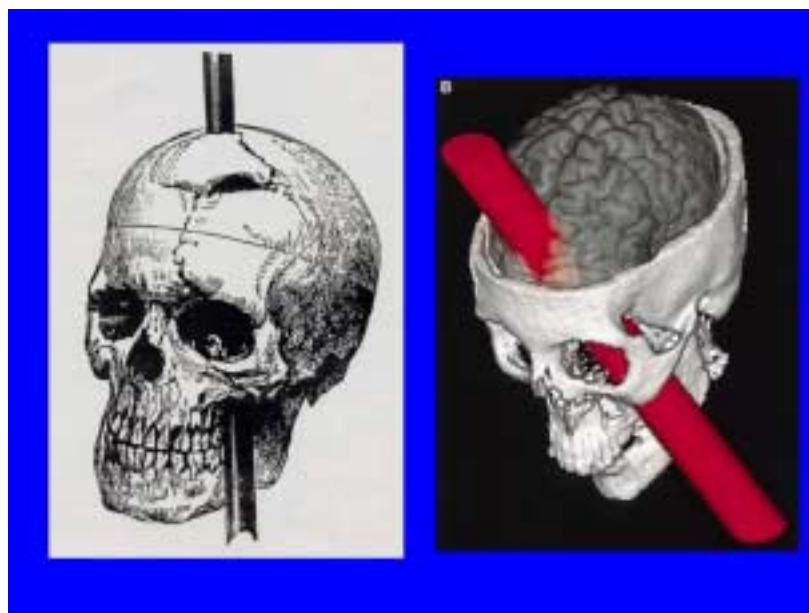
The Train and the Brain: Part II (The Story of Phineas Gage)

In 1848, a 25-year-old railway worker named Phineas Gage was in charge of blasting rock to clear the way for track expansion. The workers drilled a hole, filled it with explosive powder, added a fuse, and topped the powder with sand. Part of Gage's job was to tamp the sand with an iron rod to make sure that the powder properly detonated.

One fateful afternoon, Gage filled a hole with powder and was waiting for a co-worker to add the sand. Just then someone behind him called, and Gage looked over his right shoulder. Thus distracted, Gage started to tamp *before* his co-worker had added the sand. He sparked a fire, causing the rod to fire out of the rock toward him.

The rod entered Gage's left cheek, blasted through the front of his brain, and exited the top of his skull at high speed. (See Exhibit 1.) The rod—thirteen-and-half pounds, three-feet seven inches long, and one and a quarter inches wide—landed more than a hundred feet away. The impact threw Gage on his back but within a few moments he was speaking. He then rode nearly a mile to town in an ox cart and managed to get up and walk to the doctor's office with little assistance.

Exhibit 1: Phineas Gage's Injury



Source: <http://soma.npa.uiuc.edu/courses/bio303/Ch1.html>.

Amazingly, Gage not only survived but maintained most of his faculties: he could touch, hear, see, and suffered no paralysis. What did change was Gage's personality. Known as a measured, diligent, hard-working man, he became "fitful, irreverent" and indulged in "the grossest profanity which was not previously his custom." Gage also lost an ability to plan for the future. Friends summed it up by saying, "Gage was no longer Gage."⁷

The Mind of the Investor

Gage's remarkable story is a vivid illustration of the modularization of brain function. He lost a significant part of his right frontal cortex, a part of the brain that (among other things) keeps us from saying everything we think and helps us plan for the future. The part of the brain we use to solve a problem is likely to influence the solution we come up with.

Take a recent example based on the Pepsi Challenge. In a 1970s and 1980s marketing tactic, Pepsi conducted consumer taste tests pitting its drink versus rival Coca-Cola. A majority of the time, people preferred Pepsi's taste. But Coke continues to be the top cola brand. What gives?

Neuroscientist Read Montague recently set out to answer the question using magnetic resonance imaging (MRI) technology. Montague first restaged the Pepsi Challenge and corroborated the past marketing claims by showing that Pepsi generates a stronger response in a brain region associated with reward. Now this is downright weird: if enjoying a soft drink is about taste, why isn't the best-tasting brand winning?

But Montague's investigation didn't stop there. He repeated the test with a twist—instead of presenting unidentified samples, he told the tasters which one was Coke. All of a sudden, a majority of the drinkers preferred Coke. And, remarkably, Montague found activity in the part of the brain linked to high-level cognitive powers. Coke wasn't winning on taste alone, but on a combination of taste and other (presumably positive) associations.⁸

It's not too hard to make the leap from seeing how Coke beats Pepsi to seeing why we might prefer one investment to another—even when the rational facts don't justify that preference. Many investors have positive or negative histories with stocks, and their emotions play a real role in guiding their decisions.

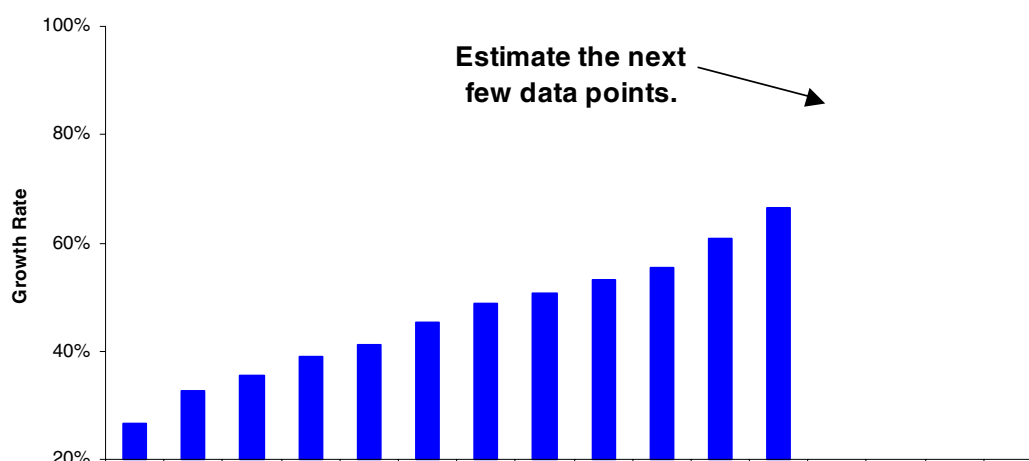
Here are some other examples of how our brains work, and the implications for investors:

- **Pattern recognition.** Humans are natural pattern seekers. In fact, we're so used to finding patterns that we see them when they aren't really there. Examples include the "hot hand" in basketball and stock charts. Pattern recognition was extremely important to the survival of our ancestors, and is hard wired in our brains.⁹

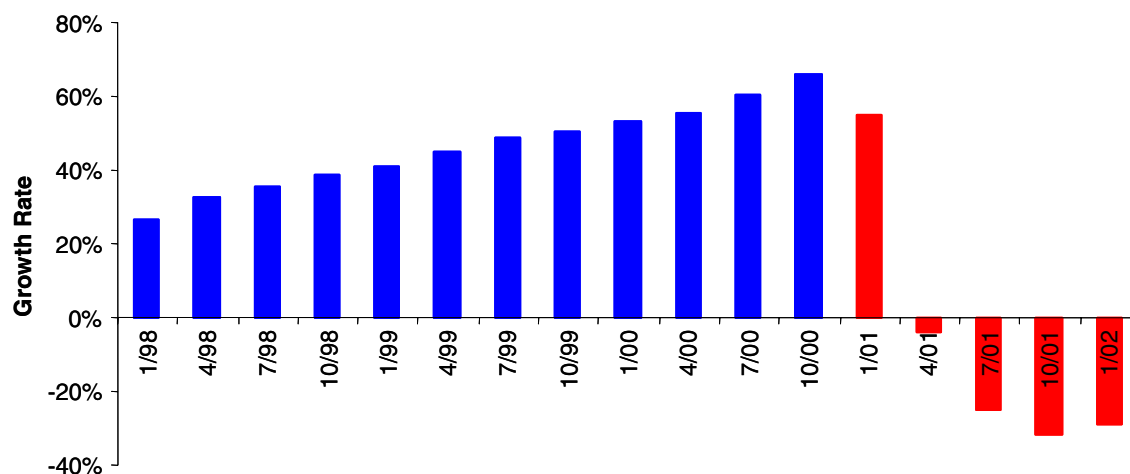
Using functional magnetic resonance imaging (fMRI) to track activity, neuroscientists found that parts of the prefrontal cortex specialize in pattern recognition, especially in repetition and alternation. Amazingly, the researchers discovered that the brain starts to anticipate another repetition after a stimulus occurs only twice in a row.¹⁰

Take a look at Exhibit 2 and consider where you think the next two data points should appear. Now look at Exhibit 3, which reveals the underlying system: Cisco's quarterly sales growth from early 1998 through early 2002. Our strong inclination is to extrapolate a trend. When a pattern breaks, parts of the brain that cause fear and anxiety become active.

Exhibit 2: Pattern Recognition and Extrapolation



Source: Company data.

Exhibit 3: Cisco's Quarterly Sales Growth**Quarterly Cisco Year/Year Growth Rates (FQ2 '98 - FQ2 '02)**

Source: Company data.

- **Intuition.** A quick quiz: A bat and ball together cost \$1.10. The bat costs \$1 more than the ball. How much does the ball cost?

The first answer that pops into people minds, if not out of their mouths, is ten cents. Of course, that answer is wrong. Research shows that we make many judgments very quickly, often without checking. Studies of prejudice and stereotyping show that people categorize others in milliseconds.¹¹ Evidence suggests that investors, too, often rely on intuition in their decision-making.¹²

Journalist Jason Zweig describes an experiment where an MRI machine tracked his neural hot spots as he tried to maximize his earnings by selecting between two boxes (one added value, the other detracted—he had no idea which was which). To complicate matters, the researchers inserted a pacifier in Zweig's mouth that periodically squirted either Kool-Aid or plain water. Again, the researchers told him nothing about how, when, or why he would get the Kool-Aid versus the water.

After struggling a while to improve his earnings, Zweig found his earnings swelling as he repeatedly hit the left bottom. The reason, he explains, is that his brain unconsciously recognized association between the Kool-Aid and the added value before he had any conscious idea of what was going on. Zweig's experience appears to be a case for using intuition.¹³

Intuition is wonderful, but tends to fail in systems that are nonstationary (i.e., the statistical properties change) and nonlinear (cause and effect are not clear). Given that markets have elements of nonstationarity and nonlinearity, investors should be careful about relying too heavily on intuition.

- **Mental models.** Psychologists, philosophers, and economists have long held the view that humans follow basic rules of logic. ("If a, then, b" and "a", you can conclude, "then b".)

But research by psychologist Philip Johnson-Laird shows that people instead operate with mental models. The key idea is that "the content you're reasoning about can affect the conclusions you draw." Specifically, [you] think about possibilities that are compatible with the premises [you're] reasoning from."

As a result, "people focus on what is true or possible from a given set of premises; *they often fail to consider what they believe must be false.*"¹⁴

- **Follow the crowd.** Research by psychiatrist Greg Berns shows that, "there is probably some reward or kick in conforming to a group." Berns asked subjects to compare abstract images, and provided the answers of four other people. In many cases, the subjects went with the majority view. Berns then compared activity between the area that deals with integrating spatial images and the decision-making prefrontal cortex. A tilt in favor of the cortex shows how people rely on others to decide.¹⁵

- *Long shots.* Dopamine is a brain chemical associated with natural highs. When you receive a long shot reward, dopamine neurons become extremely active, making you feel very good. Not surprising, research shows that handicappers consistently bet too much on long shots at the track.¹⁶

That periodic reward also keeps you coming back. Scientists show that once you associate a gain with a specific cue, your brain only needs the cue to release dopamine. Finally, once it becomes clear that the gain will not follow the cue, dopamine fades instantly, taking you from a high to a low very quickly.¹⁷

Investor Implications

So what lessons can investors learn from neuroscience? The first is that you should be aware of the limits of intuition. Intuition can be very useful in a host of circumstances, including interpersonal dealings and certain professional settings. But we can often improve on the judgments and decision courses that intuition suggests. In particular, we should be careful to identify all alternatives.

Next, we must be aware of the blind spots inherent in mental models. Often, we don't recognize our own biases in our decision-making.

Finally, we must be careful about interpreting patterns. Our mind wants to see patterns, and is quick to find them.

- ¹ Jason Zweig, "Are You Wired for Wealth?" *Money*, October 2002, 75-83.
See http://money.cnn.com/2002/09/25/pf/investing/agenda_brain_short/.
- ² Joseph E. LeDoux, *The Emotional Brain: The Mysterious Underpinnings of Emotional Life* (New York: Simon and Schuster, 1996), 19.
- ³ http://cogweb.ucla.edu/ep/EP-primer_contents.html.
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- ⁵ Dale Purves, et al., eds., *Neuroscience*, 2nd ed. (Sunderland, MA: Sinauer Associates, Inc., 2001), 519; Colin Camerer, George Loewenstein, and Drazen Prelec, "Neuroeconomics: How neuroscience can inform economics," *Mimeo*, February 2003.
See <http://www.hss.caltech.edu/~camerer/neurojepsbmitted.pdf>.
- ⁶ Zweig, 82-83.
- ⁷ Antonio R. Damasio, *Descartes' Error: Emotion, Reason and the Human Brain* (New York: Avon Books, 1994), 3-10.
- ⁸ Clive Thompson, "There's a Sucker Born in Every Medial Prefrontal Cortex," *The New York Times Magazine*, October 26, 2003, 54-57.
- ⁹ Michael J. Mauboussin and Kristen Bartholdson, "On Streaks: Perception, Probability, and Skill," *The Consilient Observer*, Issue 2, 8, April 22, 2003.
- ¹⁰ Scott A. Huettel, et al., "Perceiving patterns in random series: dynamic processing of sequence in prefrontal cortex," *Nature Neuroscience*, Vol. 5, 5, May 2002.
- ¹¹ Goodman, 31.
- ¹² Robert A. Olsen, "Professional Investors as Naturalistic Decision Makers: Evidence and Market Implications," *The Journal of Psychology and Financial Markets*, Vol. 3,3, 2002, 161-167.
- ¹³ Zweig, 80.
- ¹⁴ Goodman, 30.
- ¹⁵ Melanie Wells, "In Search of the Buy Button," *Forbes*, September 1, 2003, 65-66.
- ¹⁶ Wayne W. Snyder, "Horse Racing: Testing the Efficient Markets Model," *Journal of Finance*, Vol. 33, 4, September 1978, 1109-1118.
- ¹⁷ Zweig, 81.

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