

measurements, is often called the “new unconscious,” to distinguish it from the idea of the unconscious that was popularized by a neurologist-turned-clinician named Sigmund Freud. Early on, Freud made several notable contributions to the fields of neurology, neuropathology, and anesthesia.⁵ For example, he introduced the use of gold chloride to stain nerve tissue and used the technique to study the neural interconnections between the medulla oblongata, in the brain stem, and the cerebellum. In that, Freud was far ahead of his time, because it would be many decades before scientists understood the importance of brain connectivity and developed the tools needed to study it in any depth. But Freud himself did not pursue that study for long. Instead, he became interested in clinical practice. In treating his patients, Freud came to the correct conclusion that much of their behavior was governed by mental processes of which they were unaware. Lacking the technical tools with which to explore that idea in any scientific way, however, he simply talked to his patients, tried to draw them out about what was going on in the furthest recesses of their minds, observed them, and made whatever inferences he deemed valid. As we’ll see, however, such methods are unreliable, and many unconscious processes can *never* be directly revealed through the kind of self-reflection encouraged by therapy, because they transpire in areas of the brain not open to the conscious mind. As a result, Freud was mainly off the mark.

HUMAN BEHAVIOR IS the product of an endless stream of perceptions, feelings, and thoughts, at both the conscious and the unconscious levels. The idea that we are not aware of the cause of much of our behavior can be difficult to accept. Although Freud and his followers believed in it, among research psychologists—the scientists within the field—the idea that the unconscious is important to our behavior was, until recent years, shunned as pop psychology. As one researcher wrote, “Many psychologists were reluctant to use the word ‘unconscious’ out of fear that their colleagues would think they had gone soft in the head.”⁶ John Bargh, a psychologist at Yale, recounts that when he started as a graduate student at the University of Michigan, in the late 1970s, it was almost universally assumed that not only our social perceptions and our judgments but also our behaviors were conscious and deliberate.⁷ Anything that threatened

that assumption was greeted with derision, as when Bargh told a close relative, a successful professional, about some of the early studies showing that people did things for reasons they were unaware of. Using his own experience as evidence that the studies were wrong, Bargh's relative insisted that he was unaware of even a single instance in which he'd done something for reasons he wasn't aware of.⁸ Says Bargh, "We all hold dear the idea that we're the captain of our own soul, and we're in charge, and it's a very scary feeling when we're not. In fact, that's what psychosis is—the feeling of detachment from reality and that you're not in control, and that's a very frightening feeling for anyone."

Though psychological science has now come to recognize the importance of the unconscious, the internal forces of the new unconscious have little to do with the innate drives described by Freud, such as a boy's desire to kill his father in order to marry his mom, or a woman's envy of the male sexual organ.⁹ We should certainly credit Freud with understanding the immense power of the unconscious—this was an important achievement—but we also have to recognize that science has cast serious doubt on the existence of many of the specific unconscious emotional and motivational factors he identified as molding the conscious mind.¹⁰ As the social psychologist Daniel Gilbert wrote, the "supernatural flavor of Freud's Unbewusst [unconscious] made the concept generally unpalatable."¹¹

The unconscious envisioned by Freud was, in the words of a group of neuroscientists, "hot and wet; it seethed with lust and anger; it was hallucinatory, primitive, and irrational," while the new unconscious is "kinder and gentler than that and more reality bound."¹² In the new view, mental processes are thought to be unconscious because there are portions of the mind that are inaccessible to consciousness due to the architecture of the brain, rather than because they have been subject to motivational forces like repression. The inaccessibility of the new unconscious is not considered to be a defense mechanism, or unhealthy. It is considered normal.

If there are times when a phenomenon I discuss sounds vaguely Freudian, the modern understanding of that phenomenon and its causes won't be. The new unconscious plays a far more important role than protecting us from inappropriate sexual desires (for our mothers or fathers) or from painful memories. Instead, it is a gift of evolution that is crucial to our

survival as a species. Conscious thought is a great aid in designing a car or deciphering the mathematical laws of nature, but for avoiding snake bites or cars that swerve into your path or people who may mean to harm you, only the speed and efficiency of the unconscious can save you. As we'll see, to ensure our smooth functioning in both the physical and the social world, nature has dictated that many processes of perception, memory, attention, learning, and judgment are delegated to brain structures outside conscious awareness.

SUPPOSE YOUR FAMILY vacationed in Disneyland last summer. Looking back, you might question the rationality of having braved the crowds and ninety-five-degree heat to watch your little daughter spin in a giant teacup. But then you might remember that when you planned the trip, you assessed all the possibilities and concluded that her big smile would be all the payoff you needed. We are usually confident that we know the causes of our behavior. And sometimes that confidence is warranted. Yet if forces outside our awareness play a great role in our judgment and behavior, then we must not know ourselves as well as we think we do. *I took the job because I wanted a new challenge. I like that fellow because he has a great sense of humor. I trust my gastroenterologist because she lives and breathes intestines.* Each day we ask and answer many questions about our feelings and our choices. Our answers usually seem to make sense, but nonetheless they are often dead wrong.

How do I love thee? Elizabeth Barrett Browning felt she could count the ways, but chances are, she couldn't accurately list the reasons. Today we are beginning to be able to do just that, as you'll see when you have a look at the following table. It shows who has been marrying whom in three states of the southeastern United States.¹³ One would think that both the who and the whom married for love, and no doubt they did. But what is love's source? It can be the beloved's smile, generosity, grace, charm, sensitivity—or the size of his biceps. The source of love has been pondered for eons by lovers, poets, and philosophers, but it is probably safe to say that none of them has ever waxed eloquent about this particular factor: the person's name. This table, however, shows that a person's name can subtly influence your heart—if the name matches your own.

one-page description of an exercise routine instead of a recipe, and found similar results: subjects rated the exercise as harder and said they were less likely to try it when the instructions were printed in a font that was hard to read. Psychologists call this the “fluency effect.” If the *form* of information is difficult to assimilate, that affects our judgments about the *substance* of that information.¹⁸

The science of the new unconscious is full of reports about phenomena such as these, quirks in our judgment and perception of people and events, artifacts that arise from the usually beneficial ways in which our brains automatically process information. The point is that we are not like computers that crunch data in a relatively straightforward manner and calculate results. Instead, our brains are made up of a collection of many modules that work in parallel, with complex interactions, most of which operate outside of our consciousness. As a consequence, the real reasons behind our judgments, feelings, and behavior can surprise us.

IF UNTIL RECENTLY academic psychologists have been reluctant to accept the power of the unconscious, so have others in the social sciences. Economists, for example, built their textbook theories on the assumption that people make decisions in their own best interests, by consciously weighing the relevant factors. If the new unconscious is as powerful as modern psychologists and neuroscientists believe it to be, economists are going to have to rethink that assumption. Indeed, in recent years a growing minority of maverick economists have had great success questioning the theories of their more traditional colleagues. Today, behavioral economists like Caltech’s Antonio Rangel are changing the way economists think by presenting strong evidence that the textbook theories are flawed.

Rangel is nothing like what most people think of when they picture economists—theorists who pore over data and build complex computer models to describe market dynamics. A portly Spaniard who is himself a great lover of the good things in life, Rangel works with real people, often student volunteers, whom he drags into his lab to study while they taste wine or stare at candy bars after having fasted all morning. In a recent experiment, he and his colleagues showed that people would pay 40 to 61 percent more for an item of junk food if, rather than choosing from a text

or image display, they were presented with the actual item.¹⁹ The study also found that if the item is presented behind Plexiglas, rather than being available for you to simply grab, your willingness to pay sinks back down to the text and image levels. Sound weird? How about rating one detergent as being superior to another because it comes in a blue-and-yellow box? Or would you buy German wine rather than French because German beer hall music was playing in the background as you walked down the liquor aisle? Would you rate the quality of silk stockings as higher because you liked their scent?

In each of these studies, people were strongly influenced by the irrelevant factors—the ones that speak to our unconscious desires and motivations, which traditional economists ignore. Moreover, when quizzed about the reasons for their decisions, the subjects proved completely unaware that those factors had influenced them. For example, in the detergent study, subjects were given three different boxes of detergent and asked to try them all out for a few weeks, then report on which they liked best and why. One box was predominantly yellow, another blue, and the third was blue with splashes of yellow. In their reports, the subjects overwhelmingly favored the detergent in the box with mixed colors. Their comments included much about the relative merits of the detergents, but none mentioned the box. Why should they? A pretty box doesn't make the detergent work better. But in reality it was *just* the box that differed—the detergents inside were all identical.²⁰ We judge products by their boxes, books by their covers, and even corporations' annual reports by their glossy finish. That's why doctors instinctively "package" themselves in nice shirts and ties and it's not advisable for attorneys to greet clients in Budweiser T-shirts.

In the wine study, four French and four German wines, matched for price and dryness, were placed on the shelves of a supermarket in England. French and German music were played on alternate days from a tape deck on the top shelf of the display. On days when the French music played, 77 percent of the wine purchased was French, while on the days of German music, 73 percent of the wine purchased was German. Clearly, the music was a crucial factor in which type of wine shoppers chose to buy, but when asked whether the music had influenced their choice, only one shopper in seven said it had.²¹ In the stocking study, subjects inspected four pairs

of silk stockings that, unbeknownst to them, were absolutely identical, except that each had had a different and very faint scent applied to it. The subjects “found no difficulty in telling why one pair was the best” and reported perceiving differences in texture, weave, feel, sheen, and weight. Everything but scent. Stockings with one particular scent *were* rated highest much more often than the others, but the subjects denied using scent as a criterion, and only 6 of the 250 subjects even noticed that the stockings had been perfumed.²²

“People think that their enjoyment of a product is based on the qualities of the product, but their experience of it is also very much based on the product’s marketing,” says Rangel. “For example, the same beer, described in different ways, or labeled as different brands, or with a different price, can taste very different. The same is true for wine, even though people like to believe it’s all in the grapes, and the winemaker’s expertise.” Studies have indeed shown that when wines are tasted blind, there is little correlation between a wine’s taste and its cost, but that there is a strong correlation when the wines are not sampled blind.²³ Since people generally expect higher-priced wine to taste better, Rangel was not surprised when volunteers he recruited to sip a series of wines labeled only by price rated a \$90 bottle as better than another wine in the series that was marked as costing just \$10.²⁴ But Rangel had cheated: those two wines, perceived as disparate, were actually identical—they were both from the \$90 bottle. More important, the study had another twist: the wine tasting was conducted while the subjects were having their brains scanned in an fMRI machine. The resulting images showed that the price of the wine increased activity in an area of the brain behind the eyes called the orbito-frontal cortex, a region that has been associated with the experience of pleasure.²⁵ So though the two wines were not different, their taste difference was real, or at least the subjects’ relative enjoyment of the taste was.

How can a brain conclude that one beverage tastes better than another when they are physically the same? The naive view is that sensory signals, such as taste, travel from the sense organ to the region of the brain where they are experienced in a more or less straightforward fashion. But as we’ll see, brain architecture is not that simple. Though you are unaware of it, when you run cool wine over your tongue, you don’t just taste its chemical composition; you also taste its price. The same effect has been dem-

onstrated in the Coke-Pepsi wars, only with regard to brand. The effect was long ago dubbed the “Pepsi paradox,” referring to the fact that Pepsi consistently beats Coke in blind taste tests, although people seem to prefer Coke when they know what they are drinking. Over the years, various theories have been proposed to explain this. One obvious explanation is the effect of the brand name, but if you ask people whether it is all those uplifting Coke ads they’ve seen that they are *really* tasting when they slurp their beverage, they almost always deny it. In the early 2000s, however, new brain-imaging studies found evidence that an area of the brain that neighbors the orbitofrontal cortex, called the ventromedial prefrontal cortex, or VMPC, is the seat of warm, fuzzy feelings such as those we experience when we contemplate a familiar brand-name product.²⁶ In 2007, researchers recruited a group of participants whose brain scans showed significant VMPC damage, and also a group whose VMPCs were healthy. As expected, both the normal and the brain-damaged volunteers preferred Pepsi to Coke when they did not know what they were drinking. And, as expected, those with healthy brains switched their preference when they knew what they were drinking. But those who had damage to their VMPC—their brain’s “brand-appreciation” module—did *not* change preferences. They liked Pepsi better whether or not they knew what they were drinking. Without the ability to unconsciously experience a warm and fuzzy feeling toward a brand name, there is no Pepsi paradox.

The real lesson here has nothing to do with either wine or Pepsi. It is that what is true of beverages and brands is also true of the other ways we experience the world. Both direct, explicit aspects of life (the drink, in this case) and indirect, implicit aspects (the price or brand) conspire to create our mental experience (the taste). The key word here is “create.” Our brains are not simply recording a taste or other experience, they are *creating* it. That’s a theme we’ll come back to again and again. We’d like to think that, when we pass up one guacamole in favor of another, it is because we have made a conscious choice based on taste, caloric content, price, our mood, the principle that guacamole should not contain mayonnaise, or any of a hundred other factors under our control. We believe that when we choose a laptop or a laundry detergent, plan a vacation, pick a stock, take a job, assess a sports star, make a friend, judge a stranger, and even fall in love, we understand the principal factors that influenced us.

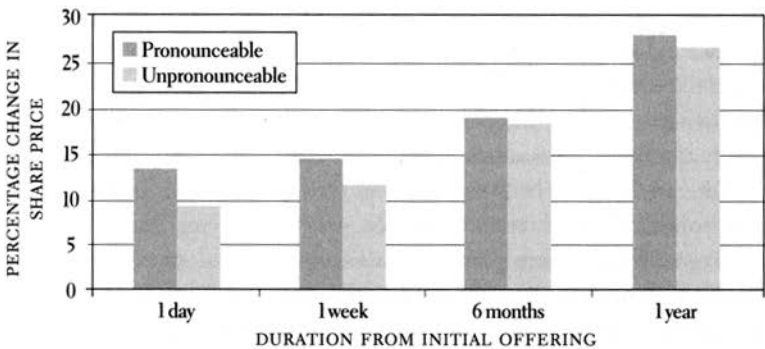
Very often nothing could be further from the truth. As a result, many of our most basic assumptions about ourselves, and society, are false.

IF THE INFLUENCE of the unconscious is so great, it shouldn't just make itself known in the isolated situations of our private lives; it ought to have a demonstrable collective effect on our society as a whole. And it does—for instance, in the financial world. Since money is very important to us, each individual should be motivated to make financial decisions based exclusively on conscious and rational deliberation. That's why the foundations of classical economic theory are built on the idea that people do just that—that they behave rationally, in accordance with the guiding principle of their self-interest. While no one has yet figured out how to devise a general economic theory that takes into account the fact that “rationally” is not how people act, plenty of economic studies have demonstrated the societal implications of our collective deviation from the cold calculations of the conscious mind.

Consider the fluency effect I mentioned earlier. If you were debating whether to invest in a stock, you'd certainly take a look at the industry, the business climate, and the financial details of a company before deciding if you should put your money behind it. Low on any rational thinker's list, we probably agree, would be the ease with which you can pronounce the company's name. If you let *that* affect your investment decision, you probably have relatives scheming to seize control of your nest egg on the grounds that you are mentally incompetent. Still, as we saw with typefaces, the ease with which a person can process information (such as the name of a stock) does exert an *unconscious* effect on people's assessment of that information. While you may find it plausible that the fluency of information might affect people's judgment of a recipe for a Japanese dish, could it really affect a decision as important as choosing an investment? Do companies with simple names do better than companies whose names are tongue twisters?

Think about a firm preparing for an initial public offering (IPO). Its leaders will make a pitch regarding the company's wonderful future prospects, and they will back up that pitch with data. But privately held companies are usually far less familiar to prospective investors than companies

that are already on the exchange, and since the newcomers have no long public track record, there is even more guessing than usual involved in this type of investment. To see whether savvy Wall Street traders making real investments are unconsciously prejudiced against companies with hard-to-pronounce names, researchers turned to data concerning actual IPOs. As the graph below indicates, they found that investors were indeed more likely to invest in the initial public offerings of companies whose name or ticker symbols were easy to pronounce than in companies with complicated names or symbols. Notice how the effect fades over time, which is to be expected, because with time firms develop both a track record and a reputation. (In case the effect also applies to books and authors, please take note of how easy it is to pronounce my name: Ma-lah-DI-nov.)



Performance of shares with pronounceable and unpronounceable ticker codes in the NYSE 1 day, 1 week, 6 months, and 1 year after entry into the market, from 1990 to 2004. A similar effect was found concerning IPOs on the American exchange.

Researchers have found other factors irrelevant to finance (but relevant to the human psyche) that affect stock performance. Take sunshine. Psychologists have long known that sunshine exerts subtly positive effects on human behavior. For example, one researcher recruited six waitresses at a restaurant in a shopping center in Chicago to keep track of their tips and the weather over thirteen randomly chosen spring days. Customers were probably unaware that the weather influenced them, but when it was

sunny outside, they were significantly more generous.²⁷ Another study produced a similar result concerning the gratuities received by a waiter delivering meals to guests' rooms in an Atlantic City casino.²⁸ Could the same effect that induces customers to give an extra buck to a waiter for bringing them curly fries also apply to sophisticated traders evaluating the future earnings prospects of General Motors? Again, the idea can be tested. Much of the trading on Wall Street is, of course, done on behalf of people who reside far from New York, and investors are located across the country, but the trading patterns of agents in New York City have a significant effect on overall New York Stock Exchange performance. For example, at least before the global financial crisis of 2007–8, much of Wall Street's activity was due to proprietary trading—that is, big firms trading for their own accounts. As a result, plenty of money was traded by people who had occasion to know whether the sun was shining in New York—because they lived there. And so a finance professor at the University of Massachusetts decided to look into the relationship between local New York City weather and daily changes in the indices of stocks traded on Wall Street.²⁹ Analyzing data from between 1927 and 1990, he found that both very sunny and totally cloudy weather influenced stock prices.

You would be right to be skeptical of this. There are inherent dangers in what is called data mining, the wholesale sifting through data in the hope of discovering previously unrecognized patterns. According to the laws of chance, if you look around enough, you are bound to find something interesting. That “something interesting” may be an artifact of randomness or a real trend, and telling the difference between the two can require considerable expertise. The fool's gold in data mining is the statistical correlation that appears surprising and profound, even though it is meaningless. In the case of the sunshine study, if the connection between stock price and weather were a coincidence, one would probably find no such correlation in the data regarding stock markets in other cities. And so another pair of researchers repeated the earlier study, looking at stock market indices in twenty-six countries from 1982 through 1997.³⁰ They confirmed the correlation. According to their statistics, if a year had included only perfectly sunny days, the market return of the New York Stock Exchange would have averaged 24.8 percent, while if a year had been made up of completely overcast days, it would have averaged only 8.7

percent. (Unfortunately, they also found that there is little or nothing to be gained from buying and selling according to this observation, because the large number of trades required to keep up with the changing weather would eat up your profits in transaction costs.)

We all make personal, financial, and business decisions, confident that we have properly weighed all the important factors and acted accordingly—and that we know how we came to those decisions. But we are aware of only our conscious influences, and so have only partial information. As a result, our view of ourselves and our motivations, and of society, is like a jigsaw puzzle with most of the pieces missing. We fill in blanks and make guesses, but the truth about us is far more complex and subtle than that which can be understood as the straightforward calculation of conscious and rational minds.

WE PERCEIVE, WE remember our experiences, we make judgments, we act—and in all of these endeavors we are influenced by factors we aren't aware of. We'll run into many more examples of this in the pages that follow, as I describe the different aspects of the unconscious brain. We'll see how our brains process information through two parallel tiers, one conscious, the other unconscious, and we'll begin to recognize the power of the unconscious. The truth is that our unconscious minds are active, purposeful, and independent. Hidden they may be, but their effects are anything but, for they play a critical role in shaping the way our conscious minds experience and respond to the world.

To begin our tour of the hidden areas of the mind, let's consider the way we receive sensory input, the conscious and unconscious pathways through which we absorb information about the physical world.