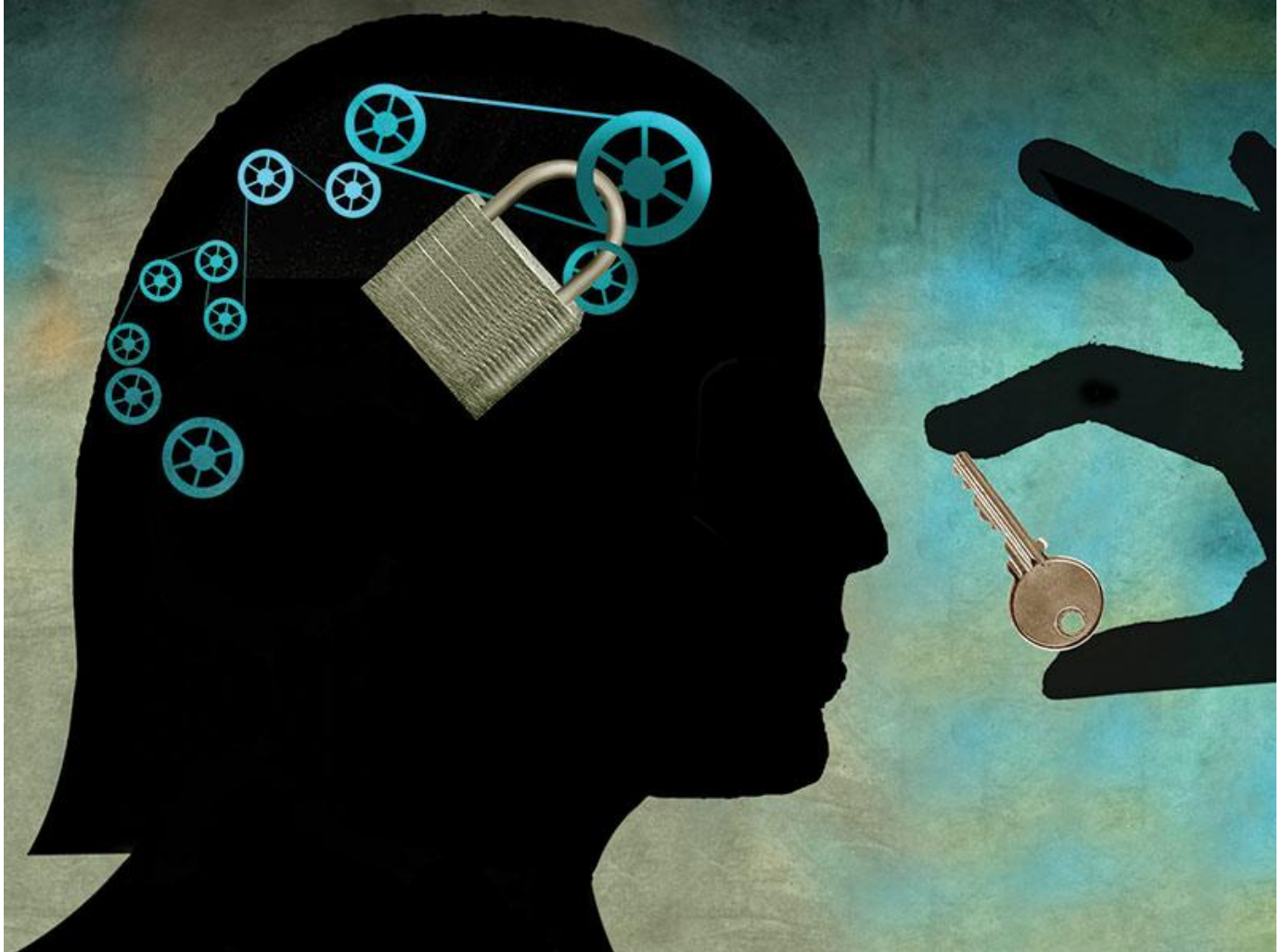


Raising consciousness

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Part of the intrigue of consciousness is that it may ultimately be an unsolvable mystery because we're not finished evolving as humans. (Illustration by Michael Morgenstern)

Underneath your mental state, your mood, your biases and perceptions, your daily habits and to-do list, your cravings and aversions, there lies a fluid cognitive barrier between you and the rest of the world: consciousness.

The easiest definition of consciousness is a state of awareness of your own existence and environment. But there's a deeper, more complicated definition—at least we think there is—that explains not so much what consciousness is but why we have it

and how it exists.

Consciousness is a fairly new field of study. It can be difficult to track because it does not seem to present a clear pathway to controlled experiments that deliver concrete results. It's challenging to pinpoint subtle preferences such as why one person likes the sound of classical music and another likes jazz. What we do know about consciousness is that it creates a fascinating intersection of philosophy, psychology, neuroscience and even quantum mechanics.

THE CONSCIOUS MIND

"The human mind in general is puzzling in an evolutionary sense, why it evolved and why it's so different from animal minds," says Radu Bogdan, Tulane professor of philosophy and director of the Cognitive Studies Program. "Other species are smart for their environment, but they don't do science, math, art, religion and so forth." Bogdan has written several books on the human mind, including *Our Own Minds: Sociocultural Grounds for Self-Consciousness* (MIT Press, 2010).

"With intense debate, it is not very clear what consciousness does for us," he says.

If all that sounds like a lot to take in, maybe that's the point: It's an exciting time for consciousness research.

PHYSICAL CLUES

Brain and mind activity are closely linked. Consciousness is associated with the cerebral cortex and the underlying white matter, says Tulane professor emeritus of biomedical engineering Paul L. Nunez, who wrote *The New Science of Consciousness: Exploring the Complexity of Brain, Mind, and Self* (Prometheus Books, 2016).

Consciousness also requires the proper functioning of certain brain systems, such as the cortical-thalamic system. With electroencephalography and functional magnetic resonance imaging, some of these brain sites can be monitored, thereby providing reliable brain signatures of consciousness.

The relationship between the physical brain and consciousness are promising on more than one level.

"There's all kinds of new information showing a direct correlation between mental illnesses like schizophrenia and bipolar disorder, as well as developmental disorders

like autism. All these diseases have white matter involvement—and their understanding could benefit from further consciousness study,” says Nunez, who now runs a San Diego consulting firm that specializes in brain research.

Other brain sites associated with higher cognitive functions include the hippocampus, frontal cortex and basal ganglia.

ATTENTION AND MEMORY

Julie Markant, Tulane assistant professor of psychology and a faculty member at the Tulane Brain Institute, studies attention and memory, two critical markers of consciousness. Her research concentrates on infants.

Because humans rarely form memories before age 2 or 3—a concept known as infantile amnesia—scientists previously thought that babies do not have conscious awareness.

But, in fact, young brains rapidly take in and store information, learn to control their attention span, and develop ways to understand their surroundings, says Markant.

“Infants are good learners. They’re pulling in a huge amount of information from the environment,” she says. “The idea that I’m working with in my lab is that learning and memory are developing over the first two years of life not just because of the memory system developing, but also because the attention system is developing.”

The important link between attention and memory allows children to learn to filter out seemingly extraneous information and store the useful information.

UNCONSCIOUS VS. CONSCIOUS

This filtering suggests a conscious process is at work. It turns out that most of the mind functions on an unconscious level, even though the conscious and unconscious systems are in constant communication. Neurophysiological experiments have shown that the brain initiates an action—such as voluntary movement—well before the movement takes place, before even awareness of the desire to move sets in.

Think about a person who is learning to play an instrument: Her conscious mind is hard at work, memorizing what the notes look and sound like, how to hold the instrument, how to time her breaths. But after years of practice, many of these fundamentals fall into the unconscious, and the musician’s hands and breath operate almost on their own.

“We’re bombarded with all this information from the outside world; most of it goes into the unconscious and is processed in some way without our awareness. The process is like a bunch of workers in the basement of an office building [that’s the unconscious mind] who are processing all this data, and the executives at the very top [that’s the awareness of a healthy, alert person] don’t want all this data. They want simplified versions of it,” Nunez offers in a common analogy.

The unconscious mind tends to stay busy in the brain’s “back-ground.” But even as it filters out unnecessary items, it supports cognitive processes overall. “Creativity also appears to originate with unconscious mental processes; solutions to difficult problems may appear to ‘pop out of nowhere’ after an incubation period in the unconscious,” Nunez points out in his book.

That’s why you might blank on the name of your 10th-grade teacher while you’re talking about your high school days; it might suddenly come to you when you’re thinking about something else entirely.

But even if you grew up to have a terrible memory, it means little for actual consciousness. True disruptions to consciousness occur when the brain has been severely injured or is affected by illnesses such as Alzheimer’s disease. “That’s getting a lot closer to losing conscious awareness,” Markant says. “At that point you start to lose the sense of continuity in life. Memory is what provides this idea of continuity in our identity and how we move through the world.”

UNPREDICTABLE ENVIRONMENTS

Consciousness may be shaped by executive functions such as attention and memory, but outside influences have a bearing on it, too. Children who grow up in extreme isolation or neglectful or abusive situations may suffer lasting cognitive impairment. Being deprived of social interaction in the early years can actually change the development of the brain’s white matter, which aids in the transmission of brain messages.

At one time psychologists considered motor, social and cognitive development to be separate domains, says Carrie Wyland, Tulane senior professor of practice in social psychology. “In reality all of them develop together—the self and social factors go hand-in-hand.” Around age 2 or 3, children start to display social emotions like guilt and pride.

“They’re developing in part because kids are learning to communicate with language. Social relationships are key ingredients,” she says. Later they begin to understand that their own knowledge is a separate entity from the knowledge of others.

“Young children must be conscious in the sense that they must activate mental tools that suggest consciousness; children develop consciousness precisely because they live in an unpredictable environment,” Bogdan argues. At birth, “they don’t know what language they will speak, they don’t know in what culture they will grow up. All of this taxes their minds; they have to be prepared for whatever” the environment presents.

EASY AND HARD PROBLEMS

A discussion of consciousness can drift into two channels of thought: the easy and the hard problem.

What’s called the “easy problem” deals with measurable facets of cognitive science—biological processes in the brain, for example, or the neuromotor ability to react to stimuli.

But it’s the so-called “hard problem” that makes people squirm: How to characterize the subjectivity of an individual’s experience. Remember “the dress” that inspired passionate debate across the internet in 2015? In reality, the dress was blue and black. But many people saw it (and still see it) as white and gold.

Philosophers have considered the individual conscious experience for centuries. But an introspective exploration on the nature of consciousness will only get you so far, says Bogdan. That’s why in his book, on the hunt for “fresh angles” into consciousness discussion, he used human evolution and development to probe the topic.

“To me, consciousness is a distant outcome of unpredictability—meaning, not by itself, but rather being a byproduct of the mental tools that an organism needs to deal with unpredictability” in the environment over the millennia.

Likewise, Nunez appreciates the interdisciplinary nature of consciousness, so he looks to philosophy for clues. “Your enemy is your best teacher,” he says, quoting Buddhist thinking. “I tried to concentrate on the works of philosophers that I disagreed with.”

Some scientists have rejected consciousness study outright: One argument is that there is no mystery to consciousness—the brain creates the mind, end of story. Another argument against its exploration suggests that to do so invites scientifically unprovable concepts such as higher powers, miracles and intelligent design.

Nonetheless, chipping away at the “easy problem” will lead us to a greater understanding of the hard problem, Nunez says, even if it involves philosophy or concepts that may appear a bit mystical, given the limits of our current understanding.

FUTURE OF THE FIELD

Some scholars have wondered whether even the most modern scientific techniques are capable of unlocking all of the brain’s secrets.

Nunez thinks the appetite for consciousness research is substantial. The science of consciousness can be expected to advance in a series of small steps.

“It’s perhaps the most important area of philosophical and neuro-scientific investigation—where the two meet,” adds Bogdan. The next generation of consciousness scholars may be found in Tulane’s Cognitive Studies Program, where students pursue a coordinate major while they study the mind, cognition and language from a multi-dimensional perspective. (Bogdan runs a similar summer program called Open Mind at the University of Bucharest in Romania.)

Then again, part of the intrigue of consciousness is that it may ultimately be an unsolvable mystery because we’re not finished evolving as humans. By the time we’ve got consciousness figured out, Mother Nature may have changed the code again.

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Paul L. Nunez, ‘The New Science of Consciousness’