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Three Myths About the Brain

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Gray Matter

By GREGORY HICKOK

IN the early 19th century, a French neurophysiologist named Pierre Flourens conducted a series of innovative experiments. He successively removed larger and larger portions of brain tissue from a range of animals, including pigeons, chickens and frogs, and observed how their behavior was affected.

His findings were clear and reasonably consistent. “One can remove,” he wrote in 1824, “from the front, or the back, or the top or the side, a certain portion of the cerebral lobes, without destroying their function.” For mental faculties to work properly, it seemed, just a “small part of the lobe” sufficed.

Thus the foundation was laid for a popular myth: that we use only a small portion — 10 percent is the figure most often cited — of our brain. An early incarnation of the idea can be found in the work of another 19th-century scientist, Charles-Édouard Brown-Séquard, who in 1876 wrote of the powers of the human brain that “very few people develop very much, and perhaps nobody quite fully.”

But Flourens was wrong, in part because his methods for assessing mental capacity were crude and his animal subjects were poor models for human brain function. Today the neuroscience community uniformly

rejects the notion, as it has for decades, that our brain's potential is largely untapped.

The myth persists, however. The newly released movie "Lucy," about a woman who acquires superhuman abilities by tapping the full potential of her brain, is only the latest and most prominent expression of this idea.

Myths about the brain typically arise in this fashion: An intriguing experimental result generates a plausible if speculative interpretation (a small part of the lobe seems sufficient) that is later overextended or distorted (we use only 10 percent of our brain). The caricature ultimately infiltrates pop culture and takes on a life of its own, quite independent from the facts that spawned it.

Another such myth is the idea that the left and right hemispheres of the brain are fundamentally different. The "left brain" is supposedly logical and detail-oriented, whereas the "right brain" is the seat of passion and creativity. This caricature developed initially out of the observation, dating from the 1860s, that damage to the left hemisphere of the brain can have drastically different effects on language and motor control than does damage to the right hemisphere.

But while these and other, more subtle, asymmetries certainly exist, far too much has been made of the idea of distinct left- and right-brain function. The fact is that the two sides of the brain are more similar to each other than they are different, and both sides participate in most tasks, especially complex ones like acts of creativity and feats of logic.

In recent years, a new myth about the brain has started to emerge. This is the myth of mirror neurons, or the idea that a certain class of brain cells discovered in the macaque monkey is the key to understanding the human mind.

Mirror neurons are activated both when a macaque monkey generates its own actions, such as reaching for a piece of fruit, and when it observes others who are performing the same action themselves. Some scientists have argued that these cells are responsible for the ability of monkeys to understand other monkeys' actions, by simulating the action in their own

brains. It has also been claimed that humans have their own mirror system (most likely true), which not only allows us to understand actions but also underlies a wide range of our mental skills — language, imitation, empathy — as well as disorders, such as autism, in which the system is said to be dysfunctional.

The mirror neuron claim has escaped the lab and is starting to find its way into popular culture. You might hear it said, for example, that watching a World Cup match is an intense experience because our mirror neurons allow us to experience the game as if we were on the field itself, simulating every kick and pass.

But as with older myths, this speculation has lost its connection with the data. We now recognize that physical movements themselves don't uniquely determine our understanding of them. After all, we can understand actions that we can't ourselves perform (flying, slithering) and a single movement can be understood in many ways (tipping a carafe can be pouring or filling or emptying). Further research shows that dysfunction of the motor system, for example in cerebral palsy, stroke or Lou Gehrig's disease, does not preclude the ability to understand actions (or enjoy World Cup matches). Accordingly, more recently developed theories of mirror neuron function emphasize their role in motor control instead of understanding actions.

So please, take heed. An ounce of myth prevention now may save a pound of neuroscientific nonsense later.

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