What are ideas?

—Celine Joiris, via e-mail

Psychologist Richard J. Haier of the University of California, Irvine, School of Medicine replies:

WHEN AN IDEA pops into your head, it is unlikely the result of a single event—like the click of the proverbial lightbulb—in your brain. Studies have shown that no solitary brain area is an exclusive thinking center where ideas emerge. A musical inspiration may start in a different part of the brain than a mathematical concept or a notion about what to eat for dinner. Every idea, like thinking in general, probably arises from a cascade of neural events, which we should be able to discern by scientific means.

In some ways, it is the holy grail of cognitive brain research to detect an isolated thought or idea, so that by knowing only the physical data, such as which neurons fire and when, we could infer exactly what is in a person’s mind. Such mind reading is theoretically possible but a daunting challenge.

Nevertheless, neuroimaging has already had some limited success. For example, by analyzing activity in the brain while a person watches a video, it is possible to get a general sense of the content of the video. Though impressive, this feat is a long way from distinguishing the signature of a specific spontaneous thought or insight from the constant cacophony of billions of neurons firing on and off, randomly and in dynamic patterns. How many neurons must fire for an idea to emerge? Where are these neurons located? Does one person require more neurons than another to form an idea? Why do some people have more or better ideas than others?

Imagine knowing the answers to even some of these questions—we might unlock the mysteries of creativity and intelligence. My colleagues and I are currently trying to identify brain areas where structure and function correlate with intelligence. In the near future, this research will evolve into experimental studies in which specific brain regions, networks and neurotransmitter systems will be manipulated by chemical, electrical or magnetic means. These experiments will aim at facilitating learning and memory, enhancing creativity and increasing intelligence. This possibility of cognitive manipulation is why there is growing interest and enthusiasm—and some concern—regarding these ideas about the nature of ideas.

How does being confident in your knowledge affect the way you apply that knowledge?

—Paul Stranahan, via e-mail

Susana Martinez-Conde, a neuroscientist at the Barrow Neurological Institute in Phoenix, explains:...