Collisions of Creativity

The capacity to generate original ideas is, arguably, the most important cognitive trait that human beings possess. No wonder more neuroscientists and psychologists are working to understand it better.

BY SHARON BEGLEY

Even Sigmund Freud, the modern world’s best-known investigator of the mind, admitted he was befuddled by human creativity. His colleagues and those who followed in his footsteps agreed that creativity was something mysterious and out of reach.

But today’s scientists are not giving up so easily.

Neuroscientists, psychologists, and others are probing as never before the mechanisms that underlie those “eureka!” moments of creativity. These range from the most momentous, like the moment when some unknown Paleolithic genius discovered how to light a fire, to the most routine, such as when your third-grader announces he needs a dinosaur costume for school tomorrow and you come up with a bedsheets-and-hanger T. rex.

Early research on the neural basis of creativity focused on what scientists call “small-c creativity,” the kind that allows you to crush that dinosaur assignment. To probe small-c creativity, researchers monitor people’s brains when, for instance, they search for a word that goes with sauce, pine, and crab. (That would be “apple,” by the way.) But that kind of creativity isn’t necessarily predictive of “big C creativity,” the kind that brings forth math proofs and maps of Middle Earth. Big C had long been out of reach, scientifically: it’s one thing to put someone in a brain-imaging device and ask her to come up with 20 uses for a brick; it’s quite another to ask her to toss off a Keats-quality sonnet. But with the growing recognition that the capacity to generate novel and original ideas “is
perhaps the most important cognitive trait that human beings possess,” as neuroscientist Nancy Andreasen of the University of Iowa has put it, research into big-C creativity has taken off.

This work has already refuted two popular misconceptions about creativity. First, the idea that the right brain innovates and the left brain calculates has been abandoned. We now know that the right and left hemispheres are equally involved in most creative tasks. Second, there is no special creativity hot spot in the brain— the same areas that are active in everyday thinking, planning, and understanding also pitch in to come up with original insights.

And *insight* is the right word when it comes to creativity. Through case studies of dozens of writers, Andreasen has shown that exceptionally creative people work their magic through flashes of insight, not analytic thinking. She has also found that creativity rises as intelligence heads into above-average levels, although it seems to peak at an IQ of around 120. Above-average intelligence results in great creativity because the raw materials of creativity are disparate facts and thoughts, which the brain assembles into novel combinations. The more mental building blocks a brain can contain and assemble, the greater the chance of a novel combination—much as having lots of different Lego pieces, not just four-dot bricks, gives you a better shot at creating castles and pirates and ferris wheels.

Intelligence also enables you to tell the difference between an idea for, say, mustard-stuffed cupcakes and one for uniform potato chips sold in a can. The first is just gross; the second launched a zillion Pringles. Chemist Linus Pauling, who won two Nobel prizes, celebrated the intellect’s capacity to handle a blizzard of ideas and yet pick out the good ones. “You aren’t going to have good ideas,” he said, “unless you have lots of ideas and some sort of principle of selection.” The mathematician Henri Poincaré believed that the mass of ideas that springs from the creative mind “collide until pairs interlocked, so to speak, making a stable combination.”
Crucially, although intelligence is necessary for creativity, it is not sufficient. In fact, when the scientific study of creativity got going in the 1950s and 1960s, the key question was whether creativity was essentially the same as intelligence. The demonstration that the two are different mental and neurological processes—and therefore that nurturing intelligence would not inevitably encourage creativity—established the study of creativity as a distinct scientific field. Creativity, according to Mark Runco, professor of creativity studies at the University of Georgia and founder of the Creativity Research Journal, is “not dependent on traditional intelligence.”

That became evident in Andreasen’s finding that by IQs of 140 or so, creativity tails off. Why? Perhaps creativity is handcuffed by the analytical ability that tends to accompany high IQs. Or perhaps people who ace IQ tests come up short on a process that Andreasen has identified as key to creativity: an unconscious, almost dreamlike, resting mental state. This state is officially called the “default mode.”

When the brain is in default mode, not processing anything in particular, its association cortices—located along the surface of the cerebrum—step up their game. These regions bring together seemingly unrelated memories, facts, thoughts, images, and other mental flotsam into something original, or at least unusual. Asked to come up with a word that goes with mother, most of us will settle for father, while particularly creative people are more likely to say something like earth. When Andreasen gave creative artists and scientists this word task, the association cortices were intensively activated in both the scientists and artists, suggesting to her that the neural mechanisms of creativity are the same across disciplines.

How do the raw materials of a creative leap wind up in the association cortexes? Creative people, finds psychologist Shelley Carson of Harvard University, have leaky “mental filters.” These built-in censors screen thoughts, images, memories, and perceptions, allowing only some into conscious awareness. That keeps us focused—but it also keeps “burrs” and “zipper” far apart, at least in most brains. In Georges de
Mestral’s mind, however, the filter didn’t keep thoughts that “don’t belong together” from mingling in the association cortex. The Swiss engineer did put burrs and zippers together. Result: Velcro.

To study the filtering mechanism—called latent inhibition—Carson had volunteers listen to strings of nonsense syllables while background noise blared and lights flashed. Those who noticed the most background noise and lights (evidence of low latent inhibition) had achieved musical or artistic success at a young age, an indication of creative power. Their brains, Carson concluded, were very forgiving. They allowed unrelated “bits and pieces in the cognitive workspace” to come together, yielding connections and associations that might, in less creative brains, be stillborn. Low latent inhibition, then, allows a brain to access and combine mental elements from disparate domains, in other words to be open to new ideas—the essence of creativity.

Short of a personality or brain transplant, you can maximize your inherent creativity by sheer perseverance. “Original ideas tend to be remote,” Runco argues, which means that the first 10 uses of string you think of will likely be commonplace, but if you push yourself, the next 10 will include some quite creative ones. If original ideas come late in the creative process, he points out, we should give ourselves time and space to come up with those “remote” ideas—time for our leaky filters to allow notions that have never made each other’s acquaintance to come together and undergo a kind of alchemy.

Easing off on the latent inhibition and allowing thoughts to leak out of their tight containers and collide in interesting ways is what seems to form novel ideas. It’s probably what allowed Seurat to combine painting and atomic theory to arrive at Pointillism, Einstein to merge flying and keeping pace with a beam of light to end up with the theory of relativity, and Mark Zuckerberg and friends to put together school yearbook and internet to give us Facebook. It’s astounding what a leaky brain can get us into.