Your brain has an estimated 85 billion neurons\(^*\) (nerve cells) that send signals with speeds of up to 270 miles per hour. Through neurons, your brain controls every move you make and every thought you think.

We know this, and much more, from advancements in neuroscience—the study of the nervous system, including the brain. Neuroscientists use brain-imaging tools—MRI, fMRI, and PET—to study the brain’s structures and functions.

With these technologies, neuroscientists have mapped out which brain regions control different bodily functions. They’ve identified the brain areas that control critical thinking, movement, and breathing, as well as feelings like pleasure, sadness, and fear. They’ve also learned what happens to the brain as we age, as well as the effects of injury and of using drugs.

But there is still a lot to figure out. Read on to learn how these technologies work and how they are helping to teach us about ourselves, now and in the future.

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\*The prefix neuro- signals a word related to the brain, nerves, or the nervous system—such as neuron (a nerve cell).
SOMETHING WE’VE LEARNED

**Dopamine is the brain chemical that helps us feel pleasure.** By following radiotracers for dopamine receptors, PET scans have shown that using drugs heavily reduces the number of these receptors. Fewer receptors indicates less dopamine activity in the brain. This finding helps explain why people addicted to drugs experience less pleasure from everyday activities. They begin to crave the drug to get their dopamine activity back up to normal.

**WHAT IT SHOWS**

Areas of the brain that are active during a task.

**HOW IT WORKS**

A person lies in an MRI machine while doing an activity such as looking at an image, hearing a sound, laughing at something funny, or completing a puzzle. The areas of the brain that are active during the behavior have increases in blood flow and blood oxygen levels. A computer analyzes these changes to map brain function.

**SOMETHING WE’VE LEARNED**

In studies where adolescents played a game to earn rewards, their brain scans showed higher activity in the area of the brain that processes motivation and pleasure (the nucleus accumbens2) compared with the area of the brain that guides thoughtful decision making (the prefrontal cortex). Scientists think this imbalance in activated brain regions may lead teens to focus more on the possible rewards of a decision than on any drawbacks. This could increase a person’s risk for using drugs.

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2 The nucleus accumbens is a brain structure located at the base of the frontal lobe deep inside the brain. It does not appear on the MRI scan shown on this page.