

Lesson 3 Brain Insights

Main Reading

Amazing Brain!

You carry around a three-pound mass of wrinkly material in your head that controls every single thing you do.

From enabling you to think, learn, create, and feel emotions to controlling every blink, breath, and heartbeat — this fantastic control center is your brain. Let's explore the reason why our amazing brain is often called "the most complex thing we have yet discovered in our universe."

Q What happens in our brain when we read?

A Let's first start with "letters." When you pick up a book and start to read, your brain recognizes a pattern as "writing" and sends signals to a special word-decoding area. This word-reading area has special skills. It has learned to recognize "a" as the same letter no matter how it is written or what size it is. It also knows that "p" and "q" are different letters, even though they are basically the same shape.

And then we have "words." When a neuron fires, it sends a signal to the other neurons it is connected to. For words you have seen before and recognize easily, the shape of the words triggers the memory of their meaning and how they sound. It also triggers other memories connected to the word.

When you see the word "cake," you remember that it is sweet and delicious and also recall times you have eaten cake, who you ate it with, how it tasted and smelled, what your favorite kind was, and maybe how you made it.

Finally, the brain puts together the meanings of words based on where they are in the sentence to get a bigger idea. This idea goes back into your working memory as you assemble more sentences and ideas, which connect up into a paragraph, and finally into a story!

Q What memories are kept and why do we forget things?

A When neurons fire together — for example, when you see a dog and hear the word “dog” at the same time — they get tuned to each other. When that happens a lot, we say they make a trail — or memory. A part of your brain decides what memories to keep and for how long. It strengthens memories of things that make you happy or sad or nervous. Memories are stored all over your brain. Facts you only need to remember for a short time — like where you put your hat — are kept for a bit, then forgotten. But long-term memory trails can stay for months, years, or even your entire life!

When you forget something, the connections between the brain up that memory get weaker and disappear. Information is simply lost from memory, other cases, it was never stored correctly in place. Some memories compete with one another, making it difficult to remember certain information. In other instances, people actively try to forget things that they simply don't want to remember.

Q Does my brain shut off when I sleep?

A Your brain does not turn off when you are asleep — in fact, your sleeping brain is very active. During the night, you go through different stages of sleep, from very light to very deep. But your brain cells are still sending messages to each other the entire time. Some of that signaling makes dreams. During very deep sleep, your brain moves important information from short-term to long-term memory. So, sleep is highly critical, given that it's when your brain forms memories, carries out cleaning processes, and resets itself.

Q Where does fear come from and what makes my body react in such ways when I am afraid?

A Fear is an emotion made by a particular part of the brain. This part constantly scans information from your senses — the things you see, hear, and feel. When your brain recognizes a similar situation to one stored as a memory, however trivial it is, it brings up those same feelings that are attached to the memory. It stores memories of danger and whether what you did (like running away) helped or made things worse. These memories help the brain make very fast decisions about how to respond to threats.

Q How fast does information travel between neurons and the brain?

A It travels at a speed of around 240 kilometers per hour. So, if a bee lands on your bare foot, the sensory neurons in your skin send this information to your brain at that speed. Your brain then uses motor neurons to transmit the message quick enough for you to shake the bee off.

Q Is that true that neurons generate electricity?

A Absolutely. Your brain generates enough electricity to power a light bulb. Whenever you dream, laugh, think, see, or move, it's because tiny chemical and electrical signals are racing between the neurons along billions of tiny neuron highways. Believe it or not, the activity in your brain never stops. Countless messages race around inside it every second. Your neurons create and send more messages than all the phones in the entire world. And while a single neuron generates only a tiny amount of electricity, all your neurons together can generate enough electricity to power a low-wattage bulb.

Extended Reading

Exploring Workings of Artists' Brains

What does it mean to have an "artistic point of view"? It means that artists view the world differently, focusing on the whole visual field rather than individual objects. This allows them to see shadows and contours that non-artists would miss. According to various research studies, the difference lies in the structure and functioning of the brain between artists and non-artists. A study looked at differences in the brains of 44 art and non-art students who were asked to complete various drawing tasks. Brain scans of these students were obtained and analyzed. The results showed that brain areas involved in drawing are more enhanced in artists than in non-artists.

In another study, scientists tried to see how artists and non-artists differed in their gaze. The results showed that artists tended to focus on shadows, contours, edges, and other surface features of objects. In particular, when simply observing images, artists' eyes tended to scan the whole picture, including apparently empty expanses of ocean or sky, while non-artists focused on objects, especially people. Non-artists spent about 40 percent of the time looking at objects, while artists focused on them only 20 percent of the time. The results suggested that non-artists were busy converting pictures into concepts, while artists were busy looking at contours and shadows.

Essentially, all this research tells us that having an "artistic point of view" is not a myth after all!

Critical Thinking

Don't Believe Everything You Remember

A false memory refers to a case in which a person remembers an event differently from the way it happened or, in the most dramatic case, remembers an event that never happened at all.

False memories aren't rare; everyone has them. They range from small and trivial, like where you swear you put your keys last night, to significant, like how an accident happened or what you saw during a crime.

False memories are created in several ways. You may create new false memories by the questions you are asked. For example, let's say that you witnessed someone stealing money from the bank, and the police asked you if the bank robber was wearing a red mask. You say yes, then quickly correct yourself to say it was black. In actuality, the robber wasn't wearing a mask, but the suggestion planted a memory that wasn't real. Additionally, emotions can create false memories. Emotions, especially negative emotions like fear or anxiety, can distort memories, and make it difficult to accurately recall past events. For instance, when you've argued with someone and need to recall that argument later, you are most likely to remember parts of the argument that made you angry, and you may even make up memories that did not actually happen. So, can you trust your own memories?