33 things your brain doesn't know about itself

RUSSELL MCLENDON

October 6, 2015, 11:15 a.m.

Illustrations: Russell McLendon/MNN

You are a highly intelligent ape reading an Internet article about your brain. You probably used your fingers to find this page, and are now using your eyes to absorb data encoded in light — including this text as well as the crude illustrations below.

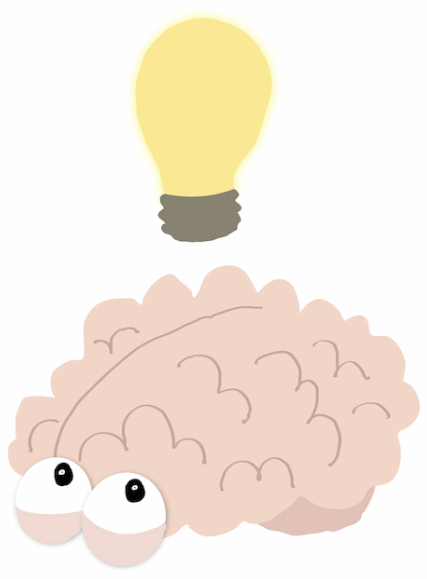
But is that ape really "you"? Are you your entire body, as people tend to see themselves, or are you just a brain piloting a mindless, ape-shaped vessel?

Eyes alone don't know what they're looking at, for example, and your fingers likely wouldn't have brought you here on their own. Senses and dexterity aren't much use without a supervisor to analyze

input, make decisions and give orders. A brain obviously needs the rest of its body to survive, so of course you're more than one organ. But that wrinkly blob is still your personal CEO, not to mention head of IT, accounting, creative services and more. (Your brain wears a lot of hats.)

With that in mind, here are a few random facts and interesting oddities you may not know about your central nervous system. The human brain is still shrouded in mystery, but thanks to recent advances in cognitive research, we're now in a golden age of neurological enlightenment. As you'll see below, your brain is an awe-inspiring marvel of biology — just don't let it go to your head.

***



1. Your brain uses roughly **20 watts of energy,** about the same amount needed to power a light bulb. Yet that was more than enough energy for human brains to invent light bulbs, among other things.

2. Your brain is about **75 percent water**.

3. Signals can move through your brain at up to **268 miles per hour** (431 kph). That rivals wind gusts in an EF-5 tornado, or the regular service speed of the Transrapid maglev train in Shanghai. No wonder it's so easy to lose a train of thought.

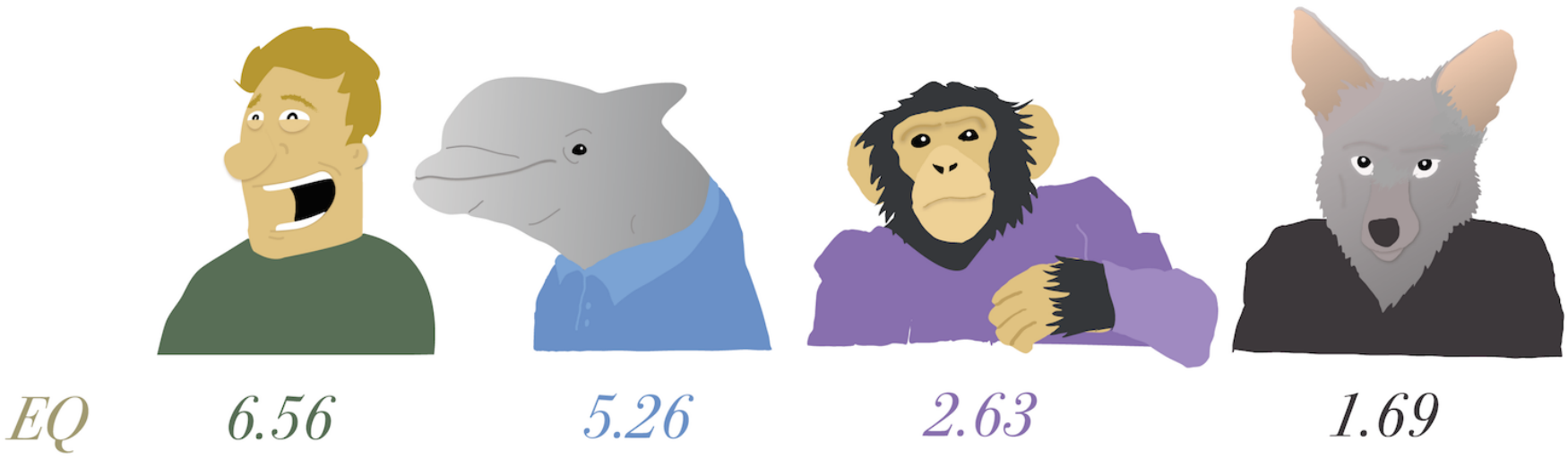
4. Like trains, brain signals travel on tracks. Neurons receive data via short, branched pathways called **dendrites**. Outgoing signals use long, threadlike **axons,** some of which are **several feet in length**.

5. Your brain probably weighs **about 3 pounds.** That's a lot, but don't get a big head about it: An elephant brain can top 10 pounds, and a sperm whale boasts the largest and heaviest brain of any animal on Earth, often exceeding 17 pounds.

6. A human brain accounts for about **2 percent** of a person's body weight, while elephants' and sperm whales' brains are just **0.2 percent** of their massive bodies. So, pound for pound, we're brainier.

7. But here's a head-scratcher: A mouse's brain-to-body weight ratio is **2 percent**, nearly identical to that of humans. Some birds' ratio is **8 percent**, and ants can be up to **15 percent** brain by weight. (I, for one, welcome our new insect overlords.)

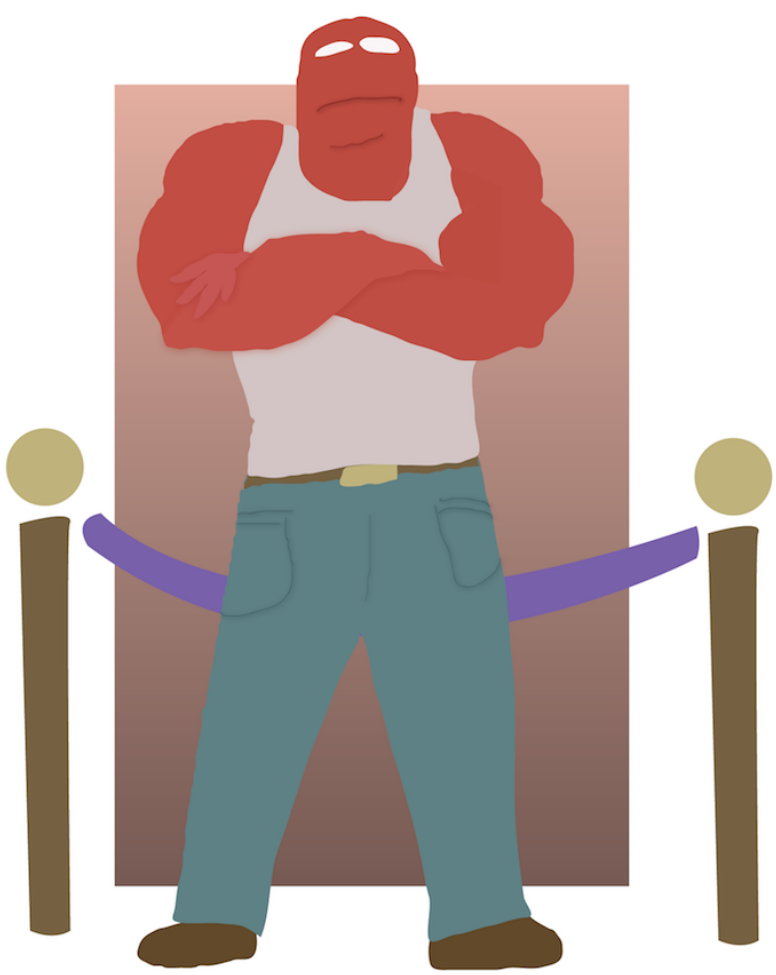
8. Instead of just comparing brains to bodies, scientists can also use the **encephalization quotient** (EQ) to compare an animal's brain mass with the typical brain mass of related species. **Humans' EQ of 6.56** is the highest known, followed by several dolphins: the right-whale dolphin (5.55), bottlenose dolphin (5.26) and Commerson's dolphin (4.97). Other high-EQ animals include macaques (3.15), chimpanzees (2.63), gorillas (1.75) and coyotes (1.69).



9. Our big brains don't come cheap. While they account for just 2 percent of our body weight, they use about **20 percent of the oxygen** in our entire bloodstream.

10. Up to **1 liter of blood** flows through an adult human brain every minute.

11. And that's not just any blood. Access to our brains is restricted by a bouncer, the **blood-brain barrier** (BBB), whose job is to protect the brain from toxins and frequent chemical fluctuations in the rest of our bloodstream.



12. BBB can't keep out all the riffraff, though. **Ethanol,** the key ingredient in alcoholic drinks, waltzes past thanks to its small size and lipid solubility.

13. Despite a common myth, moderate alcohol consumption **doesn't kill brain cells**. Instead, it's associated with damage to dendrites in the cerebellum, a brain region that's important for balance, motor control and certain cognitive functions like language. It may also speed up the normal brain shrinkage that occurs as we age.

14. In some cases, light drinking could be good for your brain. A daily glass of wine seems to **lower stroke risk,** and a compound in beer hops known as **xanthohumol** can protect mouse brains from cell damage. A 2015 study called it "a potential candidate for the prevention of neurodegenerative disorders." (Of course, chronic alcohol abuse and binge drinking are a different story.)

15. Exposure to cosmic rays seems to harm dendrites in mice, according to a 2015 study, raising concerns about sending humans into deep space. Astronauts on the International Space Station are still shielded from cosmic rays by Earth's magnetosphere, but this may complicate future missions to Mars or beyond.

16. Your brain holds about **86 billion neurons.** The Milky Way, by comparison, has anywhere from 200 billion to 400 billion stars. That means your head contains roughly one neuron for every three stars in our galaxy — and if neurons were stars, our species could collectively fill more than 1 billion Milky Ways.

17. We didn't start the fire. Learning to control fire was a big step in human evolution, but *Homo sapiens* weren't the first to do it. The oldest-known campfires come from the heyday of *Homo erectus*, an earlier human species whose average brain volume was about **1,000 cubic centimeters** — smaller than ours by several hundred cc.

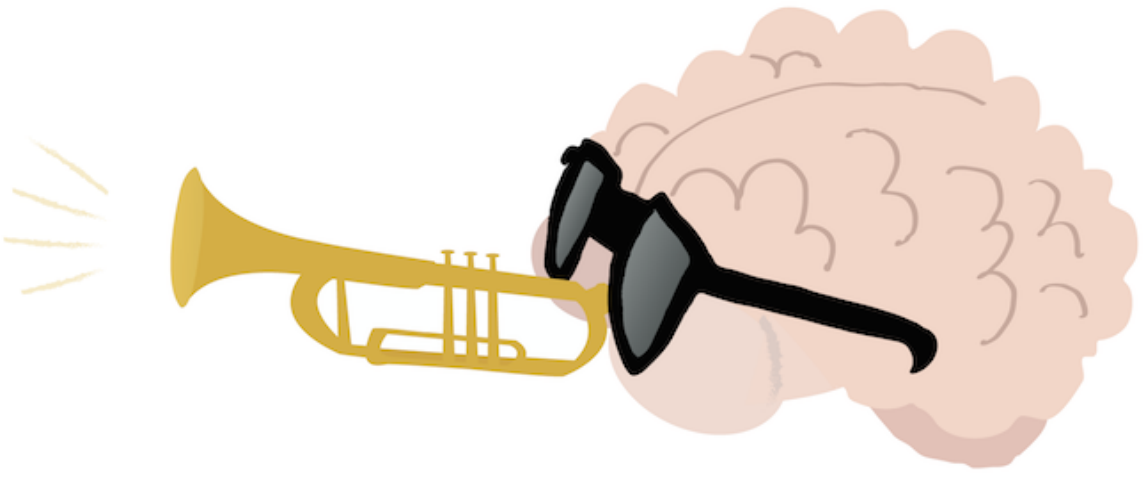
18. Our brains are **shrinking**. Over the past 10,000 to 20,000 years, the average volume of a human brain has gone

from 1,500 to 1,350 cc, shrinking by about the **size of a tennis ball**. This is partly because our bodies have shrunk over time, and smaller brains may be more efficient at some tasks. It could also be our lifestyles, since domesticated animals typically have smaller brains than their wild relatives. But this doesn't necessarily mean we're getting dumber; civilization might simply help us accomplish bigger feats with slightly smaller heads.

19. The membrane surface of all the neurons in your brain is about **21,500 square meters**, enough to cover **three soccer fields**.

20. Brains need brawn. Physical activity modulates neurotransmitters like serotonin and dopamine, one of many reasons why exercise can make you happier. It can also raise levels of brain-derived neurotrophic factor (BDNF), a protein that promotes neuron growth and survival, thus buffering against diseases like Alzheimer's and Parkinson's. Regular aerobic exercise has even been shown to enlarge the **hippocampus**, a brain region involved with emotion, learning and memory.

21. People who **make music** tend to have better communication between left and right brain hemispheres, stronger speech processing, better motor skills and better verbal memory, among other perks. A 2014 study found that kids ages 6 to 18 who play an instrument have a thicker cortex in areas that regulate emotions, anxiety and the capacity to pay attention. Another study found that people ages 60 to 83 who studied music for at least 10 years remember more sensory data than those who studied for one to nine years. Both groups scored higher than non-musicians.



22. Your **spinal cord** only weighs about 1.2 ounces (35 grams), but it contains an estimated **1 billion neurons**. While the signals that trigger voluntary movements begin in your brain's motor cortex, the circuits for involuntary reflexes are often located in the spinal cord, thus bypassing your brain.

23. You also have a **"second brain"** in your gut, formally known as the enteric nervous system, that holds surprisingly large numbers of neurons. Ranging from the esophagus to the intestines, its

neuron population can reach **up to 600 million**.

24. Whether you feel hungry, thirsty or happy, that's your **hypothalamus** pulling strings. The tiny brain region has a gigantic job, monitoring your body's various needs like a thermostat and using hormones to trigger responses. About the size of an almond, it regulates an array of things like hunger, thirst and mood.

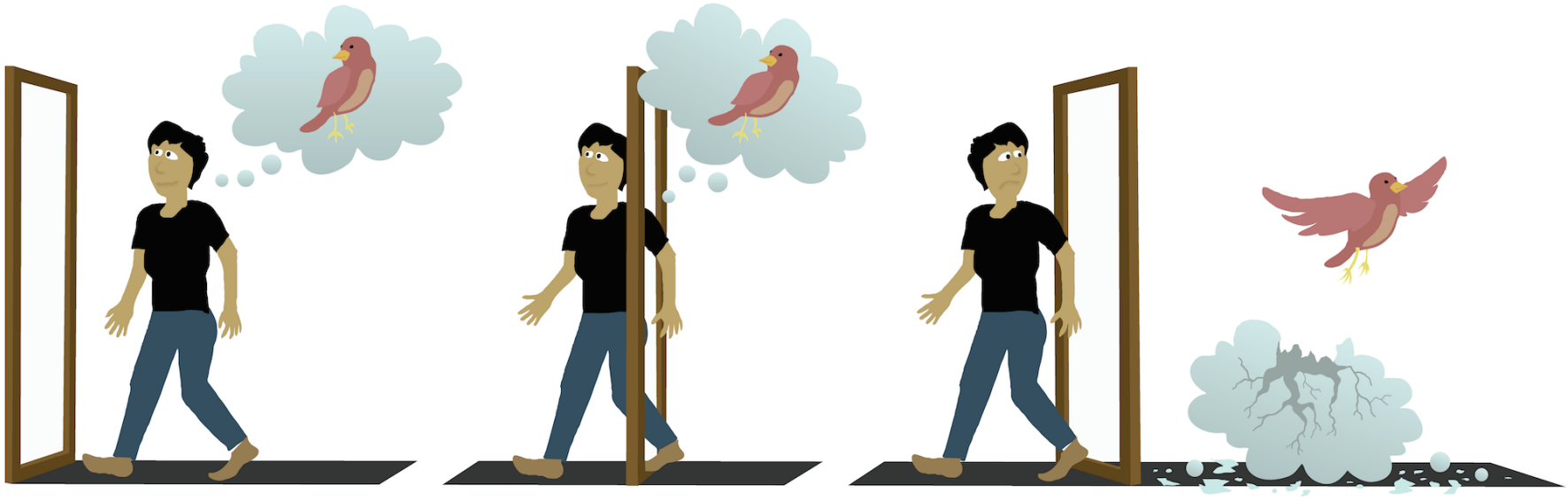
25. We spend about **one-third of our lives asleep**. That may seem like a lot, but humans are party animals compared to some mammals. While we need about eight hours of sleep daily, **bats** get up to 20 hours, armadillos get 18, chipmunks get 15, and cats and dogs get 10 to 14. We do outsleep grazers like deer and horses, though, which often sleep just a few hours a day. Adult **giraffes** may only get 30 minutes.

26. Most people over the age of 10 dream for at least four to six hours per night in REM sleep, which adds up to about **11 weeks of dreaming per year**. Research shows we can also dream during non-REM sleep in the hour or two before waking up.

27. It's estimated that we **forget 95 to 99 percent of our dreams**, although some people remember more than others.

28. Yuo cna porbalby raed tihs, **desptie teh msispeillgns**. Taht's becusae uor brians ecxel at uisng cnotxet to mkae perditcions abuot waht shulod cmoe nxet — wehther ti's a suond, a wrod or a lteter.

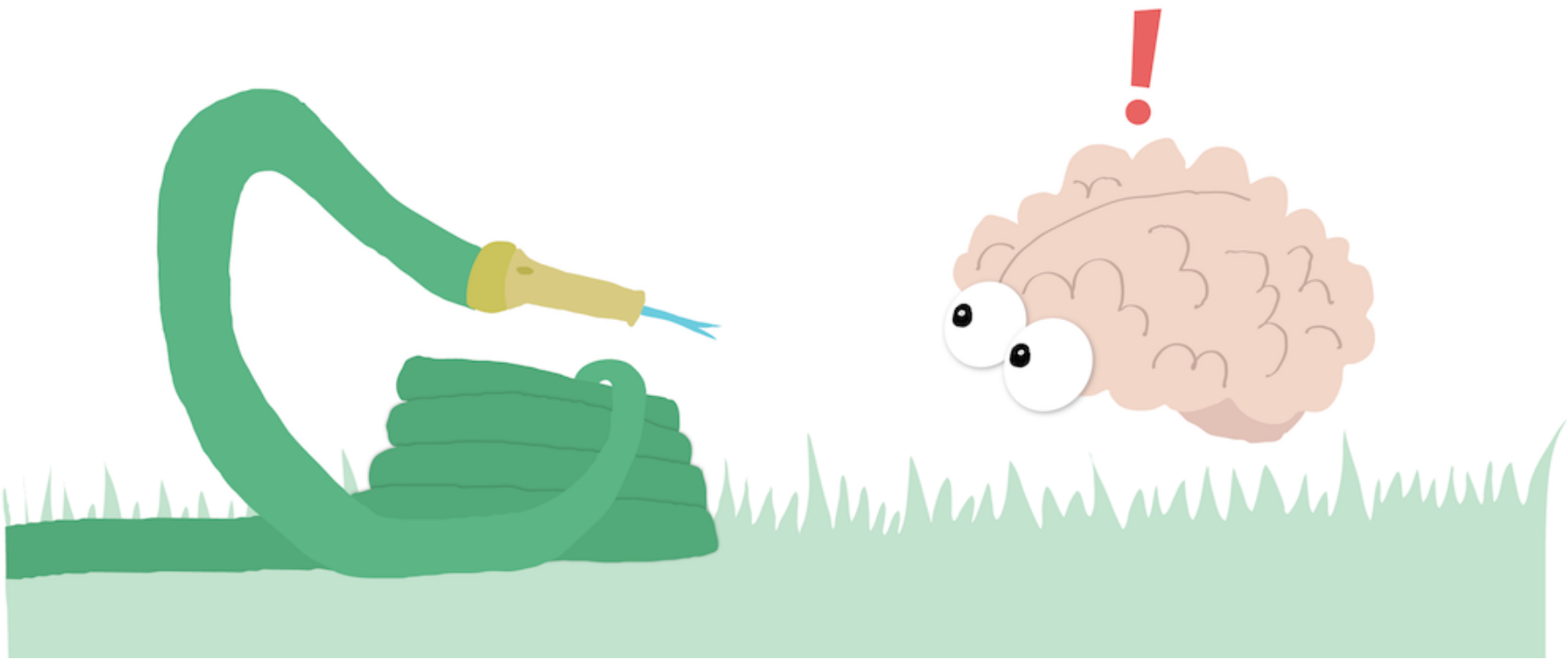
29. Have you ever **walked into a room and immediately forgotten why**? According to a 2011 study, that might be a byproduct of your brain's efforts to link memories with related locations. "Entering or exiting through a doorway serves as an 'event boundary' in the mind, which separates episodes of activity and files them away," explains study author Gabriel Radvansky. "Recalling the decision or activity that was made in a different room is difficult because it has been compartmentalized."



30. Our brains keep track of where we are with specialized neurons known as **place cells**, which correspond to various real-world locations. These cells fire when we're actually in a place and when we're thinking (or dreaming) about it, and they work together to help us build mental maps of our environment.

31. If you can remember that your hippocampus deals with **declarative memory** — the long-term retention of facts and events — then don't forget to thank your hippocampus. Then again, it may already know how you feel. A 2009 study found that **feelings of gratitude** are associated with increased activity in the hypothalamus, a brain region that — like the nearby hippocampus — is part of the limbic system.

32. The **amygdala** is a small brain structure linked to fear response. Data from the outside world reach your amygdala in two ways: a fast, direct route and a longer, slower route that includes the cortex. Since the short route skips the cortex, it helps us prepare for **potential danger** before we even know what we're seeing. When your eyes detect a long, coiled shape on the ground, your amygdala may warn **"snake!"** — triggering your fight-or-flight response — before your visual cortex realizes it's just a garden hose. Still, it's better than the other way around.



33. Raise your hand if you believe in **free will**. Voluntary movements like that may be conscious "decisions," but they're predicted by **unconscious brain activity** moments before they enter our awareness. This was discovered in the 1960s by German scientists, who named it *bereitschaftspotential* ("readiness potential," or RP), and their initial EEG scans have since been supported by modern tools like fMRIs. A 1985 study found RP began about 0.35 seconds before a person reported making a decision, and recent research suggests it can occur up to 10 seconds beforehand.

That doesn't necessarily mean we don't have free will, but it does illustrate how much of our brainpower stays behind the scenes. Just before you decided to click on this article, for example, your brain may have known where it was taking you. And it may already know where you're going next ... like one of the related links below.

Replenish: It’s About Balancing the Water We Use

Unleashing the Economic Potential of US Women Entrepreneurs

Volunteering for Special Olympics Refreshes Coca-Cola Ambassador’s Perspective on Life

Restoring Inspiration: Coke Helps Create Healthy and Happy Parks and Recreation Spaces

Our Commitment to Well-Being