

The why of neurological reflexes

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THERE IS A NATURAL tendency to think that things exist for a reason, especially in trying to understand evolution. The Darwinian concept of survival of the fittest leads people to wonder and theorize about peculiarities found in nature that seem to have no survival value. Of course, if they simply have no negative survival value the trait may endure forever, unchanging until there is some positive or negative value that attaches to the trait. I have read of wonderment that the appendix exists in modern man, a presumably vestigial part of the intestine, without an identifiable function, that occasionally leads to a potentially mortal condition. Thus, an appendix has a negative survival value, as best we understand, but small. Perhaps there is some benefit, in an as yet unknown immune or hormonal role.

As a neurologist I have puzzled for years over certain neurological reflexes. Is there some value in their existence? Of course I puzzle over the “major” reflexes, the ones that are used every day in clinical neurology, such as the deep tendon reflex or the Babinski reflex. Why should a muscle contract uncontrollably when tapped? Why should the large toe go up or down when the sole of the foot is stroked? These serve no identifiable functional role, but seem to have



evolved in parallel with the nervous system. I’ve had a greater interest in the less commonly used reflexes like the palmo-mandibular and the corneo-mandibular but also in a genetic reflex that runs in my own family, photic-reflexive sneezing.

I had never heard of “sun sneezes” until a wonderful and entertaining letter was printed in the *New England Journal of Medicine* many years ago. Their

editorial policy concerning letters to the editor was, I think, a bit more liberal than it is currently. “Sun sneezes,” more technically called, “photic-reflexive sneezing,” is a reflex sneeze precipitated by bright sunlight. It’s fairly common and although I had never heard of it before, many who I asked about it were well aware. I do not have this reflex, although I do sneeze a lot, but two of my three children have it. I never noticed that they had it until I shared my discovery from the *Journal*, and two told me that they had “sun sneezes” and my observation confirmed this.



Half-length figure of a child with his hand extended over a small fire; also indicated is the section of the brain that operates the mechanism for automatic reaction in response to external stimuli.

This lack of observation on my part is something that is always in the back of my mind when seeing patients: “What am I missing?” “What am I not seeing?” I also wonder just why in the world such a reflex should exist. I’m sure someone else is wondering what its pathways are.

Occasionally I set myself an exercise. How many reasons can I find for a particular reflex? Usually the answer is zero. What is the survival value of a sun sneeze? What brain-spinal connections are short-circuited to cause the palmo-mental reflex, in which a mildly uncomfortable scrape of an object on the palm produces a contraction in the mentalis muscle (a chin muscle of little use) on the same side? When I think of sun sneezes and evolution, I imagine some poor guy walking out from the shade of a forest into the savannah, where it’s bright and sunny, sneezing and getting eaten by a lion. Perhaps sun sneezes are associated with faster reaction times, or better vision, allowing the sneezer to better detect or respond to a threat caused by the sneeze? Maybe sun sneezers taste bad or cause diarrhea and the sneeze is a warning to a would-be predator that eating this particular homo sapiens would be a bad idea. Or, perhaps sun sneezing might be viewed by animals as a boast, “Here I am, come and try to eat me,” and thus an indirect warning. Since this peculiar reflex runs in my family, although it may reflect my wife’s genes rather than my own, perhaps this reflex is associated with higher intelligence, greater diligence or

have a survival value for the rest of the village. If this guy isn’t eaten, it’s safe to go out.

Pain reflexes serve an obvious purpose. When we touch something very hot, we withdraw the hand a very short time before the pain hits. We blink when something approaches the cornea. We don’t think about it. It happens on its own. And it’s clearly very protective. Blinking with corneal stimulation, as when a breeze blows into it, or a tiny foreign object is lodged on it, causing a blink and a tear to wash out the object or lubricate the surface is useful. The pupil contracts with light, which reduces stimulation of the retina, a good thing, but what advantage is there to have the pupil contract when focusing on a near object? Why should the ipsilateral testicle contract with a brisk stroke down the inner thigh of a man? It’s hardly protective, although maybe it was 20,000 years ago. The corneo-mandibular reflex involves forced eyelid closure (generally elicited by stimulating the cornea), which causes an immediate contraction of the contralateral pterygoid (jaw) muscles which pull the jaw to the side of the contracting pterygoids, another reflex in search of a utilitarian explanation, other than providing a question to stump neurology residents.

When I ponder questions like this, I tend to think of it akin to an IQ test, which I apparently do rather poorly on. It’s the way I feel when I confront a *New York Times* crossword puzzle. On the other hand, it makes clinical practice

more interesting, and that might, indirectly, make me a better clinician. There are always questions to answer, and thinking is what we like to believe our brains were designed to do.

I think of Faraday, one of the great physicists and science teachers of all time. He gave six of the most famous lectures in science history, using over a hundred observations on a lighted candle to illustrate how science worked, to secondary school students and non-scientists. Faraday noted that observations should trigger two questions: “What is the cause?” “Why does it occur?”

Physics and biology are different. Evolution is the result of seemingly random occurrences, restrained by certain rules and refined by raw experience. Perhaps sun sneezes are linked to other phenomena that have survival value? Perhaps future scientists may answer these questions. Perhaps not. The answer may not matter. I am content to think about the questions, an endeavor which is always useful. ❖

Author

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The Location of the Aronson Tree

SUTCHIN R. PATEL, MD; ANTHONY A. CALDAMONE, MD

In last month's journal, the article, "The Aronson Tree and the Roots of Brown's Medical School" challenged the reader to find the location of the Aronson Tree. It is located at Brown University next to the entrance of the Arnold Laboratory on Waterman Street. The photograph at left can help further identify the *platanus* tree that was raised from a seedling that came from the original Tree of Hippocrates from the Greek island of Kos and planted by Dean **STANLEY M. ARONSON, MD**, the medical school's founding dean.

References

1. Aronson SA. *The Tapestry of Medicine*, Manisses Communications Group, Inc ©1999; "A Tree Grows on Waterman Street," pp. 31-34.
2. Aronson SA. A Platanus Tree Grows in Providence. *RIMJ*; November 2013:13-14.

Authors

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