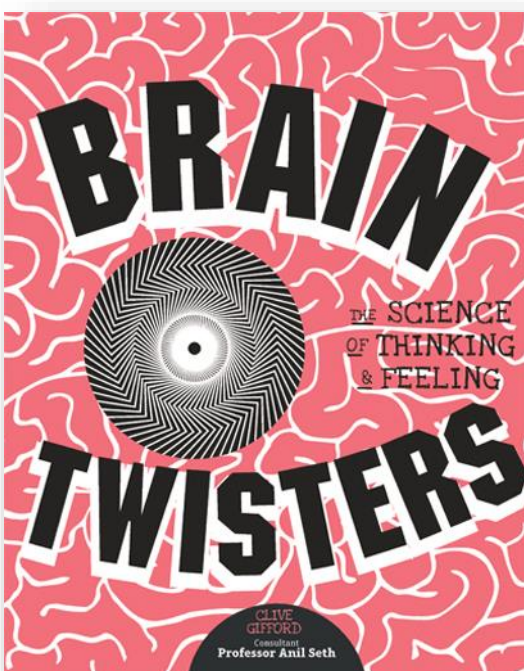


BRAIN TWISTERS

Clive Gifford with Dr. Anil Seth

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Explore the science of thinking and feeling while scrambling your sensory perception, mastering the magic of misdirection and much, much more.



- Playful introduction to neuroscience.
- Activities bring concepts and theories to life.
- STEM, cross-curriculum applications; good for large and small groups.
- Opportunities to further explore science behind each activity.

GETTING ON YOUR NERVES

Did you know that inside your body lies the world's single most complex object? Your nervous system is made up of vast numbers of nerve cells (neurons) — nearly 80 thousand million of them. Each nerve cell is connected to many others and the total number of connections is truly astronomical.

The brain is just one part of your nervous system. It also includes large bundles of nerve fibres (axons) that connect the brain to the body. Signals pass along these bundles in both directions, so your brain can control both what is going on inside your body as well as the actions it takes on the outside.

NERVOUS NETWORK

Your nervous system is made up of two regions: central and peripheral. The central nervous system is made up of the spinal cord and the brain, and it is connected to the peripheral nervous system by a collection of 48 different pairs of nerves.

Thousands of peripheral nerves stretch out through all parts of your body, carrying tiny electrical signals to and from the central nervous system. This system is an information superhighway, buzzing with activity as it channels all the signals sent to and from the brain.

A NEURON TO CLOSE

A neuron collects signals from other neurons through the finger-like projections, called dendrites. The signal then passes through the neuron to an electrical pulse, the special chemical, called neurotransmitters, are released for the next step. These help the signal leave off the neuron, each neuron's own branching network.

Dendrites are branched out to form connections with the axons of other neurons.

The long wire ends in bulb of receptor, called terminal.

TEST YOUR REACT

Your nervous system is so slow! Signals conveyed by neurons can race through your body at high speed, up to 300 miles per hour — faster than a Formula 1 car! To see how much slower it is, follow a reaction test using a string and a ruler.

Ask someone to hold the top of the ruler with the other end just one inch with your thumb and index finger, which should be open and not touching the ruler. Without warning, they should release the ruler and you must catch it between your thumb and index finger as quickly as you can.

Perform the experiment five times, noting when the ruler your finger and thumb grip. Add the five measurements together, then divide by five to get your average reaction distance. Use the following handy table to rate your reactions.

Reaction Distance	Reaction Time
<1 in	0.04 s
1-2 in	0.06 s
3-4 in	0.08 s
5-6 in	0.10 s
>6 in	>0.12 s

TOUCHY FEELY

Your sense of touch is a bit like many senses rolled up into one. There are a lot of different types of touch receptors in your body, many found in the layers of your skin, which all sense different stimuli, such as pressure, light and heavy touches, and vibrations.

These sensors send back signals through the nervous system up through your spinal cord, brain stem, and thalamus to your consciousness cortex in your brain. Your sense of touch is able to determine textures and shapes, allowing for your brain to identify many objects with your eyes closed.

TOUCH TEST

Different parts of your body have a greater or lesser concentration of touch receptors, which give you pain or itch sensitivity. Find out where the highest concentration of touch receptors lie, using this two-part discrimination test.

Roll a paper strip into an open U-shape so that its top is ¼ inch apart. Close your eyes or look away as you touch different parts of your body (for example, forehead, cheek, palm, and stomach). Note down where you feel two separate points and where only one. Follow the paper strip by ½ inch width and repeat the exercise where you feel two points. You can also bend the paper strip wider than ¼ inch and repeat where you only feel one point. The smaller the distance where you can still feel two points, the greater the concentration of touch receptors.

Touch the sides of both fingers at the same time. Does it feel like one pen or two?

TOUCHING YOUR OWN TOUCH

Tricking your sense of touch is as easy as crossing your middle and ring fingers and grasping a pen. Looking away, try to touch the wall. V-shape formed by your crossed fingers with the pen. There's a good chance you will feel as if you are being touched by two different pens. This is known as the Aristotle Illusion and is due to the scales of the fingers touching the pen normally being far apart from each other, making the brain conclude that you are touching two objects.

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