



AN IMMUNE SYSTEM FOR PLANET EARTH

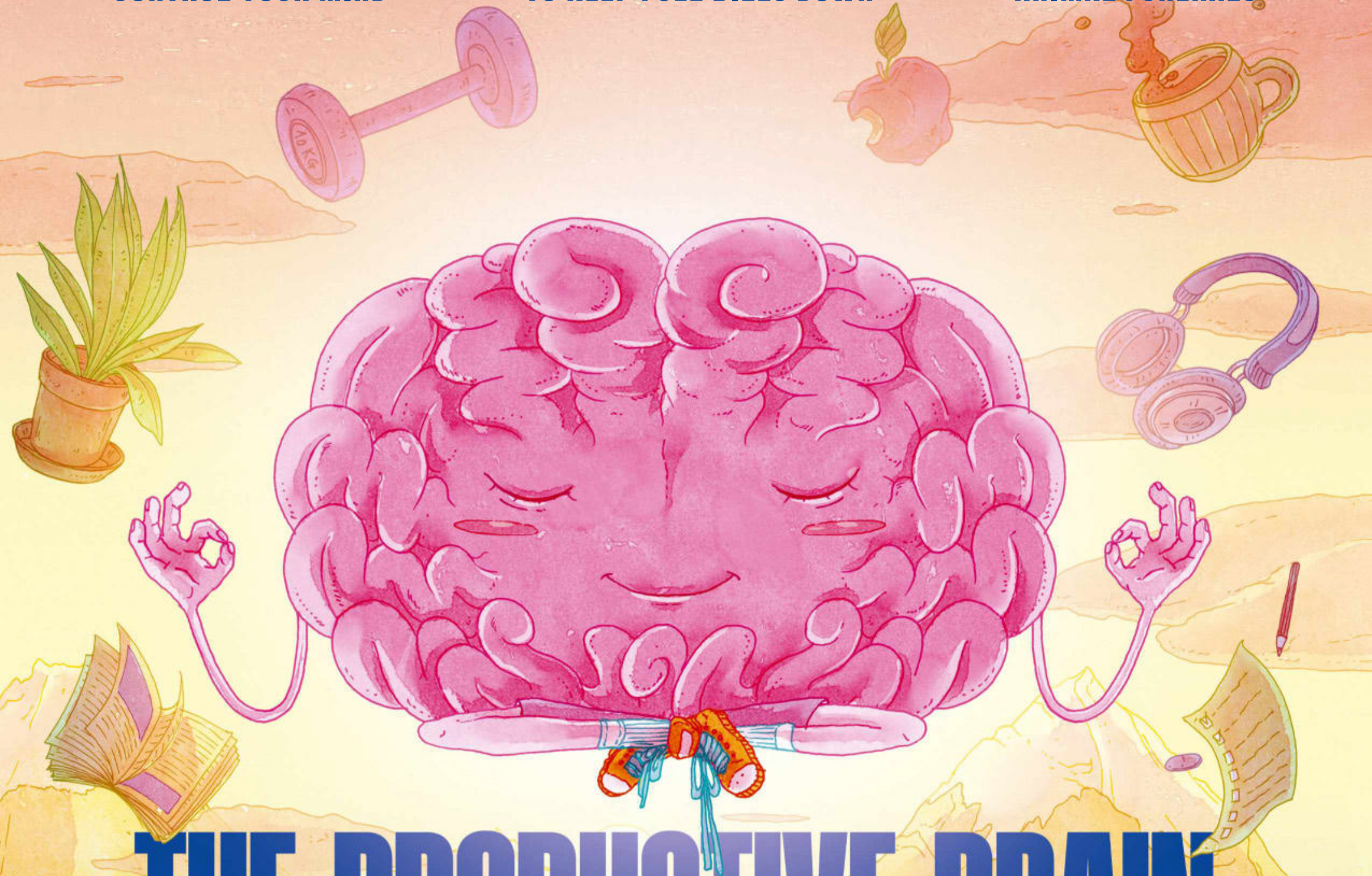
Can we build a network to detect and treat a new disease before it causes a pandemic?

Science Focus

How magnets could
CONTROL YOUR MIND

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TO KEEP FUEL BILLS DOWN

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ANIMAL FUNERALS



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A neuroscientist explains how to get your mind working at its best



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Cyanide was present
in the atmosphere
of a young Earth

CHEMISTRY

Cyanide may have played a key role in the origin of life on Earth, and could help us find alien life

The chemical may drive reactions that produce organic molecules

Though perhaps better known as the lethal substance taken in pill form by captured spies in cheesy thrillers, cyanide may have helped life to evolve on Earth. And looking for signs of it on alien planets could help us to locate life elsewhere in the Universe, chemists at Scripps Research have discovered.

The scientists found that the chemical compound, which contains a carbon atom bonded to a nitrogen atom, could have enabled some of the first metabolic reactions on Earth that created carbon-based compounds from carbon dioxide. Metabolic reactions are reactions that generate energy out of food and are essential for sustaining life.

“When we look for signs of life – either on the early Earth or on other planets – we base the search on the biochemistry we know exists in life today. The fact that these same metabolic reactions can be driven by cyanide shows that life can be very

different,” said the study’s lead author Ramanarayanan Krishnamurthy, an associate professor of chemistry at the institute.

To make the discovery, the team focused on a set of chemical reactions that combine carbon dioxide and water to create the more complex compounds that are necessary for life, known as the reverse tricarboxylic acid cycle.

The cycle is used by some bacteria, but it relies on the use of complex proteins that weren’t present on the planet four billion years ago.

As previous studies have shown that

“We mixed together these molecules, waited and the reaction happened”

certain metals can trigger the same reactions under extremely hot and highly acidic conditions, the Scripps team had a hunch that another chemical may also be able to do so, only under the less violent conditions seen on the early Earth.

They already knew that cyanide was present in the atmosphere back then, so they mapped out a set of reactions that could potentially use cyanide to produce complex organic molecules from carbon dioxide and then tested them in the lab.

“It was scary how simple it was,” said Krishnamurthy. “We really didn’t have to do anything special, we mixed together these molecules, waited and the reaction happened spontaneously.”

Although the experiment doesn’t provide proof that cyanide was involved in this process on the early Earth, it does offer a fresh way of thinking about the origin of life, and perhaps a new means of searching for life on other planets.