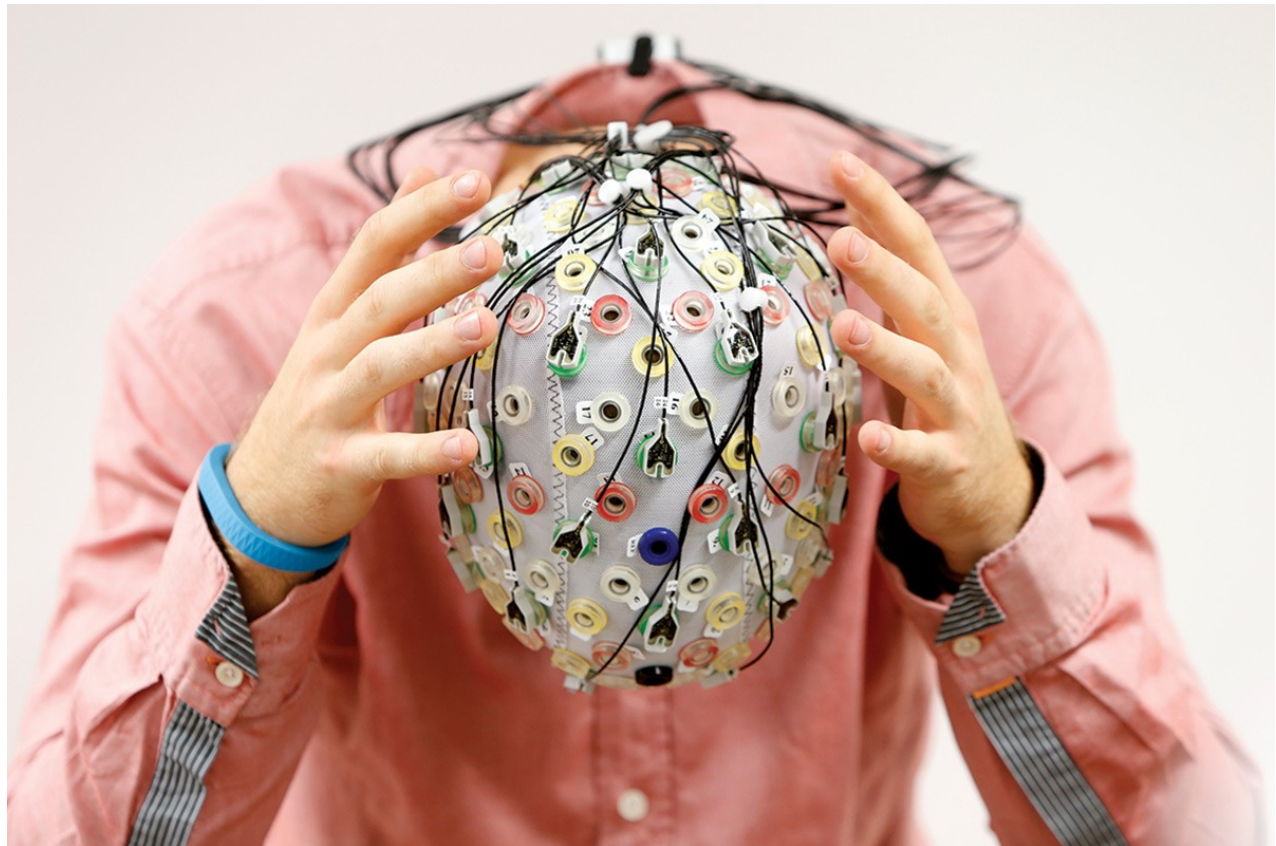


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# A classic quantum test could reveal the limits of the human mind



Experimental brainwave  
Michaela Rehle/Reuters

By Anil Ananthaswamy

THE boundary between mind and matter could be tested using a new twist on a well-known experiment in quantum physics.

For years, experiments known as Bell tests have confirmed the weirdness of quantum mechanics – specifically the “spooky action at a distance” that so irked Einstein.

Now, a Bell test has been proposed using something unprecedented: human consciousness. If the results differ from those of standard Bell tests, it could hint that our minds are immaterial.

Spooky action at a distance was Einstein’s phrase for a quantum effect called entanglement. When two particles are entangled, measuring the state of one seems to instantly influence the other, even if they are light years apart.

But any signal passing between them would have to travel faster than the speed of light, breaking the cosmic speed limit. To Einstein, this implied that quantum theory was incomplete, and that a deeper theory was needed to explain the particles’ behaviour. We have been trying to find this deeper theory ever since.

In 1964, physicist John Bell paved the way for testing whether the particles do in fact influence each other. He devised an experiment that involves sending a pair of entangled particles to locations A and B. At each point, there is a device that measures, say, the spin of the particle.

## “It would be the first time we as scientists can put our hands on this problem of consciousness”

Random number generators choose the setting on the device in such a way that it’s impossible for device A to know of B’s setting and vice versa at the time of measurement.

In all actual Bell tests so far, the measurements correlated far more than they would if Einstein had been right, indicating that spooky action at a distance exists.

However, some physicists have argued that even random number generators may not be truly random. They could be governed by some underlying physics that we don’t yet understand.

Now, Lucien Hardy at the Perimeter Institute in Canada suggests that the measurements at A and B can be controlled by something that could potentially be separate from the material world: the human mind.

In the 17th century, French philosopher René Descartes proposed a mind-matter duality, where the mind is outside regular physics and intervenes on the physical world, says Hardy.

In the new experiment, A and B would be 100 kilometres apart. At each location, about 100 people would wear EEG headsets that read their brain activity. These signals would then be used to switch the settings on the measuring device at each location ([arXiv.org/abs/1705.04620](https://arxiv.org/abs/1705.04620)).

If the correlation between readings differs from earlier Bell tests, implying a violation of quantum theory, it would hint that the measurements are being controlled by processes outside the purview of standard physics.

“I can’t imagine a more striking experimental result in physics than that,” Hardy says. “We’d want to debate as to what that meant.”

Such a finding would stir up debate about the existence of free will. Even if physics oversaw the material world, the human mind not being made of that same matter might mean that we could overcome physics with free will.

Nicolas Gisin at the University of Geneva in Switzerland thinks Hardy’s proposal makes plenty of sense, but he is sceptical about using unstructured EEG signals. He would prefer an experiment where conscious intent is used to perform the switching – but that would be tougher to carry out.

“The reward is enormous. It would be the first time we as scientists can put our hands on this mind-body [problem] or problem of consciousness,” says Gisin.

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