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Consciousness

Out of your mind, not out of your body

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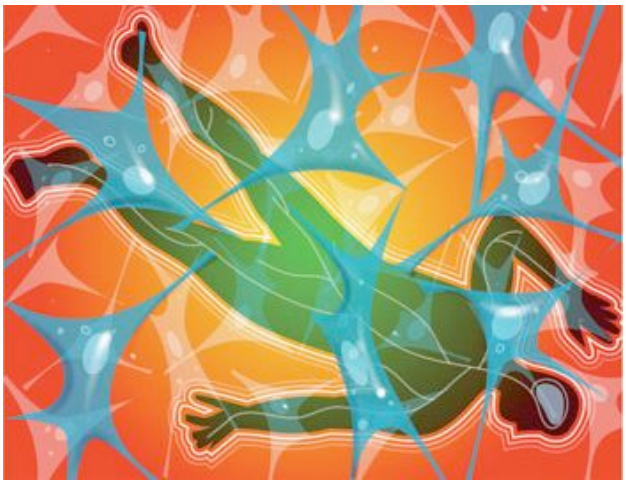
Out-of-body experiences can now be created at will. Studying them sheds light on the nature of consciousness

Illustration by Stephen Jeffrey



"I HOPE to convince you that the time has come to take up consciousness as a strictly biological problem." So rang out the opening address at the 1902 meeting of the American Association for the Advancement of Science (AAAS). However Charles Sedgwick Minot, the anatomist who said those words, jumped the gun. Consciousness is still an enigma. That it is created within the brain, scientists agree. That it is biology's most intellectually glamorous problem, they also concur. But what it is and how to find it remain unclear. Which is why, despite Minot's aspiration, its study has remained fodder for the rambling final chapters of cognitive-science textbooks and those at the dusky end of distinguished scientific careers. Few have dared take it on without a tenured position under their belts and a Nobel-prize medal around their necks.

Recently, however, two youngish biologists without Nobel prizes have had a

go. Working independently, Henrik Ehrsson of the Karolinska Institute in Stockholm and Olaf Blanke of Geneva University Hospital have been making inquiries into the notion of the bodily self—an important part of conscious experience.

A sense of self is what makes a person distinct from his environment and from other people in it. It is also the thing upon which more complex layers of consciousness appear to rest. Dr Ehrsson and Dr Blanke try to divorce this perceived self from the perceiver's body—in other words to create that phenomenon so beloved of mystics, an out-of-body experience. And in two papers published in this week's edition of *Science*, the AAAS's house journal, they report their latest results.

Reality is an illusion

Dr Ehrsson's previous experiments have relied on an illusion called the rubber hand. This shifts someone's sense of owning his body away from his real hand to a prosthetic one. It works by allowing him to view only the rubber hand while both it and his real hand are stroked in synchronicity with one another. That coincidence is enough to fool the part of the brain that integrates inputs from different senses. The result is to redirect the subject's sense of self from his real hand to the rubber hand in a way analogous to the redirection employed by a ventriloquist when he makes his dummy “speak”.

Dr Blanke, by contrast, works with epileptics. Occasionally, people who suffer from epilepsy report having standard out-of-body experiences—the ones in which an individual looks down on himself from above. Five years ago Dr Blanke found he could induce such experiences at will in one such person by stimulating a particular part of her brain—the right angular gyrus—with an electric current. A small current made her feel as though she was sinking into her bed; a little more had her floating close to the ceiling or seeing her legs kicking towards her face.

Once again, the part of the brain in question seems to be involved in integrating inputs from different senses. If this area is overstimulated during the electrical brainstorm that is an epileptic fit, the consequence is an out-of-body experience.

With these results in mind, both Dr Ehrsson and Dr Blanke wondered if they could design experiments that would induce complete out-of-body experiences in healthy volunteers. The answer, in both cases, was that they could.

Dr Ehrsson did it by making his volunteers look at themselves from behind. He sat them in a chair and asked them to wear virtual-reality goggles, which work by projecting a picture in front of each eye. Behind the chair there were two video cameras adjusted so that they were at the level of the volunteer's eyes. The left-hand camera sent its picture to the left eye of the goggles; the right-hand camera sent its picture to the right eye. The subjects could thus see their own backs, in stereo, as though they were sitting behind themselves.

Dr Ehrsson then tested how touch is combined with vision to locate the self. When he tapped his volunteers on their chests at the same time as he tapped the air at chest-height below the cameras, they reported feeling that the core of their identity inhabited the camera's position. They were, in other words, out of their own bodies, and they considered their real selves—seen through the goggles—as another person. When, however, he prodded the chest and the air at different times, that illusion immediately dissolved.

To make sure his volunteers were telling the truth, Dr Ehrsson surprised them after two minutes of tapping by swinging a hammer towards the camera. While he did this, his apparatus measured the level of sweat on the volunteer's skin. Since people sweat in response to a threat, that level is a good indication of what someone is really feeling. The sweat levels confirmed that volunteers really did feel threatened when the place they perceived themselves to be—the site of the camera—was attacked.

Dr Blanke also asked his volunteers to wear virtual-reality goggles. But in his case the volunteer was standing and what he saw was one of three things. The first was a three-dimensional "avatar" of his own body—viewed from behind, as with Dr Ehrsson's experiment. The second was an avatar of a humanlike dummy, again viewed from behind. The third was a human-sized cuboid.

Instead of tapping his volunteers, Dr Blanke stroked them with a paintbrush while, at the same time, the computer "stroked" the avatar with a virtual brush. Sometimes the strokes were in synchronicity, sometimes they weren't.

After each viewing the goggles went dark, so that the volunteer could see nothing at all. He was then pulled backwards a few steps and asked to return to his original position. If the avatar he had been watching was a cuboid, that was easy. It was also easy if the avatar had been humanlike (whether representing the volunteer or not) and the stroking had been asynchronous. But if the avatar had been humanlike and the stroking synchronous, then the volunteer always walked to the place where the avatar would have been standing had it been real. The volunteer, in other words, identified the avatar's former location as having been his own.

Astral projection this is not. But it is a demonstration that one aspect of consciousness can be modified in a reproducible way. And that may be the key that unlocks the vault. For, if the methods Dr Ehrsson and Dr Blanke have come up with can be reproduced on volunteers inside a brain-scanner, then it might be possible to study the neurological network involved. Presumably this will include the right angular gyrus. But other components, as yet unknown, must surely be involved.

That will help to bring the study of consciousness into a mainstream in which the non-tenured can study it without receiving funny looks from their colleagues. And, who knows, it may one day lead Dr Ehrsson, Dr Blanke, or someone else whom they have inspired, to having one of those Nobel medals hung around his own neck.