

How to leave your body

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Leave your body and shake hands with yourself, gain an extra limb or change into a robot for a while. Swedish neuroscientist Henrik Ehrsson has demonstrated that the brain's image of the body is negotiable. Applications stretch from touch-sensitive prostheses to robotics and virtual worlds.

Ask a child if their hands belong to them and they will answer, "Of course!" But how does the brain actually identify its own body? And why do we experience our centre of awareness as located inside a physical body?

In a series of studies, neuroscientist Henrik Ehrsson of the Swedish medical university Karolinska Institutet has shown that the brain's [perception](#) of its own body can alter remarkably. Through the coordinated manipulation of the different senses, subjects can be made to feel that their body suddenly includes artificial objects or that they have departed their body entirely to enter another. His experiments have been published in *Science* and other leading scientific periodicals and journals, and have garnered considered international attention.

"By clarifying how the normal brain produces a sense of ownership of the body, we can learn to project ownership onto artificial bodies and simulated virtual ones, and even make two people have the experience of swapping bodies with one another," says Dr Ehrsson.

The research addresses fundamental questions about the relationship between mind and body, which have been the topic of theological, philosophical and psychological discussion for centuries but which have only recently been accessible to experimental investigation. The key to solving the problem is to identify the multisensory mechanisms through which the [central nervous system](#) distinguishes between sensory signals from the body and from its environment.

The research may have important implications in a

wide range of areas, such as developing hand prostheses that feel more like real hands and the next generation of virtual reality applications, where the sense of self is projected onto computer-generated 'virtual bodies'.

Researchers are currently looking into what kind of bodies the brain can perceive as its own. The self can, for example, be transferred into a body of another sex, age and size, but not into objects such as blocks or chairs. One ongoing project with potential applications in robotics is examining if the perceived body can be shrunk to the size of a Barbie doll; another is studying if the brain can accept a body with three arms.

"This could give paralysed people a third prosthetic arm, which they would perceive as real," says Dr Ehrsson.

Provided by Karolinska Institutet

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