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Brain sensor allows mind-control

A sensor implanted in a paralysed man's brain has enabled him to control objects by using his thoughts alone.

Mr Nagle was the first patient to trial the device

The experimental set-up allowed the man, who has no limb movement at all, to open e-mail, play a computer game, and pinch a prosthetic hand's fingers.

The US team behind the sensor hopes its technology can one day be incorporated into the body to restore the movement of paralysed limbs themselves.

The Massachusetts-based team's study is published in the journal Nature.

> **It's just wild**
>
> Matthew Nagle

Matthew Nagle, 25 at the time of the trial, was left paralysed from the neck down and confined to a wheelchair after a knife attack in 2001. He was the first patient to try out the brain sensor.

A team of scientists inserted the device, called a neuromotor prosthesis (NMP), into an area of the brain known as the motor cortex, which is responsible for voluntary movement.

The NMP comprises an internal sensor that detects brain cell activity, and external processors that convert the activity into signals that can be recognised by a computer.

See how the system works

Although the patient's spinal cord had been severed for three years by the time of the trial, the scientists found that brain cell activity - or neural firing patterns - persisted in the patient's motor cortex.

The electrodes in the NMP were able to record this activity and send it to a computer. The computer then translated the firing patterns into movement commands which could drive computer controls or artificial limbs.

Regained independence

Using the device, Mr Nagle was able to move a computer cursor to open an e-mail, play simple computer games, open and close a prosthetic hand, and use a robot limb to grasp and move objects.

Mr Nagle said the sensor had restored some of his

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independence by allowing him to carry out a number of tasks - such as turning the lights on - that a nurse would normally do for him.

He told the BBC: "I can't put it into words. It's just wild."

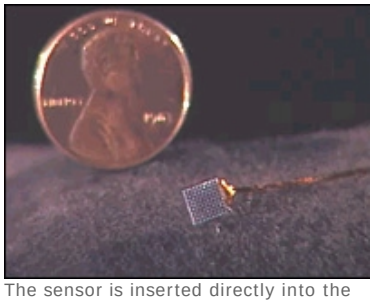
Lead researcher Dr Leigh Hochberg, a neurologist at the Massachusetts General Hospital, said: "One of the exciting results from the trial is that this part of the brain, the motor cortex, could still be activated voluntarily by this gentleman with spinal cord injury.

"The fact that this activity was still there, despite the injury that had occurred several years ago, is very encouraging for our potential ability to harness those signals to control an external device."

Co-author Professor John Donoghue is director of the brain science programme at Brown University and chief scientific officer of Cyberkinetics, the company that created and trialled the sensor.

He said: "The results hold promise to one day being able to activate limb muscles with these brain signals, effectively restoring brain-to-muscle control via a physical nervous system."

The team also looked at a second, 55-year-old patient, but said technical issues meant the sensor could not record brain activity.


The sensor is inserted directly into the brain

Professor Stephen Scott, from Queen's University, Ontario, Canada, said in a related article: "This research suggests that implanted prosthetics are a viable approach for assisting severely impaired individuals to communicate and interact with the environment."

But he warned that considerable problems needed to be overcome before this technology could be put into regular use.

He said problems such as the device's longevity, infection risks, and data transfer methods needed to be looked at.

Tested too early?

Professor Igor Aleksander, an expert in neural systems engineering at Imperial College London, UK, said: "I think this is enormously important stuff because there is real potential for helping people that have had severe neural disabilities."

But Professor Miguel Nicolelis, a neurobiologist from Duke University, was critical of the research.

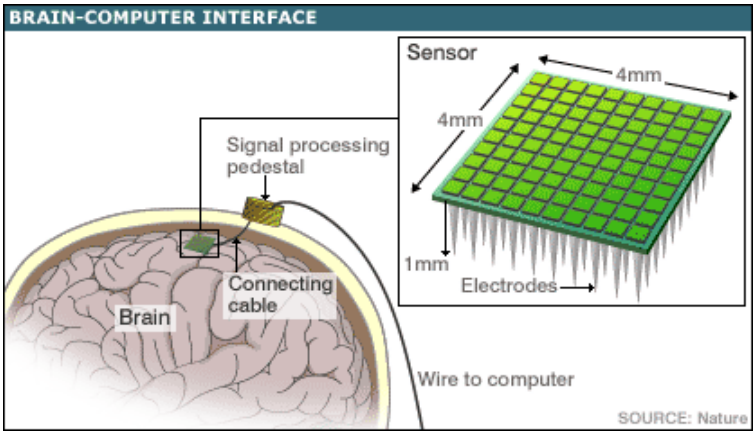
He told the BBC's Science in Action programme that although some positive signs had been seen for one patient, the paper showed that the technology did not work in the second, older patient.

He said: "When you decide, like this company did, to go into clinical trials for an invasive technique the stakes are very high.

"They should have demonstrated something that lasts for a long period of time, that it is reliable and safe, and that it can restore much more elaborate functions. I don't think that this paper shows that.

"I think it was too early to use this kind of technology in this kind of clinical trial."

Matthew Nagle's story was featured in a BBC Radio 4 Frontiers programme last year. Wednesday's announcement represents the formal publication of the research in a scientific journal.



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