Bioelectronics

Silky circuits

Making electronic circuits that will work inside a person's body

May 6th 2010 | From *The Economist* print edition

OVER the years, electronics have found their way into almost every aspect of human life. They are in homes, offices, cars and just about all gadgets. Some electronic circuits have also made their way into the bodies of people in the form of heart pacemakers and cochlear implants. Now new kinds of bodily electronics are coming.

Most electronics are made in the form of integrated circuits, which are tiny chips that contain transistors and other components etched onto silicon wafers. While fine for computers and other products, they are inflexible and cannot be easily wrapped around curved surfaces or pliable ones, making them hard to be used in the body. Researchers have devised ways to make flexible electronics, for such things as electronic paper. Now, John Rogers of the University of Illinois, Urbana-Champaign, who is one of the pioneers of flexible electronics, has devised a new technique to create ultra-thin and flexible circuits suitable for medical use.

Dr Rogers first fabricated a mesh containing a circuit of silicon electronics by thinning silicon until it becomes flexible. But this causes a problem. Since it is so thin, it soon collapses. To avoid this, Dr Rogers deposited the circuit onto a special silk to provide structural support without sacrificing flexibility. The silk was engineered by Tufts University, near Boston, from a silkworm cocoon that had been boiled to create a silk solution that can be deposited as a thin film. When the film containing the circuit is placed on biological tissue, it dissolves naturally. What it leaves behind is the circuit, attached to the tissue by capillary forces and supported by it.

To apply his technique to medicine, Dr Rogers has teamed up with Brian Litt of the University of Pennsylvania, a neurology expert interested in creating electronic implants to monitor and treat epilepsy. In a paper recently published in *Nature Materials* the pair explained how they placed one of Dr Rogers's silk-supported electronic meshes on the exposed brain of an anaesthetised cat. After the silk dissolved, the electrodes in the mesh followed the contours of the cat's brain and were able to detect neurological activity more accurately than conventional implanted electrodes.

Next, Dr Rogers and Dr Litt hope to test the technique on epileptic dogs to see if the electrodes can detect seizures. Eventually it may be possible to use such circuits to prevent epileptic seizures. Other applications could include electrically stimulated repairs to spinal injuries or controlling drug delivery inside the body. For such applications it may even be possible to engineer circuits and components that dissolve once they have done their work.

Readers' comments

The Economist welcomes your views.

Be the first to comment on this article

About *The Economist* online About *The Economist* Media directory Staff books Career opportunities Contact us Subscribe [+] Site feedback

 Advertising info Legal disclaimer Accessibility Privacy policy Terms & Conditions Help