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TECHNOLOGY UPDATE

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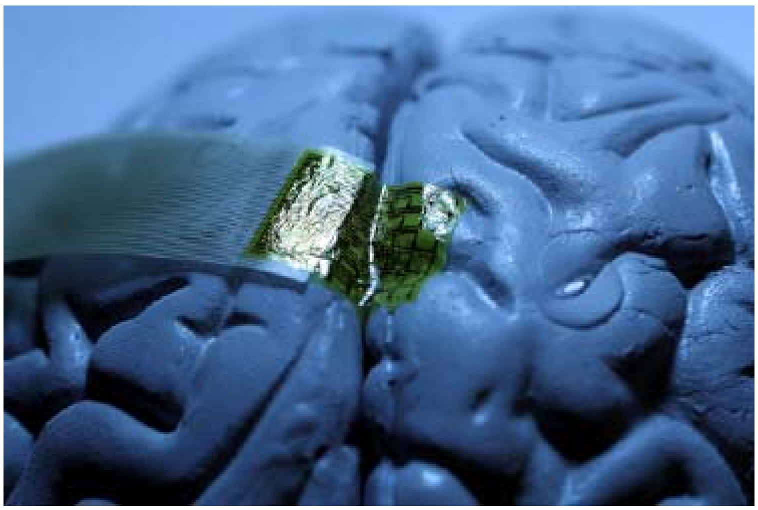
Silk helps make bio-integrated electronics

Researchers in the US have developed a new way to connect tiny electronic circuits to the human brain. John Rogers of the University of Illinois at Urbana-Champaign and colleagues have developed a high-quality biocompatible interface from silk substrates containing electronic components that can "wrap" itself around biological tissue. The system allows electrical activity of living tissue to be measured with unprecedented precision, without damaging the tissue in any way.



(http://images.iop.org/objects/ntw/news/9/5/1/bioimplant.jpg)
Neural electrode array wrapped onto brain model (http://images.iop.org/objects/ntw/news/9/5/1/bioimplant.jpg)

"Potential applications for our interface range from systems for diagnosing and treating epilepsy, to devices for brain-computer interfaces for controlling prosthetics," Rogers told *nanotechweb.org*.

The new bio-integrated devices consist of arrays of electrodes made with conventional materials, like silicon, but arranged in ultra-thin, open-mesh structures. The team mounted these circuits, which are normally too "floppy" to handle, on a film of silk fibroin. The silk substrate provides the mechanical support needed for placing the devices on brain tissue, for example.

Tissue wrap

Next, Rogers and colleagues gently washed the structures with saline solution to dissolve the silk. As the silk washes away, the remaining mesh gently wraps itself around the curved surfaces and folds of the brain thanks to capillary forces at the interface. "The wrapping provides excellent contact between measurement electrodes and the tissues of the brain," explained Rogers.

The devices allow for high-resolution electrical measurements to be made on biological tissue, without damaging the tissue in any way. The scientists have already tested their device on cat brain models and found that they could get a good electrical response to the animals' brain signals. What's more, the cats supported the devices well, without showing any sign of inflammation for at least four weeks.

"We are now looking to make more sophisticated electronics, larger arrays and smaller electrodes with active integrated multiplexers and amplifiers to improve device performance," revealed Rogers. "We also hope to make the technology available to interested research teams around the world."

The work was published in *Nature Materials*.

About the author

Belle Dumé is contributing editor at *nanotechweb.org*