

U.S. Military Aims for Brain Implants to Treat Wounded Soldiers

By Jeremy Hsu

Posted 30 May 2014 | 17:00 GMT

This post was corrected on 1 June 2014.

A new U.S. military program focused on brain implants could help diagnose and treat soldiers suffering from psychiatric disorders. The program funded by the U.S. [Defense Advanced Research Projects Agency](http://www.darpa.mil/NewsEvents/Releases/2014/05/27a.aspx) (<http://www.darpa.mil/NewsEvents/Releases/2014/05/27a.aspx>) (DARPA) will develop a new generation of devices inspired by [deep brain stimulation](http://spectrum.ieee.org/tech-talk/biomedical/devices/deep-brain-stimulation-improves-paralyzed-rats-gait) (<http://spectrum.ieee.org/tech-talk/biomedical/devices/deep-brain-stimulation-improves-paralyzed-rats-gait>)—a technology that uses implanted electrodes to electrically stimulate parts of the brain. But the new brain implants would start out by monitoring the brain activity of patients instead of stimulating them. The aim is to provide new insights into the workings of psychiatric disorders such as depression. The implants could then use targeted stimulation of certain brain regions to restore normal brain function over time.

"If you have been injured in the line of duty and you can't remember your family, we want to be able to restore those kinds of functions," said Justin Sanchez, DARPA program manager, during a conference held in Washington, D.C. in early May, [AFP reported](http://news.discovery.com/tech/biotechnology/brain-implant-could-restore-memory-140501.htm) (<http://news.discovery.com/tech/biotechnology/brain-implant-could-restore-memory-140501.htm>). "We think that we can develop neuroprosthetic devices that can directly interface with the hippocampus, and can restore the first type of memories we are looking at, the declarative memories."

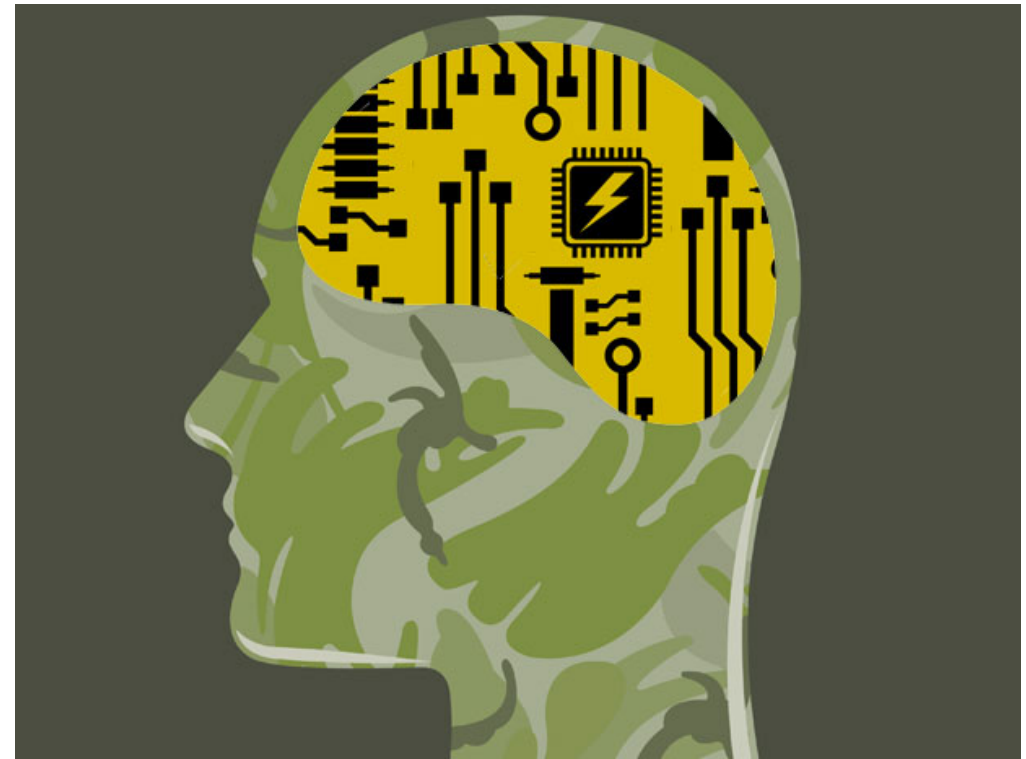


Illustration: iStockphoto

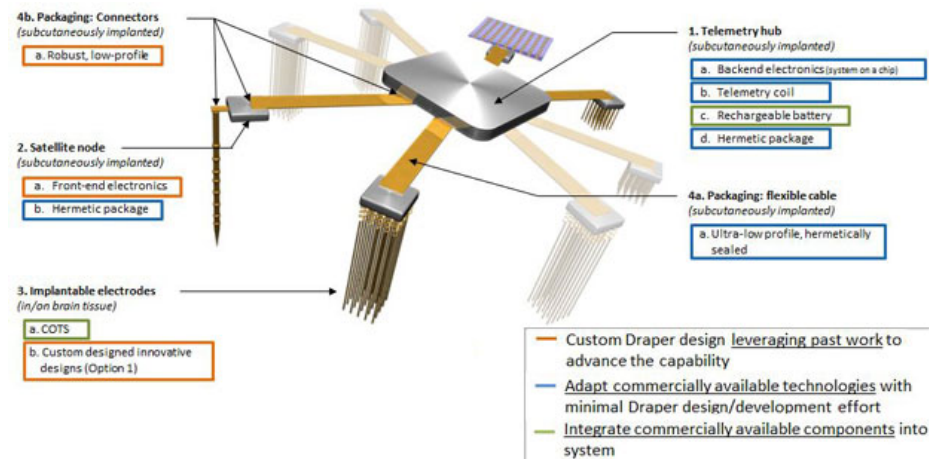


Illustration: Massachusetts General Hospital and Draper Labs

DARPA's Systems-Based Neurotechnology for Emerging Therapies (SUBNETS) program is part of President Obama's Brain Initiative (<http://spectrum.ieee.org/tech-talk/biomedical/imaging/what-obamas-brain-initiative-will-really-do>), a \$100 million program unveiled in April 2013 aimed at funding new technologies for tackling neurological and psychiatric diseases.

The University of California, San Francisco is spearheading one arm of SUBNETS (<http://www.ucsf.edu/news/2014/05/114621/new-venture-aims-understand-and-heal-disrupted-brain-circuitry-treat-mental>) with up to \$26 million from DARPA. It will focus on understanding and treating anxiety and depression. Success with such initiatives could go a long way toward lessening the suffering of millions of people and helping reduce the economic cost to Americans of dealing with psychiatric problems. Anxiety disorders alone cost the United States about \$42 billion each year.

The other arm of the program is a \$30-million grant to a team led by Massachusetts General Hospital (<http://www.massgeneral.org/about/pressrelease.aspx?id=1708>). That group will work on traumatic brain injury, post-traumatic stress disorder, and severe depression.

The electronic implant program relies on neural plasticity (<http://spectrum.ieee.org/biomedical/bionics/how-to-control-a-prosthesis-with-your-mind>), which allows the brain's anatomy and physiology to change over time. Deep brain stimulation already takes advantage of the brain's plasticity, but DARPA program aims to combine diagnostic and therapeutic functions into the same implanted device.

One brain implant prototype developed by Draper Labs and Massachusetts General Hospital uses both commercial electrodes and custom technology. The hermetically-sealed device also has a rechargeable battery that can be recharged via inductive coupling. DARPA expects a variety of brain implants to be developed through this program over the next five years.

