DARPA's Restoring Active Memory Program Poised To Launch

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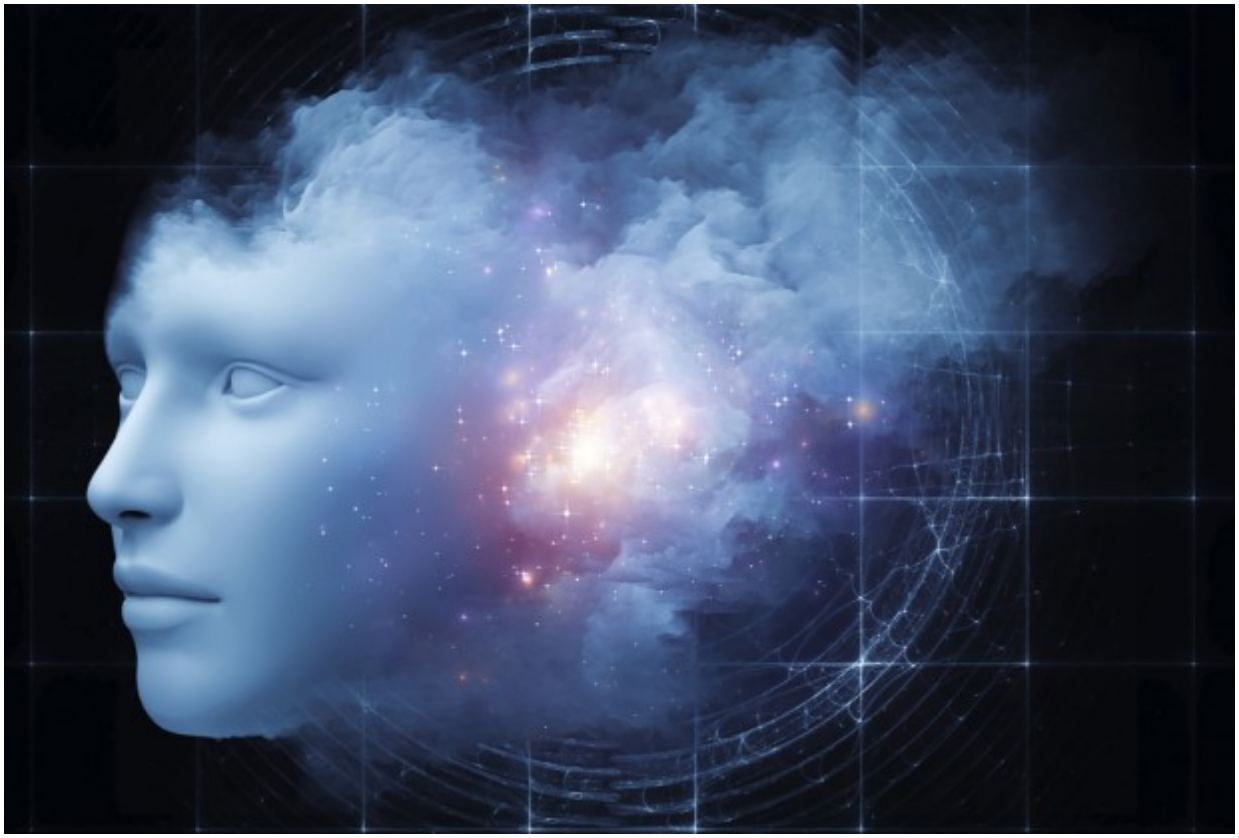

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Image Caption: DARPA's Restoring Active Memory program will attempt to develop implantable technology to bridge gaps in the injured brain and restore normal memory function to people with memory loss caused by injury or disease. Credit: Thinkstock.com

Alan McStravick for redOrbit.com – Your Universe Online

Just over a year ago I reported on the announcement of the BRAIN (Brain Research through Advancing Innovative Neurotechnologies) Initiative, the scientific cousin to the wildly successful Human Genome Project.

In his 2013 State of the Union address, President Obama announced the new study saying, "Every dollar we invested to map the human genome returned $140 to our economy – every dollar. Today our scientists are mapping the human brain to unlock the answers to Alzheimer's. They're developing drugs to regenerate damaged organs, devising new materials to make batteries 10 times more powerful. Now is not the time to gut these job-creating investments in science and innovation."

A year after the ambitious announcement, redOrbit detailed some of the early work already commencing in the field of anxiety and depression and how the work being done will be aimed initially at helping members of our armed services who have returned from battle theaters in Iraq and Afghanistan suffering from post-traumatic stress disorder (PTSD) and traumatic brain injuries (TBI).

The Defense Advanced Research Projects Agency (DARPA) is the arm of the government tasked with identifying academic and private institutions currently working on research projects that can further the BRAIN Initiative. This week DARPA announced they have awarded funding to two more universities to aid them in launching their programs for restoring active memory. This latest program is called 'Restoring Active Memory' (RAM).

According to a statement by DARPA, the University of California, Los Angeles (UCLA) and the University of Pennsylvania (Penn) will serve as leaders of a multidisciplinary team tasked with developing and testing electronic interfaces that can sense memory deficits as a result of an injury. The devices are also intended and expected to help restore normal brain function to the affected area.

Funding in the amounts of $15 million and $22.5 million will be granted to UCLA and Penn, respectively. The full funding, over a four year time period, will be contingent upon both institutions consistently meeting a series of technical milestones. An additional $2.5 million grant has been earmarked for the Lawrence Livermore National Laboratory for the development of an implantable neural device. This device is intended as a supplement to the UCLA-led effort.

"The start of the Restoring Active Memory program marks an exciting opportunity to reveal many new aspects of human memory and learn about the brain in ways that were never before possible," said DARPA Program Manager Justin Sanchez. "Anyone who has witnessed the effects of memory loss in another person knows its toll and how few options are available to treat it. We're going to apply the knowledge and understanding gained in RAM to develop new options for treatment through technology."

As mentioned above, much of the initial benefit is aimed at returning servicemembers who have suffered one form or another of a TBI. However, this injury affects more than just those coming home from the war fronts. It is

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estimated that as many as 1.7 million US civilians also suffer from a TBI. The condition frequently results in a reduced capacity to form or retain new memories following the injury as well as causing difficulty in retrieving memories formed prior to the incident.

Caretakers recognize the insidious nature of TBIs and frequently lament the fact that there are currently no effective therapies in existence to alleviate or mitigate the long-term consequences. DARPA hopes the RAM program will be the necessary driver for the future development of TBI focused technologies.

“We owe it to our servicemembers to accelerate research that can minimize the long-term impacts of their injuries,” Sanchez said. “Despite increasingly aggressive prevention efforts, traumatic brain injury remains a serious problem in military and civilian sectors. Through the Restoring Active Memory program, DARPA aims to better understand the underlying neurological basis of memory loss and speed the development of innovative therapies.”

The goal of the RAM program, specifically, is to develop and test wireless, fully implantable neural-interface medical devices that can be used as “neuroprosthetics.” These devices will serve as a sort of bridge across the TBI induced gaps that interfere with an individual’s ability to encode new memories and retrieve old ones.

The UCLA team will focus on a region of the brain known as the entorhinal area. Previous research done at the university showed human memory could be facilitated by stimulating this portion of the brain, known to be involved in both learning and memory. This region, considered by neuroscientists to be the front door to the hippocampus, is integral in helping situations encountered in one’s day-to-day become lasting memories.

On the other side of the country, the Penn team’s approach will be based on the understanding that memory is the result of complex interactions among multiple regions of the brain. This group of researchers will record the neural activity of patients who have already had electrodes implanted in multiple areas of the brain. The neural activity will be captured as the participants play computer-based memory games. The team will measure the biomarkers of successful memory function – patterns of activity that accompany the successful formation of new memories and the successful retrieval of old ones. This early work by the Penn team will lead to a better understanding of the brain and how brain stimulation therapy can possibly aid in restoring normal brain function following injury or the onset of a neuropsychological illness, like Alzheimer’s disease.

The RAM program, in addition to its human trials, will also support animal studies meant to advance the state-of-the-art quantitative models that currently account for the encoding and retrieval of complex memories and memory attributes.

DARPAs neuroscience efforts in the BRAIN Initiative, of which RAM is a part, are informed by members of an independent ethical, legal and social implications (ELSI) panel. This panel is employed as a means of oversight to supplement the existing institutional review boards present on the research lead’s campuses that govern human clinical studies and animal use.

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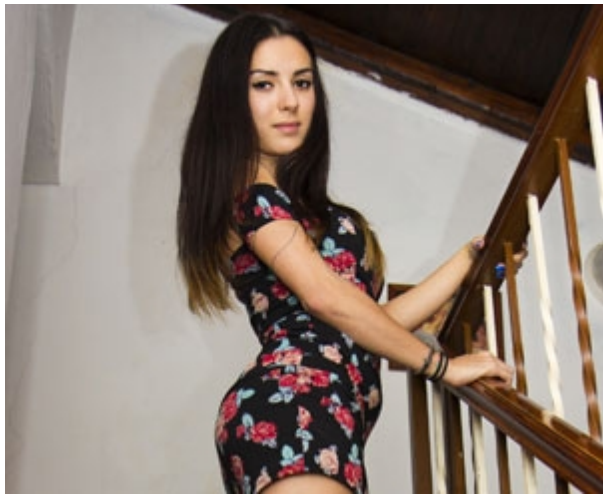

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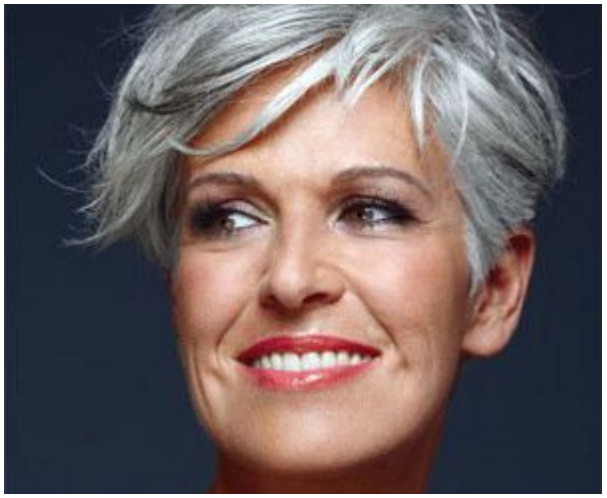

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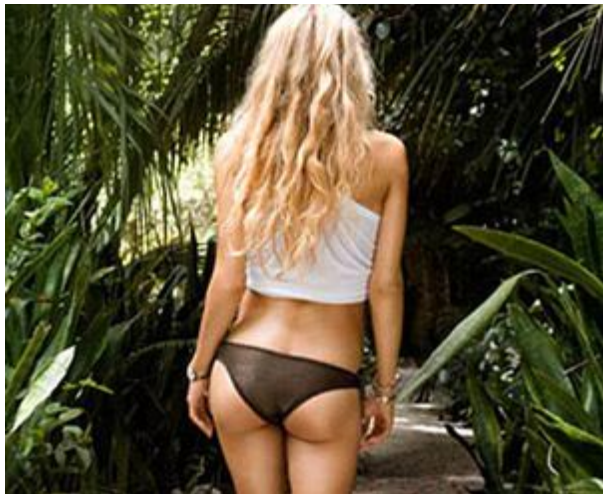

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