Naval Research Lab Attempts To Meld Neurons and Chips

Studies May Produce Army of 'Zombies'

By PAT COOPER
Defense News Staff Writer

WASHINGTON — Battles of the future could be waged with genetically engineered organisms, such as rodents, whose minds are controlled by computer chips engineered with living brain cells, according to defense officials and scientific analysts.

Such a scenario could become reality within the next 15 years if research conducted at the Washington-based Naval Research Laboratory pays off, they said.

The research, called Hippocampal Neuron Patterning, grows live neurons on computer chips, William Tolles, the recently retired associate director of research at the Naval Research Lab, said March 15.

"This technology that alters neurons could potentially be used on people to create zombie armies," Lawrence Korb, a senior fellow at the Brookings Institution, said March 16.

The research specifically is focused on neurons, the biological unit of human and animal nervous systems that sends information from the brain to the body. The brain's billions of neurons control muscle movement and all other activities of the nervous system.

"It sounds like science fiction, but science fiction is only 10 to 15 years ahead of [these kinds of] novel technologies," Kyle Olson, vice president of the Chemical and Biological Arms Control Institute, Alexandria, Va., said March 16.

The research has captured the attention of the U.S. intelligence community.

"We are looking at the technology," one intelligence source said March 15. "We're not going to create little green men who sprinkle [biological] contaminants on people. The applications are geared toward creating something that could go into areas humans could not go because of biological, chemical or nuclear contaminants," he said.

In the short term, Navy scientists hope to create what they call an electronic canary. Like coalminers who once used the birds in mines to warn them of deadly gases, the Navy organism would monitor biological and chemical toxins on the battlefield, Tolles said.

As for the electronic canary analogy, scientists are growing live neuron cells on sensor chips that monitor the health of the neurons, Tolles said.

Biological and chemical agents alter the function of the cell, and

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its reaction, such as impending paralyzation or death, would be communicated through the sensor chip, Joel Schnur, director of the Naval research lab's Center for Biomolecular Science and Engineering, said March 15.

"Once this technology is proved, you could control a living species," Tolles said. Tolles spoke before the Defense Electronics Symposium for the Warfighter, sponsored by the American Defense Preparedness Association in Arlington, on March 15.

"There is a valid need for new mechanisms to detect biological and chemical agents, but this is risky territory. For all the desirable applications, it may have horrific applications," Steve Aftergood, a senior analyst for the Washington-based Federation of American Scientists, said March 15.

In the near future, Navy scientists hope to create living neural computer networks that can learn, Schnur said. He declined to comment on applications that would control living things.

Neural networks as they now exist are composed of computers and not living organisms.

They are used in computing to conduct parallel processing. Unlike sequential processing which solve complicated equations one step at a time, parallel processing breaks down problems into small components that are computed simultaneously, similar to the way the human brain solves complex problems.

Neural networks solve problems far more rapidly than conventional computer programs and have their greatest applications in artificial intelligence. The military uses such networks for processing signals to find targets in the dark, for example.

"This could provide a real [living] neural net that could learn," Tolles said. The computer neural networks function as the brain does. With living neural nets, actual brain matter would make the computations.

The work has tremendous medical implications. If a computer could communicate with neurons, it could be used to compensate for nerve damage, possibly compensating for vision or hearing losses, Dr. Mike Heller, a physical chemist and vice president for research of Nanotronics Inc., San Diego, said March 15. Nanotronics is a biomolecular research firm.

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For example, Heller said, lost vision potentially could be restored by connecting a sensor to the optic nerve.

"This opens up whole new applications in bioelectronics, where you could use the memory on a [biological] chip, pop it into your head and learn French, for example," Olson said.

"This is a classic case of military [research and development]. The door swings in two directions. You've got this Frankenstein-type weapon on one hand, and it can deal with problems of the human condition on the other," Olson added.

However, experts say it is unlikely that Pentagon officials would ever unleash genetically engineered soldiers on adversaries.

There is a moral component that policy-makers must face, Heller said. "By the time we can [use the technology] we'll understand why we shouldn't. That's why we aren't throwing [biological] viruses on our enemies, or [using] nuclear weapons: We know it will result in total annihilation," he said.