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# With Brain Corp., Qualcomm Started Computing Like a Neuron Years Ago

Bruce V. Bigelow | 4/3/13 | Follow @bvbigelow

When President Obama stepped before the media yesterday to unveil a \$100 million initiative to revolutionize our understanding of the human mind, Qualcomm CTO Matt Grob was among the experts who gathered to watch in the East Room of the White House.

The president said he had invited some of the smartest people in the country to join a nationwide effort to make neuroscience the next "grand challenge," akin to the Human Genome Project. He laid out a plan that calls on a group of elite scientists to set R&D priorities for funding neuroscience research, and for the creation of "public-private partnerships" to advance brain research at "companies, foundations, and private research institutions."

Much of the attention focused on basic research into diseases like Alzheimer's at such places as San Diego's Salk Institute and Seattle's Allen Institute for Brain Science. But the president also hinted of possible breakthroughs in computer science.

"Imagine if someone with a prosthetic limb can now play the piano or throw a baseball as well as anybody else, because the wiring from the brain to that prosthetic is direct and triggered by what's already happening in the patient's mind," he said. "What if computers could respond to our thoughts or our language barriers could come tumbling down. Or if millions of Americans were suddenly finding new jobs in these fields—jobs we haven't even dreamt up yet—because we chose to invest in this project."

And this, in a nutshell, explains why the chief technology officer of the San Diego wireless technology giant was invited to attend the rollout of the administration's new BRAIN Initiative (Basic Research through Advancing Innovative Neurotechnologies).

For the past four years or longer, Qualcomm has been quietly working at the frontiers of neuroscience—in areas that might seem more like science fiction. Much of this work has been taking place at "Brain Corp.," an independent venture that Qualcomm has kept mostly under wraps.

Qualcomm didn't say much about Brain Corp. before yesterday; the company declined my request for an interview with Brain Corp. earlier this year. And if you search for "Brain Corp" on the Qualcomm website, you won't get any results.

Yet the [Brain Corp. website](#) is easy enough to find.

BRAIN Initiative announcement

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Founded in 2009, Brain Corp. set out to develop radically different computer systems and software, based on algorithms that emulate the “spiking neuron” processes of the human brain. An underlying premise of the research is that biological systems are extremely efficient at processing electrical signals. Thus it would be a huge advantage if the world’s biggest wireless chipmaker could make specialized silicon chips that operate like the brain—and require significantly less power. The immediate goal, though, is to build software systems based on Brain Corp. technology for use in commercial applications—such as an artificial nervous system for unmanned aircraft.

Brain Corp. is based in first-floor offices at Qualcomm’s corporate headquarters on Morehouse Drive, and Qualcomm Ventures has provided funding through two investment rounds. The website also offers some fascinating glimpses of innovations at the cutting edge of computational neuroscience. For example:

—DARPA, the U.S. military’s Defense Advanced Research Project Agency, provided an undisclosed amount of funding to Brain Corp. in 2010 “to design an artificial nervous system for UAVs” (unmanned aerial vehicles).

—Brain Corp. has signed several multi-year agreements with Qualcomm to apply its “spiking neuron” technology in different ways. For example, a vision project is intended to recreate the stereoscopic vision system found in humans and other mammals in a large-scale computer model, including the part of the brain that actually processes images. And a motor control project is focused on developing new ways to control robots by using a computer model of the biological systems in the cerebellum and basal ganglia that control movement.

—Todd Hylton joined Brain Corp. as a top executive last year, after resigning from DARPA, where he spent nearly five years as a program manager. Hylton developed and managed funding for a variety of R&D programs focused on machine intelligence, including UAV systems, neuromorphic computation, computer architecture, and Systems of Neuromorphic Adaptive Plastic Scalable Electronics (SyNAPSE).

Brain Corp. was founded in 2009 by Eugene Izhikevich, a Russian computational neuroscientist who was previously a research fellow at The Neurosciences Institute in La Jolla.

Izhikevich developed a mathematical model that describes the “spiking” behavior of neural activity in the brain. Creating the algorithm allowed him to develop a computer-based simulation of the human brain—with roughly the same density of neurons and synapses. The computer model, which simulates 1 million neurons and almost 500 million synapses, spontaneously exhibited types of brain activity (such as alpha and gamma waves)—which was something it was not designed to do. (Izhikevich and a co-author, the renowned neuroscientist Gerald Edelman, published a [scientific paper](#) describing this “large-scale model of mammalian thalamocortical systems” in the March 4, 2008, issue of Proceedings of the National Academy of Sciences.)

Of course, the work underway at Brain Corp. represents a small fraction of the BRAIN Initiative that President Obama announced yesterday.

Still, the White House initiative is intended to spur innovation in the neurosciences in the same way the 10-year effort to sequence the human genome developed new technologies and industries. According to a 2011 [Battelle study](#), the Human Genome Project contributed more than \$140 to the U.S. economy for every \$1 invested by the federal government.

As the president said in his [prepared remarks](#) yesterday: “In the budget I will send to Congress next week, I will propose a significant investment by the National Institutes of Health, DARPA, and the National Science Foundation to help get this project off the ground. I’m directing my bioethics commission to make sure all of the research is being done in a responsible way. And we’re also partnering with the

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Bruce V. Bigelow is the editor of Xconomy San Diego. You can e-mail him at [bbigelow@xconomy.com](mailto:bbigelow@xconomy.com) or call (619) 669-8788 [Follow @bvbigelow](#)

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