

# The BrainGate™ Neural Interface System

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Prosthetic devices and assistive technology usually require some sort human action, such as a muscular contraction or breath, in order to operate. The idea of using human thought to move a robotic device, wheelchair, prosthetic limb, or a computer was once bound solely to science fiction. However, this concept is currently undergoing a complete change. In 2000, six Brown University scientists began exploring human brain functions using nanotechnology, and discovered that signals from the brain could be decoded and used to produce commands for external technology. After years of research and trials, the BrainGate™ Neural Interface system was created. Developed by a Brown University research team made up of leading neurologists, neuroscientists, engineers, computer scientists, neurosurgeons, mathematicians, and other researchers under the leadership of Dr. James Donoghue, the BrainGate is a brain-computer interface, or BCI, meaning it is a direct communication pathway between the human brain and an external device. It consists of a microchip which is surgically implanted into the brain, which is then wired to a plug and port interface system attached to the top of the skull, used for connecting to various forms of assistive technology. The computer chip consists of 100 electrodes, each one as thin as a strand of human hair, and senses the specific electro-magnetic signature of neurons, such as those which deal with limb movement. The computer chip itself is comparable to a “baby aspirin”, much smaller than a penny. Though the BrainGate is not yet released commercially, there has been a successful human clinical trial. Matthew Nagle, a 25-year-old man, was left quadriplegic due to a spinal cord injury. For the trial, Nagle was linked to a PC via the BrainGate. He almost immediately became able move the computer

mouse pointer. As the trials progressed, over time Nagle became able to turn on lights, change television channels and read e-mail, open a prosthetic hand, control a robotic limb and move a computer cursor, all by using his thoughts alone. An improved model of the BrainGate, the ‘BrainGate2’ is currently under clinical trials in Massachusetts General Hospital. According to Dr. James Donoghue, the new trial will hopefully help patients with severe spinal cord injury, stroke, muscular dystrophy, Lou Gehrig's disease or limb loss turn their thoughts into actions. Donoghue said that the ultimate goal of the BrainGate Project is for the paralyzed to eventually regain control of their own limbs, rather than solely operating assistive technology. He believes that the BrainGate system has the potential to eventually serve as a successful replacement for a damaged human nervous system.

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