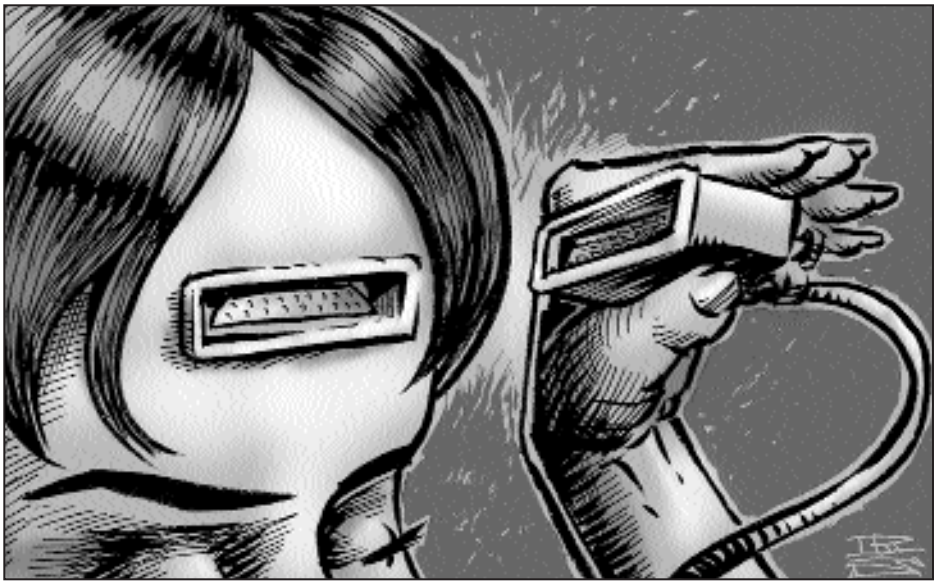
Beyond Personal Computing



Neurohackers

By Vance Frickey

While researching another article for *ComputorEdge*, I discovered that some people want to make changes to the ultimate personal, portable computer—the brain. A brave few "neurohackers" have already embarked on the adventure of hacking their brains.

"Wonko the Sane," author of the Web site "Not for Wimps—The Neurohacker's Guide to Fun" (*www.fast-forward.info/ramonsky/not-for-wimps*), proclaims, "I have fundamentally different software *and* hardware now than that which I had 10 years ago, an increase in IQ way over the odds, massive hormonal changes, and a serious addiction to walnuts."

The "software *and* hardware" that Wonko refers to is between his ears. He wants to "upload"—transfer—his mind from his brain into a computer.

According to Wonko, "Freedom is the issue, I'm afraid—freedom from genetic slavery and biological serfdom. This to me means uploading. Suffice it to say that a biological body is too much of an inconvenience as a home for an intelligence, except in an emergency."

Cyberpunk

In the 1950s, physiologist James Olds discovered that he could provoke or suppress many sorts of behavior—hunger, sexual arousal, aggression—in rats by stimulating different parts of their brains with electrodes.

Science-fiction writers eventually seized upon Dr. Olds' discoveries. A new genre of literature—cyberpunk—grew up around the idea of neurohacking, and movies like *The Matrix*, *Johnny Mnemonic*, and *Strange Days* have explored its dramatic possibilities.

Neurohacking isn't as far along as it is in the movies, though. Interpreting data from the brain, such as electroencephalographs (EEGs), is in its infancy. Intriguing glimpses of what happens in the brain appear—Australian researchers discovered a unique "blip" in the EEG that consistently occurs when people switch from reading or listening in one language to another—but not the roadmap needed to interpret sensations and thoughts.

Playing recorded EEG data back into the brain is even tougher. All sensation—thought, memory, speech, and vision—happens when neurons in the brain fire, making other neurons nearby fire in patterns we don't completely understand. Playback of these events would require the right neurons to fire in the right sequence. Normally, that happens accidentally during neurosurgery, or when electrodes in the brain excite nearby neurons.

That hasn't stopped neurohackers from trying. An article in *Wired* magazine describes a number of ways to excite the brain, from electrodes on the scalp, light and sound displays designed to induce certain brain waves, exciting the brain with microwaves or electromagnetic pulses from solenoids, to drilling through the skull to place electrodes directly on the brain—an approach endorsed by Wonko the Sane.

Researcher David Cole is working on ways to transfer electrical patterns caused by sight or sound from one brain to another. In Cole's research, brain waves from one subject are amplified, then transferred to another subject—Cole himself. His first experiments used regular EEG electrodes on the scalp. In one of these sessions, Cole saw a "hot spot" right where the source's eyes saw a flashlight—and also felt "nervousness, alarm, agitation, and flushed face."

After that, Cole was skittish about attempting more experiments using electrical stimulation. He has since used deep magnetic stimulation with solenoids made by wrapping conventional iron nails with 22-gauge copper wire. "The results are not as dramatic, but they are consistent enough to warrant more study," Cole says.

Stimulating the Brain

Getting people to admit to radical neurohacking is not easy. However, the *Wired* article did draw on an interview with the inventor of what some might consider a great leap of

neurohacking—a device to stimulate the brain into orgasm.

This is supposedly something you would put on, and then flip a switch and have a really good time. *Wired* got only vague hints about this cheap thrill generator from its inventor. "Well, it's something I'd rather not talk about. It's a device I built that could very easily be abused. I really can't say anything more about it. It would be a disaster if it got out into the world."

The inventor may have had in mind Dr. James Olds' discovery of an area of the brain that, when stimulated, seems to produce extreme pleasure. Rats given a choice between food, water or pressing a bar that administered electric current to this part of their brains would literally starve or die of thirst while continuing to press that bar. Since some people already behave that way around the Internet, you can see the potential problem.

Most of the *Wired* article dealt with ways of monitoring the brain, not stimulating it, including sound or light displays that allow the user to consciously alter his or her brain function, ways to control computers and prosthetic limbs directly from brain impulses, and cochlear implants, widely used medical devices that excite the nerve responsible for hearing—and restore hearing in many patients.

Things to Come

Progress has been made toward replacing lost sight with tiny video cameras wired to the nerves related to vision, such as microchip imaging devices placed directly on the retina of the eye. In 1999, Stevie Wonder volunteered as a test subject for this new technology.

When these chips were implanted into patients for brief periods, patients saw colors and outlines of letters. Unfortunately, Stevie Wonder could not benefit from the device because his blindness is not caused by the gradual breakdown of the retina for which the device was designed.

Newer designs of retinal implants are out there. One is self-powered—an array of 5,000 tiny solar cells that stimulate the retina, restoring sight to 10 patients in clinical trials. According to its manufacturer, these patients report "moderate to substantial improvement in vision." Other devices transmit images magnetically from an external camera to the visual cortex of the brain, requiring no hole for wires through the skull.

Advances in miniaturization that gave us pocket-sized computers and cell phones should increase these new devices' power and efficiency while reducing their cost. Hacking the brain to restore lost sight may not only be feasible, it might be covered by health insurance. ❑

Do you have your own personal computing story to share with our readers? We pay $50 for each Beyond Personal Computing story we publish. You can electronically submit your 800- to 1,000-word story to submissions@computoredge.com. *Please put "BPC" in the subject line of your e-mail.*