

Restoring speech to paralyzed individuals

At the NSF-funded CELEST Science of Learning Center, Boston University Professor Frank Guenther's research team has succeeded in creating synthetic speech sounds from the thoughts of a volunteer as he imagined producing those sounds. The volunteer was completely paralyzed by a brain-stem stroke, but is fully conscious because higher brain centers were spared – a condition known as *locked-in syndrome*. Dr. Philip Kennedy, Guenther's collaborator on the project, designed a long-term electrode that was implanted permanently into the volunteer's brain, in the region that controls speech movements. When the subject thinks about speaking, the electrode picks up signals from nearby neurons and transmits them to a computer. There, a system developed by Guenther's team (the "Neural Decoder" and "Speech Synthesizer" in the figure at right) translates the signals into the speech sounds the volunteer is thinking of making. The entire process occurs nearly instantaneously.

A new CELEST collaborative project involving Guenther's modeling/technology lab and MIT Professor Earl Miller's primate experimental lab involves developing and testing new brain-machine interface hardware in monkeys that will allow the long-term recording of many more neurons than is currently possible, thereby greatly increasing the system's capabilities for generating synthetic speech when adapted for humans. [Figure reprinted by permission from Frank Guenther.]

