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Neural Prosthesis Seminar

“Connecting with the World: Electrical Stimulation to Provide a Sense of Touch for Persons with Limb Loss”

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Biomedical Research Building 105

Case Western Reserve University



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Abstract

There have been significant advances in the mechatronics of amputee prosthetics and the control of these devices. All of these advances, however, have been largely outside the body. When a person loses a limb, however, they lose sensory connection to the world. Without sensory feedback, even simple tasks can be difficult or impossible. There are significant psychosocial deficits, as well, such as the inability to feel the touch of a spouse, a child, or another person. Our work is showing how proper interfaces to the residual nervous system and appropriate electrical stimulation can restore a natural sense of touch and feeling that corresponds to natural locations on the missing limb and restore the sense of the hand being present and interacting with the world. Specialized patterns of electrical pulses into the nerve are excite axons from sensory fibers, which carry pulses to the brain. Stimulation of small regions of the peripheral nerve provides spatial resolution in the perceived sensation. The pattern pulses are critical to the brain's interpretation of the sensation. Varying the pattern can produce multiple different sensations at a common location. This technology has been demonstrated stable for almost two years in two individuals with limb loss. Restoring feeling has allowed the individuals to, “feel (my) hand for the first time since the accident,” and “feel (my) wife touch my hand.” Individuals using a prosthetic hand with sensation can pull cherries and grapes from the stem, open water bottles, and move objects without destroying these objects - all while audio and visually deprived. A prosthesis with natural feeling, which will be the first truly artificial hand, is possible in the next five to ten years.

For more information, please contact Cheryl Dudek
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