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Advancing the Arizona State University Knowledge Enterprise

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Compliant Devices for Neural Prosthetics

Neural prostheses require special electrical interfaces for interacting with neural tissue to substitute for motor, sensory, visceral or cognitive functions. One target for such interfaces is peripheral nerves which connect the brain and spinal cord to the rest of the body. Current peripheral nerve interfaces all suffer from at least one of two design challenges. They are either made of non-compliant and brittle materials that are subject to failure in real-world use, or they do not sample a complete cross-section of the nerve limiting the amount of information that can be exchanged with the nervous system.

Researchers at Arizona State University have developed a novel device/interface that addresses both of the main design challenges that plague current peripheral nerve interfaces. This device and its unique implantation technique enables a long-term chronic neural interface for neural prosthetic applications. The neural interface provides both conformal materials to maximize robustness and signal stationarity and sampling from the complete cross-section of the nerve to maximize information transfer to and from the nerve.

This novel interface overcomes the two major challenges of current peripheral nerve interfaces and enables a long-term chronic neural interface for a myriad of applications.

Potential Applications

- Peripheral nerve interface
  - Neural prostheses (hearing, vision, motor, cognitive, etc.)
  - Prosthetics for pain relief
  - Prosthetics for bladder control/incontinence
  - Restoration of motor function following spinal cord injury or stroke
  - Treatment of epilepsy by electrical stimulation of the vagus nerve
  - Treatment of chronic migraines by stimulation of the occipital nerve

Benefits and Advantages

- Provides conformal materials to maximize robustness and signal stationarity
- Non-destructively samples from the complete cross-section of the nerve to maximize information transfer to and from the nerve
- Enables a long-term chronic neural interface for neural prosthetic applications
- Unique implantation techniques minimize damage and trauma to the nerve
- Can measure electrical activity adjacent to the nerve fibers without sharp or concussive penetration

For more information about the inventor(s) and their research, please see Dr. Greger's Laboratory Webpage