# *Front-End Engineering of Neural Recording Microsystems for Neuroscience and Neural Prostheses*

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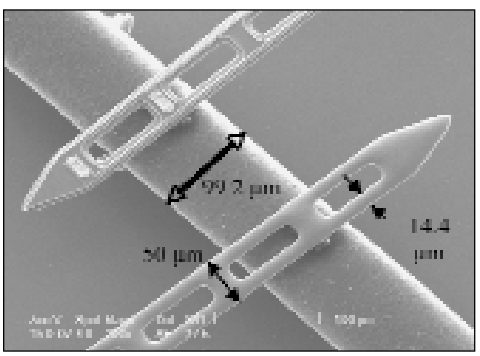
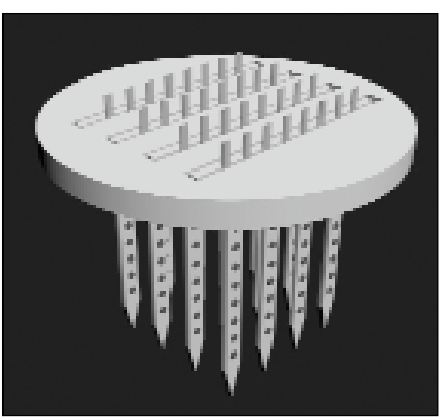
Fully implantable wireless interfaces to the nervous system at the cellular level are key to understanding the fundamental behavior of the brain and to overcoming the debilitating effects of various neurological disorders. This project contributes to a larger effort in developing an implantable wireless microsystem for use in neuroscience and neural prostheses through work at the system front-end (the microelectrodes and signal conditioning circuitry). The work spans three general areas: 1) advanced electrode engineering for improved electrode-cell coupling and chronic compatibility; 2) robust front-end signal conditioning circuit design; and 3) integration and packaging of the electrodes and circuit chips.




*Lattice probe on a human hair.*

Electrodes having recording and/or stimulating sites available on both sides of the substrate have been developed to study and improve cell coupling in tissue. Lattice-structured shanks have been engineered to reduce micromotion-related tissue response in chronic applications. Advances in three-dimensional electrode arrays and their assembly techniques resulting in zero-rise compact structures have been made. A programmable signal-conditioning ASIC for neural recording has also been successfully developed, and a low-profile platform structure has been realized for integrating the electrode arrays with the front-end electronics of the neural recording microsystem. This project is supported by the Engineering Research Centers Program of the National Science Foundation under award number EEC-9986866.



*Zero-rise 3-D neural recording/ stimulating array.*