

Engineering Cell and Brain Interfaces

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Abstract:

Interfacing inorganic or man-made systems to biological cells and tissues is an emerging yet powerful approach that could lead to improved biological understanding, accelerated drug development, and safer, more effective therapies. However, connecting typically ‘hard’ materials with little of the molecular complexity of biological systems is challenging. Researchers have begun to harness the exquisite control and processing afforded by nanofabrication and nanomaterials synthesis to begin to bridge this divide, and create devices with intimate contact and communication with biological systems. Here we will explore several examples of this approach, ranging from high aspect ratio nanostructure for direct cell penetration, cell-fusing artificial electrodes, and physical membrane electroporation. In addition, we will discuss some of the challenges involved with brain-machine interfaces, and some of the current strategies for achieving high channel count, non-perturbative electrical recording and stimulation systems.