Interface Between Modern Microelectronics and the Human Brain.

Adam Williamson, Aix-Marseille University

One of the most scientifically interesting topics currently in applied sciences is the interface between modern microelectronics and the human brain. There are two primary motivations for combining microelectronics and neuroscience. The first is to improve the technological tools used to investigate neuroscientific questions. Ideally improved technology will help illuminate aspects of neuroscience previously not understood. The second is to create new tools for diagnosis and treatment of neuropathologies, including epilepsy and Parkinson's disease.

There are many fields of material science currently developing microelectronics to interface with the brain, however organic electronics has developed several materials with exceptionally attractive properties for neuroscience, including mechanical flexibility, mixed ionic/electronic conduction, enhanced biocompatibility, and the capability for drug delivery.

In this talk, we will briefly describe the history of brain microelectronics, for the purposes of studying and treating the brain. We will present examples of non-organic and organic-based devices for the stimulation and recording of brain activity, and highlights the importance of the organic material properties and their corresponding performance in the neural tissue. These organic electronic materials offer unmatched possibilities for device design to advance the understanding of neurophysiology and pathophysiology, and to create a new generation of therapeutic devices.