

## “Towards Seamless Integration of Microelectrodes in Neural Tissue”

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**Lecture: 9:00 AM-10:00 AM**  
**ENGINEERING CENTER**  
**ROOM EC 2300**



**Abstract:** Microelectrode arrays placed in the nervous system to directly interface with neurons or monitor neurochemicals, have tremendous research and clinical significance. Current arrays experience chronic failure including signal drift and degradation due to the biochemical, mechanical and electrical mismatch between the artificial device and brain tissue. Several bioengineering strategies are being investigated towards a seamless sensor-tissue interface. The first strategy is to camouflage the abiotic implant with biomolecules. A neural adhesion molecule L1 has been coated onto the implant surface showed to improve neuronal growth on and around the implant and reduce inflammatory tissue response and scarring. Secondly, therapeutics to modulate the host tissue responses such as inflammation, degeneration, BBB breach and oxidative stress, have been identified to improve electrode-tissue integration. On demand local drug delivery technologies are being developed for these drug candidates. Thirdly, new implant materials and designs are being developed that reduces the form factor and matches the mechanical properties of the brain. An elastomeric electrically conductive polymer blend is synthesized that has the mechanical modulus similar brain tissue. Soft electrodes made of the new materials showed much better integration with the host tissue compared to the stiff wires. The ultimate solution to a reliable and durable neural interface device may be a combinatorial approach that takes advantage of multiple strategies discussed above and beyond.

**Biography:** Dr. Tracy Cui is William Kepler Whiteford Professor of Bioengineering at the University of Pittsburgh. She is the Director of the Neural Tissue/Electrode Interface and Neural Tissue Engineering Lab. She is also the Neural Engineering Track Coordinator for the Department of Bioengineering Graduate Committee and serves on the Leadership Team of the Center for Medical Innovation. Prior to Pitt, she was a Research Scientist at Unilever Research US. Dr. Cui earned her BE in Polymer Materials and Chemical Engineering, and her MS in Biophysics from Tsinghua University in Beijing, China. She went on to earn her PhD in Macromolecular Science and Engineering at the University of Michigan, Ann Arbor, Michigan. In Dr. Cui’s laboratory, the primary research focus is on the interactions between neural tissue and smart biomaterials. Research areas include the neural electrode-tissue interface, neural tissue engineering, drug delivery, and biosensors. Dr. Cui holds one granted and five filed U.S. patents and has over 60 publications with over 3900 citations and H index of 29. For her research, Dr. Cui has won numerous awards including 2013 Carnegie Science Emerging Female Scientist Award, 2009 and 2011 Pitt Innovator Award, 2008 National Science Foundation Career Award and 2005 Wallace Coulter Foundation Translational Early Career Award. She serves as a grant agency reviewer for the National Institute of Health, National Science Foundation, Science Foundation of Ireland as well as the American Institute of Biological Sciences. Dr. Cui is the Associate Editor of the *Journal of Materials Chemistry B* since 2014 and has recently been elected as the Fellow of American Institute of Medical and Biological Engineering Class 2016.