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Patterned Conducting Polymer Microelectronics for Analysis of Neural Signaling DANIEL T. SIMON, Department of Physics, University of California, Santa Cruz, California, 95064, S. A. CARTER, Department of Physics, University of California, Santa Cruz, California, 95064 — The ion-mediated conduction and versatility of device-fabrication of conducting polymers provide a route to the study of signaling in neural networks. To this end, network patterned junctions of conducting polypyrrole have been electropolymerized on commercially available micro-electrode arrays. The typical dimensions are 200 μm between electrodes, each electrode being 30 μm in diameter. Tetrabutylammonium perchlorate or sodium p-toluenesulfonate were used as electrolyte in the organic solvent. Individual polypyrrole junctions, when synthesized and connected in a three-electrode configuration, exhibit current-switching behavior analogous to synaptic weighting or neural "learning." Junctions copolymerized with polythiophene exhibit current rectification and the non-linear current-voltage behavior requisite for neural electronics (*i.e.* the activation function).

Daniel Simon
Department of Physics, University of California, Santa Cruz, California, 95064

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