

Abstract Submitted
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High Density Shielded MEA / Optrode Arrays JEFF NAUGHTON, JUAN M. VARELA, JOHN P. CHRISTIANSON, THOMAS C. CHILES, MICHAEL J. BURNS, MICHAEL J. NAUGHTON, Boston College — We report on the development of a novel, high density, locally-shielded neuroelectronic / optoelectronic array architecture, useful for bioelectronics and neurophysiology [1]. The device has been used in real time to noninvasively couple to leech neurons, allowing for extracellular recording of synaptic activity in the form of spontaneous synapse firing in pre- and post-synaptic somata. In addition, we show by subtly altering the architecture the ability for optical integration with the device – that is, it can function as both a local light delivery conduit and a recording electrode. We utilized this novel device to optically elicit and electrically record membrane currents in HEK293 cells transfected with plasmids encoding ChR2-YFP (i.e. optogenetics). Finally, we show that the local (Faraday) shield is effective in isolating the sensing area, so as to record only from cells in immediate proximity. This effective isolation or cross-talk suppression is important for moving closer to “ground truth” measurements of neurons, critical to the development of valid spike sorting algorithms. [1] J.R. Naughton, et al., *Front. Neurosci.* 10, 252 (2016). doi: 10.3389/fnins.2016.00252 .

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