P.43 Fabrication of "intelligent nanosurfaces" for controlled cell- substrate interaction

P Mokarian-Tabari[1,2], C Vallejo-Giraldo[3], C Cummins[1], M A Morris[1,2] and M Biggs[3]

[1]Department of Chemistry, University College Cork and Tyndall National Institute, Ireland, [2]Centre for Research on Adaptive Nanostructures and Nanodevices (CRANN), Trinity College Dublin, Ireland, [3]Network of Excellence for Functional Biomaterials (NFB), National University of Ireland, Ireland

Neuroelectrodes are susceptible to deterioration via scar encapsulation following implantation. “intelligent nanosurfaces” which mimic the biological length scale may prevent this deterioration via the modulation of protein adsorption and cell adhesion. Furthermore nanotopography may significantly enhance electrode performance via enhanced charge transfer. A paradigme of nanobiomimetic design is that topographical features with dimensions similar to those of surface bound proteins (~10 nm) can significantly affect protein adsorption and cellular activity. However, the gold-standard for ordered nanofeature fabrication is E-beam lithography which is very expensive and time consuming. Furthermore, biological-dimension (sub-30 nm) feature size cannot be easily achieved. We describe a self-assembly process for the production of aligned and dense arrays of silicon nanopillars and nanowires using block copolymers. By modifying the shape and size of the nano features they act as functional materials for mimicking the natural biological architecture. We discuss the effect of the surface modifications on cell- substrate interaction in vitro and how they may enhance electrode charge transfer and improve neuron/electrode integration via modulation of the peri-electrode scar.