Using nano-mechanics to explore biological function

Suzanne P. Jarvis

Centre for Research on Adaptive Nanostructures and Nanodevices, Trinity College Dublin, Lincoln Place Gate, Dublin 2, Ireland.
E-mail: suzi.jarvis@tcd.ie
Website: http://www.nanofunction.org

Using a range of atomic force microscope techniques we have explored biological function across a broad range of systems and length scales. To this end we have utilized imaging, force-extension curves, indentation, and in some cases, AFM combined with fluorescence microscopy. Our measurements have included model systems investigated at the submolecular level, for example, to understand interactions between hydrophilic residues and their aqueous environment. We have also explored more complex systems *in vitro* and *in vivo* where mechanical responses have helped us to explain the beneficial mechanical properties of physiological amyloid fibrils. The most complex systems we have studied to date involve measurements at the single cell level, where we have used AFM both to measure and also to mechanically stimulate single cells. We have focused on cell types where mechanics is believed to be particularly important including mesenchymal stem cells where mechanical stimulus is thought to be important for differentiation, and cells of the lamina cribrosa, one of the regions in the intraocular portion of the optic nerve chronically exposed to a mechanically dynamic environment.

I will give a brief overview of the methods used and the systems studied so far, highlighting in particular our work on more complex biological systems.

This work was performed in collaboration with Prof. P. Prendergast and colleagues at the Centre for Bioengineering, Trinity College Dublin and the group of Prof. C. O'Brien, Mater Hospital, Dublin.