At the Bio-Nano Interface:
Integrating Live Cells with Nanosensors

The rapidly evolving field of nanotechnology creates new frontiers for biological sciences. Recently, we and other groups show that vertical nanopillars protruding from a flat surface support cell survival and can be used as subcellular sensors to probe biological processes in live cells. In particular, we are exploring nanopillars as electric sensor, optical sensors, and structural probes. As an electrode sensor, nanopillars electrodes offer several advantages such as high sensitivity, subcellular spatial resolution, and precise control of the sensor geometry. We found that the 3D topology of the nanopillars electrodes is crucial for its enhanced signal detection. The high membrane curvature induced by vertical nanopillars significantly affects the distribution of curvature-sensitive proteins and stimulates several cellular processes in live cells. Our studies show a strong interplay between biological cells and nano-sized sensors, which is an essential consideration for future development of interfacing devices.