

## **Scanning Ion Conductance Microscope as a New Tool for Bionanotechnology**

The ability to precisely move the nanopipette and to measure simultaneously an ion current allows an unprecedented level of nanoscale imaging of living cells – scanning ion conductance microscopy (SICM). Scanning ion conductance microscopy (SICM) a type of noncontact scanning microscopy technique creating topographical image of sample surface by means of glass nanopipette filled with electrolyte scanning over the sample. We have introduced a novel imaging mode of SICM, referred to as the “hopping mode”, which for the first time resolved topography of convoluted biological structures such as stereocilia bundles of inner ear hair cells or multilayered neuronal networks in their full complexity at nanoscale resolution. When it comes to imaging topography of soft cells with complex morphology under physiological conditions, the capabilities of hopping mode SICM remain largely unmatched to this day.

The speed of data acquisition positions this as a technology which may be suited to relatively highspeed scanning of cell membrane during various biological processes in real time. SICM can be used in combination with other techniques such as confocal and fluorescence microscopy, microinjection, electrochemical measurement, and patchclamp recording. This has the potential to open new horizons in medicine and biology and could be of particular value to the pharmaceutical industry. We have demonstrated developed semiautomated technique for spatially resolved recording of single channel and wholeterminal activity in small synaptic terminals in hippocampal neuronal culture. The technology was used to investigate the effect of subthreshold somatic potentials on the broadening of action potential recorded at the small synaptic bouton of the same neuron and also for mapping of ligand gated receptors in and sensory neurons.