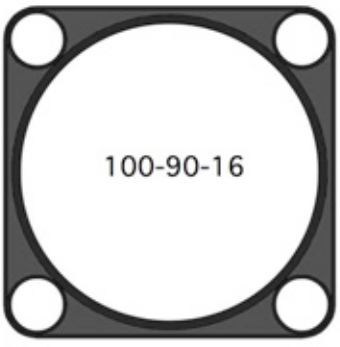
Thermally Stable Cube

A Frame for High Precision Optical Instruments made with high Modulus Graphite Carbon Fibre Beams

The framework of the cube is made from CompoTech Beams that were specially designed to have zero thermal expansion in the longitudinal direction and near zero across the section.

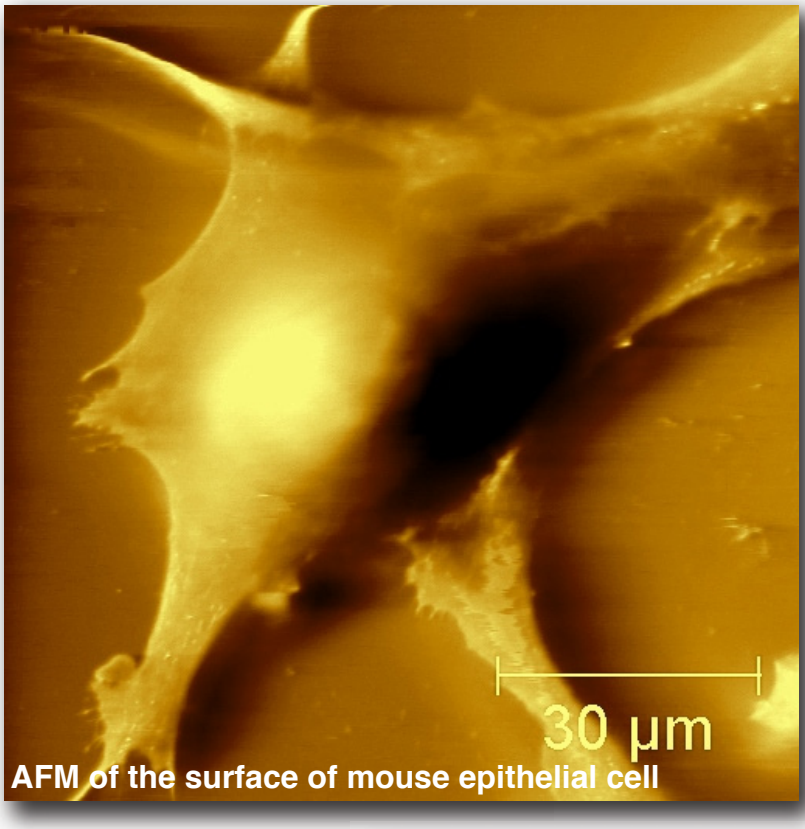
This is achieved by using a combination of high strength and high modulus carbon fibres laid in a matrix of epoxy resin with carbon nano particles. These tubes also have very good dynamic vibration characteristics which are also important for the accuracy of the optical instruments.



Joining is achieved using the built in patented connection system. For this version external brackets were used so that the configuration could be changed at a later date.

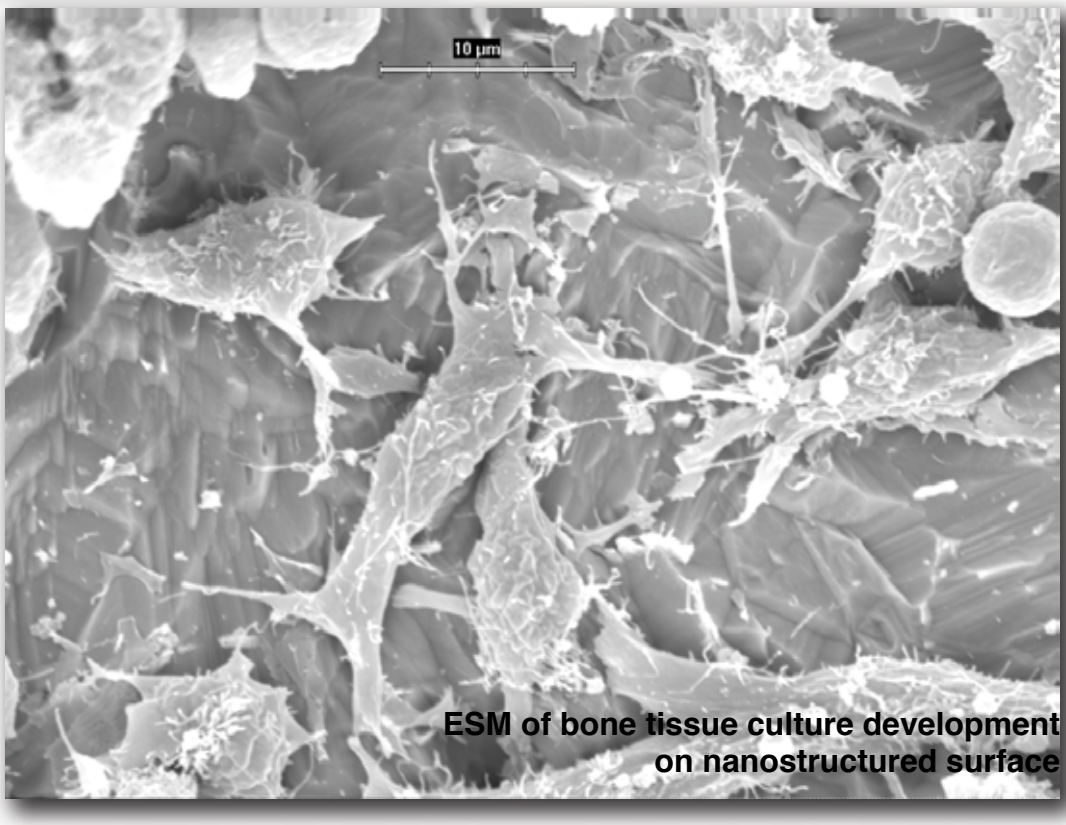
The frame was made using the 100-90-16 section

Nanoscopy and Nanotomography for Biomedical Diagnostic In Vivo



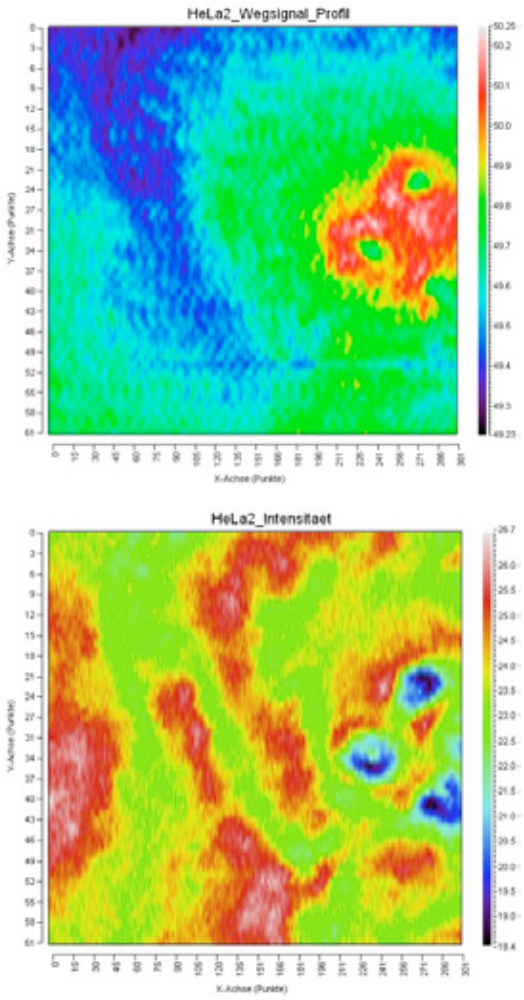
AFM of the surface of mouse epithelial cell

At resolutions higher that 10^{-7} m, large biomolecular complexes and fine structure of organelles is explored. Standard resolution achievable by microscopy of unstained and unlabelled sample stops at the border of 10^{-6}. Higher resolutions are achieved by electron cryotomography (ECT) of frozen cells, by atomic force microscopy (AFM), by scanning electron microscopy (SEM) of stained samples. ECT images the cell interior of dead cells, AFM scans the surface of living cells and SEM scans the surface of dead, surface stained, cells. All these methods will benefit from fast and precise positioning of sample. New methods will be enabled using the stable cube support combined with carbon nanorobotic arm.

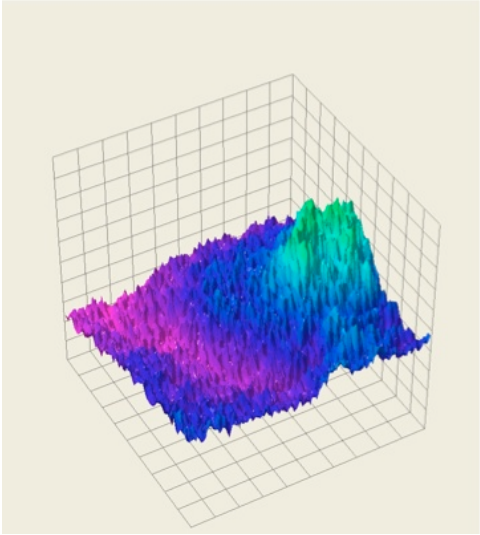


ESM of bone tissue culture development on nanostructured surface

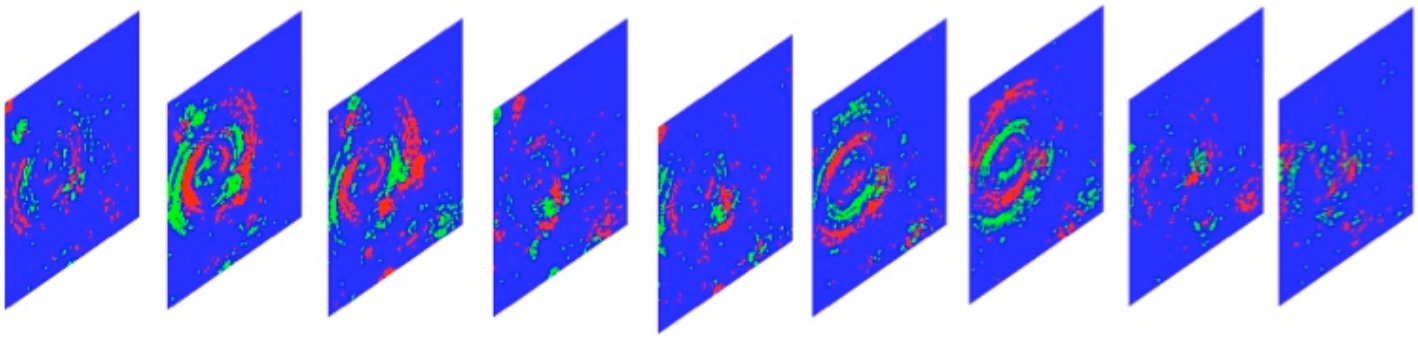
Nanorobotes for Biomedical Nanodiagnostics



Interferometric tomography and namely tomography using confocal probe allow 3D observation of cell interior with resolution of under 100 nm, respectively 7 nm. Moreover, these methods bring information about the composition of the matter. **The speed of scanning is limited purely by speed and precision of mechanical movement control.**
Other limits come from computational power – that is being overcome using graphical cards. New, quite unexpected theoretical challenges arise.



First test images of living cells in nanometer depth resolution using confocal probe. Upper image: depth profile in false colours, lower left image intensity profile in false colours, lower right 3D image showing that elevated part of the cell have lower reflectivity – their diffraction index is more similar to surrounding medium than that of the rest of the cell.
Information entropy flux in cell development – the basis for model building and objective diagnostic



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