ZERNIKE INSTITUTE COLLOQUIUM

Thursday, October 7th, 2010

16:00h, Lecture Hall: 5111.0080 **Coffee and cakes from 15:30h**

High-speed AFM and the holographic Assembler – soft matter imaging and manipulation

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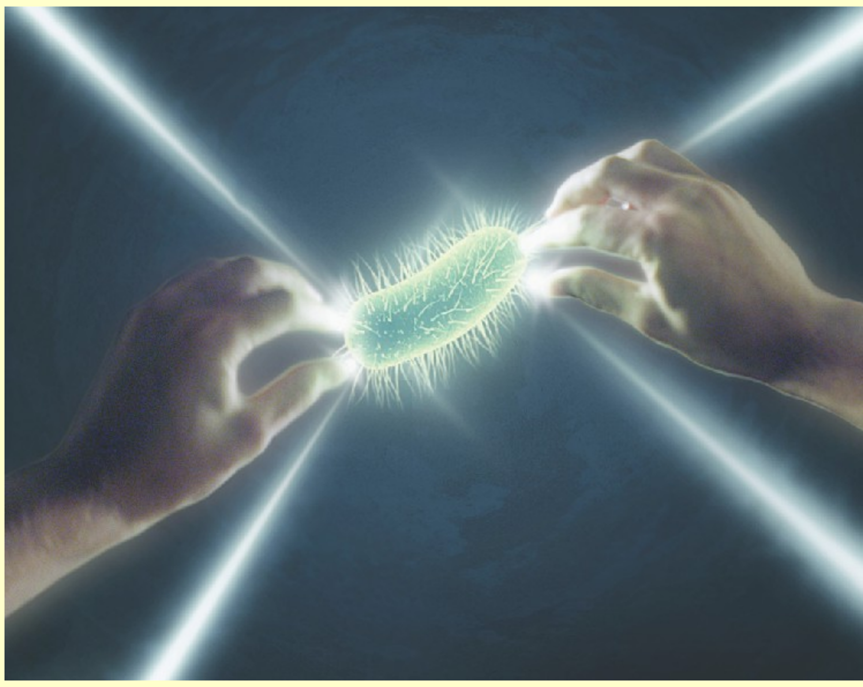
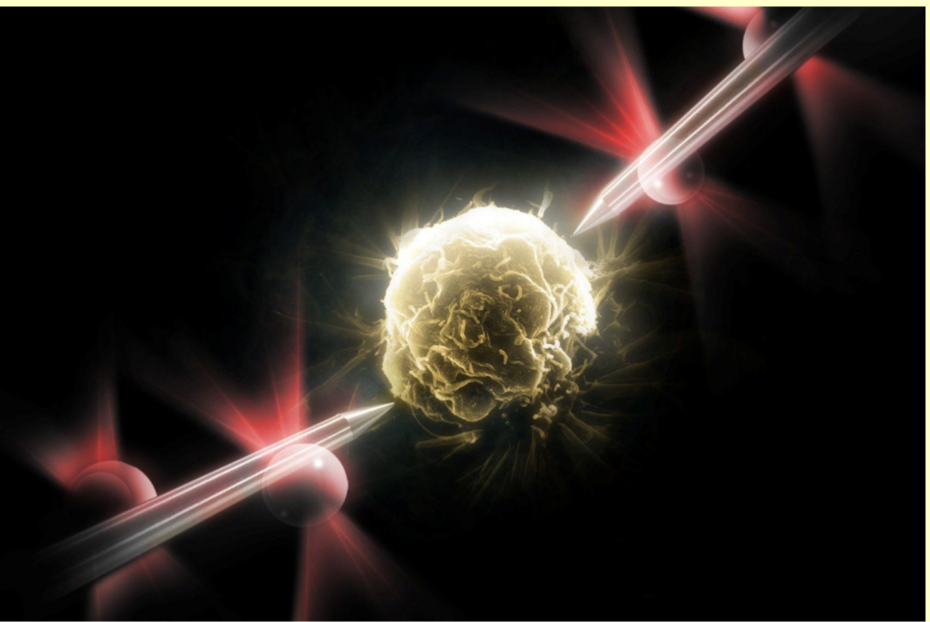
In nanotechnology, one of the most important tools for characterisation is scanning probe microscopy (SPM). Within the SPM family of microscopy techniques, atomic force microscopy (AFM) is the most widely applicable to a wide range of materials, through, for example, its ability to image in 3D in gaseous or liquid environments. This allows processes to be followed directly in the microscope. There have been two significant disadvantages to the use of AFM for softer materials such as polymers: (i) tip-sample interaction forces, which may cause distortion of the sample and the resulting image, and (ii) the low imaging rate which has restricted processes that can be imaged to those occurring on the timescale of several minutes.



High-speed AFM is important in materials science, as well as for biostructures, in following processes occurring on short time scales inaccessible to conventional AFM. We are working on two versions of high-speed force microscopy: one is capable of extremely high imaging rates (> 1000 frames per second) and over relatively large areas on samples with relatively large height variations (upto 1 μm), and the other is a non-contact version which is more appropriate for studying delicate nanoscale structures and processes. Both are also capable of writing structures, e.g., by electrochemical oxidation, at high-speed. Furthermore, AFM at video rates has allowed us to develop a multitouch highly-intuitive interface to directly interact with the scan area and size.



At the same time, we have been developing a holographic optical tweezers capable of assembling micro and nano structures including nanotools based on nanorods which can become independent AFM probes controlled and scanned by the holographic optical traps and capable of operating with 4π directional freedom, that is, an optical AFM capable of scanning an object from all directions.

(see http://HoloAssembler.com)

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