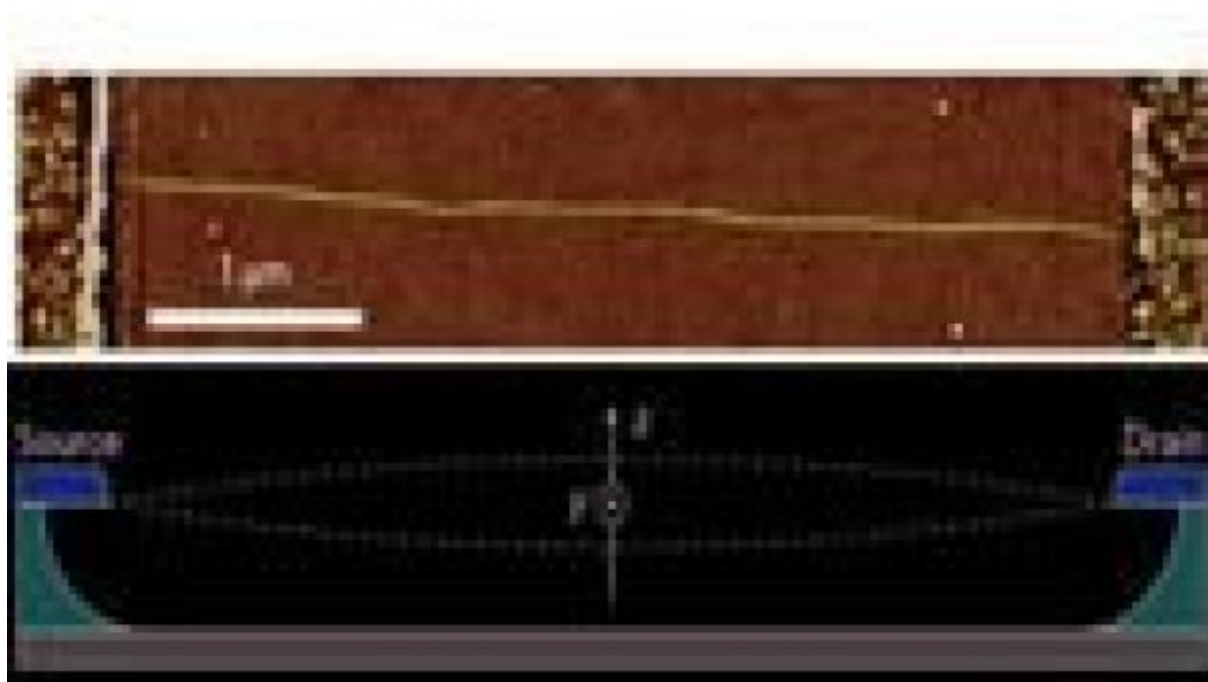




Carbon nanotubes detect forces as low as 10 zN in a bandwidth of 1Hz

Research group led by Prof. Adrian Bachtold in *Nature Nanotechnology*.

June 10, 2013

Researchers at ICFO, in collaboration with ICN2 and the University of Michigan, report in *Nature Nanotechnology* that they have achieved the measurement of weak forces with sensitivity 50 times higher than what has been achieved to date using mechanical resonators based on carbon nanotubes, which vibrate with intensity proportional to an electrostatic force. With the use of ultra-low-noise electronics, the group led by Prof. Bachtold was able to measure the amplitude of the vibration of these nanotubes and thus surmise the intensity of the electrostatic force. This significant improvement represents a turning point in measuring very weak forces and opens the door for magnetic resonance imaging at the molecular scale.

Conventional magnetic resonance imaging registers the spin of atomic nuclei throughout our bodies which have been previously excited by an external electromagnetic field. Based on

the global response of all atoms, it is possible to monitor and diagnose the evolution of certain diseases. However, this conventional diagnostic technique has a resolution of a few millimeters. Smaller objects have an insufficient total number of atoms to allow for the observation of the response signals. These new results are very promising for measuring the force created by individual nuclear spins.