

## Nanoscience from carbon nanotubes to single-molecule biophysics

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I will attempt to illustrate recent scientific results and potential of carbon nanotubes for nanoelectronics and single-molecule techniques for biophysics of DNA-enzyme interactions.

I will start by reviewing some of the work on electrical transport through single carbon nanotubes, cylindrical all-carbon molecules with unprecedented electrical and mechanical properties. The atomic structure and molecular orbitals can be studied by STM spectroscopy in nanotubes of finite length. Electrical transport has been studied through individual nanotube molecules between nanofabricated metal contacts, demonstrating that nanotubes are excellent coherent conductors. A wealth of single-molecule devices at room temperature has been established. The main challenges are in assembly and architecture.

In the second part of my talk, I will discuss the application of nanotechnology techniques to biology. Single-molecule techniques, such as scanning probes and tweezers, provide powerful new entries to study the structure, dynamics and function of biomolecules, molecular motors, DNA-enzyme interactions, and the like. I will discuss a number of examples such as DNA-processing enzymes, motion on kinesin motor proteins in fabricated nanostructures, and in particular the use of solid-state nanopores for DNA translocation, which is relevant for DNA sizing and potentially DNA sequencing.

