

# T<sub>C</sub>SUH Special Seminar

Texas Center for Superconductivity at the University of Houston

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**Monday, January 7, 2008**

Room 102, University of Houston Science Center

3:00 p.m. – 4:00 p.m.

## Nanoscale Torque Measurements of $F_1$ ATP-Synthase

### Abstract

What is the efficiency of a biological molecular motor? The enzyme  $F_1$  ATP-synthase is a rotary motor/generator found in a huge variety of organisms (plants, animals, and bacteria). Being a major player in cellular respiration,  $F_1$  has evolved to optimize efficiency. However, a thermodynamic measurement of  $F_1$ 's efficiency has been difficult to obtain due to the 10 nanometer size of  $F_1$ . To address this, we have constructed a new type of magnetic torque manipulator, involving the binding of specially designed nanoscale magnetic rods to glass surface anchored  $F_1$ . By controlling the external magnetic field and observing the rod's rotation via optical microscopy,  $k_B T$  scale torque can be both applied and measured. Attaining this required overcoming non-trivial obstacles such as reducing thermal fluctuations of the rod magnetization, non-specific surface interactions, focus drift, and background magnetic field effects. Both mechanical energy production (ATP hydrolysis) and consumption (ATP synthesis) will be discussed.

*Persons with disabilities who require special accommodations in attending this lecture should call (713) 743-8210 as soon as possible.*



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