

# **SPECIAL**

## **CHEMICAL PHYSICS SEMINAR**

### **“Physics of Microscopic Machines: Swimming in Molasses and Walking in a Hurricane”**

**Dr. Dean Astumian\***

*Department of Physics and Astronomy  
The University of Maine*

#### **Abstract**

Molecular machines function in an environment where viscous forces dominate inertia—to move they must “swim in molasses”. Further, the thermal noise power exchanged reversibly between the machine and its environment is many orders of magnitude greater than the power provided by the chemical fuel to drive the machine through its functional cycle. One might think that moving in a specific direction would be as difficult as walking in a hurricane. Yet, biological molecular machines (and increasingly synthetic molecular machines) move and accomplish their function with almost deterministic precision. In this talk I will discuss the physical principles that govern nanoscale systems at the single molecule level and how the omnipresent thermal noise can play a constructive role in the functioning of molecular machines.

**Thursday, May 22, 2008  
11:00 a.m. Room 207  
Engineering and Physics Building  
Texas A&M University  
Department of Physics  
Institute for Quantum Studies**

Pizza party to follow in ENPH 207 (12:00 p.m.).

---

\*faculty candidate