

PHYSICS 498 Bio

INTRODUCTION TO BIOLOGICAL PHYSICS

Spring Semester 2007
Call Numbers: 36765
Credit: 3 Units

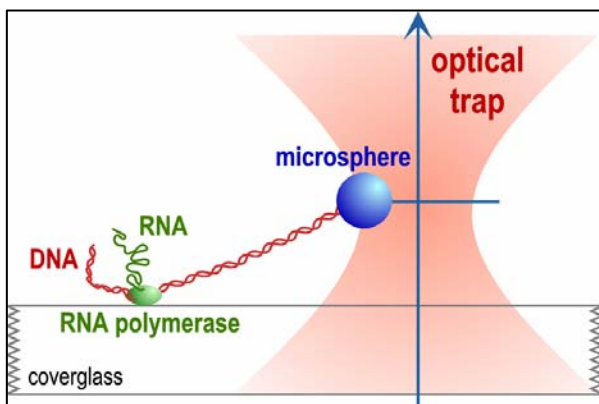
Time: M, W, 10:30-11:50 am
Room: 158 Loomis Lab

Professor Paul Selvin: selvin@uiuc.edu

Overview: Biophysics is one of the most exciting areas of physics and has much to offer in this new age of biology. This lecture course will apply simple yet powerful ideas of physics to gain some understanding of biology. As a simple example: What is the inertia of a bacteria and how does this affect its behavior? More generally, we will begin with atoms, move to molecules, then macromolecules, then cells, and finally whole systems. For example, how do we see? The answer: photons cause the release of chemicals that create electricity. How do we move? The answer: at the microscopic level, sometimes things move randomly, sometimes in a directed fashion. For directed motion, tiny biomolecular motors break chemical bonds, using the energy to create force and motion with efficiencies that put man-made machines to shame. These motors, and indeed, much of biology at the molecular level, operate at the nanometer (one-billionth of a meter) and picoNewton (1 trillionth of a pound) scales. How can we measure such tiny things? Use light as tiny force probes (see picture below). There will be a number of special lectures given by people who are developing the latest and greatest tools in biophysics.

Prerequisites: The course will contain a primer in molecular biology, so no biology prerequisites are required. Prerequisite: PHYCS 111-112-113 sequence or consent of instructor. Elementary calculus will be used.

Intended audience: The course is aimed at junior/senior students in the physical sciences (physics, chemistry, engineering). Life science majors who have the prerequisites and wish to be exposed to a “physicist’s” way of thinking about biology are also encouraged to attend. Some graduate students may also find it useful.



RNA polymerase, an enzyme, pulls on DNA with about 12 pN of force, which can be measured in an optical trap.