PHY 372. New elective course for Spring 2007

**Physical Concepts and Modeling in Cell Biology**

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MWF, 09:10 -10:00, 512 Lewis Lab

Modern biological research is becoming more quantitative. Advances in experimental methods allow us to study with extreme detail processes within the basic unit of life, the cell, all the way down to the level of molecules. We can watch DNA, proteins and lipids assemble into elaborate dynamic structures such as chromosomes, organelles, membranes, and filaments within living cells. A major challenge in modern science is to (1) find ways to extract quantitative information from such experiments, and (2) use this information to formulate predictive models which capture the essence of the underlying mechanisms. The course is an introduction to recent research in this area.

- Spatial, temporal, and energy scales in the cell.
- Mechanics and biochemistry in the cell.
- Diffusion.
- The cytoskeleton and molecular motors.
- How a bacterium senses a nutrient gradient.
- Cargo transport along neurons
- Force generation in the cell
- The Brownian polymerization ratchet.
- Models of microtubule dynamic instability.
- Quantitative fluorescence microscopy.
- Tracking

Course grade based on:
- Course project
- Homework
- Participation in class

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