

PHY 4135: WIDELY APPLIED PHYSICS II
PHY 6716: ADVANCED BIOPHYSICS

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Thermodynamics and statistical physics will be used to investigate both ends of the evolutionary process. We will examine the conditions necessary for the origin of life through self-organization of molecular components that allows localized entropy lowering through energy harvesting and energy transfer. We will then examine neural networks and biophysical theories that quantify consciousness. The material will be presented in class based upon the instructor's notes. No textbook will be used.

Course grades will be determined by homework assignments, a midterm examination, and a final examination. In addition, graduate students enrolled in PHY 6716 will be required to choose one of the topics in the course and make a 30 minute in-class presentation based upon their additional investigations.

Syllabus

Self-organization and Emergent Phenomena

Entropy: Second Law of Thermodynamics, Statistical Physics

Making Organic Compounds: Stanley-Miller Experiments

Macromolecules

RNA

Membranes

First Organisms

Neurons

Neural Connections in the Brain

Neuronal Pattern Formation

Information Content in Patterns

Thermodynamics of Pattern Stability

Statistical Mechanics of Pattern Connectivity

Consciousness