Seminar in Physics
Friday, March 15
3:30-4:45
Ross 0220

Optical Trapping: Theory, Design, and Calibration
Travis Day*

An optical trap or "optical tweezers" is a device which can apply and measure piconewton-sized forces on micron-sized dielectric objects under a microscope using a highly focused light beam. This allows for very detailed manipulations and measurements of several interesting systems in the fields of physics and biology. The history, theory, and design of this optical trap setup will be discussed.

Observing and trapping small objects, primarily silicon beads, is somewhat straightforward. However, to precisely quantify the size, position, and forces on nanometer and piconewton scales the trap must be calibrated. The two calibration procedures, position detection and trap stiffness, provided the basis of future quantitative measurements. In summary, the position and stiffness calibration theory and methods will be discussed.

Electro-acoustic Transducer Characteristics and Models
Michael Clay*

Everyone is familiar with speakers. They are used when we watch television or listen to the radio or to music at concerts. However, not everyone is aware of how speakers actually work and the technology that goes into making them. There are many types of transducers and electro-acoustic or loudspeakers is one example. In 1925 Chester Rise and Edward Kellogg came up with the modern loudspeaker that is still in use today. Loudspeakers can be modeled using LCR circuits or even simple harmonic oscillators. There are many characteristics of loudspeakers that are specific to each speaker called the Thiele Small parameters. These parameters are the "DNA" for a speaker. I will be discussing how loudspeakers work, what the basic components are, and how to characterize and model them.

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Refreshments