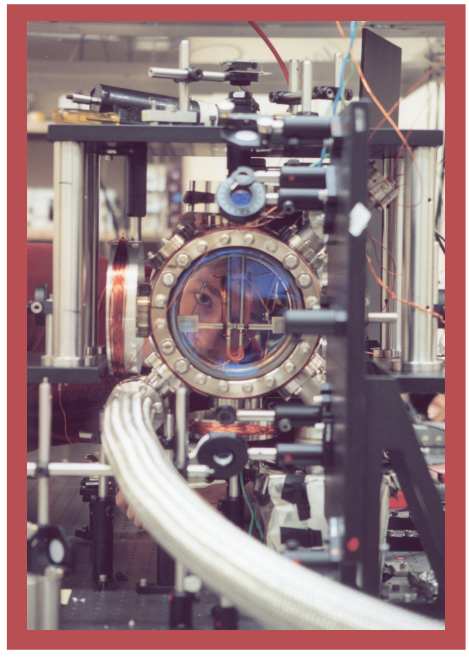
Quantum Optics and Precision Spectroscopy

Is Light a wave or a particle? Quantum mechanics solves this argument through the uncertainty principle that implies fluctuations and noise so that the wave and particle natures of light can sit self-consistently side by side. We investigate the **fluctuations of light** in an experimental system where the smallest possible fluctuation, a photon, is large enough to disrupt the system. We manage to do that by working with a **cavity quantum electrodynamical (QED)** system. The system couples atoms and light in a preferred environment that permits delicate interrogation and feedback. The studies are both fundamental in nature and relevant for quantum information, as we learn to manipulate and control the fluctuations of light.



Nature is left-handed! We know that from the studies of the weak interaction, the force responsible for changing protons into neutrons at the beginning of the solar cycle, but can we learn more about it with **precision spectroscopy of atoms**? The answer is yes. We have embarked in a research effort to understand the properties of Francium and use it as a laboratory to study the weak interaction in its nucleus. This work is in collaboration with Professor Gene D. Sprouse of Stony Brook University.

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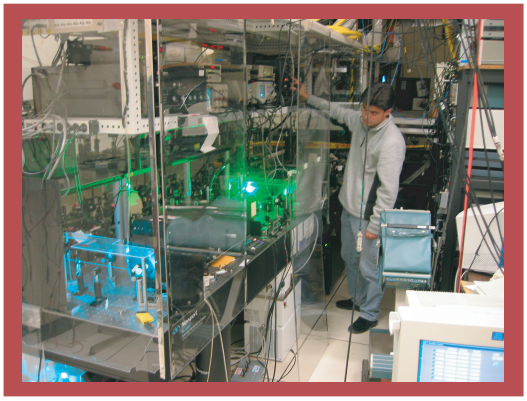

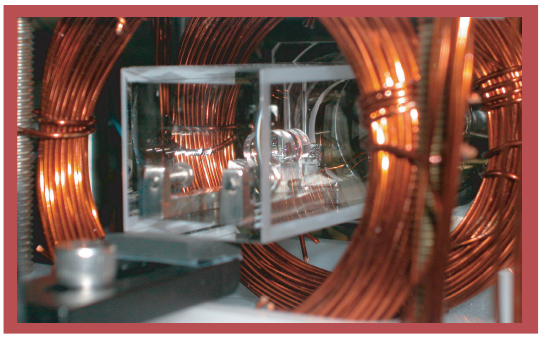

SUPPORTING AGENCIES

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