APS Colloquium

Distinguished scientists in all disciplines are invited to lecture on topics of general interest. Objectives include the cross-fertilization of research initiatives at various institutions and the identification of possible uses of the Advanced Photon Source.

When: First Wednesday of each month at 3:00 p.m.
Where: Building 402, APS Auditorium
Refreshments served at 2:45 p.m.

March 5, 2003

John N. Galayda
Stanford Linear Accelerator Center (SLAC)

"The LCLS Project: Status and Future"

Dr. John Galayda is presently Director of the LCLS Project at SLAC. Previously, he was Accelerator Systems Division Director (1990-1999), then Deputy ALD (1999-2001) of the Advanced Photon Source. After receiving his PhD in 1977 in physics, he joined the National Synchrotron Light Source (NSLS) at BNL. He was Associate Chairman for Accelerators at NSLS from 1987 to 1990. In 1996, Dr. Galayda was elected a Fellow of the American Physical Society. In 1989, he received an R&D 100 Award for global feedback orbit control.

The Linac Coherent Light Source (LCLS) will be the world's first "hard" (8 keV) x-ray laser (1.5-0.15 nm wavelengths). It will be a free-electron laser like the APS Low Energy Undulator Test Line, based on self-amplified spontaneous emission but scaled up to 14.3 GeV electron energy. A typical pulse of x-rays from the LCLS will be ~200 fs in duration, with a peak power of 8 GW. The extraordinary intensity and short pulses of the LCLS will make it possible to: do "freeze-frame" photography of atoms in the process of making and breaking chemical bonds; observe, on an atomic scale, the processes of liquid flow, melting and freezing; determine the structure of perhaps even single molecules of a protein; create and investigate excited states of atoms and "warm dense plasmas"; and produce x-rays pulses down to 10^{-14} s. The LCLS Project will be a collaborative effort of Lawrence Livermore National Lab, Argonne National Laboratory and Stanford Linear Accelerator Center. Argonne will provide the 122-meter long undulator systems: 33 high-precision undulators, quadrupoles, vacuum system, diagnostics, and controls.