APS COLLOQUIUM SERIES

Speaker: David L. Ederer, ANL Fellow and Professor Tulane University

Professor David Ederer has spent his entire career utilizing synchrotron radiation in the vacuum ultraviolet and soft x-ray region. During the past five years his research advanced in photon energy into the keV range and finally this year, as the Argonne National Laboratory Fellow, he used 15 keV x-rays at the APS. Ederer, a fellow of the American Physical Society, is an internationally recognized expert in the use of synchrotron radiation for research in atomic, molecular, and solid-state physics. He was a senior staff scientist in the Center for Atomic, Molecular and Optical Physics at the National Institute of Standards and Technology (NIST), for almost thirty years. In January of 1992 he went to Tulane University to launch a new program in experimental solid state physics with the Center for Advanced Microstructures and Devices (CAMD) in Baton Rouge. Professor Ederer carries out research on transition metals, and rare earth materials at the Advanced Light Source, using soft x-rays to elucidate the electronic properties of complex and highly correlated materials such as high Tc superconductors. His research in atomic physics involved absorption studies in contained metal vapors in the soft x-ray region, and he was involved with early laser-synchrotron pump-probe experiments.

Title: What do the blue sky and high temperature superconductors have in common?

We have looked at the sky and marveled its beauty and blue color. The sky’s blueness is connected with the redness of the sunset. A very weak electromagnetic process, first proposed and explained by Lord Rayleigh brings about this ever-present splendor. He made the measurements of the spectral distribution and showed the measurements matched the theory. About thirty years later Raman put this scattering on a firm basis and demonstrated the utility of the process whose weakness impeded its use for studies of electronic properties of gases and solids. The development of the laser provided the intense source necessary to fully utilize the potential of Rayleigh and Raman scattering as means to learn more about the elementary electronic structure of materials. The advent of third generation light sources added a new dimension to this technique by extending the useful wavelength range far into the x-ray region of the spectrum, where resonant Raman scattering has been used to understand more about magnetic materials, superconductors and other materials of technological importance. Fourth generation light sources will provide additional opportunities and challenges for utilizing light scattering to investigate material properties with intense electric fields.

DATE: Wednesday, December 1, 1999
TIME: 4:15 p.m.
LOCATION: 402 Auditorium