# 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.*

## Wednesday, January 14, 2004


## Alexei A. Abrikosov

*Materials Science Division*
*Argonne National Laboratory*


## "The Theory of High-$T_c$ Superconductivity in Layered Cuprates"

Biography:
Alexei A. Abrikosov is a Distinguished Scientist at Argonne National Laboratory and an Adjunct Professor at the University of Illinois at Chicago and the University of Utah. He has previously served as the Head of the Department of Theory of Solids at the Landau Institute for Theoretical Physics, Moscow, and the Director of the Institute for High Pressure Physics, Troitsk, Moscow District. He is a Full Member of the Russian Academy of Sciences, a Foreign Honorary Member of the American Academy of Arts and Sciences, a Fellow of the American Physical Society, a Member of the National Academy of Sciences USA, and a Foreign Member of the Royal Society of London. He is the recipient of the Lenin Prize, the International Fritz London Award, the State Prize (USSR), the Landau Prize of the Russian Academy of Sciences, and the John Bardeen Award. He was awarded the Nobel Prize in Physics in 2003.


Abstract:
A model of superconductivity in high-temperature superconducting layered cuprates will be presented. The resonant tunneling idea is used for a description of the origin and some properties of the "pseudogap phase." This model is based on the extended saddle point singularities in the electron spectrum, weak screening of the Coulomb interaction, and phonon-mediated interaction between electrons, plus a small short-range repulsion of Hund's, or spin-fluctuation, origin. This explains the large values of $T_c$, features of the isotope effect on oxygen and copper, the existence of two types of the order parameter, the peak in the inelastic neutron scattering, and the positive curvature of the upper critical field, as a function of temperature, etc.