Carnegie Mellon

Materials Science and Engineering Seminar Series

Materials Research at Carnegie Mellon

Prof. Frans Spaepen

Division of Engineering and Applied Sciences
Harvard University

"Simulating Atomic-Scale Phenomena with Colloids"

Friday, September 22, 2006
11:00 A.M. Seminar in Doherty Hall 1212
Refreshments precede seminar at 10:30 A.M. in 2325 Wean Hall

Colloids consist of micrometer-size particles in a fluid that interact by central potentials (hard sphere or electrostatic). At large packing fractions they form phases similar to those formed by atoms in condensed matter: liquids, crystals and glasses. Since the colloidal particles are large and slow, they can be tracked in time and in three-dimensional space by confocal microscopy. Colloidal systems, therefore, are highly efficient "analog computers" for the study of the dynamics of complex multiparticle phenomena in condensed matter. A number of examples are presented: crystal nucleation, coherency dislocations in epitaxial growth, indentation of single crystals, and plastic shear of glasses.

Frans Spaepen is John C. and Helen F. Franklin Professor of Applied Physics at Harvard University. He received his undergraduate degree, in Metallurgical Engineering, at the K.U. Leuven in 1971, and a Ph.D. in Applied Physics from Harvard University in 1975. He joined the faculty of the Division of Applied Sciences at Harvard in 1977 as Assistant Professor, was appointed Associate Professor in 1981, and Full Professor in 1983. In 1984 he was a Visiting Professor at the University of Leuven, and in 2000-01 a Humboldt visitor in Köln and Jülich. From 1990 till 1998 he was Director of the Harvard Materials Research Laboratory/Materials Research Science and Engineering Center. Since 2002 he is the Director of the Rowland Institute at Harvard.

His research interests span a wide range of experimental and theoretical topics in materials science, such as amorphous metals and semiconductors (viscosity, diffusion, mechanical properties), the structure and thermodynamics of interfaces (crystal/melt, amorphous/crystalline semiconductors, grain boundaries), mechanical properties of thin films, the perfection of silicon crystals for metrological applications, and colloidal systems as models for the study of dynamics and defects in crystals and glasses.