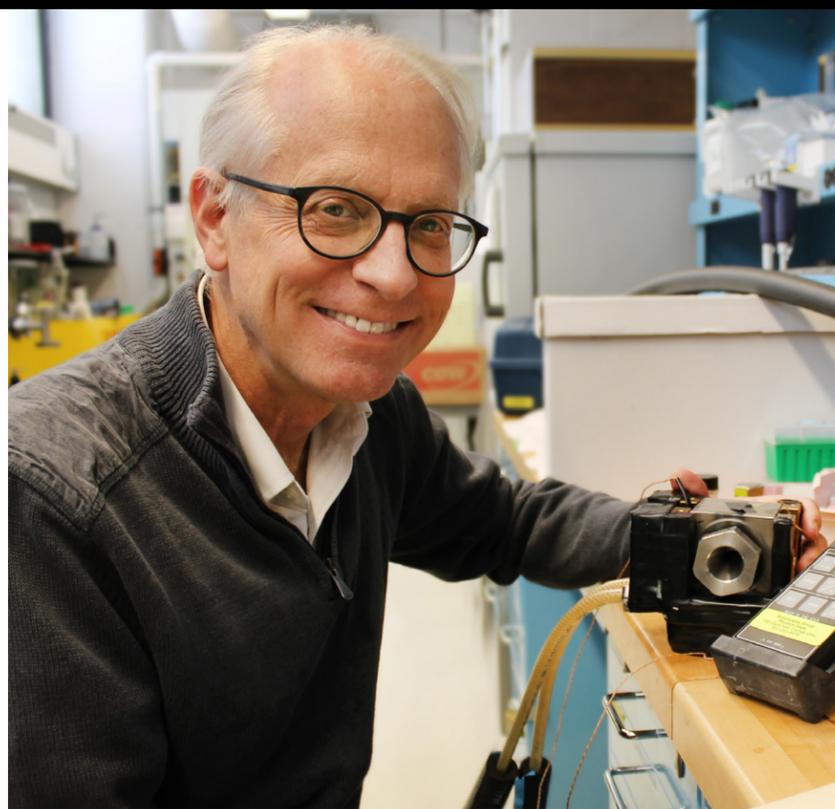


Henri Sack Memorial Lecture



Russell J. Hemley

Research Professor, *George Washington University*
Research Physicist, *Lawrence Livermore National Laboratory*
Visiting Investigator, *Geophysical Laboratory*

Thursday, May 4
4:30 pm

120 Physical Sciences Building

*Please join us after the lecture for a reception
in 401 Physical Sciences Building*

A New World of Materials in Extreme Environments

ABSTRACT

Extreme pressures and temperatures produce profound effects on structure, bonding and electronic character of atoms and molecules, molding matter to make new materials. A growing number of novel materials and phenomena are being documented over the broad range of conditions, including both static and dynamic multimegabar (e.g., >300 GPa) pressures that can now be generated in the laboratory. Examples include unexpected transitions between insulating and metallic phases, new superconductors and low-dimensional materials, and novel structural and superhard materials. Of particular interest have been pressure-induced transitions in the putatively simple systems hydrogen and water. Altogether, these studies have implications for problems in physics and chemistry, planetary science, geoscience, astrophysics, and even soft matter and biology, and the new materials being discovered may find potential applications in energy and other technologies. In this effort, accelerator-based x-ray, infrared, neutron scattering, and large-scale dynamic compression facilities are allowing new types of measurements to be made as well as more extreme environments to be reached in the laboratory.

BIO

Russell J. Hemley's research explores the behavior of materials under extreme conditions of pressure and temperature. He attended Wesleyan University (Chemistry B.A., 1977) and Harvard University (Chemistry M.A., 1980; Ph.D. 1983). After a post-doctoral fellowship at Harvard (1983-84), he joined the Geophysical Laboratory as a Carnegie Fellow (1984-86) and Research Associate (1986-87). He was a Staff Scientist from 1987-2016 and from 2007-2013, he served as Director of the Geophysical Laboratory. He is currently a Research Professor in the Department of Civil and Environmental Engineering at The George Washington University and a Research Physicist at Lawrence Livermore National Laboratory. He has been a visiting Professor at the Johns Hopkins University (1991-92) and at the Ecole Normale Supérieure, Lyon (1996). He is the Director of the DOE/Carnegie Alliance Center (CDAC), a Center of Excellence funded by DOE/NNSA, and the Director of Energy Frontier Research in Extreme Environments (EFree), an Energy Frontier Research Center funded by DOE/SC/BES. He is also currently Chair of the JASON Advisory Group. He was elected to the National Academy of Sciences in 2001. He is the recipient of the 1990 Mineralogical Society of America Award, 2003 Hillebrand Medal, 2005 Balzan Prize, and 2009 Bridgman Award. He is a Fellow of the American Academy of Arts and Sciences (1997), American Geophysical Union (1997), and Mineralogical Society of America (1990), and is Honoris Causa Professor of the Russian Academy of Sciences (2009). He has published approximately 620 papers.