The Neutron Scattering Society of America

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Press Release, March 8, 2010

The Neutron Scattering Society of America is pleased to announce the 2010 recipients of its 3 major prizes.

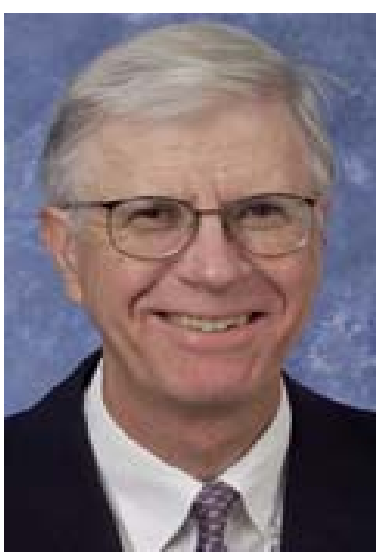
Dr. Herbert A. Mook Jr.

is the recipient of the

2010 Clifford G. Shull Prize

of the Neutron Scattering Society of America with the citation:

"For outstanding contributions to the study of magnetism, superconductivity, and quantum phenomena in matter with neutrons"



Dr. Herbert A. Mook Jr.

The Neutron Scattering Society of America (NSSA) established the Clifford G. Shull Prize in Neutron Science to recognize *outstanding research in neutron science and leadership promoting the North American neutron scattering community.* The prize is named in honor of Prof. Clifford G. Shull, who received the Nobel Prize in 1994 with Prof. Bertram Brockhouse for seminal developments in the field of neutron science. The establishment of the prize was announced at the inaugural American Conference on Neutron Scattering (ACNS) in 2002.

The nominations were reviewed by a committee of experts in the field of neutron science and the NSSA is pleased to announce that the recipient of the 2010 Shull Prize is **Dr. Herbert A. Mook Jr.** of the Oak Ridge National Laboratory. The prize and $5000 honorarium will be awarded at the 2010 ACNS in Ottawa, Canada, June 26-30, 2010 (http://cins.ca/acns2010/).

Dr. Mook has worked at the forefront of neutron scattering and condensed matter physics throughout his entire career. His research spans a number of diverse topics including magnetic excitations in transition metals and mixed valence materials to momentum distributions of the quantum fluids ^4He and ^3He. His most important and influential research, however, is related to the interaction of magnetism and superconductivity. In particular, Dr. Mook and collaborators used neutrons to investigate the nature of the magnetic to superconducting transition in the rare-earth rhodium borides in the 1980's. With the discovery of high temperature superconductivity in the cuprates, Dr. Mook championed a series of exceptional experiments to elucidate the nature of the magnetic structure and fluctuations in "214" and "Y123" high T_C materials. In addition to these investigations, he also led studies of the vortex lattice in superconducting materials by small angle scattering. As part of this research, Dr. Mook trained a large cohort students and post docs, many of whom have gone on to pursue important careers in neutron science of their own.

Dr. Mook received his PhD in 1965 from Harvard University, though notably, he worked with Prof. Cliff Shull who was then at MIT. He immediately moved to Oak Ridge National Laboratory where he has remained for the rest of his career. He held a series of leadership positions at ORNL including Head of the Neutron Scattering Section from 1995– 2000, Scientific Director of the Spallation Neutron Source from 1995-2000, Director of the Center for Neutron Science from 2000–2004 and Scientific Director of the Center for Neutron Scattering from 2004-2005. Currently Dr. Mook is a Senior Corporate Fellow of the Laboratory and a senior Advisor to the Neutron Sciences Directorate. Throughout the years, he has served on numerous advisory committees designed to develop, promote and enhance neutron scattering facilities in the U.S. He has received notable awards for science, including the DOE Award for Outstanding Scientific Accomplishments in Solid State Physics in 1982 and 1998, and for instrumentation development. In addition he holds several patents for neutron instrumentation involving, for example, better methods of accomplishing neutron polarization. The depth of his contribution to science is evident in his citation recorded: His 200 papers have been cited over 9000 times with 52 papers each cited 52 times or more.

Herb Mook and Cliff Shull are shown in the neutron beam hall at HFIR, Oak Ridge National Laboratory.

Prof. Collin Broholm

Johns Hopkins University

is the recipient of the

2010 Sustained Research Prize

of the Neutron Scattering Society of America (NSSA) with the citation:

"For outstanding neutron scattering studies of correlated electron physics in magnets, metals and superconductors, and for science-driven development of neutron scattering techniques"

Prof. Collin Broholm

The Neutron Scattering Society of America (NSSA) established the Sustained Research Prize to recognize a *sustained contribution* to a scientific subfield, or subfields, using neutron scattering techniques, or a sustained contribution to the development of neutron scattering techniques. The primary consideration shall be an enduring impact on science. Preference shall be given to applicants whose work was carried out predominantly in North America.

The nominations were reviewed by a committee of experts in the fields to which neutron scattering contributes and the NSSA is pleased to announce that the 2010 recipient of the Sustained Research Prize is **Prof. Collin Broholm** of the Johns Hopkins University. The prize and a $2500 honorarium will be awarded at the 2010 ACNS in Ottawa, Canada, June 26-30, 2010 (http://cins.ca/acns2010/).

Prof. Broholm's experiments have been central to the modern agenda of solids with strongly interacting internal degrees of freedom. He has shown great insight in choosing model systems of high intrinsic interest and broad impact for both experiment and theory. An example is his work on the metal-insulator transition in the correlated system V_2O_3. A mean-field phase diagram for such systems was worked out theoretically in the 1990's, but needed testing. Prof. Broholm's neutron studies provided the first real tests of that picture, and showed that the general trends of magnetic ordering and itinerancy were well described. This work reignited both experimental and theoretical interest in V_2O_3 and was a precursor for subsequent intense interest in orbital ordering transitions in vanadates and other oxides. His work on fundamental metal physics includes key discoveries relating to the magnetism of superconductors, ranging from URu_2Si_2, in his thesis, to the layered $CeTMIn_5$ compounds of more recent vintage, as well as that of the recently discovered pnictides. Prof. Broholm has also championed a great deal of important work on one and two dimensional quantum magnetic systems. In particular, he performed definitive experiments on the unusual quantum disorder and triplet excitations in S=1 spin chain compounds, and their distinction from S=1/2 spin chain systems. Prof. Broholm, his students and colleagues have studied a range of different frustrated magnetic materials. His pioneering work on the prototypical kagome system SCGO initiated continuing broad interest in kagome lattice antiferromagnetism. Experiments on a three-dimensional kagome analogue, the spinel $ZnCr_2O_4$, have established the concept of emergent (spin-cluster) collective degrees of freedom and the importance of magneto-elastic effects in frustrated spin states. Influential neutron work on the multiferroic properties of frustrated magnets led by Prof. Broholm have established how ferroelectric polarization emerges when magnetic order breaks the inversion symmetry of the paramagnetic phase of an insulator.

Prof. Broholm has also made outstanding contributions in the development of neutron scattering techniques, beginning with the SPINS cold-neutron triple-axis spectrometer at the NIST Center for Neutron Research (NCNR). He pursued both sophisticated instrument development and its application to elegant experimental studies of the most topical problems in condensed matter physics. The culmination of these instrumentation efforts is the Multi Axis Crystal Spectrometer (MACS) spectrometer, currently under commissioning at the NCNR. Using a very large, focusing monochromator and an array of separate analyzers and detectors, the instrument can sample a large region of phase space very efficiently. Prof. Broholm also leads an effort to enable neutron scattering measurements in ultra-high magnetic fields, e.g., above 30 Tesla, at pulsed neutron sources such as the SNS. This will open new opportunities to study structure and dynamics in both hard and soft condensed matter.

Collin Broholm is the Gerhard H. Dieke Professor in the Department of Physics and Astronomy, at Johns Hopkins University where he directs the Institute for Quantum Matter. He earned his Ph.D. from the University of Copenhagen in 1988, was a post doc at AT&T Bell Laboratories from 1988-1990, and joined Johns Hopkins in 1990. Prof. Broholm has held important advisory roles within the US neutron scattering community, including chair of the Experimental Facilities Advisory Committee of SNS from 2002-2006, and Program Co-Chair for the 2010 American Conference on Neutron Scattering.

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Dr. Craig Brown
NIST Center for Neutron Research

is the recipient of the

2010 Science Prize

of the Neutron Scattering Society of America (NSSA) with the citation:

"For outstanding neutron scattering studies of hydrogen-framework interactions in metal-organic frameworks"

Dr. Craig Brown

The Neutron Scattering Society of America (NSSA) established the Science Prize to recognize *a major scientific accomplishment or important scientific contribution within the last 5 years* using neutron scattering techniques. Nominees must be within 12 years of receiving their PhD degree. Preference shall be given to applicants whose work was carried out predominantly in North America.

The nominations were reviewed by a committee of experts in the scientific areas to which neutron scattering contributes, and the NSSA is pleased to announce that the 2010 recipient of the Science Prize is **Dr. Craig Brown** of the NIST Center for Neutron Research. The prize and a $2500 honorarium will be awarded at the 2010 ACNS in Ottawa, Canada, June 26-30, 2010 (http://cins.ca/acns2010/).

Hydrogen fuel cells present a promising alternative to the internal combustion engine. One key obstacle to their use is the need to store hydrogen in a safe, affordable, and convenient manner at high storage densities.

Metal organic frameworks (MOFs) are porous materials that possess large surface areas, but in general early examples of these materials displayed hydrogen binding energies to the MOF framework that are too small to result in storage of significant amounts of hydrogen at room temperature. Dr. Brown's research highlights the importance of coordinatively unsaturated metal centers (CUMCs) in enhancing the binding of hydrogen molecules in these sorbent materials with the aim of developing hydrogen storage systems that operate efficiently at room temperature. Using neutron diffraction to study the structure of a Mn-based MOF as a function of hydrogen loading, he isolated four separate locations of the adsorbed hydrogen molecules, showing that the interaction of hydrogen with the Mn CUMC is responsible for the rather strong binding in this material.

This discovery, along with work on other framework materials containing Cu or Zn, has served as a basis for the development of related materials with even higher storage densities. Using inelastic neutron scattering, Dr. Brown and his collaborators have also investigated hydrogen dynamics in these materials. All of these new insights into how guest hydrogen molecules interact with MOF frameworks have greatly influenced how chemists tailor new materials to achieve enhanced hydrogen storage properties. His accomplishments have established Dr. Brown as a leading expert in the field of hydrogen storage.

Dr. Brown received his PhD from the University of Sussex and the Institute Laue Langevin where he studied with Prof. K. Prassides and the late Dr. A.J. Dianoux. He is currently an instrument scientist for the Disk Chopper Spectrometer at the NIST Center for Neutron Research (NCNR) where he has been responsible for the operations of several spectrometers over the past decade. He is the leader of the NCNR effort within the Hydrogen Sorption Center of Excellence, funded by the US Department of Energy. His outstanding scientific contributions have also been recognized with a 2008 Presidential Early Career Award for Scientists and Engineers (PECASE), the highest honor bestowed by the United States government on young professionals in the early stages of their independent research careers.