The Neutron Scattering Society of America is pleased to announce the 2014 recipients of its four major prizes.

Prof. Sunil K. Sinha

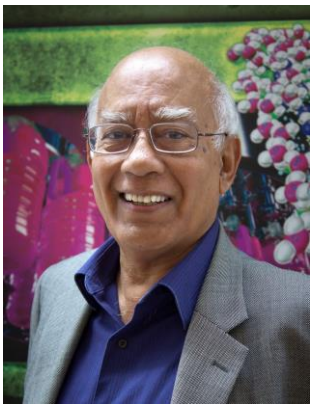
University of California San Diego

is the recipient of the

2014 Clifford G. Shull Prize

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

"In recognition of his deep and lasting experimental and theoretical contributions to the areas of Quantum Liquids and Solids, Superconductivity, Magnetism, Soft Condensed Matter, Confined and Adsorbed Liquids, Surfaces, and Neutron Scattering Techniques, together with his selfless service to the neutron scattering field as a whole"



Prof. Sunil K. Sinha

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 2014 Shull Prize is **Prof. Sunil K. Sinha,** University of California, San Diego. The prize and $5000 honorarium will be awarded at the 2014 ACNS in Knoxville, TN, June 1-5, 2014 (http://www.mrs.org/acns-2014).

"*I feel deeply honored to be awarded the Clifford G. Shull Prize*" said Prof. Sunil K. Sinha. "*I have always been a great admirer of Cliff Shull and the pioneering work he did in our field, and I have always felt privileged to be a part of the neutron scattering community, united by a technique that has contributed so much to our understanding of condensed matter*."

Most would take pride in a career achieving international recognition in a single niche of physics. Prof. Sinha's achievements produced international recognition over a broad range of topics in physics. The scope of Sinha's work ranges from theory to experiment, soft condensed matter to quantum solids, magnetic materials to superconductors, and from inelastic scattering to the myriad of elastic techniques. Prof. Sinha has demonstrated scientific versatility that is a fitting honor to Clifford Shull's legacy. He has pioneered applications of neutron scattering that have directly affected many neutron scattering research programs world-wide.

Prof. Sinha and his collaborators performed one of the earliest measurements of the phonon spectra of Quantum Crystals and his early neutron work demonstrated the coexistence of magnetism and superconductivity in $ErRh_4B_4$. Soon after the discovery of the high-T_c cuprates, Sinha and collaborators discovered long-range antiferromagnetic order in the parent compounds La_2CuO_4, $YBa_2Cu_3O_6$, and $Sr_2CuO_2Cl_2$. Today it is recognized that the coexistence of magnetism and superconductivity is critical to our understanding of high-T_c superconductivity.

Prof. Sinha's early neutron studies of two-dimensional adsorbed layers and their phase transitions include the first measurement of the power-law structure factor associated with pseudo-Bragg peaks of a 2-D solid. He analytically calculated the scattering function including finite size effects, and this is routinely used today. Prof. Sinha and collaborators carried out the first Small-Angle Neutron Scattering measurements that used methods they developed to analyze fractal structures, leading to the determination of the dimension and size of the fractal cluster. These methods are now widely emulated.

In 1988, Prof. Sinha published his seminal paper describing the theory of off specular x-ray and neutron scattering from rough surfaces and demonstrated innovative applications of the theory to studies of surface transitions in liquid and solid systems, multiple interfaces, thin films, and corrosion processes. Today, the off-specular scattering theory is a key tool in the extremely popular fields of x-ray and neutron reflectometry.

Prof. Sinha's employment record is as varied as his research program. The ability to perform great research at many different institutions, e.g., academia, industry and national labs, are an inspiration to all. Prof. Sinha received his PhD from Cambridge University in 1964. He was a Professor of Physics at Iowa State University from 1967-1974 and became a Senior Physicist at Argonne National Lab in 1975. From 1983 until 1995 Prof. Sinha was a Senior Research Associate at Exxon's Corporate Research Labs, where he played a critical role in the engagement of Exxon in neutron scattering research. In 1995 he became Associate Division Director for the Advanced Photon Source, and since 2001 has been a Distinguished Professor of Physics at the University of California San Diego.

Dr. Jeffrey W. Lynn

National Institute of Standards and Technology

is the recipient of the

2014 Sustained Research Prize

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

"For seminal studies of the colossal magneto-resistance effect and profound contributions to our understanding of the interplay of magnetism and superconductivity."

Dr. Jeffrey W. Lynn

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 2014 recipient of the Sustained Research Prize is **Dr. Jeffrey W. Lynn** of the National Institute of Standards and Technology. The prize and $2500 honorarium will be awarded at the 2014 ACNS in Knoxville, TN June 1-5, 2014 (http://www.mrs.org/acns-2014/).

Dr. Jeffrey W. Lynn has established an outstanding record of ground-breaking research on the physics of magnetic materials using neutron scattering. He began his career with insightful studies of ferromagnetic materials, both itinerant systems such as Fe, Ni and their alloys and systems where the electrons are more spatially localized such as transition metal oxides. This work helped to establish our current understanding of these materials, stimulating theoretical efforts and testing their boundaries. Throughout his career, Dr. Lynn refined and extended this early work to a variety of different systems, investigating how the static and dynamical aspects of magnetism are affected by the onset of different types of magnetic order. These later systems included manganese oxides, which display unusually large magnetoresistance, as well

as multiferroic materials, which simultaneously possess both ferromagnetic and ferroelectric order. Dr. Lynn's pioneering work on these materials profoundly affected both theoretical and computational studies.

Dr. Lynn has also made career-long contributions towards understanding the interplay between magnetism and superconductivity. He began this effort with his research on the rare earth molybdenum chalcogenides, where he helped to establish the role of magnetism as a driving force for other collective states, namely superconductivity. This led to more recent studies of cuprates and then pnictides, where he and his collaborators made seminal contributions to our knowledge of magnetic ordering in systems where magnetism and superconductivity exist in close proximity.

In addition to these major contributions to the understanding of magnetism and its role in many important phenomena, Dr. Lynn has served as a mentor to a long series of graduate and postdoctoral students, and many collaborators from other organizations, helping to establish a cadre of well-trained neutron scatterers. He also worked to help advance neutron scattering techniques by developing a new thermal triple axis spectrometer at the NIST Center for Neutron Research. This instrument combines many innovative features to provide unprecedented neutron intensity ideal for measurements of small samples, enabling many novel experimental studies.

Throughout his career Dr. Lynn has been an international leader and vocal advocate of the use of neutron scattering methods to answer fundamental questions in condensed matter physics. He exemplifies the characteristics for which this prize was established – sustained and significant contributions to both, techniques and their application to important scientific questions.

Dr. Lynn is a Fellow of the National Institute of Standards and Technology where he leads the Condensed Matter Physics team at the NIST Center for Neutron Research. He received his Ph.D. from Georgia Tech in 1974, performing neutron scattering measurements at Oak Ridge National Laboratory with Dr. Herbert Mook. He then took a post doc under the direction of Dr. Gen Shirane at Brookhaven National Laboratory. In 1976, he became a Professor at the University of Maryland and in 1992 joined NIST full time. Dr. Lynn has also held important advisory roles within the scientific community, including chair of the Division of Materials Physics of the American Physical Society and Program Co-Chair for the 2004 American Conference on Neutron Scattering. In 2011 President Obama conferred upon him the Presidential Rank Award of Distinguished Senior Professional. He is a fellow of both the American Physical Society and the NSSA.

Dr. Emil Bozin

Brookhaven National Laboratory

is the recipient of the

2014 Science Prize

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

"For his discovery of broken symmetry local structures in exotic electronic materials, his elaboration of their nature and their importance to the material properties, in particular in PbTe, iridates, manganites, and cuprates"

Dr. Emil Bozin

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 2014 recipient of the Science Prize is **Dr. Emil Bozin** of Brookhaven National Laboratory. The prize and $2500 honorarium will be awarded at the 2014 ACNS in Knoxville, TN June 1-5, 2014 (http://www.mrs.org/acns-2014/).

Over the past 5 years, Dr. Bozins's application of the atomic pair distribution function (PDF) analysis to neutron powder diffraction data to study local and nanoscale structure in materials has led to key insights regarding the physics of complex oxide and chalcogenide electronic materials. The discovery of local distortions in rock-salt lead telluride on warming was published in Science in December 2010. Despite PbTe being extensively studied for more than a century, for example, for its exceptional thermoelectric properties, this result had not been previously known, as the effect is not visible in the average structure. This discovery had a

profound effect on the understanding of the heat capacity and the electronic band-gap. It is seminal in the sense that it has awakened an interest in the importance of characterizing anharmonic effects in crystals in general, and the value of searching for and studying local broken symmetry states in other materials.

Broken local symmetries in the form of charge and spin stripes are at the forefront of understanding high temperature superconductivity and Dr. Bozin's work has also had a large impact in that field, where the effects of broken local symmetries on the electronic structure have been suggested as an explanation for the mysterious pseudogap region of the cuprate phase diagram. His recent studies on related spinel systems like $Cu(Ir_{1-x}Cr_x)_2S_4$ build on those results and show that these phenomena are widespread and not confined to a few exotic systems. Dr. Bozin's work showed that creative use of new developments in neutron diffraction and PDF can lead the way to deeper understanding of materials and their properties.

Dr. Bozin received his PhD in 2003 from Michigan State University, was Physics Lecturer at the Military Academy in Belgrade, Serbia, Postdoctoral Research Associate at Michigan State University, and Associate Research Scientist at Columbia University before joining Brookhaven National Laboratory in 2010. Dr. Bozin is currently Associate Scientist at Brookhaven National Laboratory.

Dr. Kate A.Ross

Johns Hopkins University and
NIST Center for Neutron Research

is the recipient of the

2014 Prize for Outstanding Student Research

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

"For seminal neutron scattering studies of exotic ground states, ground state selection, and spin excitations in XY Pyrochlore Magnets"

Dr. Kate A. Ross

The Neutron Scattering Society of America (NSSA) established the Prize for Outstanding Student Research to recognize *outstanding accomplishments in the general area of neutron scattering by graduate or undergraduate students who have performed much of their work at North American neutron facilities.* Nominees must be either current graduate students or scientists within two years of receiving their PhD.

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 2014 Prize for Outstanding Student Research is **Dr. Kate A. Ross** of the Johns Hopkins University and NIST Center for Neutron Research. The prize and $1000 honorarium will be awarded at the ACNS in Knoxville, TN June 1-5, 2014 (http://www.mrs.org/acns-2014/).

Pyrochlore magnets have been a playground for the physics of exotic ground states, as many different magnetic ions can be made to decorate the pyrochlore lattice - a network of corner-sharing tetrahedra and one of the defining architectures supporting geometrical frustration in three dimensions. During her graduate studies at McMaster University, Dr. Ross carried out a series of sophisticated neutron scattering experiments on two such materials, $Yb_2Ti_2O_7$ and $Er_2Ti_2O_7$, wherein the local symmetry of the rare-earth moments is planar, or XY-like. This local symmetry implies that quantum effects are extreme, due to effective S=1/2 magnetic moments, in these two materials.

Working at dilution refrigerator temperatures and in high magnetic fields at the NIST Center for Neutron Research, Dr. Ross acquired comprehensive inelastic neutron scattering data, which were used to unambiguously determine the full spin Hamiltonian for these magnets, based on anisotropic exchange. This work provided a natural explanation for a quantum spin ice ground state in $Yb_2Ti_2O_7$, and for ground state selection *via* an order-by-disorder mechanism in $Er_2Ti_2O_7$. She also carried out systematic powder neutron diffraction measurements at the Lujan Neutron Scattering Center, which identified the microscopic source of weak sample-to-sample variability in $Yb_2Ti_2O_7$.

Dr. Ross graduated from McMaster University in September of 2012, and is currently a postdoctoral fellow in the Institute for Quantum Matter and Department of Physics and Astronomy at Johns Hopkins University, as well as at the NIST Center for Neutron Research. Her current interests include new magnetic materials, as well as technique development and extreme sample environments, particularly as they pertain to the elucidation of quantum physics in new materials.