The Neutron Scattering Society of America

http:///www.neutronscattering.org

The Neutron Scattering Society of America is pleased to announce the 2022 recipients of its four major prizes.

Dr. Dan A. Neumann
NIST Center for Neutron Research

is the recipient of the

2022 Clifford G. Shull Prize

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

"For outstanding contributions, leadership, and vision to the neutron scattering community as scientist, mentor, instrument developer, and facility steward."

Dr. Dan A. Neumann

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. The NSSA is pleased to announce that the recipient of the 2022 Shull Prize is Dr. Dan A. Neumann of the NIST Center for Neutron Research. The prize and a $5000 honorarium will be awarded at the 2022 ACNS in Boulder, CO, which will take place June 5-9, 2022 (https://www.mrs.org/acns-2022).

Dr. Dan A. Neumann is the Leader of the Neutron Condensed Matter Science Group at the NIST Center for Neutron Research. He has spent most of his career shaping the NCNR scientific program and developing the NCNR into one of the world's foremost neutron research facilities. His stewardship of the NCNR is marked by his successes in recruiting and mentoring talented scientists, identifying and constructing world-class neutron instrumentation, and forging novel partnerships to leverage NCNR resources and produce the greatest possible scientific output.

Neumann possesses a profound understanding of neutron instrumentation and has been unafraid to implement cutting-edge neutron optical concepts. While leading the development of the first backscattering spectrometer in North America, he decided to incorporate a novel phase-space-transform chopper that had never been built before. His efforts succeeded, increasing the flux on sample by over a factor of four, and have since been replicated at the ILL and MLZ. Neumann provided the scientific leadership for the expansion of the NCNR by crafting the entire instrument layout for the second guide hall, overseeing the design, construction, and installation of new instruments, and reconfiguring several instruments in both the new and old guide halls to provide future instrumentation opportunities. The recently commissioned instruments vSANS and CANDOR were made possible by his carefully planned instrument layout. More recently, Neumann planned the upgrades of three of the original neutron guides, and he modernized the neutron optics of the instruments on these guides, which will significantly increase their performance.

Neumann has greatly expanded the US neutron scattering community by developing a variety of industrial and academic partnerships. This is most evident from his stewardship and expansion of the joint NSF/NIST-funded Center for High Resolution Neutron Scattering (CHRNS). He was also a co-founder, with Dr. Ron Jones and Dr. Eric Lin, of the nSoft industrial consortium that has established a new model for fostering industrial interactions at national user facilities. With Prof. Norman Wagner, Neumann co-founded the Center for Neutron Scattering at the University of Delaware. This collaboration has attracted funding for a new spin-echo instrument as well as industry funding for several projects.

Due to the success of the NCNR scientific program, Neumann is one of the most highly sought scientists by facilities seeking advice on sources and instrumentation as well as reviews of existing neutron science programs. Over the past 20 years, he has served on 50 advisory and/or review committees for various neutron and x-ray sources worldwide.

Neumann was first introduced to neutron scattering techniques in 1983 while a graduate student at the University of Illinois at Urbana-Champaign. After receiving his PhD in 1987, he was hired as a staff scientist at the National Bureau of Standards Reactor Radiation Division, now the NIST Center for Neutron Research. In 1997, he was named Leader of the Chemical Physics team, which operated the NCNR neutron spectroscopy program. In 2005, he succeeded Dr. Jack Rush as Leader of the Neutron Condensed Matter Science Group. Neumann is a Fellow of the NSSA and the American Physical Society.

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Dr. John Katsaras

Oak Ridge National Laboratory

is the recipient of the

2022 Sustained Research Prize

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

"For seminal scientific contributions using neutron scattering techniques and molecular dynamics simulations that have led to a profound understanding of biomembrane structures and dynamics on the nanoscale."

Dr. John Katsaras

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 is that the contribution has had an enduring influence on science. Preference is given to nominees 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. The NSSA is pleased to announce that the 2022 recipient of the Sustained Research Prize is Dr. John Katsaras of the Oak Ridge National Laboratory. The prize and $2500 honorarium will be awarded at the 2022 ACNS in Boulder, CO, which will take place June 5-9, 2022 (https://www.mrs.org/acns-2022).

Dr. John Katsaras is a senior scientist at Oak Ridge National Laboratory. For over 30 years, he has worked at the nexus of biology, chemistry, and physics using different neutron and x-ray scattering techniques, combined with theory and computer simulations. During that time, he has pioneered and developed scattering techniques that are now being used to solve salient problems related to the structure and dynamics of model and biological membranes. Most recently, he has been exploring the use of lipid bilayers as platforms for the next generation of neuromorphic computers and as novel therapeutic targets for brain diseases.

Katsaras revolutionized the use of small-angle neutron scattering (SANS) and neutron spin echo methods to characterize the structure and dynamics of biomembranes. His seminal contributions to the field of lipid biophysics are manifold. He is especially renowned for (i) his transformative investigations of the nanoscale structures of lipid/water systems; (ii) for developing the Scattering Density Profile model for the joint analysis of neutron and X-ray scattering data combined with molecular dynamics simulations on lipid/water systems to obtain accurate structural descriptions; and (iii) for innovative neutron scattering approaches to observe static and dynamic lateral heterogeneities in lipid/water systems (rafts), including their observation in a living bacterium. Katsaras also pioneered the use of bio-deuteration to label specific components of model and fully functional living membranes isotopically, thereby leveraging a key advantage of neutron scattering over other techniques, namely the ability to contrast match deuterium labelled specimens with the surrounding H2O/D2O solvent. He developed methods to detect and characterize in-plane membrane structures by combining neutron scattering, lipid deuteration, and data modeling, which have contributed greatly in placing the concept of lipid rafts on a firmer scientific basis.

Katsaras earned his Ph.D. at the University of Guelph in Ontario, Canada and was a Natural Sciences and Engineering Research Council of Canada Post-Doctoral Fellow (1992) before joining the faculty at Brock University in 2006. He then joined the Oak Ridge National Laboratory in 2010, where he currently holds the title of Senior Scientist. He also holds joint faculty appointments at Bredesen Center and University of Tennessee, Knoxville. He has received numerous awards and accolades for his research, including the NRC/Steacie Institute for Molecular Sciences: Outstanding Achievement Award, and in 2018 he was elected a Fellow of the NSSA and the American Institute for Medical and Biological Engineering.

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Prof. Martin Mourigal
Georgia Institute of Technology

is the recipient of the

2022 Science Prize

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

"For significant and insightful use of neutron inelastic scattering in the study of quantum materials."

Prof. Martin Mourigal

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. 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. The NSSA is pleased to announce that the 2022 recipient of the Science Prize is Prof. Martin Mourigal of the Georgia Institute of Technology. The prize and $2500 honorarium will be awarded at the 2022 ACNS in Boulder, CO, which will take place June 5-9, 2022 (https://www.mrs.org/acns-2022).

Prof. Martin Mourigal is an associate professor in experimental quantum condensed matter in the School of Physics at Georgia Tech. He is widely known for his research on novel magnetic quantum materials. He uses neutron scattering to characterize the magnetic fluctuations and the short- and long-range magnetic order in these materials to gain insight into the underlying quantum behavior. His recent work has revived worldwide interest in the physics of the triangular lattice antiferromagnet. In 2016, he and his team published a detailed neutron scattering investigation of $YbMgGaO_4$ that identified the crucial role chemical disorder plays in defining the excitations on the triangular lattice. This model system was proposed theoretically by Phil Anderson in 1972 to exhibit a quantum spin liquid (QSL) ground state. Despite extensive experimental and theoretical work since this time, it wasn't until Mourigal's recent investigations that we now have appropriate boundary conditions for the triangular lattice to determine which real materials can be considered as physical manifestations of the exotic QSL state and to what extent disorder serves to mask quantum behavior.

Mourigal's work has made it clear that while a continuum of magnetic excitations is characteristic of a QSL ground state this property alone is not sufficient to prove the existence of such a state. The use of quantum materials for applications in quantum information science requires increased understanding of entangled states and how they behave in real materials. As part of this endeavor, Mourigal and his students have focused on examining the spin dynamics of spin-1 SU(3) magnets with proposed Kitaev-like interactions. This resulted in a recent project that pushed the boundaries of both neutron scattering measurement and theoretical modeling to understand the influence of spin-orbital physics in the triangular magnet FeI_2.

Mourigal and his collaborators also observed a set of quadrupolar spin excitations that ordinarily should not be observable using neutron scattering techniques. They were able to explain that these excitations were visible due to the coupling of the spin and orbital degrees of freedom. This discovery of hybridization between dipolar and quadrupolar modes has solved a 40-year-old mystery about why these excitations exist in this compound. This work will remain a longstanding contribution in the fields of neutron scattering and quantum materials due to its high-quality data as well as the high level of sophistication used to theoretically model the results.

Mourigal received his MSc and PhD Degrees from École Polytechnique Fédérale de Lausanne (EPFL) in Switzerland for graduate work conducted at the Institut Laue Langevin in Grenoble, France. Following a postdoctoral stint at Johns Hopkins University, he joined the faculty at Georgia Tech in 2015 and was promoted to associate professor in 2020. Mourigal received the NSF CAREER award in 2018. At Georgia Tech, he received the Sigma Xi Young Faculty Award, the Cullen-Peck Faculty Scholar Award, and the Junior Faculty Teaching Excellence Award.

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Dr. Sajna Hameed

University of Minnesota

(now at the Max Plank Institute for Solid State Research)

is the recipient of the

2022 Prize for Outstanding Student Research

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

"For the elucidation of magnetism and plastic deformation effects in perovskite titanates via neutron scattering and complementary techniques."

Dr. Sajna Hameed

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. The NSSA is pleased to announce that the recipient of the 2022 Prize for Outstanding Student Research is Dr. Sanja Hameed from the University of Minnesota (now at the Max Plank Institute for Solid State Research). The prize and $1000 honorarium will be awarded at the 2022 ACNS in Boulder, CO, which will take place June 5-9, 2022 (https://www.mrs.org/acns-2022).

Dr. Sajna Hameed is an experimental physicist and a pioneer in the use of plastic deformation as a knob with which to manipulate and study quantum materials. Her Ph.D. research focused on the classic perovskite $SrTiO_3$ (STO), several rare-earth titanates that are model (doped) Mott insulators, and ionic-liquid-gating effects in the Mott insulator NiS_2.

Plastic deformation creates extended defects and induces defect motion, which, in principle, can lead to new emergent physics. While this approach is commonly used by blacksmiths and engineers, it had not yet been used to modify and control the electronic properties of quantum materials. Dr. Hameed measured the diffuse scattering from plastically deformed STO single crystals using neutrons (CORELLI/SNS) and x rays (at the Advanced Photon Source), combining these with complementary resistivity and magnetization measurements, and discovered that compressive plastic deformation causes the self-organization of dislocations, boosts the bulk superconducting transition temperature by a factor of two, and induces traces of superconductivity at temperatures of 30-50 K, two orders of magnitude higher than in undeformed STO. Her results therefore indicate that plastically deformed STO is a potential high-temperature superconductor. This work is featured as a key scientific contribution to the successful proposal to build PIONEER, one of the eight initial SNS STS instruments selected to be constructed.

Hameed other research focused on Mott insulators with two distinct projects. The first greatly advanced our understanding of rare-earth titanates, especially the archetypal systems $Y_{1-x}La_xTiO_3$ and $Y_{1-y}Ca_yTiO_3$. She used the image-furnace growth technique to grow large, high quality single crystals – in and of itself a remarkable feat – on which she performed comprehensive neutron scattering, μSR, x-ray absorption spectroscopy, diffuse x-ray scattering, nonlinear magnetic response, and charge-transport measurements. Neutron diffraction measurements of the magnetic order parameter and neutron inelastic scattering measurements of spin-wave excitations feature prominently in this work. These are the first such results for doped rare-earth titanates, since sizable high-quality samples were previously unavailable. The second project explored ionic-liquid-gating effects in the Mott insulator NiS_2 via x-ray photoelectron spectroscopy and multiple other experimental techniques.

Hameed obtained her Bachelor of Technology in Engineering Physics in 2014 from the Indian Institute of Technology Madras, Chennai, India. Following this, she completed her PhD in Physics at the University of Minnesota in 2021. She is now a postdoctoral researcher at the Max Planck Institute for Solid State Research in Stuttgart, Germany. Her current research interests include using inelastic photon scattering techniques to elucidate uniaxial strain and plastic deformation effects in quantum materials. She is a recipient of the 2015 Outstanding Teaching Assistant award from the School of Physics and Astronomy, University of Minnesota, and the Best Student Presentation award at the 2021 Virtual Joint Nanoscience and Neutron Scattering User Meeting.