3rd ICQMT 2025

3rd International Conference on Quantum Materials and Technologies

Voltage & Current Controlled Nanomagnetism For Memory and Logic

Distinguished Professor Ramamoorthy Ramesh

Ramesh pursues key materials physics and technological problems in complex multifunctional oxides and related materials. He uses epitaxial synthesis as a pathway to create model systems to probe fundamental phenomena using a combination of electron, xray and scanned probe techniques. Using conducting oxides, he solved the 30-year enigma of polarization fatigue in ferroelectrics. He pioneered research into manganites, coining the term Colossal Magnetoresistive (CMR) Oxides. His seminal work on multiferroics demonstrated electric field control of ferromagnetism, a critical step towards ultralow power memory and logic elements.

Date and Time:
From 26 April to 3 May 2025, exact day&time will be announced later.

Lecture Room:
TBD

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10th ICSM 2025

10th International Conference on Superconductivity and Magnetism

Biography-continued

His extensive publications (>650) on the synthesis and materials physics of complex oxides are highly cited (over 100,000 citations, H-factor over 150). He is a fellow of APS, AAAS & MRS and an elected member of the U.S. National Academy of Engineering and the National Academy of Sciences, a Foreign member of the Royal Society of London, the Indian National Science Academy, the Indian National Academy of Engineering and a Fellow of the American Academy for Arts and Sciences. His awards include the Humboldt Senior Scientist Prize, the MRS Turnbull lectureship prize, the APS Adler Lectureship and McGroddy New Materials Prize, the TMS Bardeen Prize and the IUPAP Magnetism Prize and Neel Medal and the Europhysics Prize in 2022. He was recognized as a Thomson-Reuters Citation Laureate in Physics for his work on multiferroics.

He served as the Founding Director of the successful Department of Energy SunShot Initiative in the Obama administration, envisioning and coordinating the R&D funding of the U.S. Solar Program, spearheading the reduction in the cost of Solar Energy. He also served as the Deputy Director of Oak Ridge National Laboratory and the Associate Lab Director at LBNL. Most recently, he served on the Biden-Harris Transition Team for Energy. He is also a co-founder of Kepler Computing, which is focused on low power computing based on his work on ferroelectrics.

Abstract

Over the past decade the oxide community has been exploring the science of ferroic materials as crystals and in thin film form by creating epitaxial heterostructures and nanostructures.Among the large number of materials systems, there exists a small set of materials which exhibit multiple order parameters; these are known as multiferroics, particularly, the coexistence of ferroelectricity and some form of ordered magnetism (typically antiferromagnetism). The scientific community has been able to demonstrate electric field control of both antiferromagnetism and ferromagnetism at room temperature. There are some very intriguing new developments in SOT based manipulation of magnets. Particularly, the role of epitaxy and electronically perfect interfaces has been shown to significantly impact the spin-to-charge conversion (or vice versa). Current work is focused on ultralow energy (1 attoJoule/operation) electric field manipulation of magnetism with both voltage and current, as the backbone for the next generation of ultralow power electronics. We are exploring many pathways to get to this goal. In this talk, I will describe our progress to date on this exciting possibility.

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