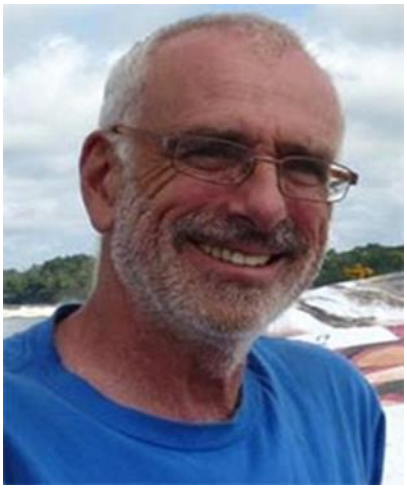

IEEE Magnetics Society Distinguish Lecture

Josep Fontcuberta
Professor
Institut de Ciència de Materials de Barcelona, Spain
e-mail: fontcuberta@icmab.es

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3043 Coover Hall

The Magnetism of Oxides

Abstract: Magnetite, Fe3O4, guided early explorers towards unknown frontiers. Since those days, oxides have been the backbone of many scientific and technological developments. When high temperature superconductors were discovered, the subsequent enthusiasm stimulated an impressive development in oxide thin film growth technologies and a deep revision of the understanding of metal oxides and strongly correlated electronic systems. Today, oxides are fueling the discovery and development of unexpected, intriguing, and fascinating new areas of knowledge, such as magnetic ferroelectrics and magnetic monopoles. Ferromagnetic oxides are finding their way as active components in spintronics, either as spin filters for advantageous magnetic tunnel junctions or used to manipulate spins in non-magnetic materials, which could eventually lead to energy-efficient pure spin-current devices. The tiny spin-orbit coupling interaction, responsible for the magnetic anisotropy, has emerged as a toy that allows us the modulation of the transport properties, not only in metallic ferromagnetic systems, but also in antiferromagnetic metals and insulators. This may lead to a new generation of magnetic memory. “Interface is the device” and interfaces between oxides and metals, and interfaces between large band-gap oxides, have led to the discovery of emerging properties such as switchable “on-off” magnetization, by applying suitable electric fields, or magnetism and superconductivity in confined two-dimensional electron gas systems, which challenge our current understanding of oxides.

This is the playground in which we fortunately play, learn, and imagine the future while enjoying building a new science out of the good old oxides. In the lecture, we will travel through the new materials and ideas that make this journey possible and so successful.

Biography: Josep Fontcuberta received the Ph.D. degree in physics from the University of Barcelona in 1982. He was postdoctoral researcher at the Inorganic Chemistry Laboratory at Oxford University and later was appointed assistant professor in the Physics Faculty of the University of Barcelona. In 1991 he moved to the Institut de Ciència de Materials de Barcelona (ICMAB-CSIC), where he is a full research professor. He is mainly interested in functional oxides. These strongly correlated electronic systems display fascinating ferroic orders (i.e., magnetic, ferroelectric) and remarkable magneto-electric and optic properties, which have motivated his research and that of the Multifunctional Thin Films and Complex Structures Group he leads. Currently, the group research activities are focused on materials and devices that may contribute to a more a sustainable world. Pep Fontcuberta is co-author of over 400 scientific papers. He is an editor of Advanced Electronic Materials, Solid State Communications, and Journal of Magnetism and Magnetic Materials.