

# The *magnetism* of oxides

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Magnetite  $\text{Fe}_3\text{O}_4$  guided the humankind towards unknown frontiers. Since those early days, oxides have been the backbone of many scientific and technologic developments and reached a peaceful maturity, robustly settled in textbooks and deeply integrated in technological applications, until late 1980's when the high temperature superconductors were discovered. The subsequent rush 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 which ultimately boosted a tremendous explosion of research on oxides. Today, long beyond the celebrated colossal magnetoresistance, oxides are fuelling the discovery and development of unexpected, intriguing and fascinating new areas of knowledge, such as magnetic ferroelectrics and magnetic monopoles. Ferromagnetic oxides are finding its 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 pure spin-current based rather than charge&spin-based devices, with prospects of more energy-efficient spintronic devices. The tinny spin-orbit coupling interaction, responsible for the magnetic anisotropy, has also emerged as a fundamental interaction allowing to modulate electric transport properties, not only of metallic ferromagnetic systems but also in antiferromagnetic metals and insulators that may lead to a new generation of magnetic memories. Still, "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 or magnetism and superconductivity that challenges our understanding of oxides. This is the playground where we happily play, learn and envision the future while enjoying building a new science out of the *old* good oxides. Along the seminar, we will jointly follow the track of the new materials and ideas that make this journey possible and so successful.