15 Dec **Wednesday** **12:00 – 12:45** **Chair: GONG Jiangbin (龚江滨)**

From Copper, Iron to Nickel Era of High Temperature Superconductivity

Professor ARIANDO, National University of Singapore, Singapore

Professor ARIANDO is currently the Deputy Head of Research & Graduate Studies of the Department of Physics at the National University of Singapore (NUS). He is leading several major grants and a research group on functional quantum materials and devices with a particular emphasis on the strongly correlated electron systems using material-by-design approach. His group has discovered various heterostructures with new emergent phenomena and topological states. He has authored >150 articles including in Nature, Science, and Physical Review Letters, and several patents on material processing. Ariando was the deputy director of NUS Nanoscience and Nanotechnology Initiative and was the recipient of the NUS Faculty of Science Dean's Chair Professorship, the CNRS NEXT Investigatorship, the NUS Young Faculty award, and the IPS Omicron Gold Medal. Professor Ariando can be reached by email at ariando@nus.edu.sg.

Abstract:

Soon after the discovery of high temperature superconductivity in a series of compounds coined as the high-T_c cuprates, researchers have looked for superconductivity in a non-cuprate counterpart but with a similar electronic and crystal structure as the cuprates, hoping to mimic the high-Tc cuprates and thus improve our understanding of the underlying mechanism for their unexplainably high transition temperature. While high-T_c superconductivity has been discovered in other classes of compounds such as MgB_2 and iron-pnictide, a cuprate-analogue has remained elusive until recent discovery of superconductivity in infinite-layer nickelates. Although the enthusiasm is high, however, the nickelates have shown unusual behaviour with much to be understood and it has also become apparent that they are much more difficult to produce than initially thought.

In this talk, I will discuss state-of-the arts and challenges in the study of superconductivity in nickelates. I will start with discussing the challenging material growth, complicated strain and interface effects, and complex multiorbital pictures and electronic properties of nickelates. I will then show our recent success in demonstration of superconductivity in lanthanide nickelate, closing the chapter of the decade-long search for superconductivity in this compound and opening a new question on the role of the 4*f* orbital. Finally, I will discuss our recent results on the study of pairing symmetry and Pauli limit violation in Nickelates that seem to contradict the cuprate analog pictures and could revolutionise understanding on the role of the copper oxide plane and 3 $d_{x^2-y^2}$ electronic band in the origin of unconventional superconductivity in cuprates.