# Title: Magnetism and Superconductivity in Cuprates: Development of Concepts.

Guest Editor:

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**Proposal:**

In this year, the physics community celebrates thirty years of the discovery of high-$T_c$ cuprate superconductors by G. Bednorz and K. A. Müller. In the absence of doping, these compounds are antiferromagnetic insulators. Upon hole doping, the antiferromagnetic order disappears and the system becomes a superconductor. The superconductivity is obtained only after the complete destruction of the three-dimensional antiferromagnetic (3D AF) order, but the two-dimensional antiferromagnetic (2D AF) order is still present in the superconducting state and survives even at optimal doping. The superconductivity appears to arise in the presence of magnetic correlations. It is possible that the magnetic interactions which destroy superconductivity in conventional superconductors could bind electrons or holes together to form pairs. The pairing mechanism in cuprate superconductors is still not understood. Although the theoretical efforts devoted to understand their anomalous properties, the problem of superconductivity in cuprates remains open up to now.

Potential Topics Include:

1 Fundamental Concepts: Experiment and Theory

- 2.1. Electron-Phonon Interaction
- 2.2. Electron-Magnon Interaction
- 2.3. $d$ - Wave Pairing
- 2.4. Antiferromagnetic Order
- 2.5. Spin Density Wave (SDW)
- 2.6. Metal-Insulator Transition
- 2.7. Pseudogap
- 2.8. Isotope Effect
- 2.9. Other Concepts

2 Theories and Development of Concepts

- 2.1. Jahn-Teller Bipolaron Concept and Superconductivity
- 2.2. Kondo Effect in Superconductors

**Conti….**

2.3. BCS Theory and its Development

2.4. Bose-Einstein Condensation (BEC) in Superconductivity

2.5. Fermi Liquid Theory and its Development

2.6. Van Hove Singularity (VHS) Model

2.7. Two-Fluid Model of Superconductivity

2.8. Ginzburg-Landau Theory of Superconductivity

2.9. Application of the Gauge Theory to the High Temperature Superconductivity

2.10. Other Approaches

If you are interested in contributing to this special thematic issue, please send your abstract / manuscript as soon as possible. Further, you are requested to forward this invitation among your colleagues who are specialized in this field.

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