Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad – 500 046

Seminar

Search for Quantum Magnetism in Naturally Grown Low–Dimensional Spin Systems

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The physical properties of low–dimensional spin systems, a subgroup of the strongly correlated electron systems, have fascinated researchers for a long time, and have recently become one of the primary centres of interest in condensed matter research. We have investigated a wide range of naturally grown low–dimensional spin systems of transition metal oxides as well as molecular magnets, including–1D linear and non-linear spin-chains, and 2D spin-systems with varying lattice-geometry i.e., triangular, square, honeycomb and kagome. Our experimental research results include the realisation of various quantum phenomena like quantum phase transition, spin-liquid state and 1/3 magnetisation plateau. An in-depth physics understanding of the roles of spin anisotropy, lattice-geometry, geometrical spin frustration and doping/substitutions as well as external perturbations like temperature and magnetic field on the magnetic ordering and magnetic correlations has been achieved. We have carried out several experiments on such systems by employing neutron diffraction, inelastic neutron scattering and several bulk techniques. In my lecture, I shall introduce the subject of quantum magnetism. I shall then present the results for the quasi-1D spin-trimer chain compound $CaNi_3P_4O_{14}$, S=1/2 metal-organic kagome compound $\{[Cu_3(CO_3)_2(bpe)_3]\cdot 2ClO_4\}_n$ [bpe=1,2-bis(4-pyridyl)ethane], spin-1/2 trimer chain compounds $Na_2Cu_3Ge_4O_{12}$ and $K_2Cu_3Ge_4O_{12}$, quasi-2D honeycomb compound $Na_2Co_2TeO_6$ and layered spin-3/2 Maple Leaf Lattice antiferromagnet $Na_2Mn_3O_7$. I will also describe the underlying physics that is responsible for novel and exotic magnetic properties.

Friday, July 29th 2022

04:00 PM (Tea/Coffee at 3:45 PM)

Auditorium, TIFR-H