DAY 5: 10:50 – 11:30

## In search of topological phases with non-abelian excitations

Eun-Ah Kim
Stanford University

Topological phases are characterized by emergence of topological invariance in their low-energy, long-distance physics. The very fact that we can postulate states with properties insensitive to local perturbations itself is remarkable. Recent proposals for using non-abelian excitations for decoherence free quantum computation added further enthusiasm. In this talk I will discuss two candidate systems for hosting non-abelian excitations: fractional quantum Hall states and $Sr_2RuO_4$. I will first give an overview of the connection between topology and fractionalized excitations and highlight common features between these two very different systems. Then I will discuss our recent proposal for detecting non-abelian statistics. Before closing the talk, I will bring out open questions critical for harnessing and exploiting these exotic excitations.

---

DAY 5: 11:30 – 12:10

## Topological Order and Non-Abelian Statistics in Noncentrosymmetric s-Wave Superconductors

Satoshi Fujimoto
Dept. of Physics, Kyoto University

In certain classes of topological states realized in quantum many-body systems in 2+1 dimension, quasiparticles obey the non-Abelian statistics which is characterized by noncommutativity of the exchange processes of particles. The possible realization of non-Abelian statistics in real systems has been extensively studied so far in connection with the $\nu = 5/2$ and $\nu = 12/5$ fractional quantum Hall states, and the vortex state of chiral $p_x + ip_y$ superconductors. In this talk, I present another candidate of a topological phase allowing the existence of non-Abelian anyons, which can be realized in strongly noncentrosymmetric $s$-wave superconductors. This topological phase belongs to the same class as those of the Moore-Read Pfaffian fractional quantum Hall state, $p_x + ip_y$ superconductors, and the gapped non-Abelian spin liquid phase of the Kitaev model. In noncentrosymmetric superconductors, the asymmetric spin-orbit interaction which breaks inversion symmetry plays important roles in various exotic superconducting properties. In our proposal, the asymmetric spin-orbit interaction combined with an external magnetic field yields the topological superconducting state for a particular electron filling.