

Physics Colloquium

Monday, January 27, 2020 / Pupin Hall Theory Center, 8th Floor / 12:30 PM

Lunch will be available for attendees

"Bose Condensation of Polaritons: A superfluid of light"

Peter B. Littlewood, University of Chicago



Macroscopic phase coherence is one of the most remarkable manifestations of quantum mechanics, yet it seems to be the inevitable ground state of interacting many-body systems. In the last two decades, the familiar examples of superfluid He and conventional superconductors have been joined by exotic and high temperature superconductors, ultra-cold atomic gases, both bosonic and fermionic, and recently systems of excitons, magnons, and exciton-photon superpositions called polaritons, the subject of this talk.

Engineering of optical microcavities make use of the mixing of electronic excitations with photons to create a composite boson called a polariton that has a very light mass, and experiments provide good evidence for a high-temperature Bose condensate. Polariton systems also offer an opportunity to use optical pumping to study quantum dynamics of a many body system outside equilibrium, in a new kind of cold atom laboratory. We suggest that a new kind of dynamical phase transition is available in these two-component condensates, associated with the presence of a many-body exceptional point that has two degenerate real eigenvalues corresponding to coalescing solutions – a dynamical-systems equivalent to a critical point of a regular phase transition.