
Seminar

Emergent states of quantum matter

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When a system is composed of many interacting components new properties can emerge that are qualitatively different from the properties of the individual components. Such emergent phenomena lead to a stratification of reality and of scientific disciplines.

Emergence can be particularly striking and challenging to understand for quantum matter, which is composed of macroscopic numbers of particles that obey quantum statistics, such as electrons. Important examples of emergent states of quantum matter include superfluidity, superconductivity, and the fractional quantum Hall effect.

I will introduce some of the organising principles for describing such phenomena: quasi-particles, spontaneously broken symmetry, and effective Hamiltonians. I may briefly describe how these ideas undergird some of my own theoretical research on complex molecular materials such as superconducting organic charge transfer salts, fluorescent proteins, and hydrogen bonded complexes. The interplay of emergence and reductionism raises issues in philosophy and as to the best scientific strategy for describing complex systems.

Tuesday, Nov 3rd 2015

4:00 PM (Tea/Coffee at 3:45 PM)

Seminar Hall, TCIS