Graduate Seminar

Speaker

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2:10-2:55pm, HH-3017

Self-consistent Approximation in Quantum Mechanics

Abstract:

Systems of interest in physics, biology and applied sciences can be described by models with a large number of components. The microscopic behavior of such systems is driven by fundamental equations such as the Newton equation of classical mechanics or the Schroedinger equation in quantum mechanics. However, because of large number of degrees of freedom, working with time evolution equations of such systems is not practical. Even for a few particles, the Schroedinger equation, for example, is prohibitively difficult to solve. One often tries to approximate the equations in different ways. One such approximation is the one approximating the solutions of a (linear) N-particle Schroedinger equation by a product of N one-particle functions in 3 variables. This approximation results in a single non-linear equation in 3 variables. It is especially effective when the number of particles is sufficiently large. In this talk, we describe a quantum mechanical system interacting with a single quantum field and study its dynamics, using this approximation method which is usually called the self-consistent approximation. The results of our study are valid for a large class of open quantum systems, namely spin 1/2 (qubit) systems.