



Condensed Matter Theory Center

Seminar

Jay Deep Sau
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Monday, November 3
10:00 AM
2202 Physics Building

“Theoretical Approaches to the Transport Properties of Nanostructures”

Recent experimental advances have made a rich variety of quantum phenomena accessible at the atomic and molecular scales. In this talk I will discuss the application of theoretical methods ranging from first principles calculations using density functional theory to more advanced concepts such as diagrammatic perturbation theory and quasiparticle band structures to understand the properties of such nanosystems. In particular, I will discuss how we used such methods to understand the emergence of stripe patterns in the STM images of semiconducting Boron Nitride nanotubes under strong electric fields. This work led to the prediction of an excitonic insulator state in semiconducting nanotubes that can be obtained by closing the gap with a sufficiently large electric field. I will discuss some of the properties and experimental signatures of such a state. Finally, I will also discuss an example where we develop an understanding of the energy levels of a C_{60} molecule studied by STM on Au and Ag surfaces using a combination of first principle methods together with the analysis of an Anderson Impurity model.