NEW YORK CITY COLLEGE OF TECHNOLOGY
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Microscopic theories of excitons in 2D materials

Presented by:

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Abstract

The transition metal dichalcogenides recently emerged as a new class of quasi-two-dimensional direct band gap semiconductors. Such atomically thin materials exhibit strong electronic interactions and an extreme sensitivity to the local environment. These effects collectively yield strongly bound electron-hole pairs or excitons, upon photoexcitation. In this talk, I'll present a microscopic theory of excitons -- developing the low-energy single-particle physics and the appropriate treatment of dielectric screening for many-body physics. I will first present results of this theory for neutral excitons, which exhibit interesting and subtle selection rules and non-hydrogenic exciton behavior. The formalism for linear and nonlinear spectra will be discussed. I will then present the extension to more complex situations, including electron-doped samples, charged excitons (trions), and biexcitons, the results of which are all in good agreement with the most recent experimental estimates.

Light refreshments will be served.