Nanostructures such as carbon nanotubes, nanowires, graphene, and topological insulators are being intensively explored for future electronic, photonic, and energy applications. For all of these applications, it is necessary to form electrical contacts to the active material in order to inject or collect charge. While the scientific community and industry have invested significant resources to develop and control metal contacts to bulk semiconductor materials, nanostructures possess unique properties that differ significantly from bulk semiconductors, rendering existing models of electrical contacts often inapplicable at the nanoscale. In this talk, the importance and uniqueness of nanoscale electrical contacts will be introduced, and key research and development challenges to understand and control nanocontacts will be discussed. Specific examples of the use of computational modeling to elucidate the properties of contacts to carbon nanotubes and topological insulators will be presented.
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