

北京大学量子材料科学中心

International Center for Quantum Materials, PKU

## Seminar

## Novel Interaction and Topological Effects in the Electronic and Optical Properties of Two-Dimensional Materials

## **Ting Cao**

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Time: 2:30pm, June 13, 2018(Wednesday)

2018 6 13 2:30

Venue: Room W563, Physics building, Peking University

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Recent advances in the experimental and theoretical studies of atomically thin two-dimensional (2D) materials have opened up opportunities in exploring new phenomena and properties as well as related applications absent in conventional bulk materials. In the first part of my talk, I will present our theoretical studies on the quantum excited-state phenomena in monolayer transition metal dichalcogenides and gapped few-layer graphene. By theoretical analyses and *ab initio* GW-BSE calculations, we discover excitons with exceptional binding energies due to the reduced dielectric screening in 2D (thus dominating their optical spectrum) and unusual optical selection rules resulting from a nontrivial topological band effect which occurs only in 2D. In the second part, I will discuss our discovery of topological phases in graphene nanoribbons. The topological phases enable us to rationally design a prototype graphene nanoribbon superlattice that hosts a coupled array of non-trivial junction states. I further connect our theoretical predictions to experimental results and demonstrate their potential applications.

**Ting Cao** is from the University of California, Berkeley, expecting to receive his Ph.D. degree in the summer of 2018. His dissertation research focus on excited-state phenomena and light-matter interactions in twodimensional materials, under the guidance of Professor Steven G. Louie. His current research employs quantum physics, advanced materials modelling techniques, and high-performance computing to explore the distinct physical properties of one- and two-dimensional material systems which are potentially useful for future applications. He was awarded a GLAM postdoctoral fellowship at Stanford University for 2018-2020.