

O 1: Overview Talk Sivan Refaely-Abramson

Time: Monday 9:30–10:15

Location: TRE Phy

Invited Talk

O 1.1 Mon 9:30 TRE Phy

From surface structure to exciton evolution: a many-body theoretical perspective — ●SIVAN REFAELY-ABRAMSON — Weizmann Institute of Science, Rehovot, Israel

Excited-state processes involving Coulomb-bound electron-hole pairs in functional materials are essential for emerging applications, from energy conversion to quantum information science. The associated exciton creation and relaxation mechanisms are often coupled to optical selection rules, stemming from the underlying material structure. In this talk, I will discuss the relation between exciton evolution and structural modifications in monolayer semiconductors. Two broadly explored examples of such modifications are the introduction of

atomic defects and the composition of layered heterostructures. Both offer controllable design pathways to induce long-lived, low-lying excitons with tunable spatial localization and spin polarization. These structure-sensitive exciton properties can be detected in a variety of experimental scenarios from absorption and luminescence under electric and magnetic fields to angle-resolved photoemission spectroscopy, allowing for a close inspection of the microscopic interaction mechanisms. I will present an overview of a many-body ab initio theoretical approach to capture and predict the involved excitonic phenomena and discuss our recent theory-experiment collaborations to explore these effects and their tunability through defect engineering and interlayer twisting.