IBS CINAP Seminar

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Room 86120 (N Center), Sungkyunkwan University, Suwon

Electronic and Optical Properties of Atomically Thin Semiconductors

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The field of 2D materials started with graphene with its novel physical properties and potential for technology. This interest has expanded to the wider class of two-dimensional materials that occur naturally as 2D layers of van-der-Waals crystals. While preserving graphene's flexibility and tunability by external perturbations, atomically thin layers of this broader set of materials provide access to more varied electronic and optical properties, including semiconducting and insulating behavior.

In this talk, will discuss some of the distinctive properties of atomically thin 2D semiconductors. We will focus on the family of transition metal dichalcogenides (MX_2 where M = Mo, W and X = S, Se, Te) and how these materials interact with and can be probed by light. Although weak light emitters as bulk crystals, at monolayer thickness they emit light efficiently, a consequence of the change in band structure to direct-gap materials. We will present some of the surprising characteristics exhibited by these systems in the extreme 2D limit, including their strong and anomalous excitonic effects and their valley selective excitation and control. We will also describe progress in forming heterostructures of such 2D layers and the novel electronic and optical properties that these new artificial materials exhibit.

TONY F. HEINZ

Education

B.S. Physics (with Distinction), Stanford University, 1978
Ph.D., Physics, University of California, Berkeley, 1982

Professional Experience

Stanford University and SLAC National Accelerator Laboratory:

- Professor of Applied Physics and Photon Science, Stanford University, 2015 -
- Director, Chemical Science Division, 2015 – , SLAC
- Associate Laboratory Director for Energy Sciences, 2017 -, SLAC

Columbia University:

- Professor of Physics and Electrical Engineering, 1995 - 2000, Rickey Professor, 2001 - 2014

IBM Research Division, T. J. Watson Research Center, Yorktown Heights, NY:

- Research Staff, 1983 – 87; Dept. Manager, 1987 – 93; Senior Department Manager, 1993 - 95