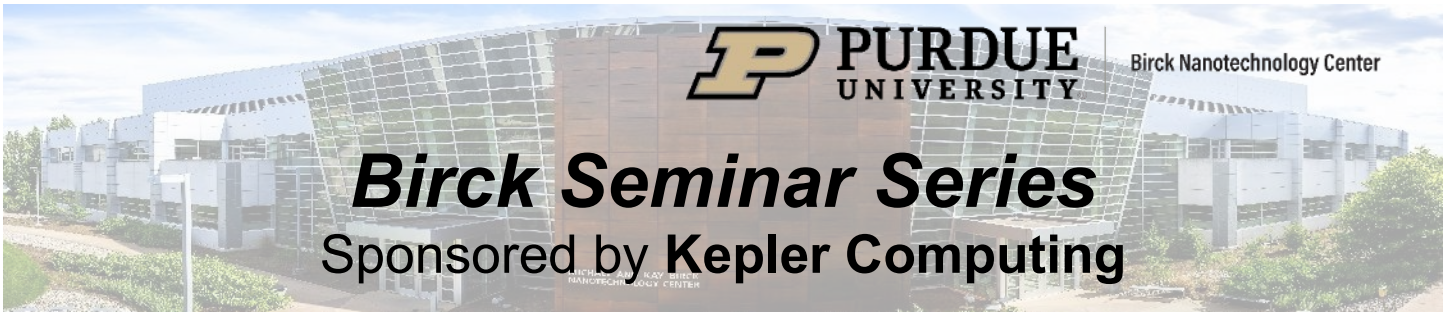

On the potential of two-dimensional semiconductors for future applications

Joerg Appenzeller
Barry M. and Patricia L. Epstein Professor of Electrical and Computer Engineering, Scientific Director of Nanoelectronics
Birck Nanotechnology Center

Wednesday, March 12th @ 2:00 pm in BRK 1001
Coffee and snacks served before seminar
also on MS Teams link

Abstract: After introducing two-dimensional (2D) materials for advanced logic applications, my talk will discuss in detail experimental progress towards high performance n-type and p-type field-effect transistors (FETs) from two different transition metal dichalcogenides (TMDs). Next, I will discuss how one and the same TMD, i.e. $MoTe_2$, can be processed to enable n-type or p-type behavior at will, allowing to build an integrated inverter. Individual device and inverter characteristics will be discussed and my group's work will be put in the context of previously published data. Following these three sections on transistors, I will discuss three recent discoveries that are benefitting from 2D materials. I will first present results on templated contacts to layered 2D materials. Last, to conclude my presentation, I will discuss a novel RRAM cell from multi-layer $MoTe_2$ and $Mo_xW_{1-x}Te_2$ that allows for a field-induced ultrafast phase transition between a low and a high resistive state.

Bio: Dr. J. Appenzeller received the M.S. and Ph.D. degrees in physics from the Technical University of Aachen, Germany in 1991 and 1995. His Ph.D. dissertation investigated quantum transport phenomena in low dimensional systems based on III/V heterostructures. He worked for one year as a Research Scientist in the Research Center in Juelich, Germany before he became an Assistant Professor with the Technical University of Aachen in 1996. During his professorship he explored mesoscopic electron transport in different materials including carbon nanotubes and superconductor-semiconductor-hybrid devices. From 1998 to 1999, he was with the Massachusetts Institute of Technology, Cambridge, as a Visiting Scientist, exploring the ultimate scaling limits of silicon MOSFET devices. From 2001 until 2007, he had been with the IBM T.J. Watson Research Center, Yorktown, NY, as a Research Staff Member mainly involved in the investigation of the potential of carbon nanotubes and silicon nanowires for a future nanoelectronics. Since 2007 he is Professor of Electrical and Computer Engineering at Purdue University and Scientific Director of Nanoelectronics in the Birck Nanotechnology Center. In 2014 he became the Barry M. and Patricia L. Epstein Professor of Electrical and Computer Engineering. His current interests include novel devices based on low-dimensional nano-materials as nanowires, nanotubes, graphene and di-chalcogenides.

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