

FRIDAY, JUNE 23, 2017

1:30 PM, 266 DREESE LABORATORIES

Prof. Vijay K. Arora
Electrical Engineering & Physics**Quantum Nanoengineering: Nonequilibrium High-Electric-Field Transport for Signal Propagation**

Abstract: Analog and digital signal processing in nanoelectronic devices in ultra-large scale integration (ULSI) is severely affected by the breakdown of Ohm's law when applied voltage V exceeds the critical voltage V_c that is the thermal voltage scaled by length to mean free path (mfp) ratio. Non-equilibrium Arora's distribution function (NEADF) is distinct from the Monte Carlo procedures and Non-equilibrium Green's function (NEGF) in predicting the saturation velocity that is scattering independent and hence ballistic. The resistance rises with the applied dc electric field or voltage, both under direct and incremental conditions beyond the onset of sublinear behavior resulting in saturation. The surge increases with the applied dc voltage. This surge is shown to change the RC time constants, power consumption, and voltage and current division laws. Signal resistance is found to rise much faster than the direct resistance. Applications of high-field transport to silicon and carbon-based devices are included to confirm their validity. Quantum effects leading to quantum resistance will be discussed in this lecture. The magneto transport in graphene reveals quantum plateaus in Hall conductivity. Carrier multiplication in high electric field as residing in a p-n junction will also be discussed to show the effect of bandgap narrowing.

Bio: Professor Arora obtained his Ph. D. from the University of Colorado, U. S. A. In addition to his tenured appointment at Wilkes University, he is privileged to have held the distinguished visiting appointments at the University of Tokyo, National University of Singapore, Nanyang Technological University, University of Western Australia, and Universiti Teknologi Malaysia (UTM). Presently, he is a UTM distinguished visiting professor and an IEEE-EDS distinguished lecturer. Professor Arora has been invited to give keynote papers/lectures/courses at international forums, spanning from nanotechnology to nanoeducation to nanomanagement, both on and off a chip. He has published more than 100 papers in reputed journals and many uncounted publications in conference proceedings. Professor Arora serves on the editorial board of a number of journals. He was chair of NanoSingapore2006, NanotechMalaysia2010, and EscienceNano2012 conferences. He is listed in a number of Who's Who biographies. Professor Arora's most recent recorded forum (30 minutes) on Educating Global Engineers can be downloaded from his webpage: <http://web.wilkes.edu/vijay.arora/>

Hosted by: Paul R. Berger