

Les Séminaires de la Fondation
“Nanosciences aux limites de la Nanoélectronique”



Mardi 22 Juin 2010
à 16h



Jim Greer & Baruch Feldman

Tyndall National Institute, University College Cork

présenteront deux séminaires intitulés :

" Charge transport in molecular and semiconductor nanowires "
&
**"Simulations of electronic transport in ultra-thin
and ultra-short junctionless transistors "**

Vous êtes tous cordialement invités au pot qui suivra la présentation.

Amphithéâtre 15 de l'école PHELMA-Polygone

(anciennement ENSERG)

23 rue des Martyrs – 38000 Grenoble

nanoSCIENCES
FONDATION



Charge transport in molecular and semiconductor nanowires – by Jim Greer

Microelectronics technology has made great progress by scaling down transistor sizes. However in nanoelectronic design, there is an advantage in starting on an atomic scale and use a full quantum mechanical treatment for electron transport. Approximations can then be introduced to allow for predictive simulations for transistors with feature sizes of a few nanometers. In this case, it is easier to start with "small" systems such as molecular tunnel junction and to develop rigorous treatments of the electronic structure combined with transport, notwithstanding the difficulties in obtaining well-defined experimental benchmarks.

Results for predicting currents across molecular tunnel junctions and challenges associated with the accurate theoretical treatment of charge transport on the nanoscale and the need for accurate calculations of electronegativity to predict currents is highlighted, The relationship of electronegativity to electron-electron correlation is given and related to electron transport. The talk concludes with examples of carrier scattering in silicon nanowires.

Jim Greer is Head of Electronics Theory and Head of Graduate Studies at the Tyndall National Institute, University College Cork, Ireland. His current research interest is atomic scale simulations for nanoelectronics - including molecular and semiconductor nanowire simulations.

Prior to joining Tyndall, he worked at United Technologies Mostek and Texas Instruments, was a visiting researcher at Hitachi Central Research Laboratory, and was a faculty member at Trinity College Dublin.

Simulations of electronic transport in ultra-thin and ultra-short junctionless transistors – by Baruch Feldman

I will describe our recent applications of the non-equilibrium Green's function (NEGF) method to electronic transport in two different systems. The junctionless Si nanowire (SiNW) transistor was recently fabricated at Tyndall, and has desirable short-channel characteristics, as well as not needing junctions.

We recently predicted that this device can work at scales as small as ~ 3 nm gate length and ~ 1 nm SiNW diameter. In such a thin SiNW, dopant delocalization occurs over length scales comparable to the gate length, making the junctionless design more robust against dopant fluctuations, while making junctioned designs difficult to achieve.

I will also discuss our simulations of a junctionless carbon nanotube (CNT) transistor and end the talk with a preview of our forthcoming paper on our NEGF code TIMES.

Baruch Feldman is doing his first postdoctoral appointment at Tyndall National Institute in Cork, Ireland.

He received his PhD in Physics in 2008 from the University of Washington in Seattle, WA, USA, with Scott Dunham from the Electrical Engineering department and in collaboration with Intel Corp.

He received his BSc in Physics in 2001 from MIT.