The single-atom transistor:
How it was created and what it may mean for the future.

Plan to attend 3 p.m. Thursday!

Dr. Gerhard Klimeck

Director, Network for Computational Nanotechnology and Professor of Electrical and Computer Engineering, Purdue University

ECE 694 Seminar
EE 170
3 p.m. Thursday, Nov. 1

About the topic

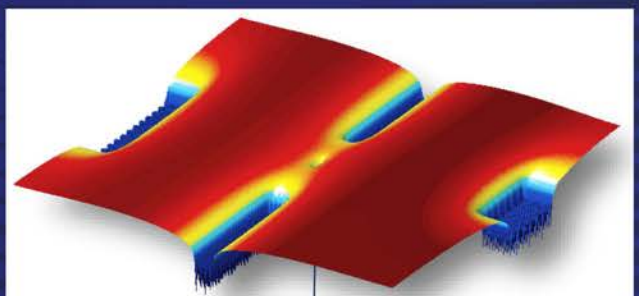
Earlier this year, the journal *Nature Nanotechnology* reported the creation of a working transistor from a single phosphor impurity atom embedded in a silicon crystal. Scientists from Australian and American universities worked together on the project, and Dr. Klimeck was US team lead.

Single-atom transistors have occasionally surfaced on a hit-or-miss basis since 2002, but the recent project represents the first time anyone has shown atomically precise placement and electrical control of a single impurity atom in silicon. Based on the same impurity placement technique the Australian and American team also reported creating nanowires in silicon just one atom tall and four atoms wide. These metallic ultra-scaled wires can in principle serve as 3D gates to single atom transistors.

The success of the project shows that Moore's Law can in principle be scaled toward atomic scales in silicon. Surprisingly the technologies for classical computing can survive to the atomic scale based on single charge transistors and metallic wires. Beyond classical electronics this demonstration may be the foundation for scalable silicon-based quantum computing gates.

About the speaker

Prior to his position at Purdue University, Dr. Gerhard Klimeck was a principal member of the technical staff at NASA JPL / Caltech. Prior to that he was at the Central Research Lab of Texas Instruments, where he served as manager and principal architect of the NanoElectric Modeling (NEMO) program. He is a senior member of IEEE, a Fellow of the American Physical Society and a Fellow of the Institute of Physics (UK). He also leads nanoHUB.org , a web-based resource for nanotechnology research, education and collaboration used by over 230,000 individuals annually.



The atom, shown here in the center of an image from a computer model, sits in a channel in a silicon crystal.