

# CMP Seminar Michigan State University

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Electrical and Computer Engineering  
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## *The Single-Atom Transistor: How it was Created and What it May Mean for the Future and Mythbusting Knowledge Transfer*

The end of Moore's law has been falsely predicted repeatedly over the past 25 years, while Silicon technology has been driven to seemingly unlimited miniaturization. One foundational limit of size downscaling, however, will be hard to overcome – the discreteness of the underlying atomic system. Let's assume cost and manufacturability issues can be overcome: Can one reach such atomic limits? Can one make wires that are 4 atoms wide and 1 atom tall and still provide Ohmic conductivity [1]? Can one connect such atomically thin wires to a single impurity atom embedded in Silicon [2]? If you can build such a thing, how would you know that it is single impurity atom? What modeling approaches are needed? How can such modeling software be disseminated widely? This presentation will address these questions through experimental and theoretical results of our recently demonstrated "Single Atom Transistor" and overview nanoHUB.org briefly. nanoHUB is changing how knowledge can be transferred from research into new research and education.

Gerhard Klimeck is a Professor of Electrical and Computer Engineering at Purdue University. In the past 23 years at Texas Instruments, NASA/JPL, and Purdue he has been the driving force for the Nanoelectronic Modeling Tool Suite (NEMO). He also leads nanoHUB.org in the service of nanoelectronic simulation and education on the web, serving over 1,400,000 users. Gerhard is a fellow of the IEEE, the American Physical Society, and the Institute of Physics.



[1] Bent Weber, Suddhasatta Mahapatra, Hoon Ryu, Sunhee Lee, A. Fuhrer, T. Reusch, D. Thompson, W. C. T. Lee, Gerhard Klimeck, Lloyd Hollenberg, Michelle Simmons, "**Ohm's Law Survives to the Atomic Scale**", Science 335, 64 (2012);[doi: 10.1126/science.1214319](https://doi.org/10.1126/science.1214319)

[2] Martin Fuechsle, Jill Miwa, Suddhasatta Mahapatra, Hoon Ryu, Sunhee Lee, Oliver Warschkow, Lloyd Hollenberg, Gerhard Klimeck, Michelle Simmons, "**A single-atom transistor**", Nature Nanotechnology, 19 February 2012;[doi: 10.1038/NNANO.2012.21](https://doi.org/10.1038/NNANO.2012.21)

**Monday, October 23, 2017**  
**4:10 p.m.**  
**BPS 1400**  
**Prof. David Tomanek - Host**