

 **ncn**
nanoHUB.org

Network for Computational Nanotechnology (NCN)

Purdue, Norfolk State, Northwestern, MIT, Molecular Foundry, UC Berkeley, Univ. of Illinois, UTEP

nanoHUB.org:
Future Cyberinfrastructure
serving over 150,000 Users TODAY

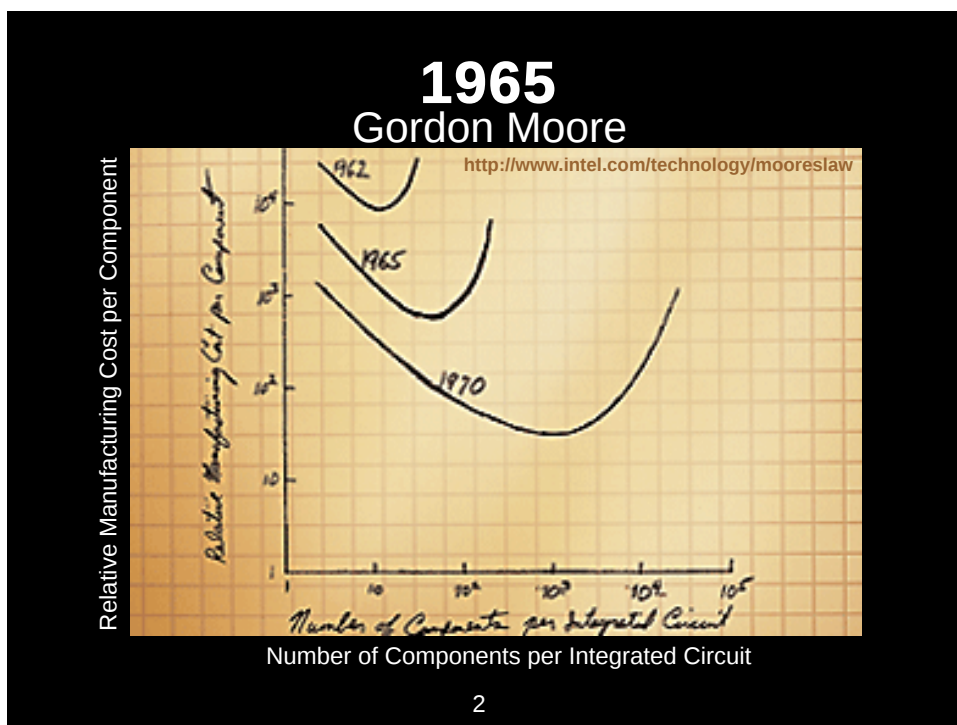
 **ncn**
nanoHUB.org
Gerhard Klimeck

Gerhard Klimeck
Director
Network for Computational Nanotechnology (NCN)

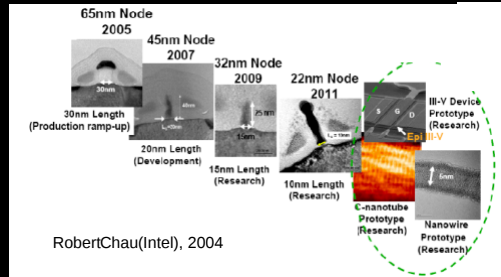
Professor
Electrical and Computer Engineering

gekco@purdue.edu





2010 Intel

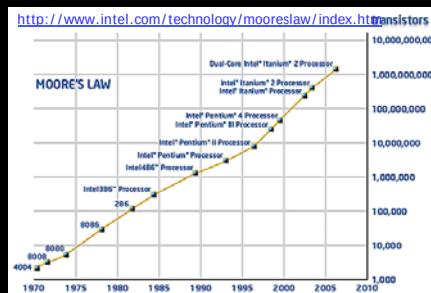


Device Size:
Tens of nanometers

Stanford SUPREM

Device Integration:
>2 Billion

Berkeley SPICE



1972 Berkeley SPICE

Simulation **P**rogram with **I**ntegrated **C**ircuit **E**mphasis.

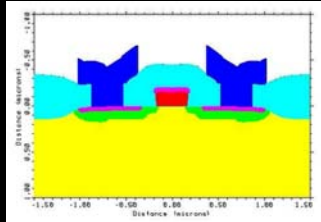


from: Larry Nagel, BCTM '96

- Started as a class project
- Developed as a teaching tool
- Quality control: pass Pederson
- Dissemination:
 - Public domain code
 - Pederson carried tapes along
 - Students took it along to industry and academia

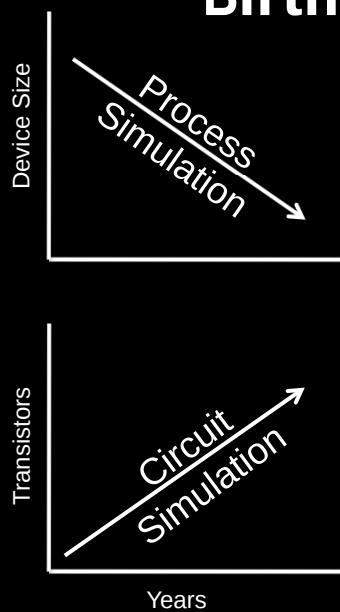
1973/4 Stanford

Stanford University PROCESS Modeling

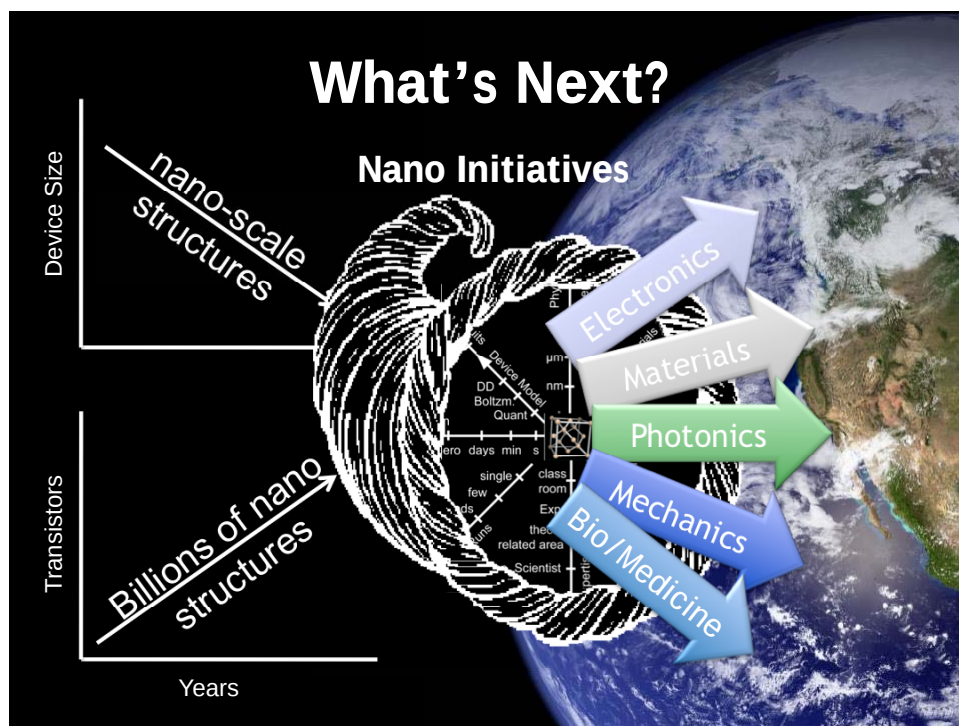


- Stanford wanted to mimic Berkeley success
- Combine various existing models
- Dissemination:
 - Public domain code
 - Community workshops
 - Students took it along to industry and academia

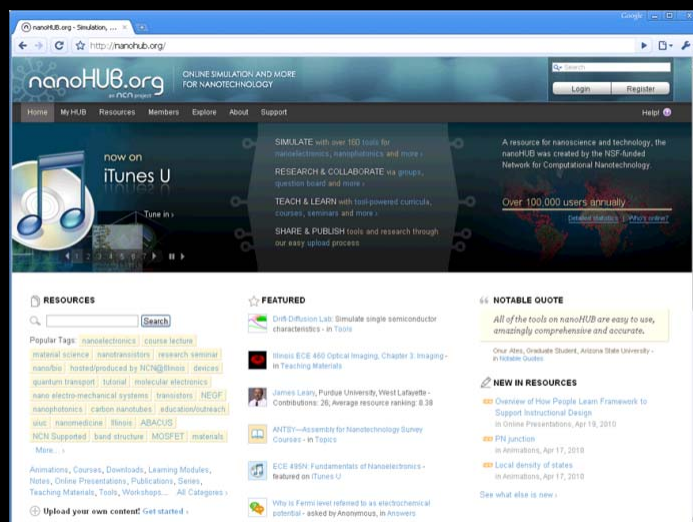
Birth of an Industry



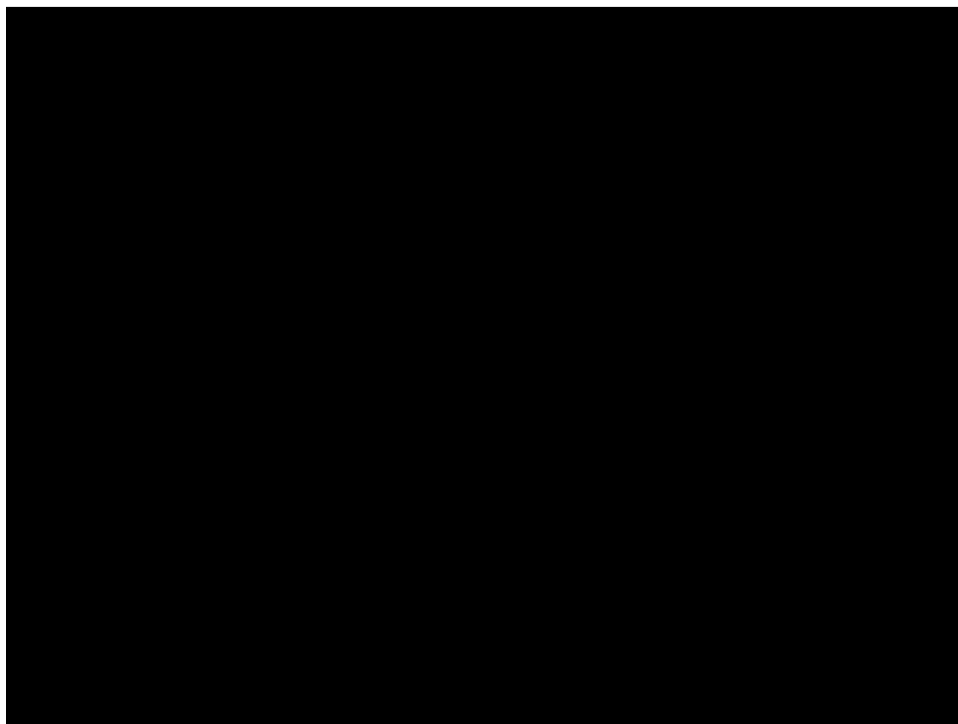
Intel Capitalization:
\$85B
 Total Industry:
\$280B



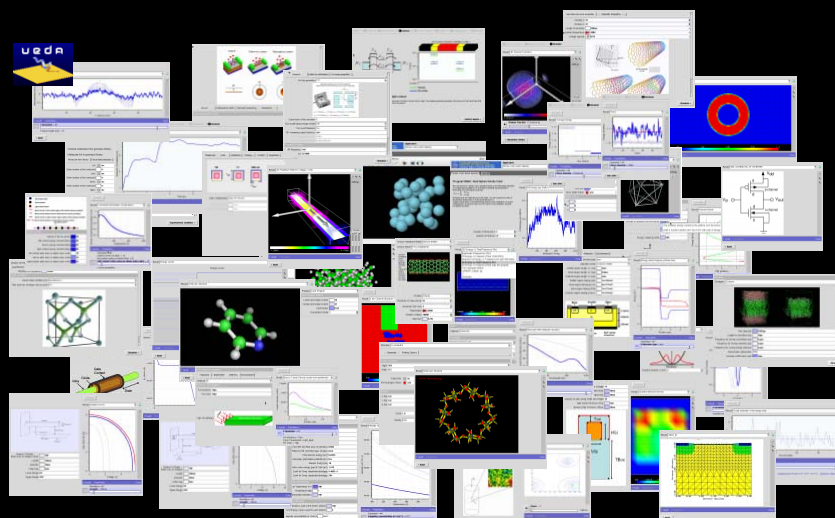
It Happens Here



Demo>>



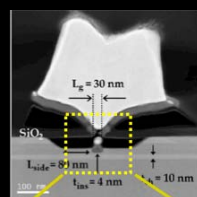
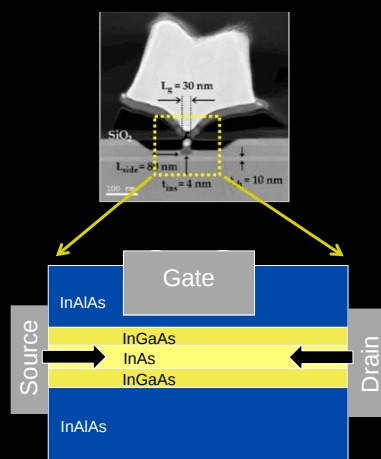
Over 170 tools online!



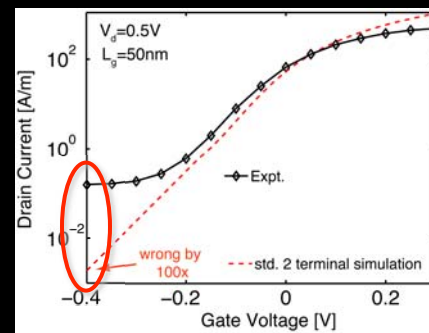
Demo

- Graphene
- Quantum dots
- Gate Tunneling in Transistors

Build a better switch



Experimental Partner:
MIT MSD Focus Center
 D.H. Kim et. al, IEDM 07, EDL 08

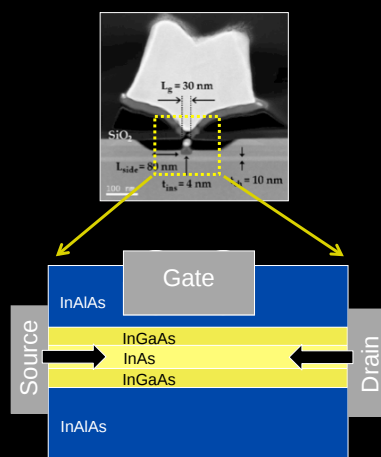


OMEN-hfet

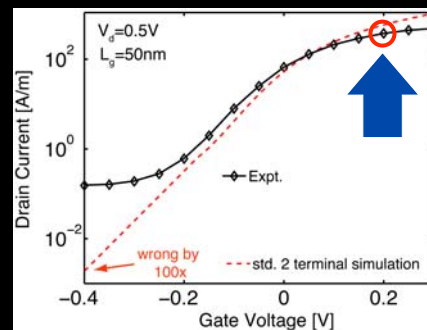
OMEN-based heterojunction field effect transistor simulator



Build a better switch

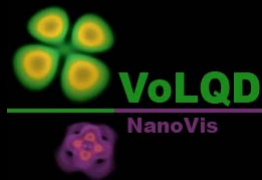


Experimental Partner:
MIT MSD Focus Center
D.H. Kim et. al, IEDM 07, EDL 08



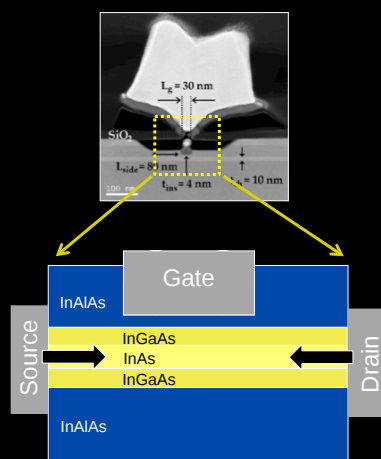
Flow Visualization

Integrated seamlessly

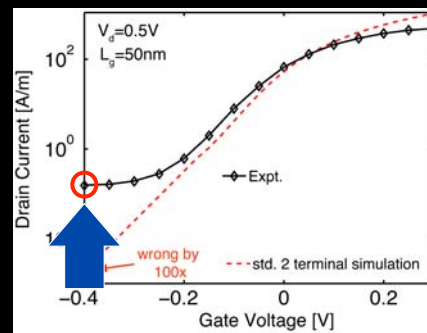


nanoVIS rendering server
 Developed by
 Insoo Woo, Karl Ostmo, David S. Ebert
 PURPL Lab, Purdue University

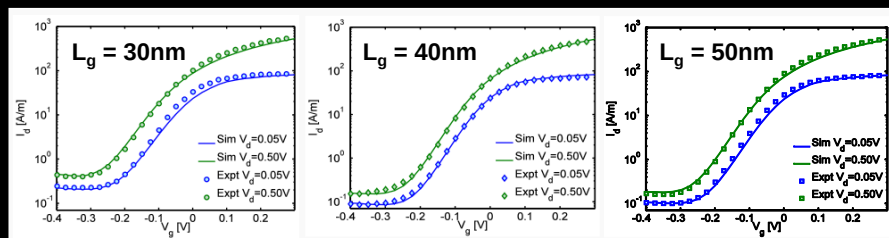
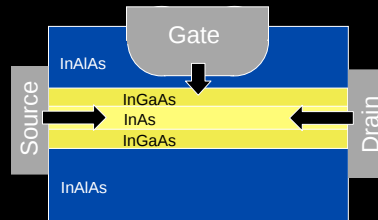
Build a better switch



Experimental Partner:
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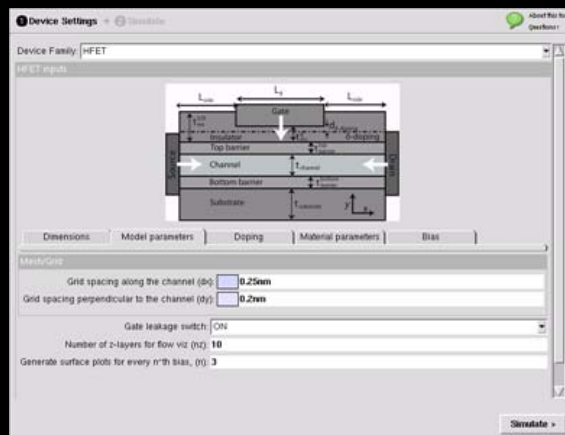


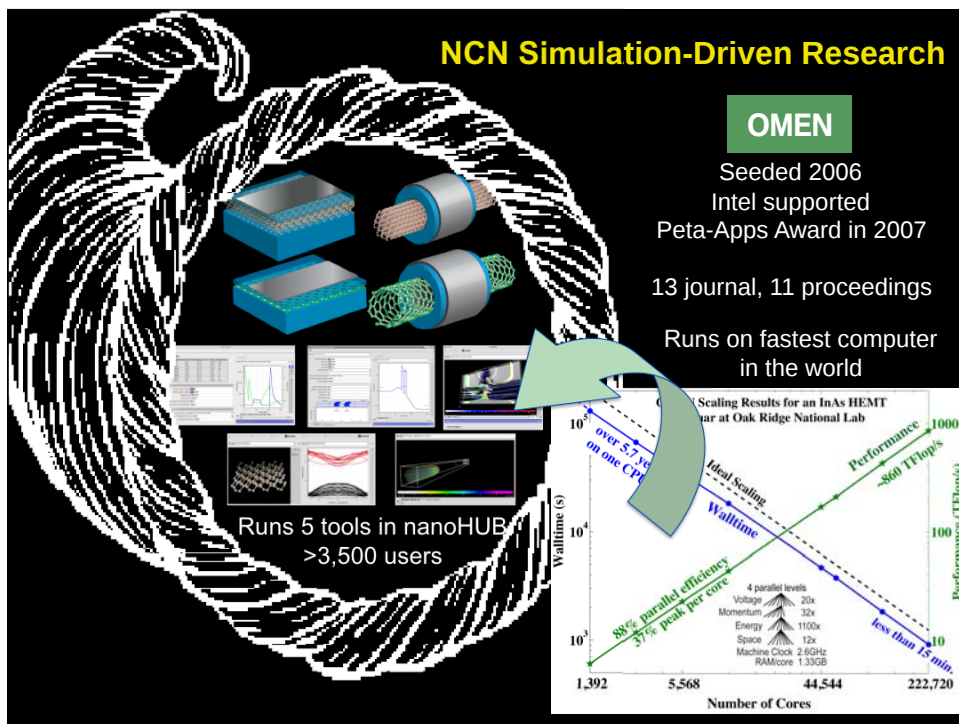
Quantative Agreement



Powered by OMEN

- New community code
- Engine for...
 - OMEN-hfet

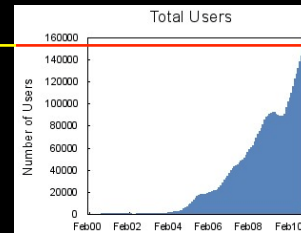




Nano App Store

153,000 users worldwide

As much traffic as www.purdue.edu
 Users at all Top 50 US Engr Schools
 19% of all .edu domains



Sociology

How do Users Behave?

- Questions:
 - How many students in the class?
 - Which tools?
 - Intensity of use
 - Sustained use
 - Percentage of service: Education vs. Research use
- Some Statistics
 - 8,600 users ran 345,000 simulations last 12 month
 - 116 classes / 97 institutions in 09/10
 - Info Obtained from self-registration, manual follow-up
 - 575 citations in the literature
 - Info obtained from Google Scholar and manual analysis

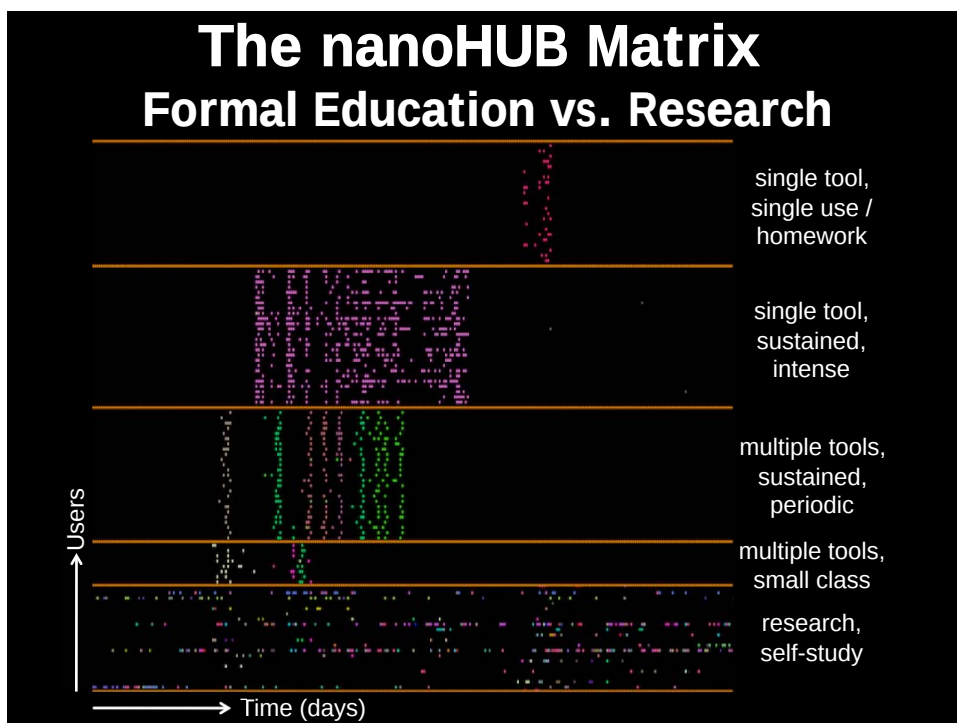
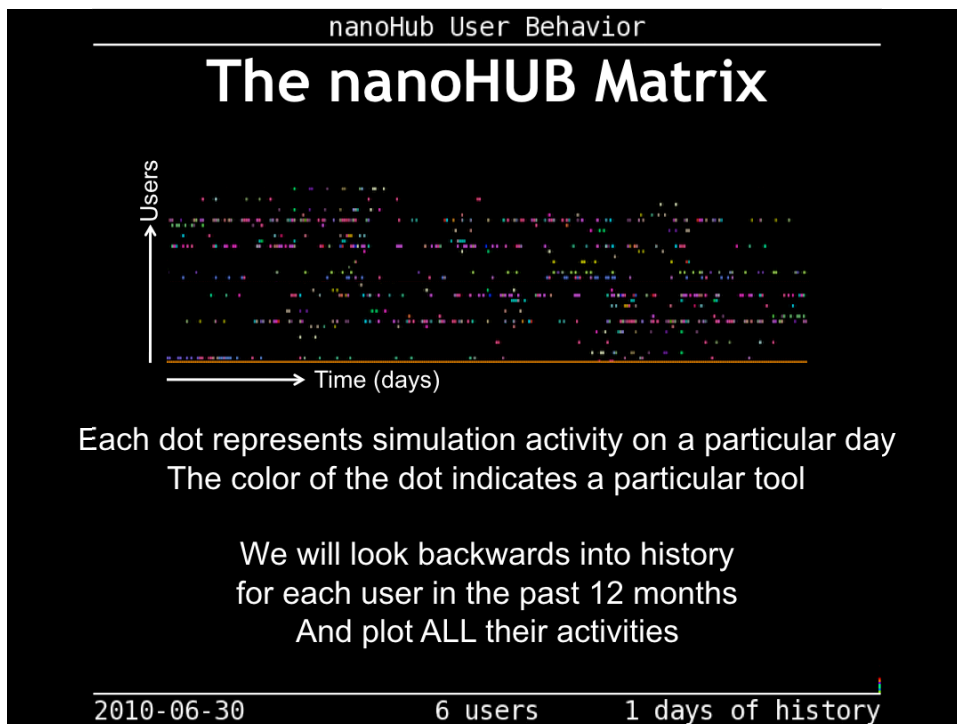
Sociology

How do Users Behave?

- Questions:
 - How many students in the class?
 - Which tools?
 - Intensity of use
 - Sustained use
 - Percentage of service: Education vs. Research use
- Can we get answers? Automatically?
=> Improve Services
 - Better tool classification
 - Customize web page for users, customize learning experience
 - Computational resource provisioning
- Broaden user base

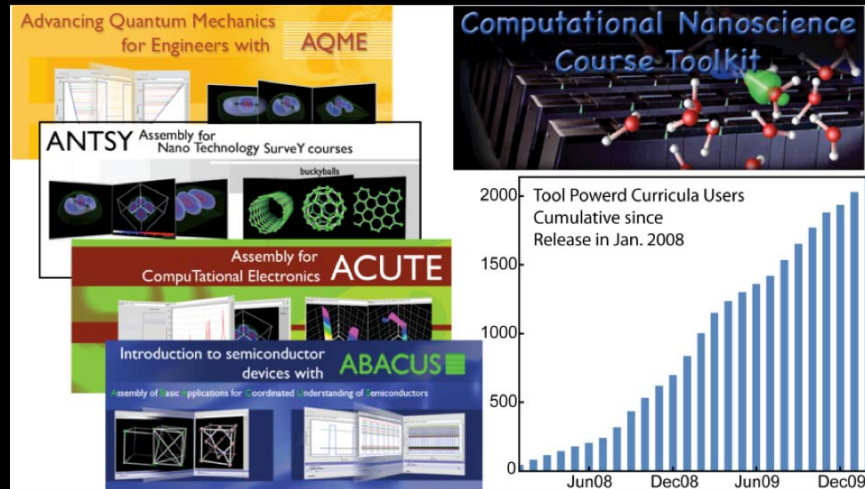
The Matrix





Tool Powered Curricula

"make abstract concepts more concrete"



Work with Teachers

Educational workshop:

- November 5-6, 2009, Chicago Airport
- 11 faculty
- 11 institutions / 8 primarily serving minorities

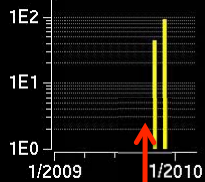


Immediate Impact

Hasina Huq
UT Pan Am.



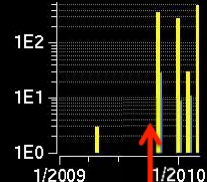
UT Pan Am.
11 Simulation users



Tanya Faltens
Cal Poly Pomona



Cal Poly Pomona
53 Simulation users

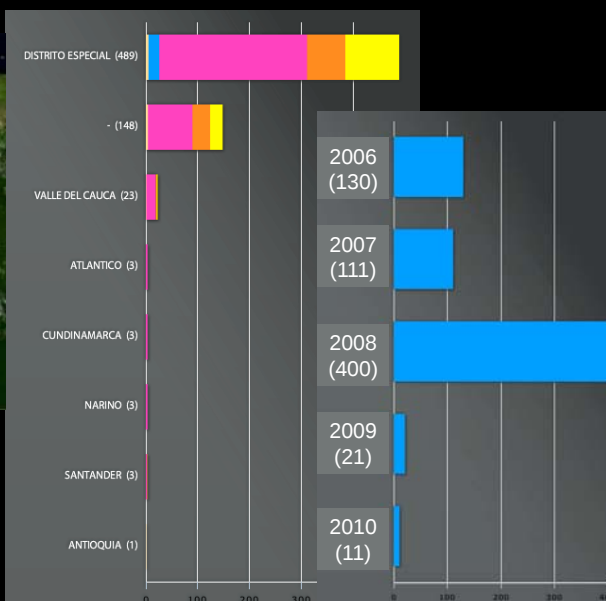


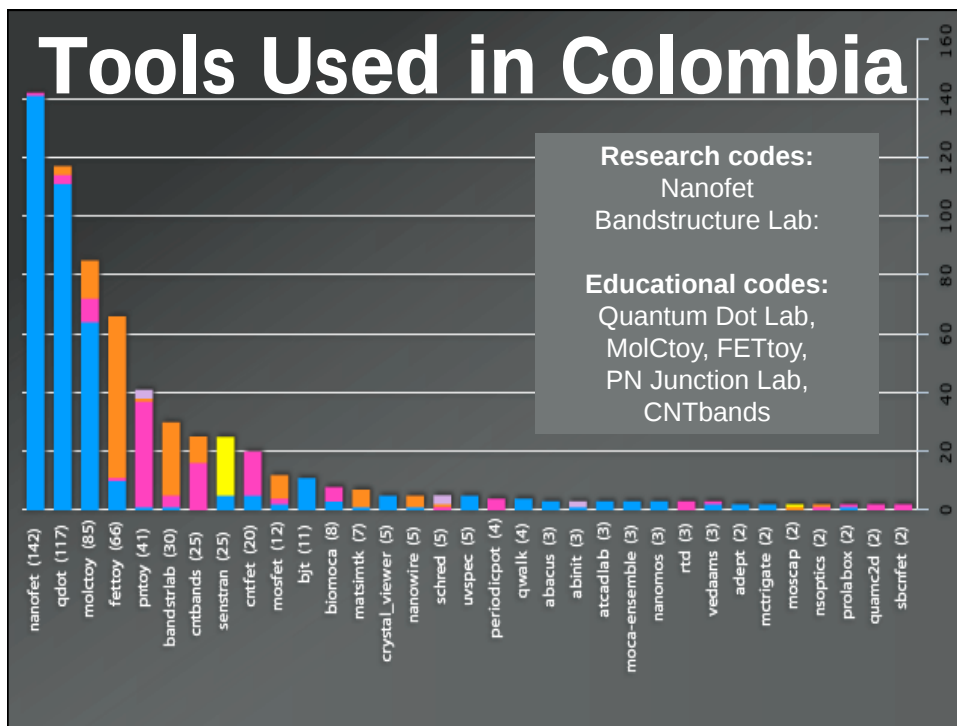
Use in Colombia

nanohub.org in Colombia



253 Users
673 Tool Sessions





Columbian Contributor!

nanoHUB.org ONLINE SIMULATION AND MORE FOR NANOTECHNOLOGY
an *NCN* project

0 New Messages
Gerhard Kilmeck (gekco_test)

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You are here: Members • Pedro Antonio Prieto • Profile

Pedro Antonio Prieto

Send Message

Profile Contributions Usage Favorites Blog

>> Demo

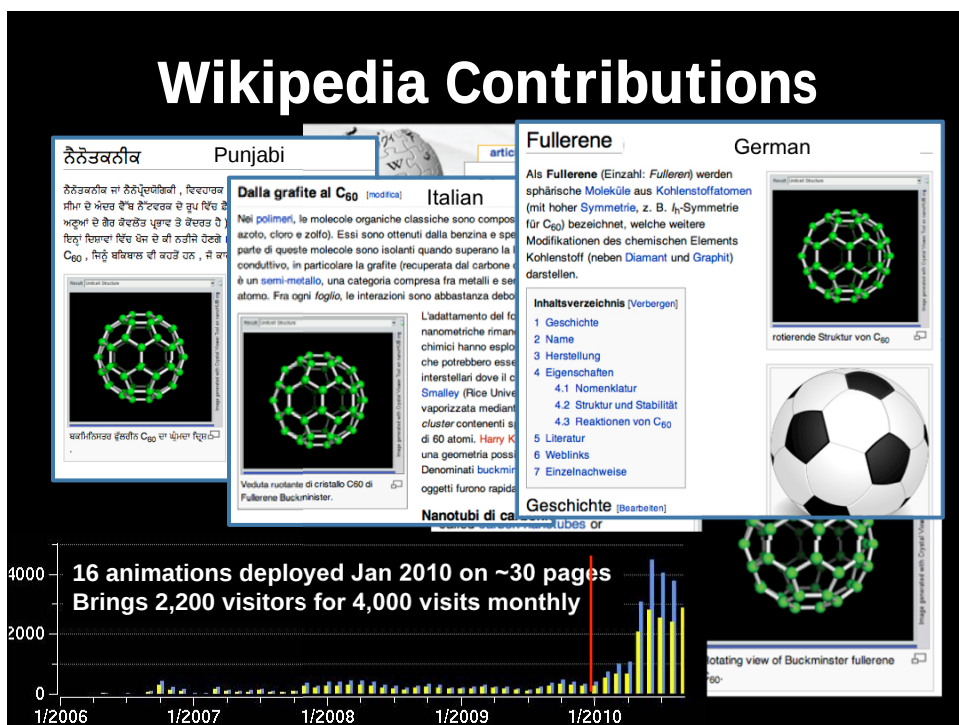
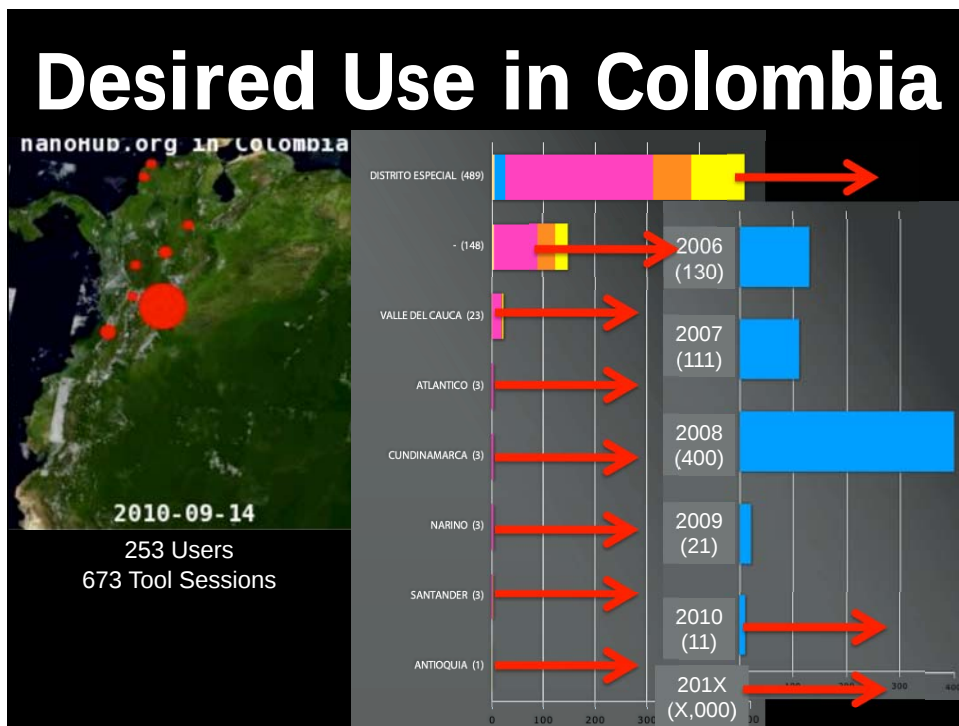
Organization: Universidad del Valle, Cali, Colombia

Employment Status: University / College Staff

Web Site: <http://www.cenm.org>

Biography: Professor Pedro Prieto is the Director of the Excellence Center for Novel Materials in Colombia, as well as the Director of the Thin Films Group in the Department of Physics at the Universidad del Valle, Cali, Colombia. He holds a Physicist degree, in 1974 and a Magister Scientiae degree in Physics from Universidad Nacional de Colombia in 1978, working on Silicon Oxide Thin films. He received the "Doktor der Naturwissenschaften" Dr.rer.nat from Rheinische Westfälische Hochschule

4 resources
Detailed usage
Blog entries



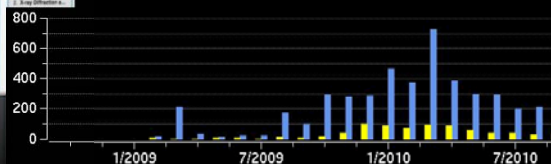
nanoHUB on iTunes U



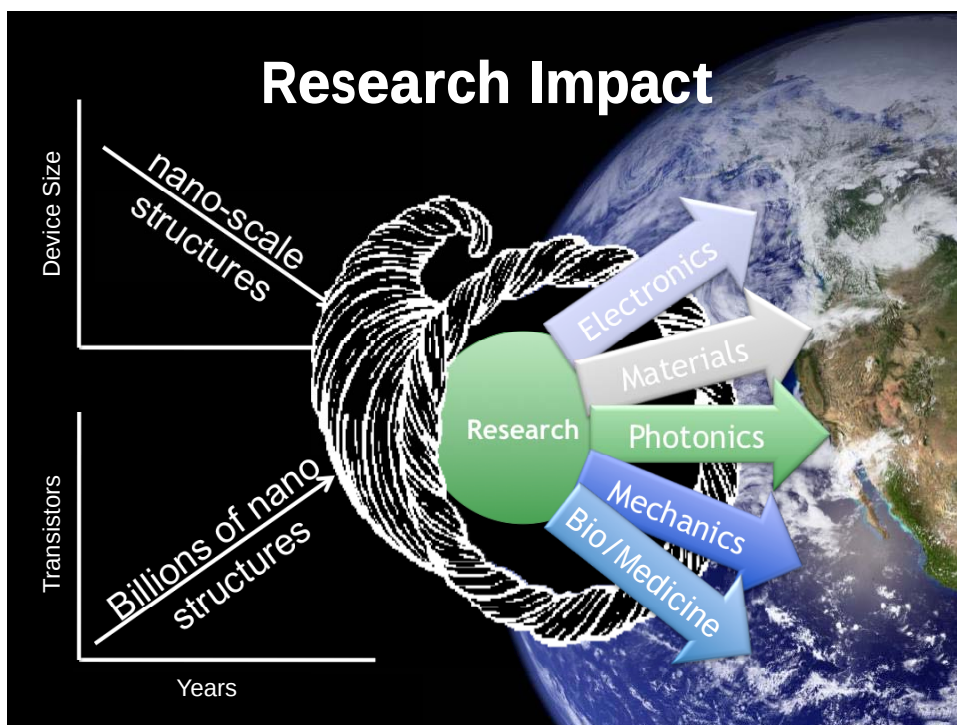
Nov 2009 start

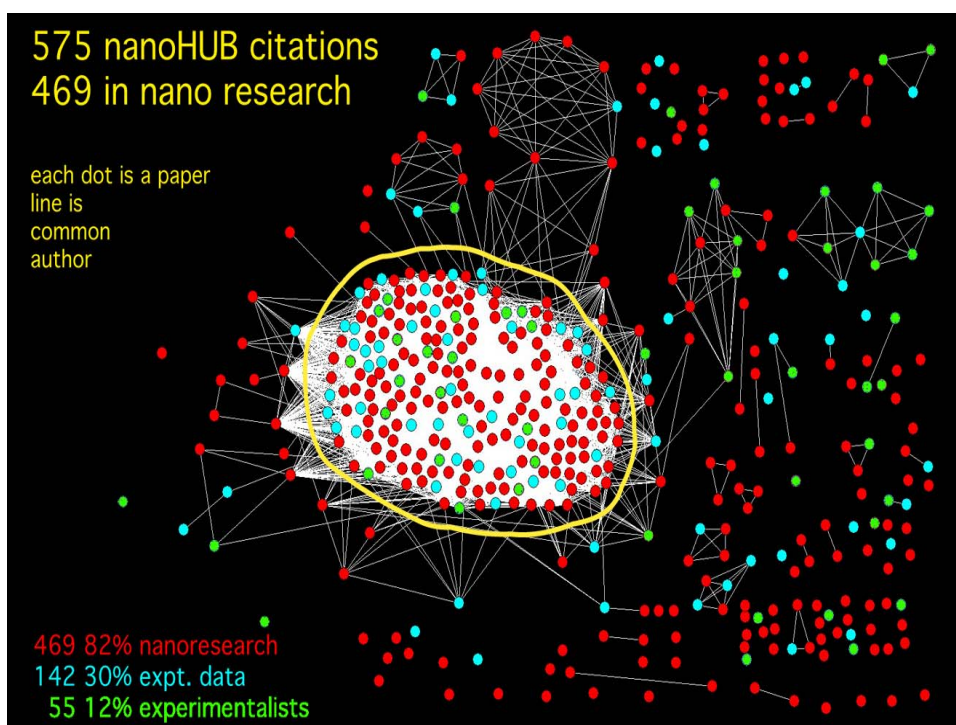
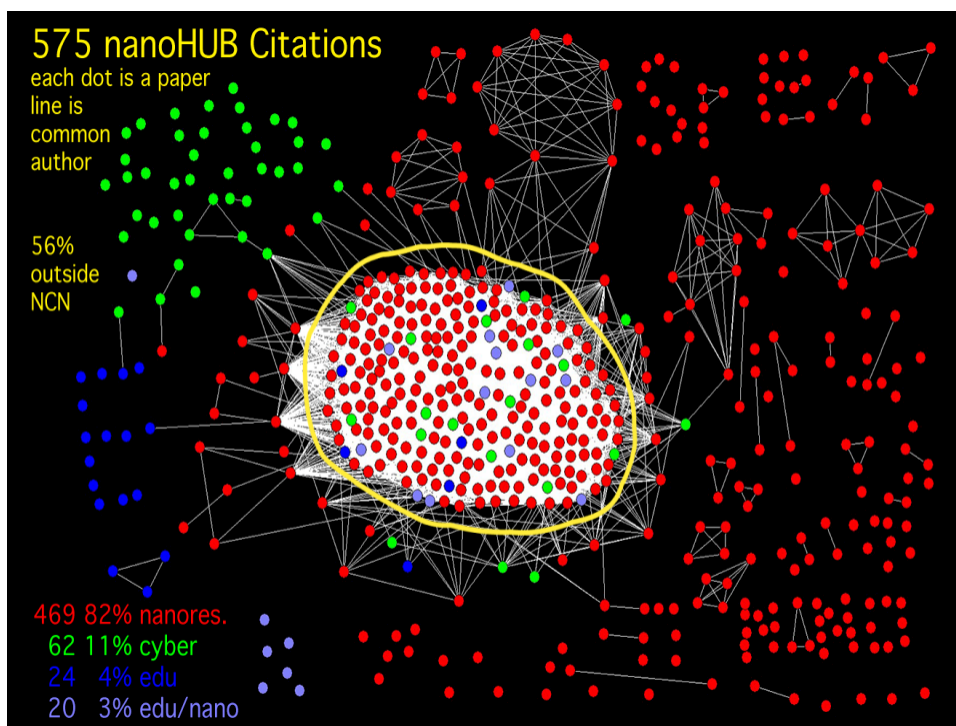
350 content items today

55,000 downloads

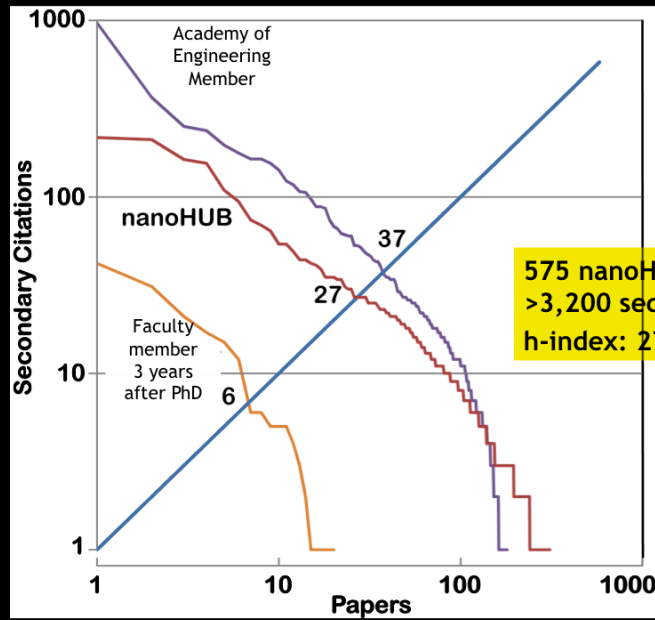


Research Impact



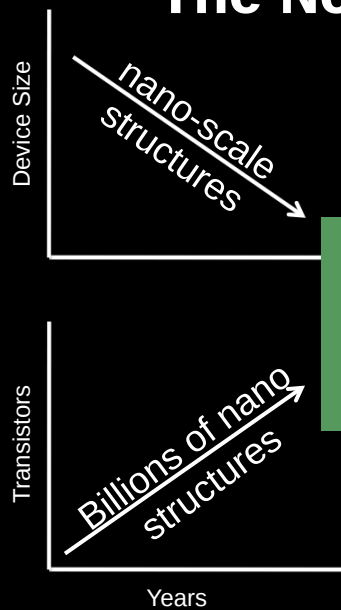


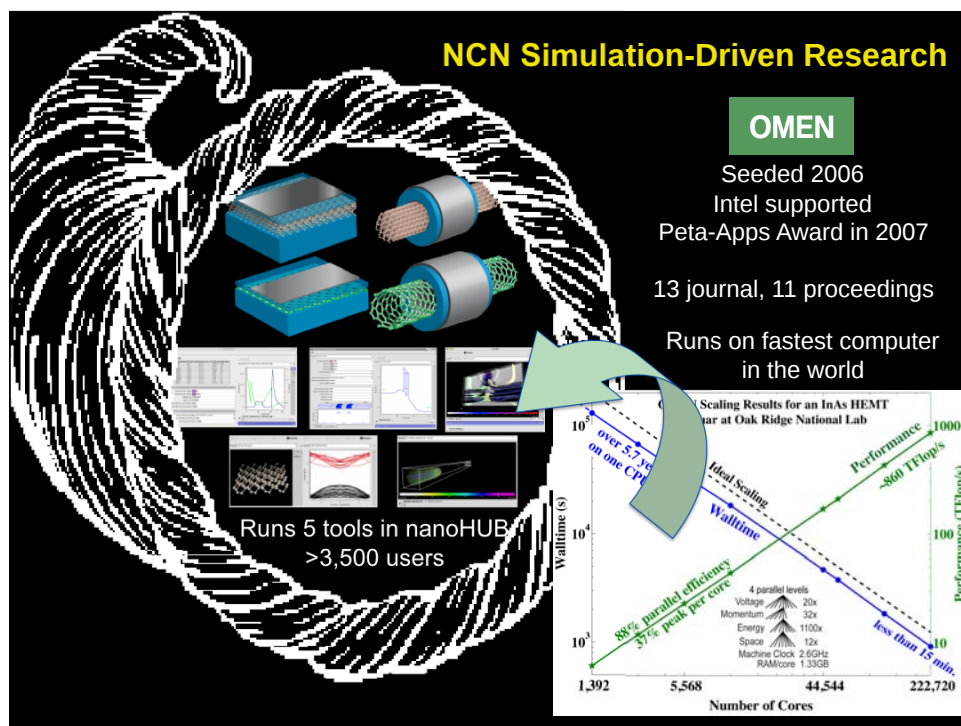
575 nanoHUB Citations Research: Publish or Perish

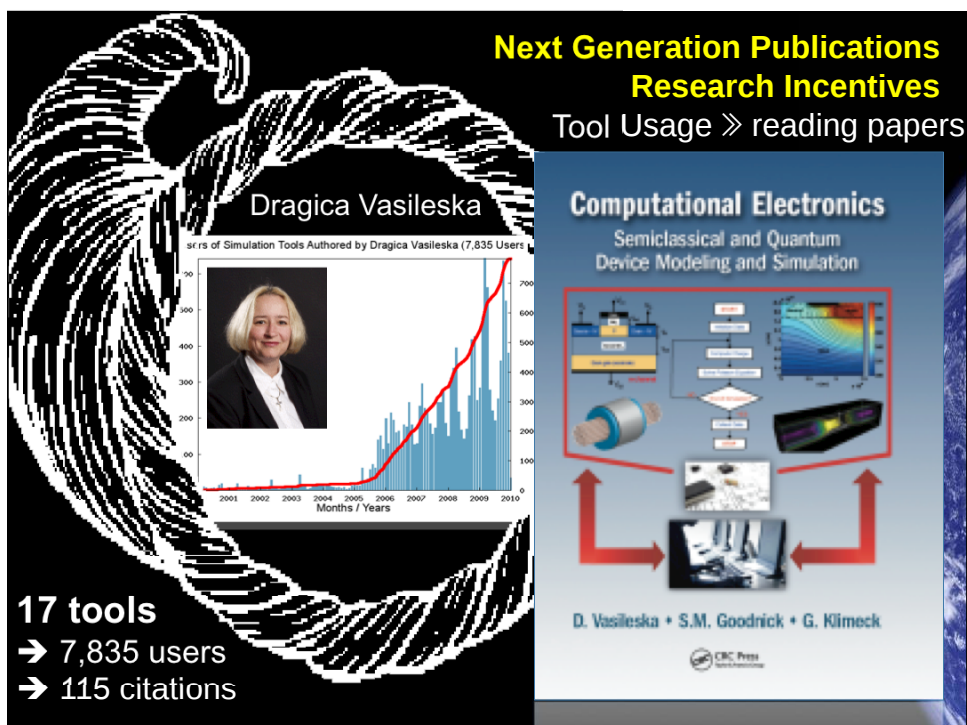
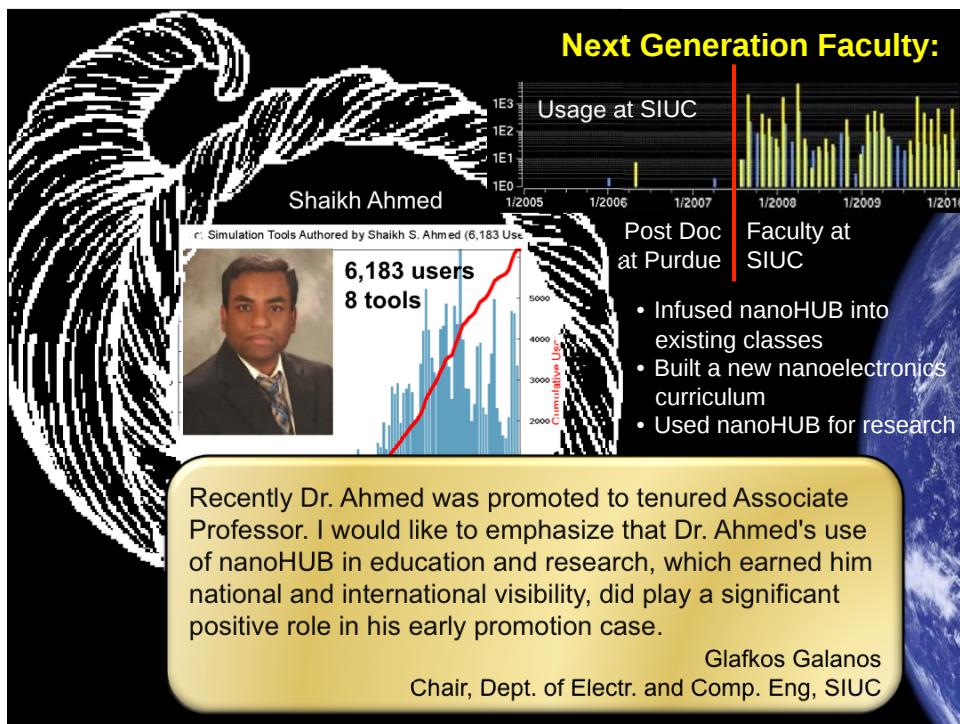


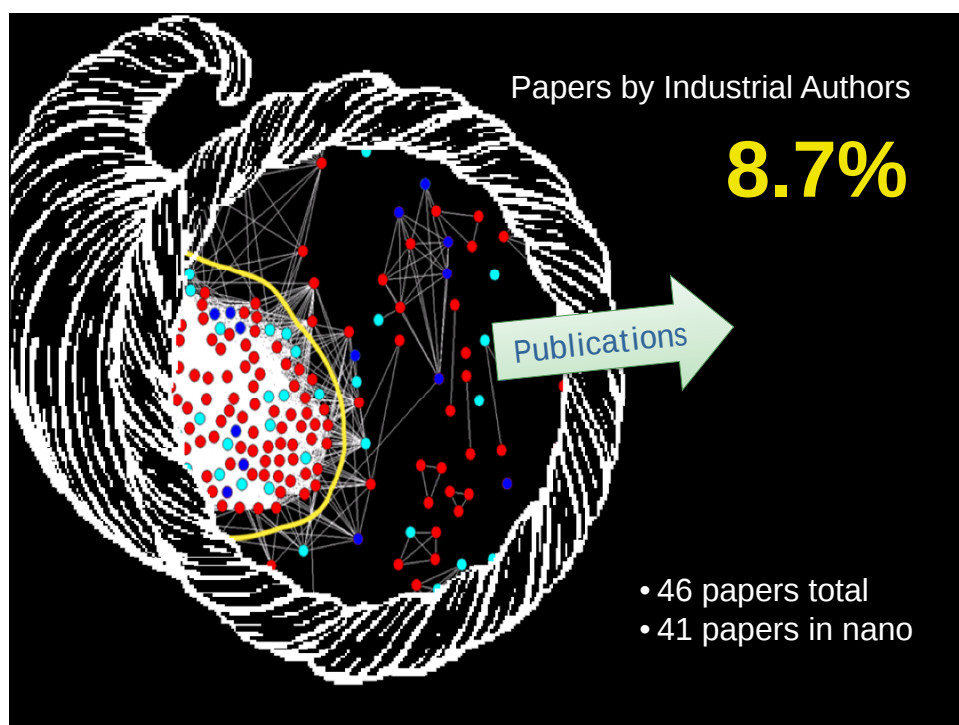
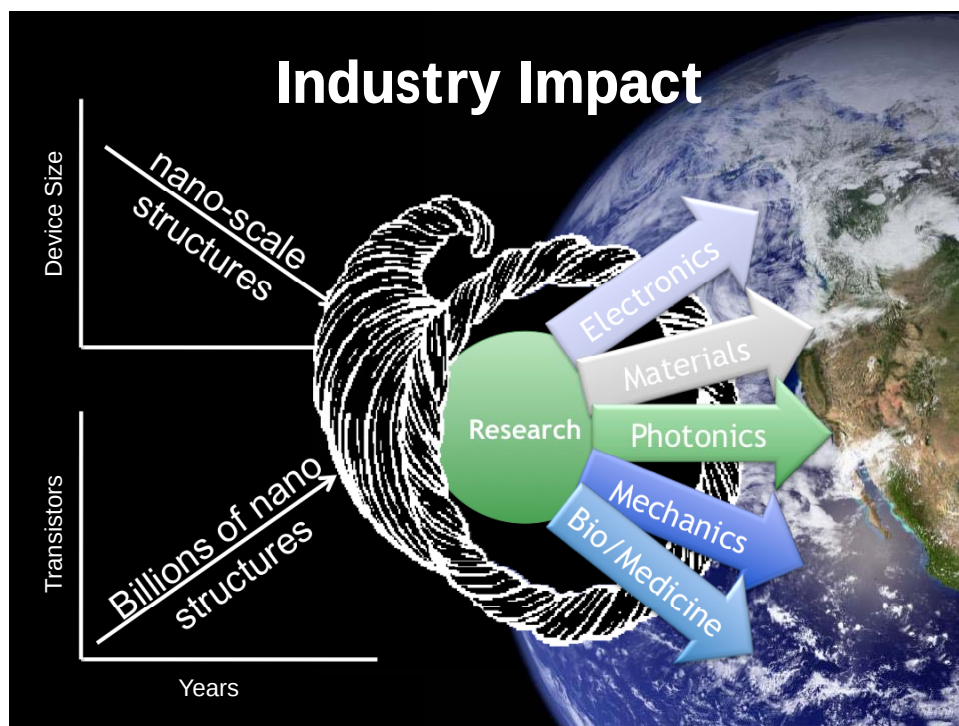
575 nanoHUB citations
>3,200 secondary citations
h-index: 27

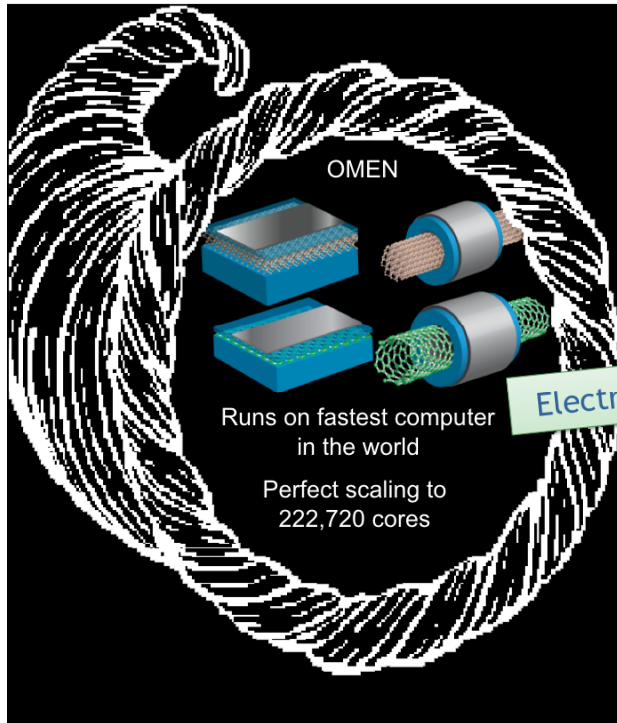
The Next Generations











OMEN

Runs on fastest computer in the world

Perfect scaling to 222,720 cores

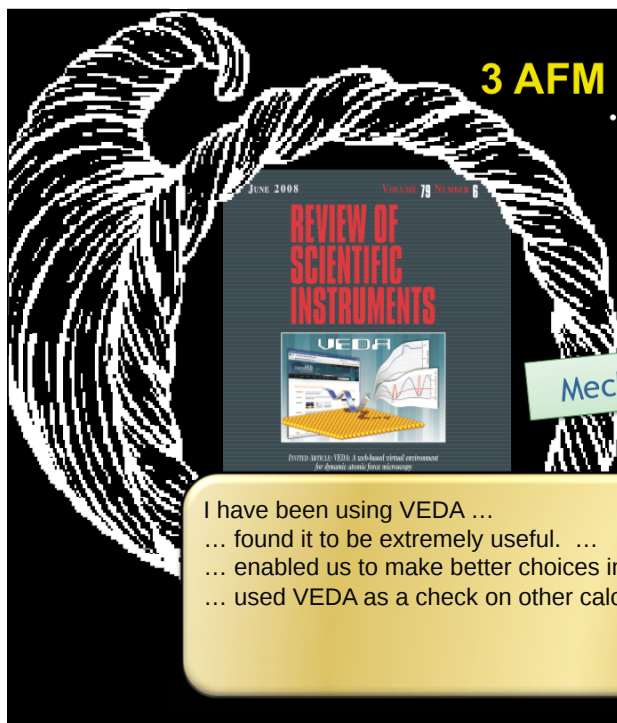
Electronics




Mark Stettler, PhD.
Mgr. TCAD, Oregon



Dmitri Nikonov, PhD.
Mgr. Strategic Research, CA



3 AFM Manufacturers:

- Training / Virtual Instrument
- Research



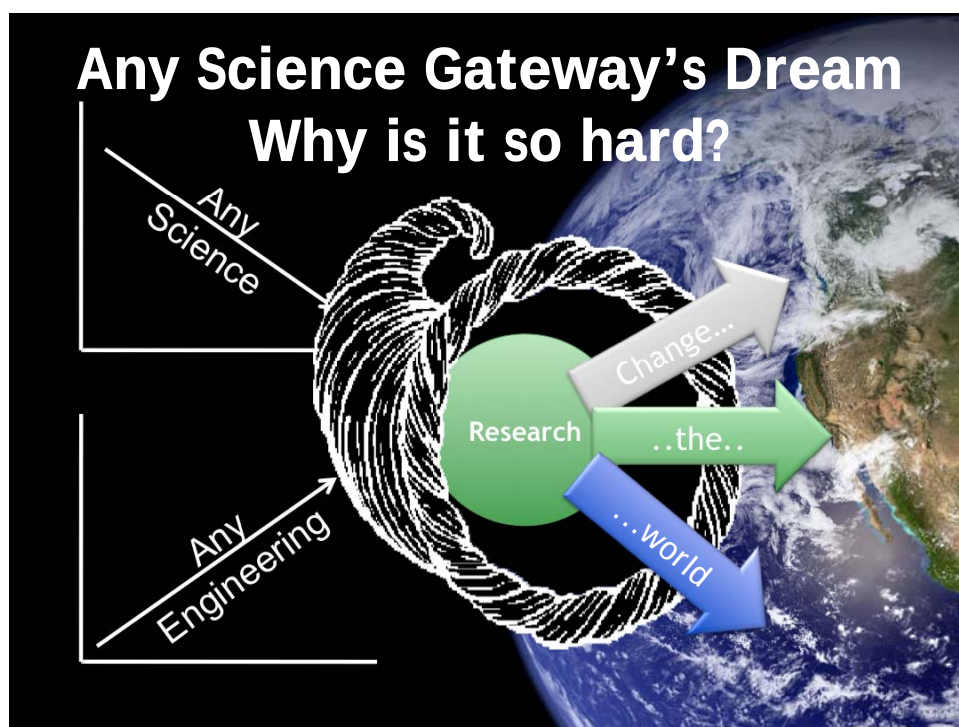
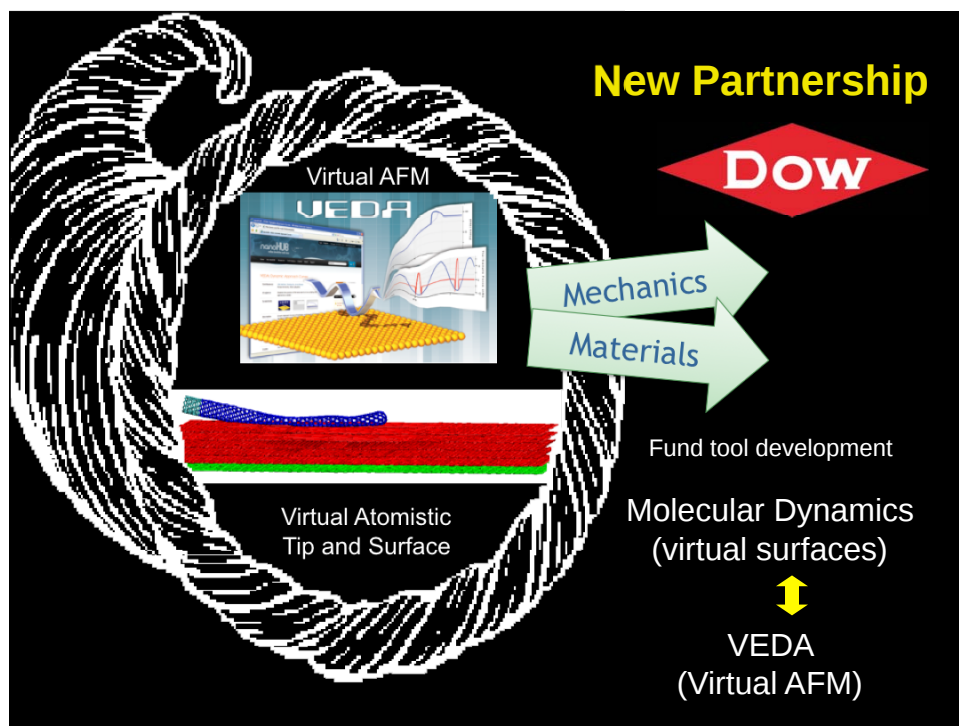
MECHANICS

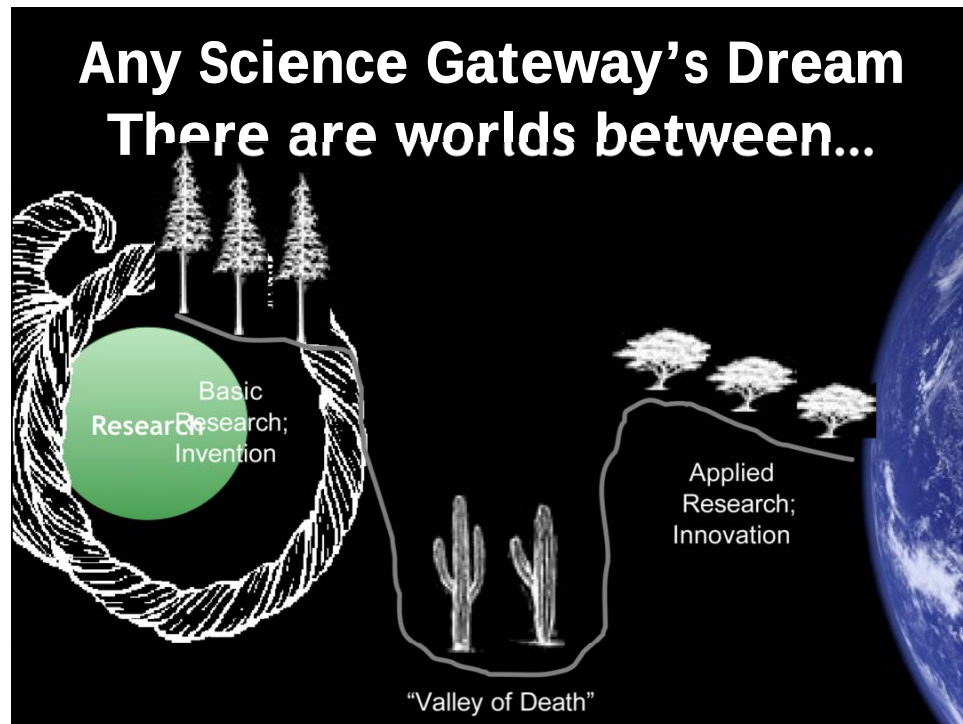




I have been using VEDA ...
... found it to be extremely useful. ...
... enabled us to make better choices in designing new probes.
... used VEDA as a check on other calculations.

Roger Proksch
Asylum Research



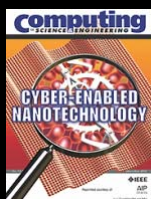
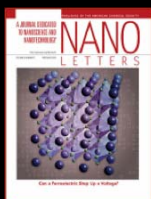


5 Criteria

**for Successful
Science Gateways**

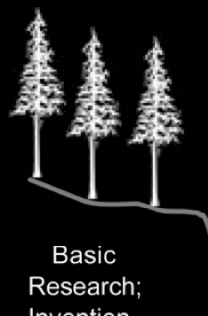
1: Outstanding Science

"Stuff the world wants"



Leveraged Research

\$5.1M

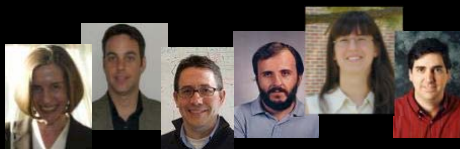


Basic
Research;
Invention

2: Commitment to Dissemination

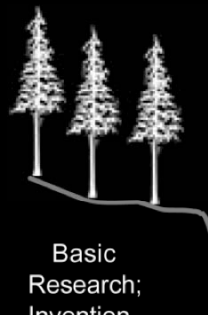
"faculty that want to give it away"

46 faculty



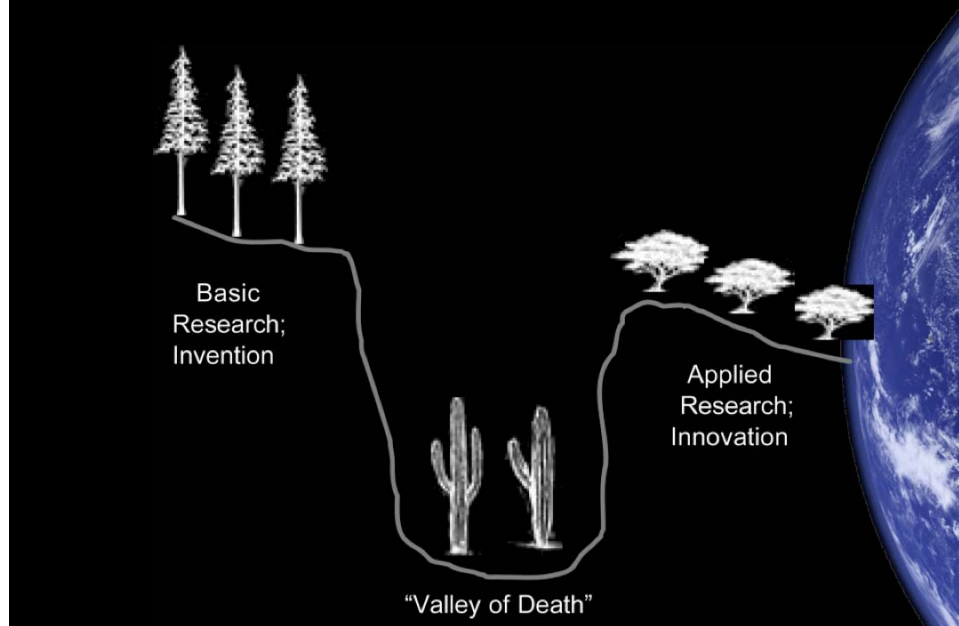
+ 6 site leads

106 grad students

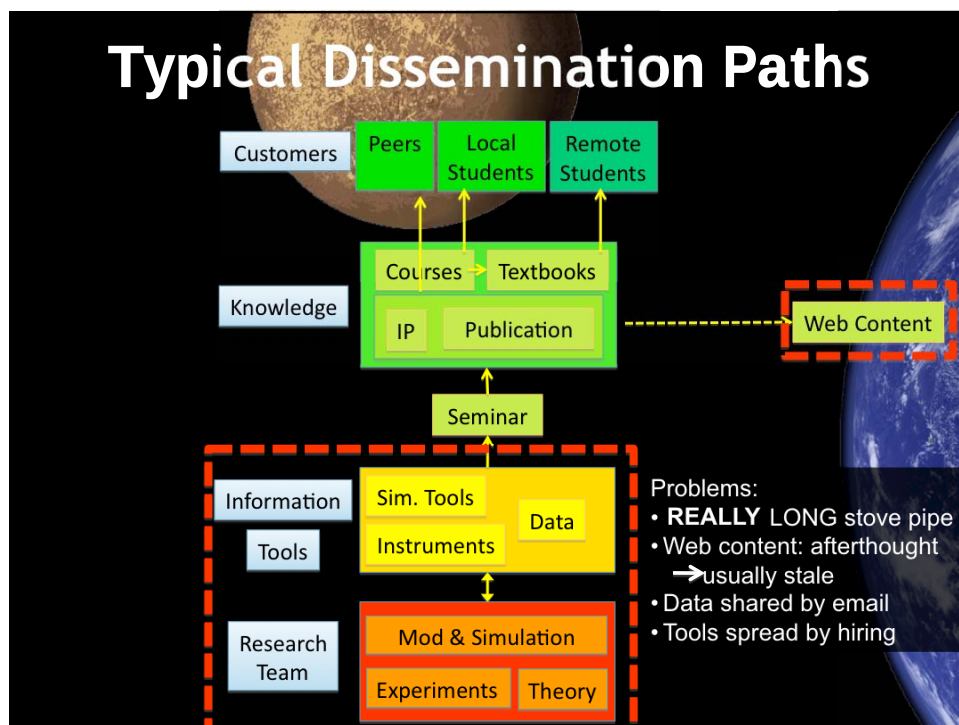


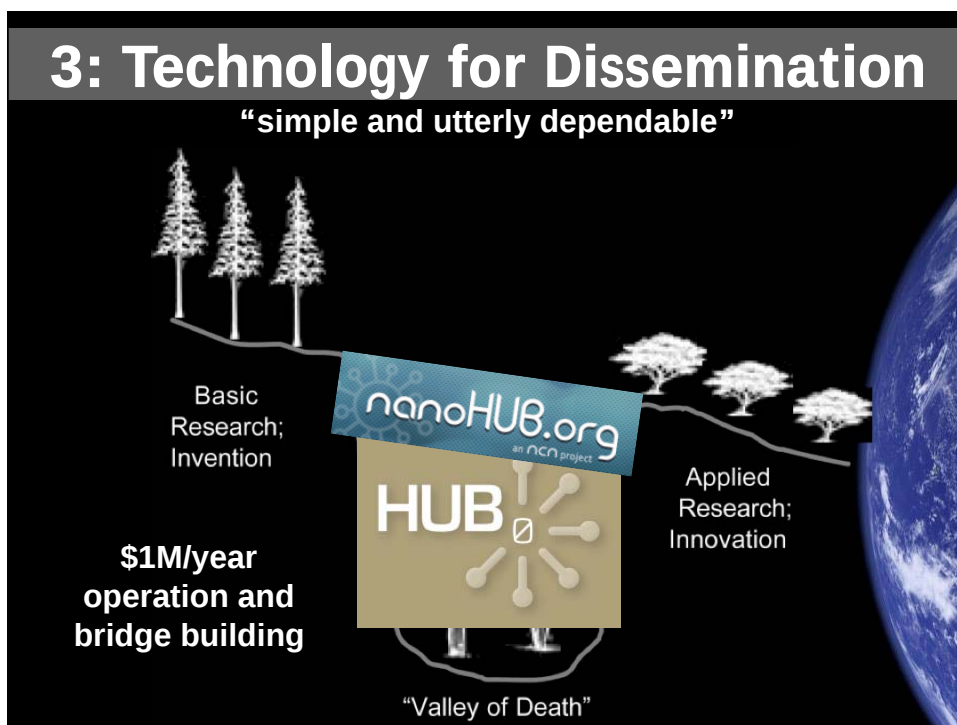
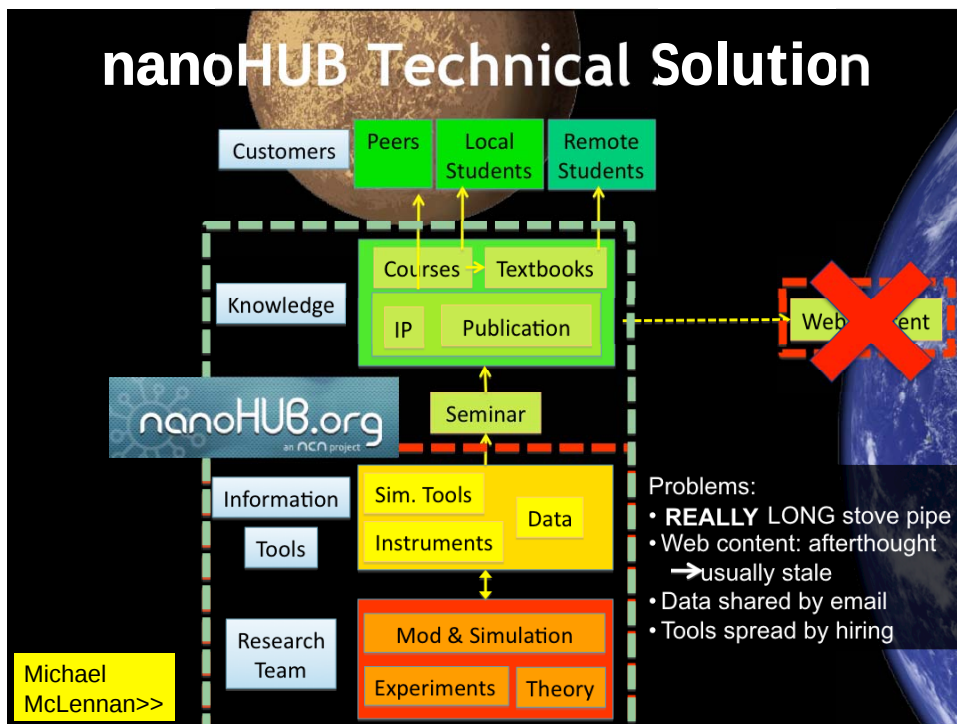
Basic
Research;
Invention

3: Technology for Dissemination

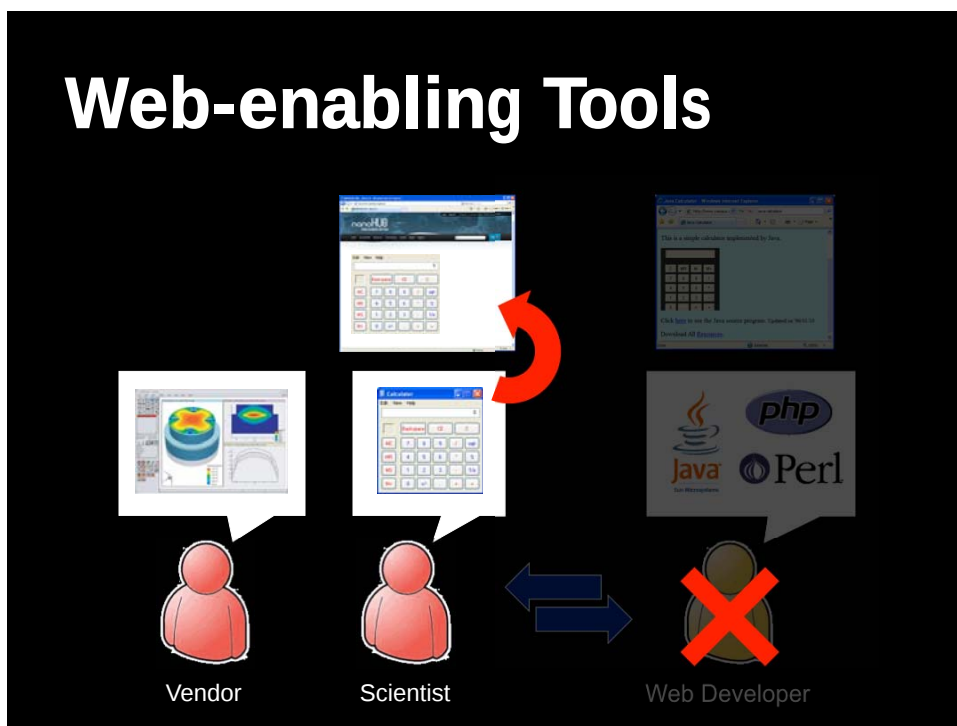


Typical Dissemination Paths





Web-enabling Tools



HUBzero Technology Group
Purdue University

Rappture: Rapid Application Infrastructure

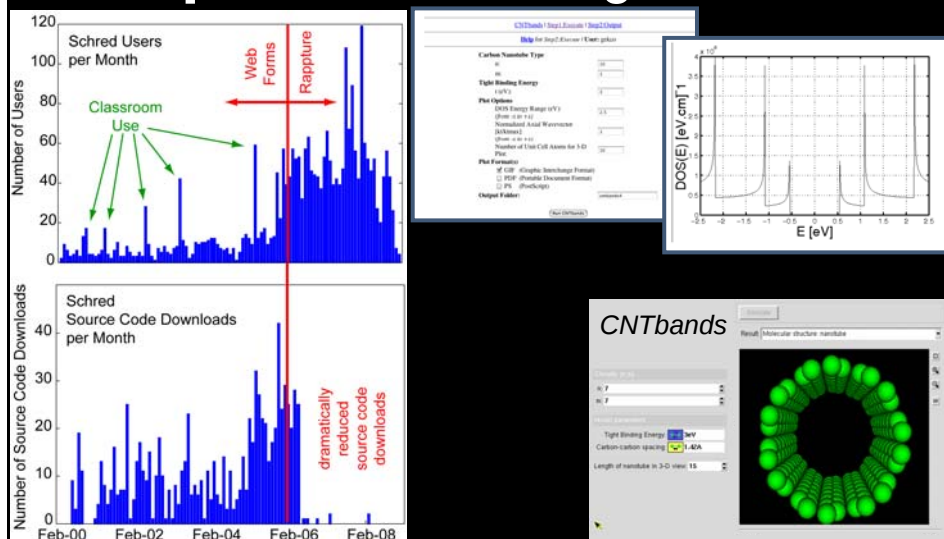
The diagram shows the Rappture architecture. It includes logos for MATLAB, Fortran, F77, C, Python, Perl, Java, and Ruby. A red plus sign and equals sign indicate the combination of these languages with Rappture. A box labeled 'Simulation Code' is shown with a Scientist icon. A screenshot of the Rappture interface is also displayed.

- Works with your favorite programming language
- Open Source
- Online at <http://rappture.org>
- Used by 200 projects and 300 developers

PURDUE UNIVERSITY IT-P

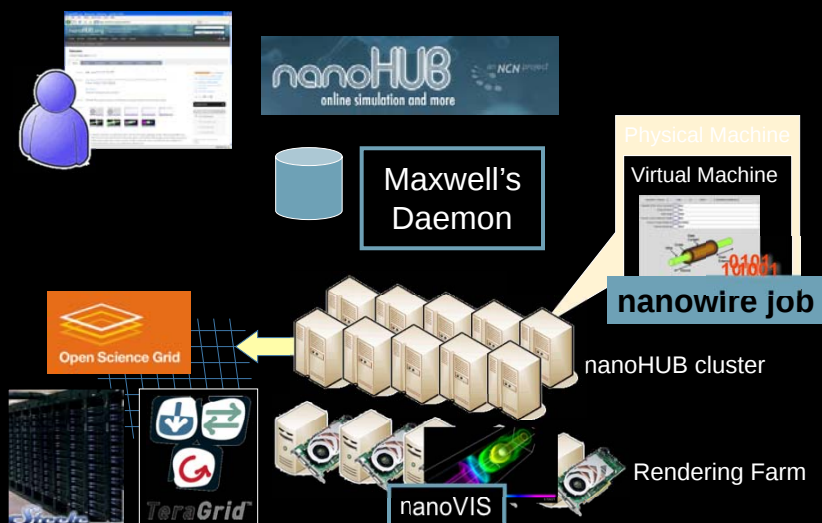
ncn nanohub.org

Importance of a good GUI



Same behavior across all similar converted tools

System Architecture



Hubs 'R Us



HUBzero Consortium



- Feb 2007: 1 hub
- Feb 2008: 5 hubs
- Feb 2009: 8 hubs
- Feb 2010: 21 hubs

Each hub has its own funding stream

Outside institutions:
EPA, NYSTAR, Rice

4: Tech Transfer Processes

“dedicated technical site leads”



