

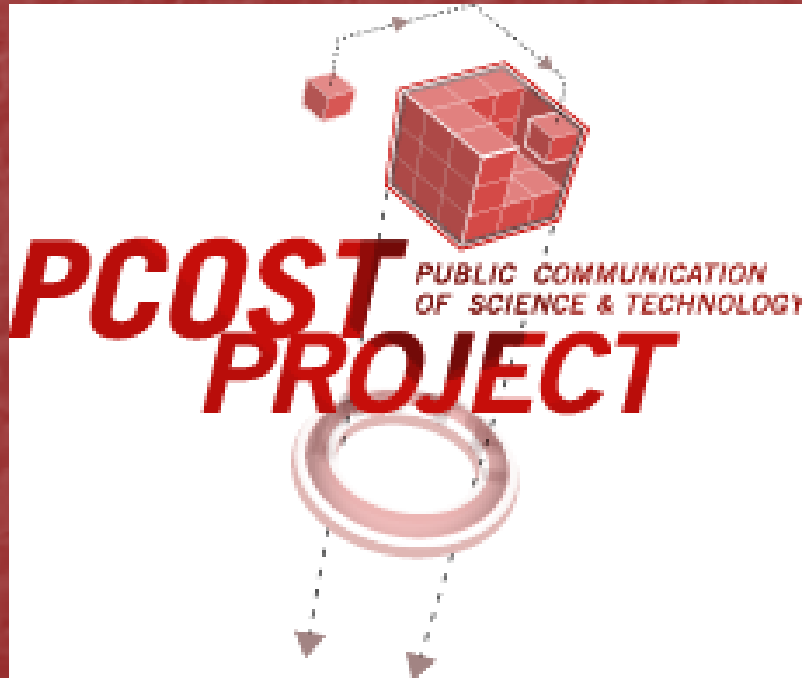


Emerging Technologies: Trust and Risk

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March 19, 2009 – Greensboro, NC



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Intuitive Nanotoxicology and
Public Engagement
& CoPI Dietram Scheufele, UWisc.
- CEINT – Duke University
w PI Mark Weisner

THE WHITE PAPER

- NSF NIRT #0809470 – Applied Nanoscience: Public Perception of Risk 2007-2011 (<http://communication.chass.ncsu.edu/nirt/Home.html>).
- Workshop (August 28-29, 2008) <http://www.pcost.org> (follow links) or <http://communication.chass.ncsu.edu/nirt/Deliverables.html>.
 - Power Points.
 - Streams and Downloads.

THE NIRT

■ Research

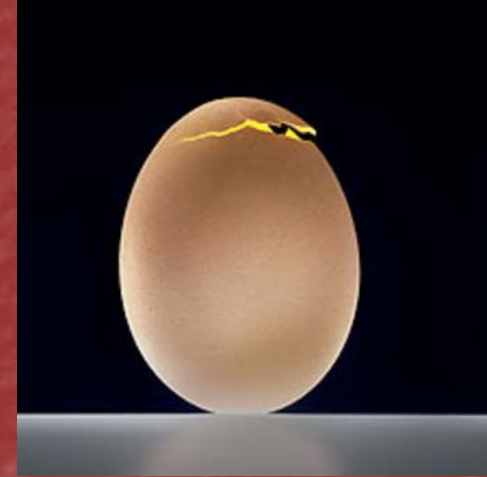
- Delphi questionnaire (Jan-Mar 2009).
- Public Service and Policy Research (IPSPR) w USouth Carolina (mirror surveys).
- Data analysis w UWisc.
- Civic Engagement exercises (assessment) w USC.
- Focus Group. (nanofood) w UMinn.

■ Supplement

- History with NSF.
- Summer 2008 (144 pp.)
- Train-the-Trainer (12/08; Scheufele, Wisc.)

EMERGING TECHNOLOGIES

- Biotechnology.
- Nanotechnology.
- Nanobiotechnology.
- NBIC (Nanotechnology, Biotechnology, Information technology and Cognitive science).
- Synthetic biology.



CHALLENGES

1. Scientific jargon.
2. Uncertainty.
3. Speculation.
4. Unobservable.
5. Over-reliance on experts.





- EHS (environmental health and safety).
- Identity issues.
 - Privacy.
 - Globalization.
- Belief issues.
 - Playing God
 - Unnatural.

NANOTECHNOLOGY

- Very small.



The Scale of Things – Nanometers and More

Things Natural

Dust mite
200 μm

Human hair
~60-120 μm wide

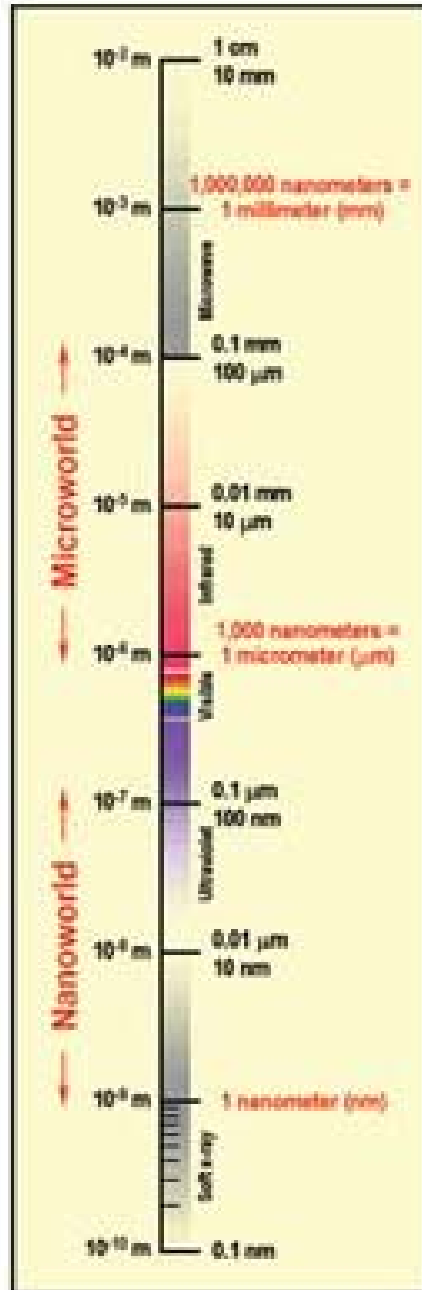
Red blood cells
(~7-8 μm)

Ant
~5 mm

Fly ash
~10-20 μm

DNA
~2-1/2 nm diameter

ATP synthase
~10 nm diameter



Things Manmade

Head of a pin
1-2 mm

MicroElectroMechanical (MEMS) devices
10 - 100 μm wide

Pollen grain
Red blood cells

Zone plate x-ray "lens"
Outer ring spacing ~35 nm

Self-assembled, Nature-inspired structure
Many 10s of nm

Nanotube electrode

Quantum coral of 48 iron atoms on copper surface
positioned one at a time with an STM tip
Coral diameter 14 nm

Carbon nanotube
~1.3 nm diameter

Carbon buckyball
~1 nm diameter

The Challenge

Fabricate and combine nanoscale building blocks to make useful devices, e.g., a photosynthetic reaction center with integral semiconductor storage.

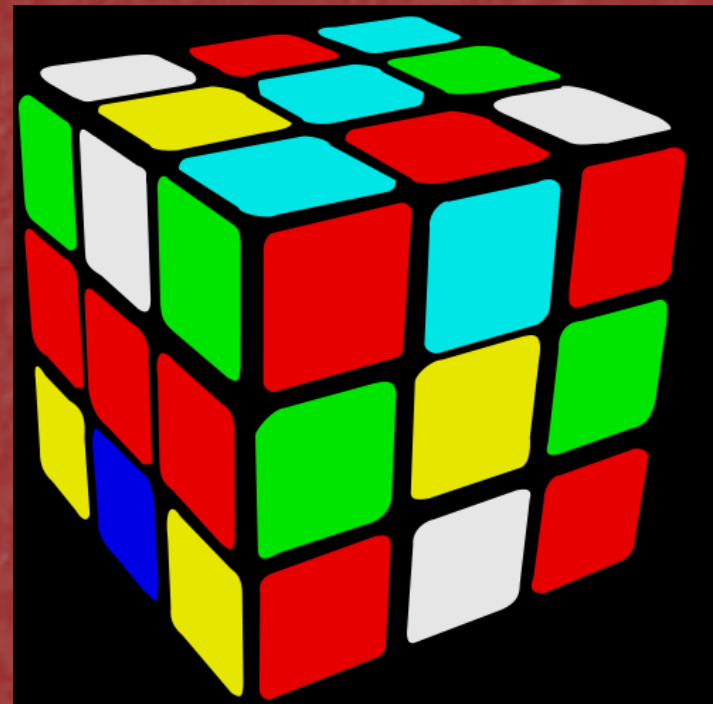
NANOTECHNOLOGY

- Very small.
- Surface area and bioavailability (+/-).



SURFACE

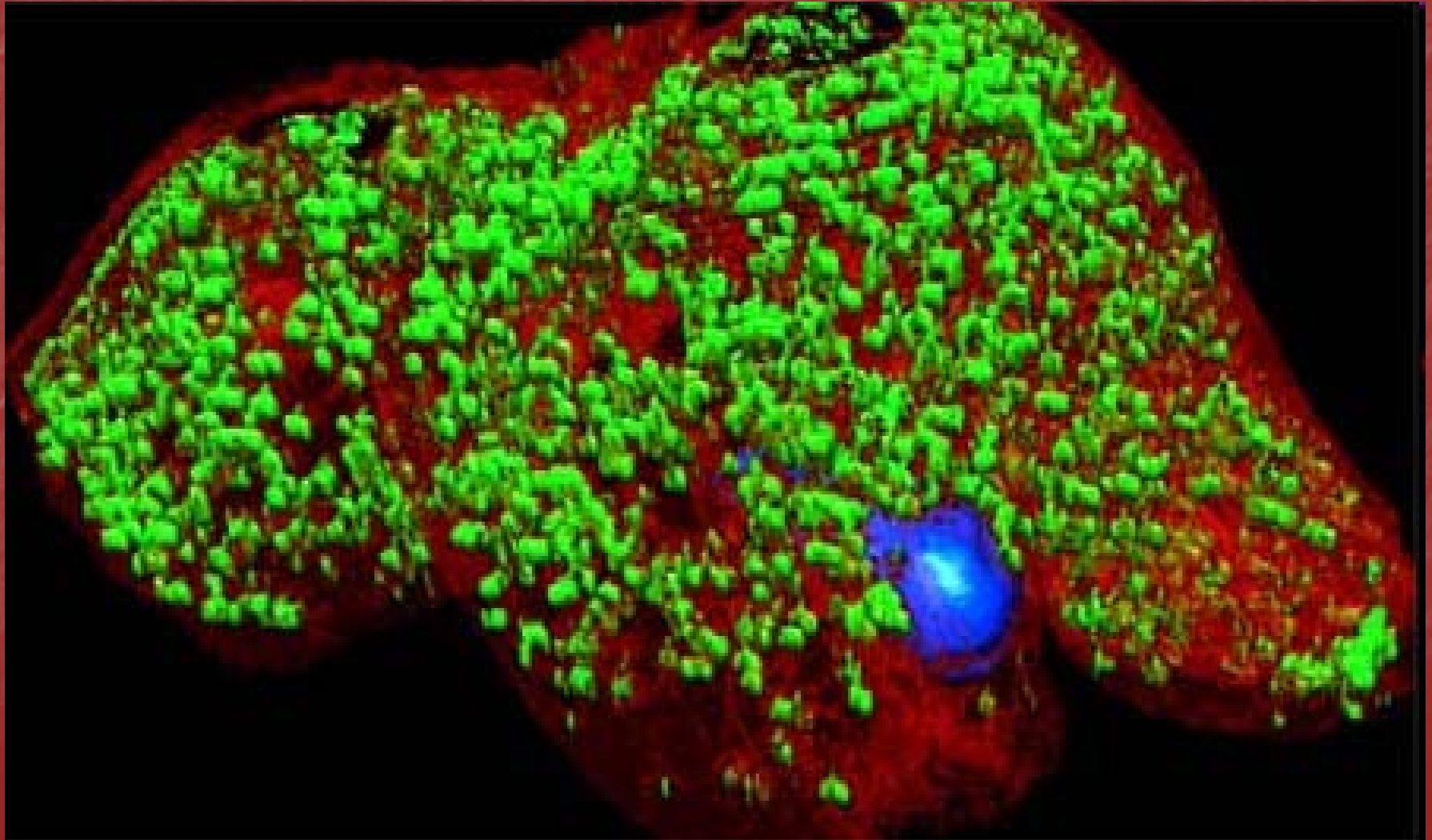
- Rubik's Cube (inches)
 - 6 surfaces (3 x 3)
 - 27 cubes (1 x 1)
 - **54 square inches.**
- 27 separate cubes
 - 6 surfaces (1 x 1)
 - 6 square inches
 - $6 \times 27 =$ **162 square inches**



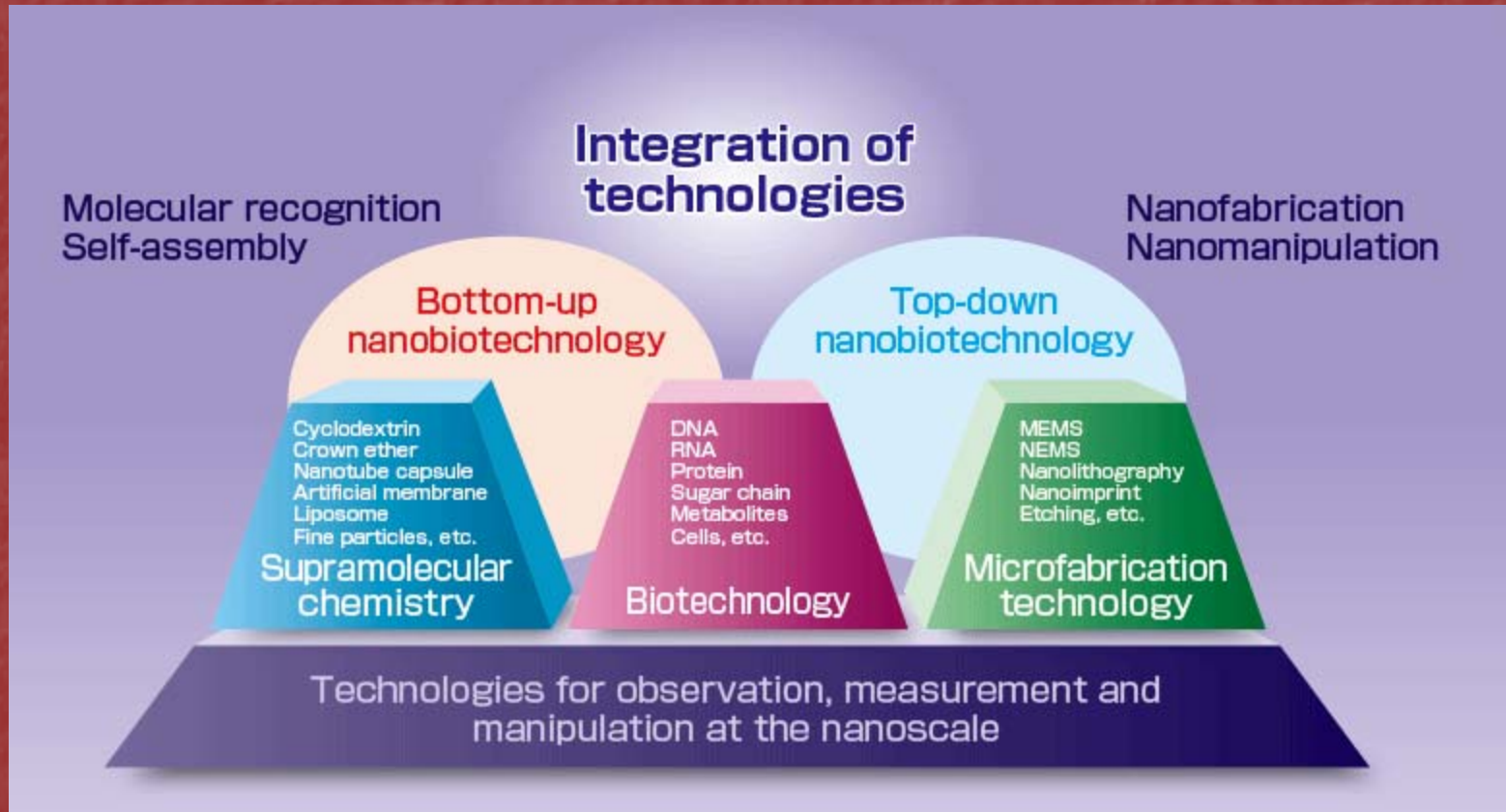
IS NANO SAFE?



NANOBIOTECHNOLOGY



NANOBIONANOTECHNOLOGY



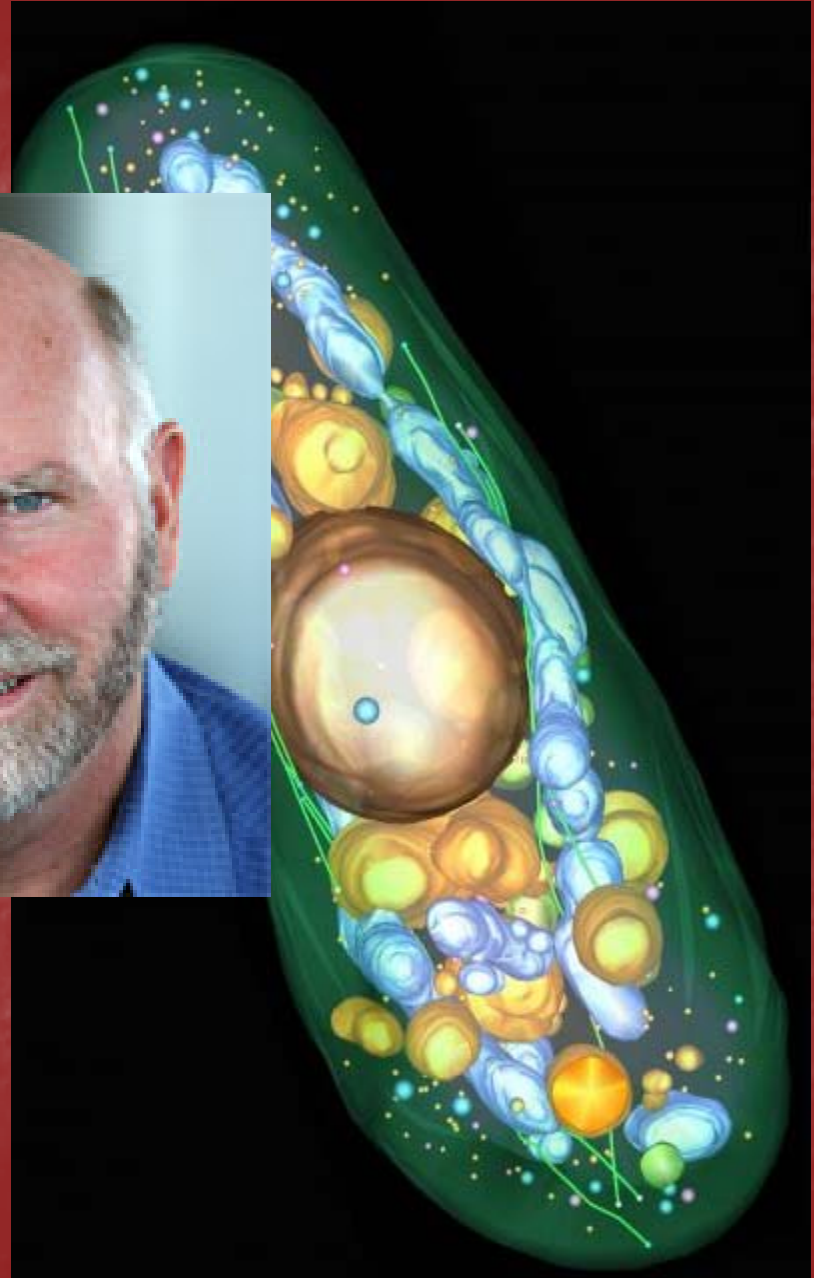
SYNTHETIC BIOLOGY

- the design and fabrication of biological components and systems that do not already exist in the natural world
- the re-design and fabrication of existing biological systems.



WHY?/WHY NOT?

- Building biological systems improves understanding.
- The living world provides a seemingly rich yet largely unexplored medium for controlling and processing information, materials, and energy
- Accidental release of an unintentionally harmful organism or system
- Purposeful design and release of an intentionally harmful organism or system
- Over-reliance on our ability to design and maintain engineered biological systems in an otherwise natural world.



TRUST

- Specific vs. general trust.
- Social (experts) vs. epistemic trust.



TRUST 2.0



- Trust relinquishing (AIG bonuses).
- Trust building (Engagement exercises).



RISK COMMUNICATION AND PUBLICS

This work was supported in part by grants from the National Science Foundation, NSF 06-595, #0809470 Nanotechnology Interdisciplinary Research Team (NIRT): Intuitive Toxicology and Public Engagement.

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THANKS

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