

“How is Nanotechnology Used in California?”

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International Association of Nanotechnology

The International Association of Nanotechnology (IANT), is a non-profit organization with the goals to foster scientific research and business development in Nanotechnology for the benefit of society.

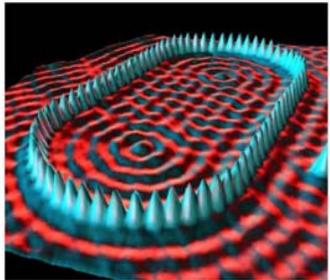
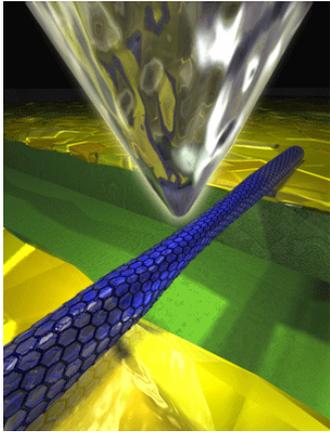
The Association fosters friendship, equality and cooperation amongst its members around the world.

IANT does not endorse nor support any applications which uses and misuses the advanced technology for destructive purposes.

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What is Nanotechnology ?



Nanotechnology deals with the manipulation of materials on an atomic or molecular scale measured in billionths of a meter (nanometers). One nanometer is about 100,000 times smaller than the diameter of a human hair.

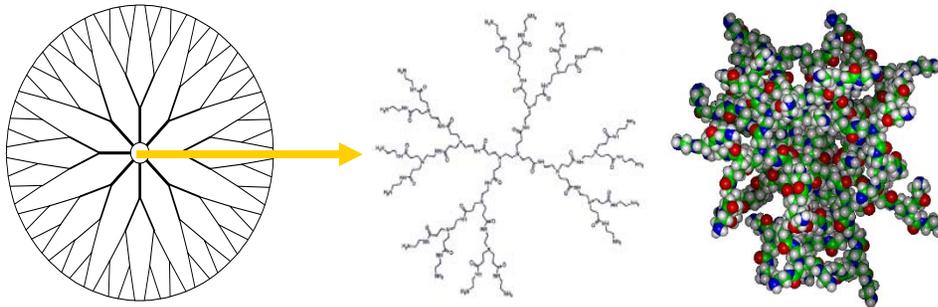
This ability to design and manipulate materials at the molecular level, atom per atom can result in changing the composition of materials and how the products are manufactured in a radical ways.

For example, carbon nanotubes which are 16 times stronger than steel and 10 times lighter have been used in numerous applications in aerospace, microelectronics, defense and biomedical industry.



Unique Advantage of Nanotechnology

- ❑ Nanotechnology is multidisciplinary and has been called a “unifying science.” It unifies the sciences of chemistry, biology and physics.
- ❑ Since many materials exhibit very different physical, chemical and biological properties at the nanoscale than they do at the macroscale, nanotechnology allows us to exploit those novel properties to create new functional materials, devices and systems with unique capabilities.
- ❑ National Nanotechnology Initiative (NNI) in February 2000 that envisioned: *“a future in which the ability to understand and control matter on the nanoscale leads to a revolution in technology and industry.”*



Applications of Nanotechnology

- Chemical Industry**
- Electronics**
- Semiconductor**
- Biotechnology**
- Automotive**
- Aerospace**
- Homeland Security**
- Defense**
- Textile**
- Consumer Product Industry**



Three Waves of Industrial Innovation

- ❑ First wave: Basic Research and Development (1996-2006)
- ❑ Second wave: Workforce Training // Small Scale Manufacturing (2007-2012)
- ❑ Third wave: Large Scale Production & Worldwide Distribution (2012-2016)



Public Investments in Nanotechnology

FEDERAL:

- The National Nanotechnology Research and Development Act of 2003 provided \$3.68 billion over three years for basic research in nanotechnology.
- The President's 2007 Budget provides over \$1.2 billion for the multi-agency National Nanotechnology Initiative (NNI).
- The total investment since the NNI was established in 2001 is more than \$6.5 billion.



Public Investments in Nanotechnology

Other States

- Many states across the nation have been aggressively attracting investment in nanotechnology in major economic development projects.
- These states include, but are not limited to: New York, Texas, Michigan, Massachusetts, Ohio, Illinois, Pennsylvania, Florida, Oregon, Arizona, etc.



California

- California State government has invested more than \$300 million over the past 5 years in Research Institutes at the following UC campuses:
 - UC Santa Barbara & UC Los Angeles
 - **California NanoSystems Institute (CNSI)**
 - UC Irvine & UC San Diego
 - **California Institute for Telecommunications & Information Technology (Calit2)**
 - UC Berkeley, UC Davis, UC Merced, UC Santa Cruz
 - **California Center for Information Technology Research in the Interests of Society (CITRIS)**
 - UC San Francisco, UC Berkeley & UC Santa Cruz
 - **California Institute for Quantitative Biomedical Research (QB3)**



Private Sector Investments

- Major corporations have invested \$3 billion in Nanotechnology in 2005 in the United States alone.
- \$2 billion in venture capital was invested in nanotechnology during 2005 in the United States
- As an example, IBM, along with six global corporate giants including Sony, Toshiba, Samsung, Infineon, AMD, and Charter, have together budgeted \$1.9 billion for nanoelectronics manufacturing in East Fishkill, New York.



Nanotechnology industries in California

- There are approximately 225 nanotechnology firms in California.
 - Region-by-region concentrations of Nanotechnology applications:
 - Greater San Francisco Bay Area
 - Los Angeles Basin
 - San Diego
 - Sacramento/Davis



Greater San Francisco Bay Area

MAJOR INDUSTRY SECTORS:

- Semiconductors
- Nano/bio
- Materials Science
- Tools



Los Angeles Basin

MAJOR INDUSTRY SECTORS:

- Medical devices
- Electronics
- Personal care products



San Diego

MAJOR INDUSTRY SECTORS:

- Nano/bio
- Aerospace
- Defense/detection devices



Sacramento/Davis

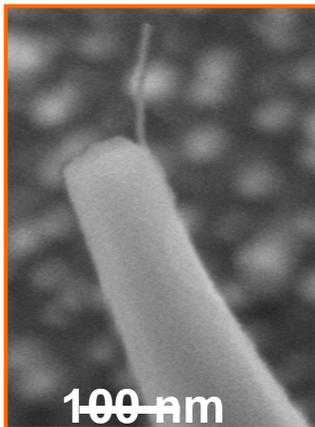
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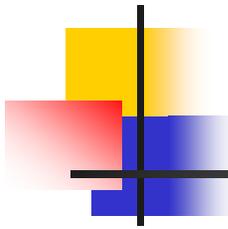
- Nano/bio
- Computer technology
- Environmental protection



Challenges Facing Nanotech Companies

- ❑ Substantial start-up capital
- ❑ Capital intensive R & D and Nano-Manufacturing
- ❑ Lack of highly trained and skilled workforce
- ❑ Costly Intellectual property protection
- ❑ Global competition
- ❑ Uncertainty in future public policy and regulations





Regulation of Nanotechnology

- Is nanotechnology regulation needed?
- Pros: Needed to protect health and safety upon risk identification based on valid research.

Cons: If regulation is too extreme an undue burden on business competitiveness may result.

THANK YOU !

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