

Nanoscience: Fast Facts

Nano Speak

1 nanometer = 1 billionth of a meter (1/100,000 the diameter of a human hair).

Nanoscience refers to a wide range of research activities that seek to discover new properties and behaviors of materials at the nanoscale (smaller than 100 nanometers).

Nanoparticles are purposefully engineered or naturally occurring particles in which one or more dimensions measure less than 100 nanometers in size. Examples include single walled carbon nanotubes (engineered) and soot from fires (naturally occurring).

Nanotechnology is when discoveries at the nanoscale are put to work and nanoparticles are manipulated in useful ways, resulting in the creation of **nanomaterials** with a wide range of commercial applications.

Where in the World is Nano?

Approximately 610 products that contain nanomaterials are currently on the market, according to the Consumer Products Inventory Report – that's about 3 times as many as in 2006. These include products across a wide range of categories, such as health care, sports and fitness, appliances, electronics and computing, food, toys, and home and garden. More than half of these products are produced in the U.S.

322 companies in 20 countries are producing products that contain nanomaterials.

More than 15,700 U.S. patents include the term "nano."

About 20,000 researchers around the world are working in nanotechnology related jobs.

Nano by the Numbers

How much of the federal budget supports nano-related research?

2001 = \$700 million

2007 = \$1.3 billion

2014 (projected) = \$2.7 billion

These dollars impact a wide range of agencies, including DOD, NSF, DOE, NIH, NIST, NASA, NIOSH/DHHS, EPA, USDA, DHS, DOJ, and DOT.

In 2007, the federal government spent \$48 million on **environmental, health, and safety research** related to nanomaterials – **that's only 3.4% of the total amount budgeted for nanotechnology.**



Regulations, Risks, and Benefits

Who is responsible for regulating nanotechnology? **Because of nanotechnology's widespread use in labs, industry, and consumer products, many federal agencies are involved in regulating it.** The National Nanotechnology Initiative (NNI) has assembled a working group with representatives from 25 different federal to address environmental, health and safety aspects of nanotechnology. **Research efforts in this area are principally being led by the EPA, FDA, NIOSH and NIEHS.** Although efforts are being made to address the complex regulatory issues surrounding nanomaterials, current regulatory guidelines on environmental, health and safety aspects of nanotechnology are viewed by many as inadequate.

Nanomaterials are exciting because of their unique properties and behaviors. These result in a great many beneficial applications, such as:

- Commercial Products (stain resistant fabric, strong and light sporting equipment, better sunscreens, more efficient batteries)
- Environmental Solutions (improved solar panels, more efficient water filtration systems, new methods for cleaning up hazardous chemicals)
- Medical Advances (smart drugs, medical imaging, anti-bacterial wound dressings)
- New Technologies and research methods

However, these same exciting properties and behaviors result in some big unknowns that might mean new risks to humans and the environment. Many questions will need to be answered, such as:

- How do various nanoparticles enter the human body, where do they go, and what do they do when they get there? Who is most at risk?
- Where do nanoparticles accumulate in the environment and what unintended effects might they have on ecosystems? How long do they persist?

Nanoscience Links and Resources

National Nanotechnology Initiative

- <http://www.nano.gov/>

Power of Small: Nanotechnology

- <http://www.powerofsmall.org/>

Nanooze

- <http://www.nanooze.org/>

The Project on Emerging Nanotechnologies

- <http://www.nanotechproject.org/>

NanoBio-RAISE

- <http://www.nanobio-raise.org/>

NanoEd Resource Patrol

- <http://www.nanoed.org/resources/resources.shtml>