

Nanotechnology Information Resources

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This page contains a list of information resources about nanotechnology.
This list is updated at irregular intervals as new information becomes available.

*The text below is quoted, with permission, from Chapter 1 of the book **Unbounding the Future**, by K. Eric Drexler and Christine Peterson, with Gayle Pergamit. The book was published in 1991 by the William Morrow and Company, Inc. Copyright © 1991 by K. Eric Drexler, Chris Peterson, and Gayle Pergamit. All rights reserved.*

A Sketch of Trends

Technology has been moving toward greater control of the structure of matter for millennia. For decades, microtechnology has been building ever-smaller devices, working toward the molecular size scale from the top down. For a century or more, chemistry has been building ever-larger molecules, working up toward molecules large enough to serve as machines. The research is global, and the competition is heating up.

Since the concept of molecular nanotechnology was first laid out, scientists have developed more powerful capabilities in chemistry and molecular manipulation (see Chapter 4). There is now a better picture of how those capabilities can come together in the next steps (see Chapter 5), and of how advanced molecular manufacturing can work (see Chapter 6). Nanotechnology has arrived as an idea and as a research direction, though not yet as a reality.

Naturally occurring molecular machines exist already. Researchers are learning to design new ones. The trend is clear, and it will accelerate because better molecular machines can help build even better molecular machines. By the standards of daily life, the development of molecular nanotechnology will be gradual, spanning years or decades, yet by the ponderous standards of human history it will happen in an eyeblink. In retrospect, the wholesale replacement of twentieth-century technologies will surely be seen as a technological revolution, as a process encompassing a great breakthrough. Today, we live in the end of the pre-breakthrough era, with pre-breakthrough technologies, hopes, fears, and preoccupations that often seem permanent, as did the Cold War. Yet it seems that the breakthrough era is not a matter for some future generation, but for our own. These developments are taking shape right now, and it would be rash to assume that their consequences will be many years delayed.

In later chapters, we'll say more about what researchers are doing today, about where their work is leading, and about the problems and choices ahead. To get a sense of the consequences, though, requires a picture of what nanotechnology can do. This can be hard to grasp because past advanced technologies—microwave tubes, lasers, superconductors, satellites, robots, and the like—have come trickling out of factories, at first with high price tags and narrow applications. Molecular manufacturing, though, will be more like computers: a flexible technology with a huge range of applications. And molecular manufacturing won't come trickling out of conventional factories as computers did: it will replace factories and replace or upgrade their products. This is something new and basic, not just another twentieth-century gadget. It will arise out of twentieth-century trends in science, but it will break the trend-lines in technology, economics, and environmental affairs.

Calculators were once thousand-dollar desktop clunkers, but microelectronics made them fast and efficient, sized to a child's pocket and priced to a child's budget. Now imagine a revolution of similar magnitude, but applied to everything else.

Original Documents

Richard Feynman: "[There's Plenty of Room at the Bottom](#)" [December 1959] Generally considered to be the first lecture on what we now think of as nanotechnology. The entire text of this presentation is available online.

K. Eric Drexler: [Engines of Creation](#) [1986] The entire text of the book is available online.

K. Eric Drexler and Christine Peterson, with Gayle Pergamit: [Unbounding the Future](#) [1991] The entire text of the book is available online.

Foresight Nanotech Institute

- [General Publications](#)
- [Nanomedicine](#)

[Drexler vs. Smalley](#): The cover story in the December 1, 2003, Chemical and Engineering News was a public debate between K. Eric Drexler and Richard Smalley on the feasibility of Drexler's vision of Molecular Nanotechnology.

["Understanding Risk Assessment of Engineered Nanomaterials"](#) by Trudy E. Bell. (Feb 2007) An article written for the National Nanotechnology Initiative that discusses possible risks of nanomaterials and how to evaluate such risks. Very clear. Available as a PDF.

A report from the Joint Economic Committee of the US Congress: ["Nanotechnology: The Future is Coming Sooner Than You Think"](#) Available as a PDF.

Resources on the Web

A great place to start is Dr. Ralph Merkle's [nanotech website](#).

National Nanotechnology Initiative

The Pew Charitable Trusts & the Woodrow Wilson International Center for Scholars

- [Project on Emerging Nanotechnologies](#)
- [Consumer Products Inventory](#)

[The Center for Nanoscale Science & Technology](#) at Rice University

U.S. Department of Agriculture: USDA funded Cooperative State Research, Education, and Extension Services ([CREES](#)) among land-grant universities throughout the country.

U.S. Food & Drug Administration [Nanotechnology Site](#)

Related Websites

- [Carbon Nanotechnologies Incorporated](#)
 - [The Center for Responsible Nanotechnology](#)
 - [Foresight Nanotech Institute](#)
 - [The Institute for Molecular Manufacturing](#)
 - [Nanotech News](#)
 - [Nanotechnology Now](#)
 - [NanoTechWire](#)
 - [Nanotube Site at Michigan State University](#)
 - [National Institute for Occupational Safety and Health: Nanotechnology](#)
 - [National Nanotechnology Initiative](#)
 - [Small Times](#)
 - [The Woodrow Wilson International Center for Scholars -- Project on Emerging Nanotechnologies](#)
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The Kavli Institutes

To advance fundamental research in the fields of astrophysics, nanoscience, neuroscience, and theoretical physics, the [Kavli Foundation](#) has established research institutes at leading universities world-wide. The institutes listed here were established explicitly for research into nanoscience and nanotechnology:

- The Kavli Nanoscience Institute at Caltech
 - The Kavli Institute at Cornell for Nanoscale Science
 - The Kavli Institute of Nanoscience at Delft University of Technology in Holland
 - The Kavli Institute for Bionano Science and Technology at Harvard University
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Non-Fiction (a very short list – there is much, much more)

- Nanotechnology: Science, Innovation, and Opportunity Lynn E. Foster [2006]
 - Nanotechnology Demystified Linda Williams and Wade Adams [August 2006]
 - Nanoelectronics and Nanosystems Karl Goser and Peter Gloesekoetter [January 2004]
 - Nanotechnology: A Gentle Introduction to the Next Big Idea Ratner & Ratner [November 2002]
 - Nano: the emerging science of nanotechnology Ed Regis [1995]
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Interesting Websites (not specifically nanotech)

- [The Economist](#)
 - [Edge Foundation, Inc](#)
 - [Kurzweil AI](#)
 - [The Long Now Foundation](#)
 - [Slashdot](#)
 - [World Changing](#)
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Science Fiction (also a very short list)

- *The Diamond Age* by Neal Stephenson
- *The Nanotech Chronicles* by Michael Flynn
- *Assemblers of Infinity* by Kevin J Anderson & Doug Beason
- *Nanotech* Edited by Jack Dann & Gardner Dozois
- *The Gentle Seduction* by Marc Stiegler The most compelling nanotech story I have encountered.
- *There Will Be Dragons* by John Ringo (Volume one of Council Wars)
- *Voyage from Yesteryear* by James P. Hogan This book is not about nanotech, but it does an exquisite job of describing what might reasonably be called a positive post-nanotech culture.