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RESOURCE PAGES



A Guide to online information about:

NanoTech

by [Bob Paddock](#)

DEFINITION: "Nano Technologies" which is also known as "molecular nanotechnology" and/or "molecular manufacturing," depending somewhat on the application, simply stated is concerned with how atoms go together to create working machines.

"Molecular nanotechnology: thorough, inexpensive control of the structure of matter based on molecule-by-molecule control of products and byproducts of molecular manufacturing..."K.Eric Drexler, Chris Peterson, Gayle Pergamit.

Although you might not have a NanoTech project in this year's plan of projects, NanoTech will be in your future. It might be in your future molecular memory "hard disk", such as the one from [Nanochip Inc.](#), or maybe your next surgical procedure using [Nanomedicine](#). The realm of the movie "Fantastic Voyage" may not be far from reality.

In 1959 Richard Feynman wrote a paper called [There's Plenty of Room at the Bottom](#) that is the only place to start on your path of learning about NanoTech.

Also, the Defense Technical Information Center considers Nanoscience to be "one of six Strategic Research Objectives".

If nothing else, you might find the [\\$250,000 prize](#) for the first NanoTech Robotic Arm of interest.

Also a good place to hang out and learn about NanoTech is the moderated newsgroup sci.nanotech. The [Frequently Asked Questions \(FAQs\)](#) for sci.nanotech can be found at:
<http://nanotech.rutgers.edu/nanotech/>.

The best general quick introduction to Nanotechnology that I've come across is the one by [Ralph C. Merkle](#) at <http://nano.xerox.com/nanotech/>. He is also the author of "[It's a Small, Small, Small, Small World](#)".

One of the most interesting areas of NanoTech is the area of medicine. If you want to know what happens to NanoTech inside your body then check out the [FAQs in nanomedicine](#).

Once the book series [Nanomedicine](#) by [Robert Freitas](#) Volume 1 is completed, and is available online in .xml format at www.nanomedicine.com. Volumes II and III are expected to be published in 2002 and 2005 respectively. AFAIK, is the only site anywhere on the web devoted exclusively to nanorobotic medicine. at www.foresight.org/Nanomedicine/index.html

You can also read his paper on the respirocytes, published in 1998, which you can read all about at:
www.foresight.org/Nanomedicine/Respirocytes.html



**Foresight Institute's goal is to guide emerging technologies to improve the human condition.
Foresight focuses its efforts upon nanotechnology,
the coming ability to build materials and products with atomic precision,
and upon systems that will enhance knowledge exchange and critical discussion,
thus improving public and private policy decisions.**

www.foresight.org

Foresight is a nonprofit educational organization formed to help prepare society for anticipated advanced technologies.

[Unbounding the Future: The Nanotechnology Revolution](#) is a good place to start on NanoTech newbies...

[Nanotechnology: The Coming Revolution in Molecular Manufacturing](#) is one example of their holdings.

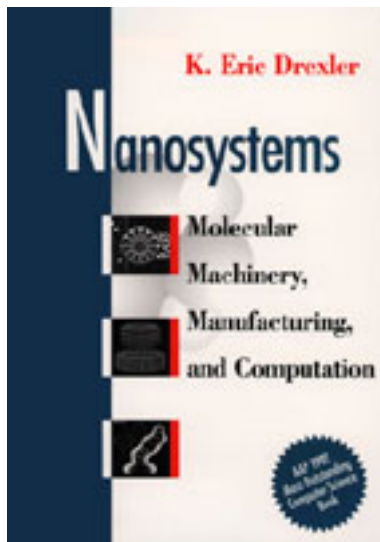
Foresight sponsors several [Nanotechnology Prizes and Awards](#) each

year, as well as the [\\$250,000 grand prize](#) for the first NanoTech Robotic Arm.

[Institute for Molecular Manufacturing](#)

[The Institute for Molecular Manufacturing \(IMM\)](#) is a nonprofit foundation formed in 1991 to carry out research aimed at developing molecular manufacturing (molecular nanotechnology).

[K. Eric Drexler](#) of IMM has authored a series of journal articles on nanotechnology and three books, including [Engines of Creation \(Doubleday, 1986\)](#) and *Unbounding the Future* (Morrow, 1991, with Chris Peterson and Gayle Pergamit), that describe the prospects ahead and some strategies for dealing with them. His most recent book, [Nanosystems: Molecular Machinery, Manufacturing and Computation \(Wiley-Interscience, 1992\)](#), describes the principles and mechanisms of molecular nanotechnology. It won the annual Association of American Publishers award for best computer science book. In May 1993, Dr. Drexler won the Kilby Young Innovator Award, named for Jack Kilby, inventor of the integrated circuit.



[The Nanotechnology Bookstore](#)

IMM is currently pursuing molecular modeling studies of molecular machinery and quantum modeling of [nanoelectronics](#).

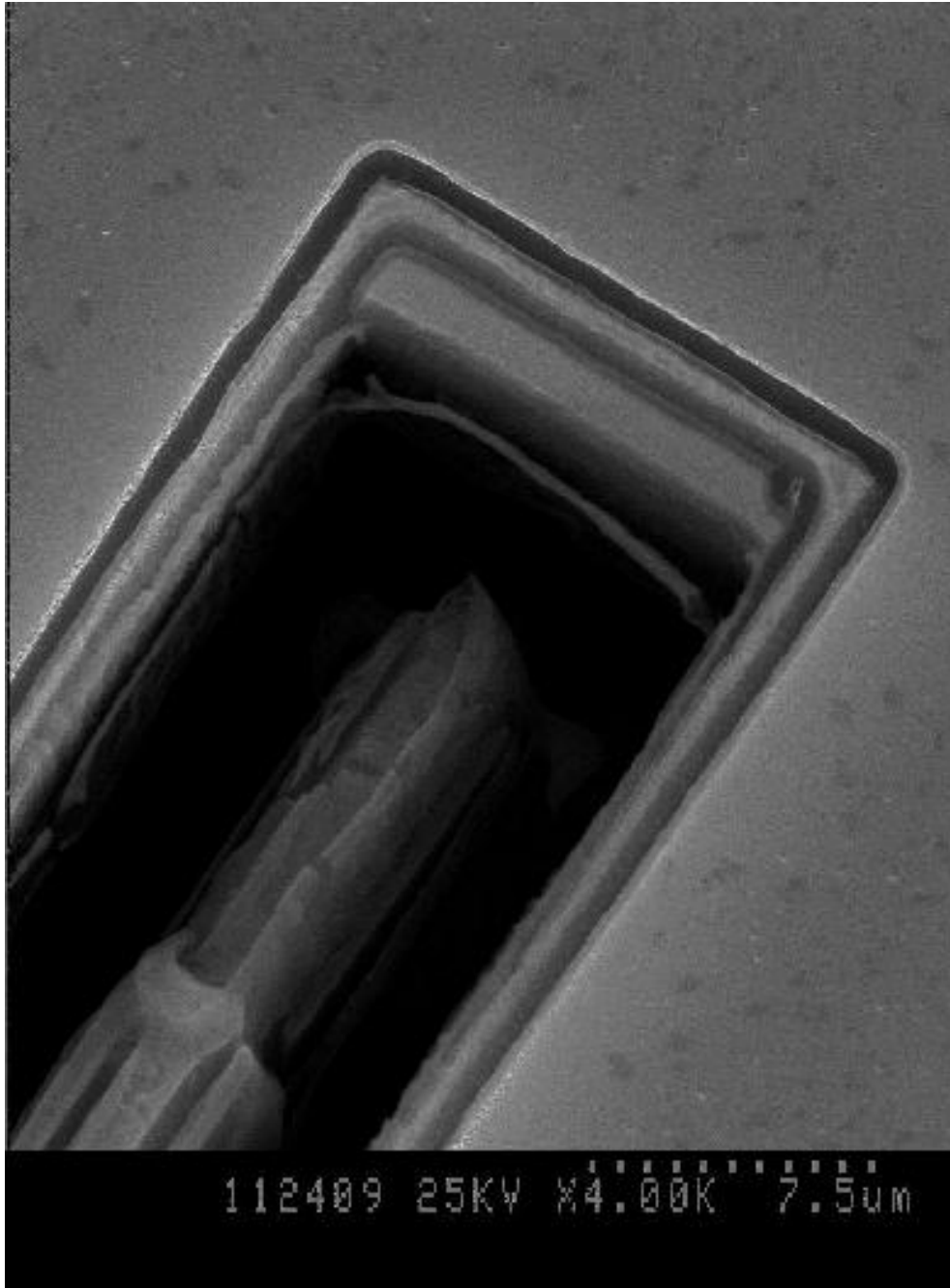
THE *Nanoelectronics & Nanocomputing Home Page* MITRE

In partnership with government clients, [MITRE](#) is a not-for-profit corporation working in the public interest.

[Biochemical and DNA-Based Nanocomputers](#), Summary by J. Christopher Love and James C. Ellenbogen of MITRE Nanosystems Group.

Nanoelectronics is the electronics technology for a future generation of much, much smaller and more densely integrated computers. [THE Nanoelectronics Home Page](#) provides the Internet Gateway to nanoelectronics research and development information and resources from around the world.

A element of [Nanochip Inc's](#) molecular scale technology hard disk can be seen here:



Tip/head at end of cantilever/Z actuator assembly with surrounding read/write sensor.

[Nanochip Inc.](#) has a excellent [bibliography](#) page if you wish to delve in depth to the research papers.



[Nanozine Magazine \(US site\)](#)

[Nanozine Magazine \(Europe-Asia site\)](#)

"This inevitable consequence of continued advancement in the fields of chip manufacture, biology and chemistry will open the era of self-replicating consumer goods, super-health, super-economy and inventions impossible to fabricate with first wave industrialization. The steps toward manipulating matter on such a fine scale and a glimpse of a very different world are presented by pioneering scientists in the field. Follow monthly the discoveries and evolution of a technology sure to change the human experience and dominate the 21st Century. Prepare yourself mentally and financially with [NanoTechnology Magazine](#)."

Check out their papers [What is Nanotechnology?](#) and [Why is Nanotechnology Happening?](#) among several others worth reading as well.



[NANOQUEST](#) bills themselves as [your Nano shop on the INTERNET](#).

While that 'billing' may not be to your taste they do have many interesting NanoTech articles to read. They are also members of the [NanoRing WebRing](#). A [WebRing](#) links member web sites together to form their sites into linked circles. Their purpose: to allow more visitors to reach them quickly and easily. To your benefit you can locate related sites that don't always show up in the Search Engines.



[Numerical Aerospace Simulation](#)

[NAS](#) acts as a "pathfinder" in advanced, affordable supercomputing by improving the hardware and software technologies needed to provide a balanced computing capability. Hence their interest in [Computational Molecular Nanotechnology](#).

The [NAS Nanotechnology Gallery](#) is full of some intriguing images and videos of NASA Ames developed components.

[Active materials](#) which sense their environment and react intelligently is sure to be a hit with many [Circuit Cellar](#) and [Chip Center](#) readers.

NASA's interest NanoTech might have even gotten them to take a serious look at [Crop Circles](#)??? "[Energetics and Structures of Fullrene Crop Circles](#)," Jie Han, *Chem. Phys. Lett. December (1997)*. [In fairness to NASA I expect the term has different meanings to different people and fields of interest.]

On a more down-to-earth level you can find many publications from the [NASA Nanotechnology Group](#).

[Small is Beautiful](#) has a collection of nanotechnology links.

[The Scripps Research Institute](#)

Particularly significant is the Institute's study of the basic structure and design of biological molecules. While biology and chemistry modeling might not seem to fit this NanoTech page, consider the similarities of the scales involved to macromolecular dynamics and mechanics.

TSRI's [Multiscale Modeling Tools for Structural Biology](#) has pointers to



simulation software and modeling tools.

Presently, modeling methods and tools exist to treat a number of aspects of model development and assessment in large systems, or over large scales of length and time. At high resolution, methods and models have been developed to examine structure, mechanics, and dynamics in full atomic representations.

For example [Yammp](#) is a molecular mechanics program suite originally developed to support the special requirements of reduced representation or virtual-atom modeling. The force field modules implement all the conventional force field terms for macromolecules. There are also modules to support the special force fields for reduced representation modeling such as distance, angular and shape constraint terms. [Yammp can be downloaded from its home page](#).



[Reliability Analysis Center](#)

[The Reliability Analysis Center \(RAC\)](#) is a Department of Defense

(DoD) [Information Analysis Center \(IAC\)](#), sponsored by the [Defense Technical Information Center \(DTIC\)](#). RAC's mission is to collect, analyze and disseminate data and information in reliability, maintainability and quality. RAC is operated by [IIT Research Institute](#).

"The Journal of the [Reliability Analysis Center](#)" sponsored by the Defense Technical Information Center operated by IIT Research Institute funded by DoD published in the [First Quarter-1999 issue \(Volume 7, Number 1\)](#) (very large pdf), a very short over view of nanoscience.

"Nanoscience is one of six Strategic Research Objectives..."

The six Strategic Research Objectives are:

- 1) Nanoscience
- 2) Biomimetrics
- 3) Smart Structures
- 4) Mobile Wireless Communication
- 5) Intelligent Systems
- 6) Compact Power Sources.

The [Reliability Analysis Center](#) has many resources on reliability that you should check out, for example [NAVSO P-3686 "Top Eleven Ways to Manage Technical Risk"](#) (pdf).

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If you would like to add any information on this topic or request a specific topic to be covered, contact [Bob Paddock](#).

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