

## Engineering from conception to innovation

When asked to speculate on technological trends that will shape 21st century engineering, Joseph Bordogna, a former director at the U.S. National Academy of Engineering, wrote "...the future is never easy to see. But the chances of having good vision are much better if you understand the larger context in which you work." Technology forecasters and futurists may differ on the specific nature and relative impact that emerging capabilities will have on engineering. But some common themes exist. Here is a sampling of websites from organizations that either shape or track that larger context:

### National Research Council Canada [www.nrc-cnrc.gc.ca](http://www.nrc-cnrc.gc.ca)

The National Research Council (NRC) directly shapes our national R&D infrastructure and innovation through some 20 research and development institutes and programs stationed across Canada. The NRC website is thus a useful portal to information about ongoing research and technology-building efforts in Canada. Go to "Institutes" in the top blue menu for institute-by-institute website links and profiles. The individual websites contain detailed information on current activities. If you prefer to see R&D activities by subject, choose "R&D" then, on the left, choose "Areas of Research." Examples of emerging areas being funded include bioinformatics, environmental and sustainable-development technologies, fuel cells, genomics, nanotechnology, photonics, nutraceuticals and pro-teomics.

### National Academy of Engineering (U.S.) [www.nae.edu](http://www.nae.edu)

The National Academy of Engineering (NAE) counts among its members some of the most eminent and influential members of the engineering profession in the United States. Besides acting as advisor to the federal U.S. government, the NAE conducts a variety of independent studies on important topics in technology and engi-

neering. The website is interesting for its many summaries of ongoing projects, workshops and meetings, which reflect ongoing and emerging concerns. From the left menu, choose "Engineering Projects" to see summaries on projects ranging from microgravity research to mathematics teacher development. Returning to the left menu, the "Publications" link leads to a mix of freely available and for-purchase reports and books. Two journals that are available mostly free of charge and worth a look are *The Bridge*, and, under "Academy Documents" on the left menu, *Issues in Science & Technology*.

### Harrow Technology Report [www.theharrowgroup.com](http://www.theharrowgroup.com)

Jeff Harrow's Technology Report is a great example of a growing number of freely available, highly readable sites providing analysis and commentary on technological trends, breakthroughs and convergence. Described as the oldest regular technology journal on the Internet, the Harrow report's primary focus has been on "contemporary computing" and related technologies. Recent articles, however, cover a wide spectrum of technologies currently moving from lab to market, such as multi-terabit non-volatile memory, bottom-up self-assembly manufacturing, and nano-combustives. You can sign up for automatic email delivery of the report, which is published monthly, or read the journal directly online. Archived articles go back to 2001.

### Nanotechnology Now [www.nanotech-now.com](http://www.nanotech-now.com)

Most experts agree that nanoscale technologies will revolutionize many areas of engineering. One of the more comprehensive nanotech sites on the open web today, Nanotechnology Now will appeal to non-specialists and professionals alike. The site is a rich source of news, links and background on rapidly emerging, evolving and converging fields, including MEMS, NEMS, nanoscale materials, molecular manufacturing, quantum computing, nanomedicine, nanoelectronics, nanotubes, self assembly and molecular biology. The "Products" link

on the left menu bar offers a variety of ways to keep up to date. *NanoTech Transfer Report*, for example, delivers a detailed monthly digest on the latest nanotech patents and patents pending worldwide. Returning to the menu bar, choose "Best Of" for recommendations and kudos awarded annually to leading individuals, businesses, institutions, products, books and websites.

### Foresight Institute [www.foresight.org](http://www.foresight.org)

Foresight Institute, the non-profit educational organization co-founded and chaired by nanotech pioneer Eric Drexler, continues to be a leader in promoting understanding and discussion of issues around nanotechnology and related emerging technologies. The Foresight website is generally recognized as one of the most complete general and technical nanotechnology reference sites on the Internet. Choose "Research" from the horizontal menu bar for links to the quarterly newsletter *Foresight Update*, white papers, background papers, and in-depth briefings. "Discussions" leads to a new discussion forum called Nanodot ([www.nanodot.org](http://www.nanodot.org)). Choose "Learn about Nanotech" for a range of introductory papers aimed at both general and technical comprehension levels. This part of the site also includes abstracts and many of the full papers presented at various Foresight conferences on molecular nanotechnology.

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