

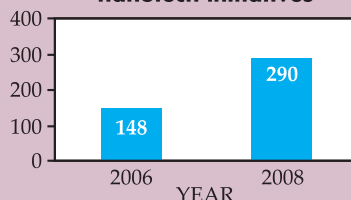
Nanotechnology in manufacturing is the focus of Industrial Physics Forum

Two days of talks, many focused on the rapid growth in nanotechnology manufacturing, marked the 2006 Industrial Physics Forum, which was held at San Francisco's cavernous Moscone West Convention Center in conjunction with the international AVS symposium. Titled "Nanotechnology in Society and Manufacturing," the annual physics forum, sponsored by the Corporate Associates of the American Institute of Physics, opened with a discussion by Mark B nger, director of research for the New York-based Lux Research Inc, about the transition of nanotechnology from the discovery phase to commercialization. Nanotechnology is following the same commercialization pattern as plastics, biotechnology, and the internet, he said, citing a Lux industry survey that forecast rapid growth in nanotechnology over the next two years (see chart).

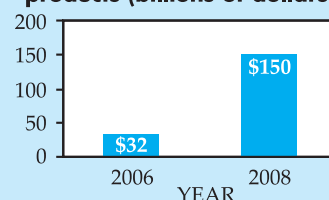
Other talks at the forum included the increasing use of nanotechnology in automobiles, semiconductor nanoelectronics, and biological systems. James Baker, a medical doctor from the University of Michigan, detailed his work on nanoscale DNA-linked dendrimers for treating some forms of ovarian cancer. Human trials of the treatment, which uses a nanoparticle as the building block of a complex molecule that targets cancerous cells, are expected to begin next summer, he said.

The risks of nanoparticles, the lack of federal regulation, and the ethical choices and dilemmas scientists may well have to confront as they develop nanotechnology-based systems were discussed by University of South Carolina science historian Ann Johnson. She noted that nanotechnology is "profound-

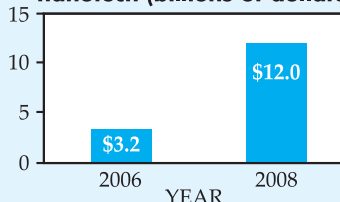
Number of companies with nanotech initiatives



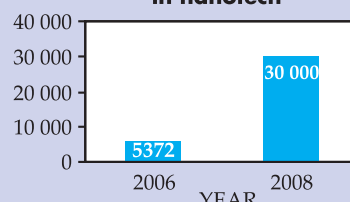
Total revenue from nano-enabled products (billions of dollars)



Total R&D spending on nanotech (billions of dollars)



Total employees active in nanotech



Analysis by Lux Research of 1331 large companies in 76 industries worldwide indicates that nanotechnology is moving from discovery to commercialization. As more nanotechnology products enter the marketplace, industrial R&D spending and nanotechnology-related jobs are expected to increase significantly.

ly interdisciplinary," linking many fields of science. With nanotechnology research, traditional scientific disciplines can become unstable, she said, and a new, nonlinear model of science might be needed.

The physics forum was blogged live for the first time since the Corporate Associates meetings began in 1958, and about 1700 people viewed the blog during the five full days of the AVS meeting. The blog is available at <http://blogs.physicstoday.org/industry>.

Jim Dawson

of substance ready to stand behind the lab," Oddone says. Collaborations between Fermilab and nearby Argonne National Laboratory will increase, thanks to the two sharing Chicago as an overseer, he adds. And the FRA team is bringing in "a group that should help in terms of business management," says University of Chicago president Robert Zimmer, who chairs the FRA board. "This follows a trend within DOE of trying to get corporate expertise in to help with the efficient use of money, accountability, and controls."

In addition, several Illinois universities are represented on the FRA board. "These partnerships will give us more horsepower," Oddone says. "The state will have to be part of making Fermilab attractive internationally" as a host for the ILC.

Also on the FRA board are the UK's Ian Halliday and Japan's Yoji Totsuka. "It shows from the beginning that Fermilab and the board are trying to con-

nect what they do to the needs of the international community," says Barry Barish, who heads the ILC global design effort. "This could be crucial for orchestrating an almost impossible marriage—between the Department of Energy and international funding agencies."

Siting the ILC at Fermilab hinges on foreign scientists feeling confident that they'll be able to get visas to enter the US. And building it at all hinges on the

cost—an estimate is being readied this year—and on the science results from the Large Hadron Collider, which is set to start up at CERN next year. "No one wants to say this out loud, but if the LHC is not wildly successful, I don't think anyone will ask for the ILC," says Turner. "I for one am bullish on the LHC and believe there will be big discoveries early on that will make the case for the ILC irresistible."

Toni Feder

Keeping women in physics is aim of conference for undergrads

Some 70 (mostly) female physics majors are convening this month for the Second Annual Conference for Undergraduate Women in Physics at the University of Southern California. Two USC graduate students came up with the idea for the conference, which now looks set to become not only annual but also imitated.

It started with idle chitchat a couple

of years ago, when Katie Mussack, who is in the final stretch of her PhD in theoretical solar physics, and Amy Cassidy, a fourth-year graduate student whose research is on the thermalization of one-dimensional Bose gases, wondered what they might do to increase the number of women who go on to graduate school in physics. At USC,

says Mussack, "there is a huge discrepancy" between the proportions of women in the physics undergraduate and graduate programs—32% and 12%, respectively. "We thought we might be able to help others make the transition" to graduate school, Mussack says. "I came up with the crazy idea that we could put on a conference, and Amy didn't say no."

A few months and lots of legwork later, 29 female undergraduates from several southern California colleges and universities showed up in January 2006 for a weekend of research talks, networking, and mentoring. "Our purpose was to bring together female students studying physics and to give them the opportunity to learn about research and meet other women in physics," says Cassidy. In surveys collected from participants, says Mussack, "all the comments were very positive." One attendee, Cassidy adds, "was not planning to go to graduate school. After the conference, she applied, and now she is a graduate student. A lot of them were able to say, 'I can see myself being a scientist.'"

Like last year, the program this time includes talks by established scientists—Delaware State University's Beverly Hartline on women in physics and ca-



Undergraduate women in physics hope to hold annual meetings, building on a conference last year organized by graduate students Katie Mussack (front row, sixth from right) and Amy Cassidy (back row, far left).

reers in physics; Frances Hellman of the University of California, Berkeley, on novel superconducting materials; and USC's Grace Lu on nanowires, to name a few. A PhD student has been invited to talk about applying to graduate school, and some participants will present their own work. This year the conference features an expanded panel with women from industry, national labs, and other careers outside of academia.

The organizing committee swelled from just Cassidy and Mussack to a total of four graduate students, a postdoc, and three undergraduates. The

team won an \$8000 grant from NSF and got \$13 000 from USC to help cover such costs as travel, room, and board for invited speakers and participants.

Although most of this year's attendees hail from southern California, a total of 26 universities in six US states plus Canada and the UK are represented. Seed groups from Yale University and the University of Michigan are coming to learn how they might hold similar conferences in their regions. "It's difficult to be a woman in physics," says Kate Green, one of seven Michigan undergraduates involved in starting a

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midwestern conference based on the one at USC. "I would hope to promote networking and camaraderie with this kind of conference."

It's best for these conferences to be local, Cassidy says. "We want to have as few barriers to attendance as possible. We're not just targeting the ones who already plan to go to graduate school. We want to get the student who is on the fence."

Toni Feder

news notes

Mars probe dead.

Radio transmissions from NASA's *Mars Global Surveyor* went silent on 5 November 2006. Three days before contact was lost, the 10-year-old spacecraft had trouble positioning the solar panels that power it. The spacecraft will crash into the Martian surface around 2040.

MGS's primary mission ended in 2001, but the spacecraft continued to return data despite difficulties such as a broken gyroscope. An MGS paper published last month in *Science* reported on suspected water flow on the Martian surface. "MGS was a watershed mission," says MGS principal investigator Michael Malin, an author of the *Science* paper. "The increase in aerial coverage and resolution has had a profound influence on what we now know. The results reported in our *Science* paper are the direct result of a long-lived mission, and would not have been possible without it."

MGS's successor, the *Mars Reconnaissance Orbiter*, arrived in orbit three weeks before MGS went silent. **PKG**

New Kavli institutes. Two new Kavli institutes in China, one in the UK, and one in the US bring the total to 14. Like the earlier ones, the new Kavli institutes have multimillion-dollar endowments from the Oxnard, California-based Kavli Foundation and funding from the host institution, and are intended to become world-leading centers in their fields of research (see *PHYSICS TODAY*, May 2004, page 32).

The Kavli Institute for Theoretical Physics China (KITPC) in Beijing is a joint venture with the Institute for Theoretical Physics of the Chinese Academy of Sciences. The other new institute in China is at Peking University and focuses on astronomy and astrophysics. The University of Cambridge is setting up an institute in cosmology. And at Harvard University, the new Kavli institute focuses on the interface of biology and nanoscience.

Most of the Kavli institutes take a traditional format of bringing together

experts in a specific field on a full-time basis. In contrast, the KITPC, which is modeled on the Kavli Institute for Theoretical Physics at the University of California, Santa Barbara, will have few full-time members and instead will use its \$1 million annual budget to host several workshops each year. "We will be program driven," says KITPC director Yue-Liang Wu. "This is totally new for China." Terry Hwa of the University of California, San Diego, who is an adviser to the new institute, adds that the KITPC "is part of an overall plan to internationalize Chinese science. Hopefully the seed will grow." **TF**

Science on the Moon. Describing the Moon as "priceless to planetary scientists," the National Research Council has, at the request of NASA, laid out a plan detailing what the scientific missions and priorities should be if the US returns to the lunar surface under President Bush's Vision for Space Exploration.

The NRC interim report, *The Scientific Context for Exploration of the Moon*, details in a series of findings and recommendations what science should be pursued. Saying that information is expected from unmanned missions flown before 2010 by the US and other nations, the report calls for NASA to quickly establish two new enabling programs, one for fundamental lunar research and the other for lunar data analysis.

Another recommendation calls for



NASA's 1959 vision of a lunar science research outpost.

NASA to explore the Moon's South Pole-Aitken basin. To determine the composition and structure of the lunar interior, the report recommends deployment of a network of geophysical stations across the Moon.

The report also calls for maximizing the diversity of lunar samples; making sure lunar landing sites are determined with science in mind; studying the volatiles at the poles early to avoid damage to the lunar environment; and characterizing the lunar atmosphere. The report also calls for a "thorough study of the potential of the Moon as an observational site for studies of Earth, Sun-Earth connections, astronomy, and astrophysics."

The committee that issued the interim report was chaired by physicist George Paulikas, a retired vice president of Aerospace Corporation. The final report is due out in mid-2007. **JLD ■**

web watch

To suggest topics or sites for Web Watch, please visit <http://www.physicstoday.org/suggestwebwatch.html>. Compiled and edited by Charles Day

<http://www.concerthalls.org>

Through their comprehensive website, Jessica Hall and Lily Wang aim "to introduce, enlighten, and entertain you on the subject of **Concert Hall Acoustics**." The site includes reverberation time calculators, animation, and, of course, sound clips.



<http://www.honeywellsience.com>

To inspire young scientists and engineers, Honeywell and the Nobel Foundation have created the **Honeywell Nobel Interactive Studio**. The studio arranges for Nobel laureates in physics and chemistry to deliver lectures on university campuses and then makes the lectures available online. Horst Stormer, who shared the 1998 physics Nobel for discovering the fractional quantum Hall effect, kicked off the series with "Small Wonders: The World of Nanoscience."

<http://www.subclub.org>

Walter Zapp introduced the Minox, the archetypal spy camera, in 1936. You can learn more about the Minox and other subminiature cameras at **The Sub Club**, an online resource center run by Joe McGloin.

