

High-technology economy

► From 1980 to 2001, the US share of worldwide high-tech exports fell from 31% to 18%. At the same time, the global share for China, South Korea, and other emerging Asian economies increased from 7% to 25%.

► During the 1990s, the US maintained a trade surplus for high-tech products even as the trade balance for other goods plummeted. But since 2001, even the trade balance for high-tech goods has fallen into deficit.

The benchmarks note that even in nanotechnology, a heavily supported US research priority, Japan and China may have already surpassed the US. While the US is "supplying 25% of the global federal funding for nanotechnology," the benchmarks say, "Japan makes certain that its national nanotechnology initiative meets or exceeds the funding levels approved in the US. The European community is doing the same."

In energy research, the benchmarks state that the US significantly scaled back its fusion-energy science program in the mid-1990s, "essentially ceding scientific dominance in fusion research to Europe and Japan." The US has fallen behind in traditional nuclear power as well. "Current expansion and growth prospects for

nuclear power are centered in Asia," the benchmarks say. "Twenty of the last 29 reactors to be connected to national grids are in the Far East and South Asia, and, of the 31 units under construction worldwide, 18 are located in India, Japan, South Korea, China, and Taiwan." In the US, no nuclear power plants have been ordered since 1978.

Peyton said the benchmarks will be updated annually to keep the connection between basic research and economic growth in front of policymakers. Intel's Comer said that clari-

fying that connection is critical. "The idea, of course, is to put more resources in the physical science research, but it goes beyond money," he said. "The whole problem in Congress is the leaders often say, 'We put all of this money into research and what good does it do?'"

The benchmarks, Comer said, "go to raising the level of consciousness and understanding on the part of members of Congress about the key connection between research and new ideas, new technology, new industries, and high-value jobs." **Jim Dawson**

US Students Retain Middle-of-the-Pack Status

Eighth graders in the US improved in both math and science, according to the recently released 2003 Trends in International Mathematics and Science Study (TIMSS) rankings, but US fourth graders scored virtually the same as they did in 1995 and lost ground to several other countries. The scores show that US students rank above the international average of nations participating in the testing, but are only in the middle of the rankings among what NSF describes as "those nations that are most advanced or . . .

that have taken part in TIMSS consistently since the study's first assessment in 1995."

Students from Singapore outperformed students from all other countries in both math and science at both grade levels. Different numbers of countries participated in different categories in the 2003 study, but overall more than 360 000 students from 46 countries were involved. The TIMSS testing was conducted by the International Association for the Evaluation of Educational Achievement and was

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funded by NSF and the Department of Education's National Center for Education Statistics. The project began in 1995, and follow-up studies are conducted every four years.

The test results show that minority students in the US, particularly African American and Hispanic students, made significant improvements in math and science at both the fourth- and eighth-grade levels. "We're pleased to note the improvements by minority students," said NSF Director Arden Bement. "Having access to quality teaching and challenging material in math and science can only help these students later use their acquired skills to fill opportunities in the workplace," he said. "Previous TIMSS studies showing declining mathematics performance in middle schools seem to have engendered a response by US school systems, because we now rank among the top three countries in the amount of time devoted to teaching algebra in eighth grade."

Several of the key rankings in the study are as follows:

- The mathematics scores of eighth-grade students by country have an "international average" of 466. US eighth graders scored 504 on the math test, placing them 15th on the list of 45 countries.
- The mathematics scores of fourth-grade students by country have an average of 495. US fourth graders scored 518, placing them 12th on a list of 25 countries.
- The science scores of eighth-grade students by country have an average of 473. US eighth graders scored 527, placing them 9th on a list of 45 countries.
- The science scores of fourth-grade students by country have an average of 489. US fourth graders scored 536, placing them 6th on a list of 25 countries.

Within the science category, NSF officials said, US students continued a trend of scoring higher in life, Earth, and environmental sciences than in physics and chemistry. Internationally, at the eighth-grade level, boys tended to do better in physics and Earth sciences, whereas girls generally scored higher in life sciences. Mathematics scores showed little difference between boys and girls. At the fourth-grade level, boys and girls scored about the same in both math and science.

"We should be concerned about US performance in chemistry and physics, which are critical parts of basic science," said Don Thompson, NSF's deputy assistant director for education and human resources. "But overall," he said, "TIMSS bodes well for our education system."

Jim Dawson

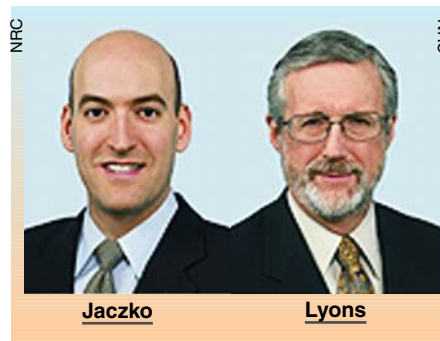
News Notes

Light source restarts at SLAC. The SPEAR3 storage ring at SLAC is once again supplying x-ray beams to users of the Stanford Synchrotron Radiation Laboratory (SSRL). After an accident at SLAC in October, lab director Jonathan Dorfan ordered all experimental facilities shut down pending an investigation and implementation of improved safety procedures (see PHYSICS TODAY, February 2005, page 24). In mid-January, Dorfan and the Department of Energy approved an SSRL team's restart plan. Two weeks later, SPEAR3 became the first facility at SLAC to resume operation.

SPEAR3 is a 3-GeV electron storage ring that serves as a synchrotron light source. Unlike the still shut-down B factory storage-ring collider, which gets its beams from SLAC's 3-km linear accelerator, the stand-alone SPEAR3 ring can run before the linac resumes operation. "The restart will not divert our attention from the strongest commitment to safety," says Dorfan.

BMS

NRC commissioners appointed. Two physicists with extensive experience on Capitol Hill have been sworn in as commissioners on the Nuclear Regulatory Commission following months of showdown politics between the



Jaczko

Lyons

Bush administration and Senate Minority Leader Harry Reid (D-NV). Reid's science adviser, Gregory Jaczko, was appointed to the commission by President Bush only after Reid blocked about 40 of the administration's nominees for everything from the ambassador to Ireland to the US attorney for Oregon.

The administration resisted Jaczko's nomination because he is closely identified with Reid's staunch opposition to the Yucca Mountain nuclear waste storage facility in Nevada. The Yucca license is set to come before the NRC sometime in the next two years. As part of a compromise between the administration and Reid, Jaczko was appointed for only two years instead of the normal five-year term. He also will not vote on any Yucca-related matters for his first

WEB WATCH

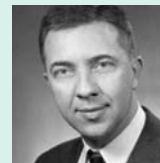
<http://chaosbook.org>



Since its debut in October 1994, the online textbook **Chaos Quantum and Classical** has aimed to provide physics graduate students with an up-to-date and authoritative course on chaos. In the words of the book's lead author, Predrag Cvitanovic of Georgia Tech, "It is better to have a webbook accessible to one and all, continuously improved, at the forefront, rather than chiseled in stone."

<http://measure.igpp.ucla.edu/solar-terrestrial-luminaries/timeline.html>

To add human interest to his course on Sun-Earth interactions, UCLA's Mark Moldwin has put together a webpage devoted to the pioneers of the field. His **Timeline of Solar-Terrestrial Physics** starts with Aristotle's *Meteorologica* of 850 BC and ends, at least for now, with Jim Burch's and Bill Sandel's IMAGE observations of 2001.



<http://interactions.org/quantumdiaries>



At **Quantum Diaries** you'll find the weblogs of 27 particle physicists from around the world. The diarists write as much about their lives (dirty diaper changes) as about their work (neutrino flavor changes). Quantum Diaries was created by the InterAction Collaboration, an international grouping of particle physics labs, to celebrate the World Year of Physics.

To suggest topics or sites for Web Watch, please visit <http://www.physicstoday.org/suggestwebwatch.html>.

Compiled and edited by Charles Day