

RANDOM SAMPLES

edited by CONSTANCE HOLDEN

Highly Cited Women in Science

The performance of women scientists is by some measures still behind that of male colleagues. But in other ways it's ahead, according to a recent study of elite female and male researchers. For instance, the women publish slightly fewer papers than the men, but the citation rate for those papers is higher.

These trends have been documented by sociologist Gerhard Sonnert and physicist Gerald Holton of Harvard University, who have been working on Project Access, a study started by Holton in 1988 that probes the attitudes of more than 800 scientists, about one third of them women, who began their careers with prestigious postdoctoral fel-

lowships between 1952 and 1987.

In an article in the January-February issue of *American Scientist*, Sonnert and Holton report that most women do indeed feel that women do science differently. They are "inclined toward more comprehensive and synthetic work," and more likely to try to find a scientific "niche" rather than engage in head-to-head competition. The authors say, however, that they found no evidence of "a feminine methodology or way of thinking." Rather, women seem "more cautious and careful," to pay greater attention to detail—in short, to have adopted "an extra-high measure of conformity" to the formalities of research.

This difference may help explain the difference in publication rates for academics, the authors say. Men published, on average, 2.8 papers a year, compared with 2.3 for women. But females had a significantly higher citation rate: 24.4 per paper versus 14.4 for the men—suggesting, the study authors say, "more noteworthy" contents. (Citation data came from the Institute for Scientific Information.)

Sheila Tobias, co-author of *Re-Thinking Science as a Career*, hails Project Access as "the study we've been waiting for." She calls it "an

OBSERVATIONS FROM PROJECT ACCESS

- While 70% of the men saw their own scientific ability as being above average, only half the women did.
- Women who had female advisers during their postdocs left science at a higher rate than those with male advisers. Said one woman: "The more you got to know [the adviser], the more you realized she'd given up all personal life to be a scientist."
- Women showed a "slightly more collaborative research style" prior to their postdoc but collaborated "noticeably less" thereafter, presumably because men were not treating them as equal partners.
- 25% of women (but fewer than 5% of men) thought that in retrospect they should have dealt with career obstacles more assertively.

important corrective to the radical feminist critique to the effect that women have 'different ways of knowing.' " She adds that it shows "the emphasis on numbers of publications is misguided and misplaced. In terms of quality, women are doing outstanding work."

Comet Could Be the Century's Brightest

Each time a new comet is discovered, the guessing game begins. How bright will it eventually get as it nears the sun, whose heat boils gases off its icy core? Comets often fail to live up to their early promise.

But after 5 months of studying the still-distant Hale-Bopp, discovered by two amateur comet hunters last July, scientists are pretty sure this comet is not just a flash in the heavenly pan. "I'm confident it will be the brightest one since Comet West in 1976,"

one of the half-dozen brightest in this century, says comet astronomer Michael A'Hearn of the University of Maryland. "It will be an easy naked-eye object even for people in the city" when it arrives in April 1997.

Scientists say Hale-Bopp looked exceptionally bright even when still beyond the orbit of Jupiter. And inspection of telescopic images made in 1993 reveal a previously unrecognized Hale-



Bopping sunward.
Hubble's-eye view on 23 October 1995.

Bopp that was relatively bright even further away. What's more, observers report that the amount of gas and dust being driven off the comet's icy nucleus is high. A lot of gas is consistent with a large nucleus, notes Harold Weaver of Applied Research Corp. in Landover, Maryland. His Hubble Space Telescope measurements place its diameter at roughly 40 kilometers, about four times the size of Comet Halley's nucleus.

Weaver cautions that when viewed from Earth, Hale Bopp "is probably going to have a pretty stubby-looking tail. Even so, as long as it doesn't run out of gas, I think it's going to be pretty darned good."

Bragging About Crystals

In the armamentarium of solid-state physics, one of the oldest warhorses is a technique called Bragg scattering. Recently it's been put to new use by physicists to establish the periodic structure of some newly developed, lighter-than-air crystals.

Bragg scattering works by measuring the diffraction pattern created when a beam of x-rays bounces off the planes of atoms inside a crystal, allowing scientists to quantify the crystal's orderly, periodic structure. Not until recently, though, has the technique been applied to ionic crystals and optical lattices, both of which are only a billionth as dense as a typical solid.

Several groups have reported successes in the new application. In the 4 December *Physics Review Letters*, physicists John Bollinger and Dave Wineland of

California Connectedness

It's being called a "high-tech barnraising"—a big push to get all of California's public schools hooked up to the Internet by 9 March. That's the date of NetDay96, a volunteer project dreamed up by mathematician John Gage, co-founder of Sun Microsystems, and Michael Kaufman, facilities manager of San Francisco TV station KQED. Gage says the idea came to him last April during a "horribly boring" meeting in Washington, D.C., about computer networking where all the talk was of budget cuts. "I sat in the meeting and I wrote a Web Page," he says, as well as a list of 70 possible institutional sponsors.

It was an idea whose time has come. The event has so far drawn 150 high-tech sponsors, including Smart Valley, a coalition of Silicon Valley firms that has contributed \$15 million to wire up 500 schools in San Mateo and Santa Clara Counties. The sponsors



are training volunteers throughout the state to install hardware as well as surveying schools, donating equipment, and developing wiring plans. The goal is to get five classrooms, plus a library or computer lab, in each of the state's 12,000 public schools wired up by the end of the school year. The project, which organizers hope will set a nationwide example, is headquartered on the World Wide Web at <<http://www.netday96.com>>.

While everyone thinks NetDay is a fine idea, getting wired is only the first step, cautions computer scientist Mitchel Resnick of the Massachusetts Institute of Technology, who with Seymour Papert studies how computers can help children learn in new ways. The big decisions—whether the Net will simply be "a new way to deliver instruction" or a way to put students in charge of their own learning—still lie ahead, he says.

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the National Institute of Standards and Technology (NIST) in Boulder, Colorado, report using Bragg scattering, using visible light instead of x-rays, to explore the internal structure of an ionic crystal. Such crystals are created by magnetic and electric fields which are used to trap ions, which are then laser-cooled to near absolute zero. This causes them to seek a configuration of the lowest possible energy, a periodic structure similar to that of crystalline solids.

Meanwhile, two groups—one led by William Phillips of NIST in Gaithersburg, Maryland, and the other by Theodor Hänsch of the University of Munich and the Max Planck Institute for Quantum Optics, have employed Bragg scattering to establish the long-range periodicity of optical lattices. These lattices, which are nothing but laser light and atoms, are created with the use of laser beams which first cool the atoms and then trap them in the nodes of a periodic interference pattern.

"Until we started to fool around with Bragg scattering," says Phillips, "we didn't realize how powerful a technique it was. We now have well-defined systems on which to make measurements to find out if we really understand how laser cooling is working." The research, he says, could lead to new atomic clocks. Such clocks rely on the regular resonant frequencies of atoms, but because these can be smeared by the atoms' motion, lasers are used to slow them down.

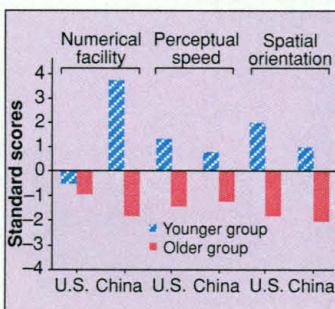
"The experiments are quite elegant and beautiful," says MIT atomic physicist Dan Kleppner, and an important step "in the progression of handling atoms and ions with light."

Chinese Math Puzzle

The poor math performance of U.S. children relative to their peers in Asia has puzzled and alarmed numerous scholars in recent years. Now psychologist David Geary of the University of

Missouri, Columbia, who's been studying two generations of Chinese and Americans, has put forth evidence that the East Asian advantage in math performance is a recent phenomenon, and that—contrary to what many scholars believe—East Asians don't have any more innate affinity for math than do Americans.

Geary's research team and colleagues at the Georgia Institute of Technology and at the East China Normal University and the Central



Sore thumb. Low numerical facility among U.S. youth stands out as exception to pattern.

China Institute for Educational Sciences administered tests of spatial abilities, perceptual speed, and arithmetic to 190 people in four groups: U.S. and Chinese college students, and U.S. and Chinese adults, matched for educational status, who got their early education in the 1920s and '30s. As expected, the younger groups did better than the older ones. But there were no differences between the nationalities—with one big exception: In math, the college-age Americans were far outstripped by their Chinese peers, and did scarcely any bet-

Malaria Made Visible With X-rays

At right is an image of a human red blood cell containing a full-grown malaria parasite, achieved through x-ray microscopy at Lawrence Berkeley National Laboratory's (LBNL's) Advanced Light Source in California. "We're pretty excited about it," says parasitologist Cathie Magowan of LBNL, who says that the resolution is such that scientists can see new membrane structures as well as organelles within the parasite.

With the microscope, one of two in the United States (the other is at the National Synchrotron Light Source in Brookhaven, New York), scientists can for the first



time "reliably image an intact cell with parasite," says physicist Werner Meyer-Ilse of the lab's Center for X-ray Optics. Until now, the best imaging available has been by electron microscopy, for which a cell has to be frozen and sliced to see its insides. But x-ray microscopy "gives you a sense of three-dimensionality inside the parasite," says Carolyn Peterson, molecular parasitologist at San Francisco General Hospital. The ability to look at micro-organisms in their real-life context, she adds, should "make it easier [for scientists] trying to determine function from structure."

ter than their U.S. elders.

The research, to appear in the March issue of *Developmental Psychology*, provides evidence to "rule out IQ as the primary source of difference in math achievement" between Americans and Chinese, says Geary. "If there were IQ differences across groups the Chinese would have been better on all three tests," he explains. As the U.S.-Chinese math discrepancy is greater in the younger groups, he says "what our study suggests is that whatever fosters complex arithmetic skills, we were doing it better in the 1930s than we are now." Other studies, he says, indicate that elementary math instruction in the United States reached its peak between the wars, when kids learned the basics more thoroughly.

Other scientists welcome the research. Psychologist Harold Stevenson of the University of Michigan says the study is in line with his own studies that have uncovered "no solid evidence" that differential Asian math performance is tied to an IQ difference. Psychologist Philippe Rushton of the University of Western Ontario, who contends that Asians do enjoy a special math facility, says he doubts that the older groups in the study are representative of the two countries' general populations. But "the more research done on the topic the better."

What's in a Domain Name

In the dog-eat-dog world of the Internet, it's been the early bird

that gets the domain name. And so the animal rights group People for the Ethical Treatment of Animals (PETA) has been ruffled to learn that its acronym has been appropriated by Michael Doughney, a whimsical suburban Maryland computer entrepreneur, for quite a different purpose: a World Wide Web page supplying links to everything PETA despises under the label "People Eating Tasty Animals."

The site (<http://peta.org>), is billed as "a resource for those who enjoy eating meat, wearing fur and leather, hunting, and the fruits of scientific research." It contains links to dozens of resources from the National Pork Producers Council to Caltech's Mouse and Rat Research Page to the Florida State Taxidermists' Association.

The original PETA is hoping to get its acronym back unsullied. The group's information systems manager Doug Percival says "we are in the process of having discussions" with Network Solutions Inc. (NSI), the organization that assigns domain names. Lawyer Dave Graves of NSI says that if one party is using another party's registered trademark (which PETA is), NSI can put use of the domain name on hold until the parties resolve their dispute.

Otherwise, says Percival, "I have no problem with him putting up the page—he's put up a lot of information that our people might find valuable." PETA's Web address, by the way, is <http://envirolink.org/arrs/peta/index.html>