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# Risk and Opportunity for Women in 21st-Century

By KATRIN BENNHOLD

PARIS — Daniel Louvard does not believe in affirmative action. Time and again, the scientists in his Left Bank cancer laboratory have urged him to recruit with gender diversity in mind. But Mr. Louvard, research director at the Institut Curie and one of France's top biochemists, just keeps hiring more women.

"I take the best candidates, period," Mr. Louvard said. There are 21 women and 4 men on his team.

The quiet revolution that has seen women across the developed world catch up with men in the work force and in education has also touched science, that most stubbornly male bastion.

Last year, three women received Nobel prizes in the sciences, a record for any year. Women now earn 42 percent of the science degrees in the 30 countries of the Organization for Economic Cooperation and Development; in the life sciences, such as biology and medicine, more than 6 out of 10 graduates are women.

Younger women, too, are sticking more with science after graduating: In the European Union, the number of women researchers is growing at a rate nearly twice that of their male counterparts, giving rise to what some have dubbed a fledgling "old girls network."

Even Barbie, the iconic doll who in 1992 was infamously made to say, "Math class is tough," has had a makeover as a computer engineer for her 2010 edition, complete with pink glasses and pink laptop.

But if progress has been dramatic since the two-time Nobel physicist Marie Curie was barred from France's science academy a century ago, it has been slower than in other parts of society — and much less uniform.

In computer science, for example, the percentage of female graduates from American universities peaked in the mid-1980s at more than 40 percent and has since dropped to half that, said Sue Rosser, a scholar who has written extensively on women in science. In electrical and mechanical engineering, enrollment percentages remain in the single digits. The number of women who are full science professors at elite universities in the United States has been stuck at 10 percent for the past half century. Throughout the world, only a handful of women preside over a national science academy. Women have been awarded only 16 of the 540 Nobels in science.

The tug-of-war between encouraging numbers and depressing details is in many ways the story of the advancement of women overall. Women get more degrees and score higher grades than men in industrialized countries. But they are still paid less and are more likely to work part time. Only 18 percent of tenured professors in the 27 countries of the European Union are women.

And the big money in science these days is in computers and engineering — the two fields with the fewest women.

In the 21st century, perhaps more than ever before, there will be a premium on scientific and technological knowledge. Science, in effect, will be the last frontier for the women's movement. With humanity poised to tackle pressing challenges — from climate change to complex illness to the fallout from the digital revolution — shortages of people with the right skill sets loom in many countries.

Therein lie both opportunity and risk for women: In the years to come, the people who master the sciences will change the world — and most likely command the big paychecks.

"Women need science and science needs women," said Béatrice Dautresme, chief executive of L'Oréal Foundation and architect of the L'Oréal-Unesco For Women in Science awards, honoring five scientists each year from across the world. "If women can make it in science, they can make it anywhere."

Many obstacles women face in general are starkly crystallized in scientific and technological professions. Balancing a career with family is particularly tricky when the tenure clock competes with the biological clock or an engineering post requires long stints on an offshore oil rig.

For couples, coordinating two careers is especially tough when both are in science. And 83 percent of women scientists in the United States have scientist partners, compared to 54

percent of male scientists.

Battling subtle and not-so-subtle prejudices is that much harder when they are transmitted by educators, from preschool teachers to Lawrence H. Summers, the former president of Harvard University. Ms. Rosser was one of the speakers at a conference in January 2005, where Mr. Summers said that differences in “intrinsic aptitude” between men and women were more important than cultural factors and discrimination in explaining why fewer women succeeded in the sciences.

At least one woman in the audience left in protest, Ms. Rosser recalled. Others, like herself, challenged Mr. Summers after his comments.

The notion that intellectual ability in men has a greater variability — that the most brilliant and the most deficient brains are found in men — first arose in 1894 to explain why there were more men in mental hospitals and fewer women geniuses. It has been discredited by empirical studies, most recently in June, by Janet Hyde and Janet Mertz of the University of Wisconsin, who showed that in some countries there is no difference between men and women at the highest level. Where a difference remains, it is shrinking and correlated with gender inequality, suggesting that cultural, rather than intrinsic, factors are at play.

But stereotypes run deep. At a presentation to high school girls a few years ago, Gigliola Staffilani, a professor of mathematics at the Massachusetts Institute of Technology, was asked whether for a woman being smart “makes it hard to date.” Mathematics departments in several universities lament a drop in the number of female applicants. At M.I.T., for example, the share of women applicants to the mathematics graduate program has declined to 13 percent this year from about 17 percent in previous years, Ms. Staffilani said. (But the quality of their applications was so strong, she added, that they will make up 22 percent of the student intake.)

The lack of women role models worries her. It reinforces a view that for girls, well, math class is tough.

Often, conditioning starts early. Blanca Treviño, a Mexican computer scientist and chief executive officer of Softtek, the largest private information-technology service provider in Latin America, recalls that the kindergarten teacher would call her to complain about her daughter, who was playing with a calculator instead of with dolls.

“The lady told me that my daughter was making up stories, saying that her mother had an office and an assistant,” Ms. Treviño said. “The idea that this could be true did not occur to

her."

In India, women scientists have complained that even in science textbooks women are depicted in traditional roles. And in the United States, some psychologists say that the surge in computer games marketed to boys is one explanation for the widening gap in computer sciences since the 1980s.

"There should be a concerted effort to undo these continuing stereotyped expectations," said Lotte Bailyn, a professor at M.I.T.'s Sloan School of Management, who studied the phenomenon. "We need more TV shows with women forensic and other scientists. We need female doctor and scientist dolls."

History shows that good science alone rarely has helped women get the credit they deserved.

Take Lise Meitner, an Austrian-born physicist who was instrumental in discovering nuclear fission with Otto Hahn but who did not share his 1944 Nobel Prize for it. Or Hedy Lamarr, another Austrian, who is remembered for the nude scenes in the notorious 1933 feature film "Ecstasy" and her Hollywood career rather than for developing a technology, with George Antheil, that became the basis for mobile telephony.

It was not until 1967 that the street outside Mr. Louvard's office window in the Latin Quarter, named Rue Pierre Curie after Marie Curie's physicist husband, was renamed Rue Pierre et Marie Curie. And it was not until 1995 that Marie Curie's body was moved to the Panthéon, the monument to the French Republic's greatest minds. The inscription above the entrance still reads: "To the Great Men."

It is a detail, but details matter. In dozens of conversations with women scientists and technology executives from the United States, Europe and Asia, a pattern emerged: Many attended single-sex schools and a significant number had scientist parents.

Although somewhat shielded from stereotyping, they still had to balance work and private life. Many do not have children (or have only one), and they are still more likely than the average educated woman to be single or divorced, Ms. Bailyn said.

In the Philippines, Lourdes Cruz, a biochemist and L'Oréal-Unesco laureate for the Asia-Pacific region this year, is a case in point. Educated in a girls' school and encouraged by a chemist father, she had a successful research career between the University of Utah and the Marine Science Institute in Quezon City. There was never time for marriage, let alone children, she said.

"I spent a lot of time in the laboratory and that was my priority," said Ms. Cruz, who studies the medical applications of a nerve poison in cone snails.

She often slept on a foam mattress in her office and set her timer to take night-time measurements during long-running experiments.

Women who managed to combine a career in science with family almost invariably say they got lucky in some way. Elizabeth Blackburn, 61, an Australian molecular biologist who shared the Nobel Prize in Medicine last year with Carol Greider, found out in the same week — when she was 37 — that she was pregnant with her son and that she had been offered tenure at the University of California at Berkeley.

Ms. Staffilani, 44, was offered tenure early, at 34, an age when many scientists in American academia have barely embarked on assistant professorships that give them about six years to strive for a permanent post. She was 36 when she had twins. By having two children at once, she had to spend only half the time away from teaching and publishing.

Edith Heard, 44, a British geneticist who runs the developmental biology and genetics department at the Institut Curie, said her good fortune had been moving to Paris with her French partner early on in her career.

"It was a turning point," said Ms. Heard, a mother of two. "I couldn't have done it in the U.K. and I couldn't have done it in the U.S."

Several of the women with whom she went to university in Britain abandoned scientific careers when they had children, she said.

Ms. Heard benefited from a permanent contract with the French government when she was 28, allowing her to undertake risky experiments often not funded by short-term contracts more common elsewhere. She took 10 weeks' maternity leave after the birth of each child and relied on France's state-subsidized child-care system. Perhaps most important, her husband, also a geneticist, shares family duties.

In this, too, Pierre and Marie Curie were trailblazers. If she is still an inspiration for women scientists, it is not only because she received two Nobel prizes, one in physics and one in chemistry. She also had a longtime marriage and two successful daughters.

Pierre, with whom she discovered radioactivity, refused to accept the 1903 Nobel Prize in Physics that was offered to him and Henri Becquerel unless his wife shared it.

Their daughter Irène Joliot-Curie won her own Nobel Prize in Chemistry, with her husband, Frédéric Joliot, in 1935. The other daughter, Eve, made the cover of Paris Match, became one of the first women war reporters in World War II and wrote her mother's biography. Ms. Blackburn read that biography when she was in her teens. "I was impressed by her ability to find great satisfaction in doing science, the message that passionate involvement in science was something an admirable person could do, and her family life as described by her daughter," she recalled.

Helpful husbands are becoming less rare. Mr. Louvard, whose wife also has a doctorate but gave up her science career to care for their three children, noted: "I see scientists turn up at conferences with their husbands and children now. That was unthinkable until pretty recently."

But good will alone will not suffice. "The institutions have to change," Ms. Blackburn said.

Ms. Rosser noted that at the Georgia Institute of Technology, where she served as dean until a year ago, women had to take sick leave to give birth, like all state employees.

Both women suggested that stopping the tenure clock for periods during which scientists — women and men — care for young children or elderly parents might motivate more women to pursue a scientific career. Some private universities, like Princeton and M.I.T., already do this. Ensuring that grant money does not dry up during parental leaves and including money for child care in research grants may be another suggestion. The key to any measure, they said, is to make it the default mode rather than optional in order to avoid stigmatizing women.

Recently, two shifts have begun to focus the thinking of politicians and companies: shortages of engineers and other highly qualified labor in the West, and rising numbers of science and technology graduates in countries like China and India, just as the economic balance of power is shifting eastward.

By 2017, a shortfall of 200,000 engineers is expected in Germany, and in Britain more than half a million skilled workers will be needed to satisfy the demands of the green energy, aerospace and transport industries. The United States, meanwhile, finds itself in the bottom third of the O.E.C.D. international rankings of mathematical and scientific aptitude at high school level.

At the same time, developing countries — most notably in Asia — have increased their share of the global researcher pool, from 30 percent in 2002 to 38 percent in 2007, according to

Unesco.

The Obama administration has made it a priority to get more women into science. Across the developed world, academia and industry are trying, together or individually, to lure women into technical professions with mentoring programs, science camps and child care.

“This talent pool is extremely important to us,” said Kerstin Wagner, head of talent recruiting for the German electronics giant Siemens. Despite the economic slump, Siemens is having trouble filling some 600 engineering jobs in the United States and more than 1,200 engineering jobs in Germany.

“Everything is in place for more women to succeed in science; now the different pieces just have to come together,” said Ms. Dautresme at the L’Oréal Foundation. “I believe this century will see a lot more women become leaders in science.”