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## Where Are the Women Scientists?

Gender discrimination still haunts the halls of academia. According to a report by 11 leading women scientists published in the August 19, 2005, issue of the journal *Science*, although the number of women in science and engineering has increased since 1980, these fields remain plagued by problems that drain them of female talent.

Women represent nearly half of all Ph.D. graduates in biology but comprise only about 30% of assistant professors, 25% of associate professors, and 15% of full professors within the biological sciences. The situation is even more dismal for women in the physical sciences and engineering, where, in some fields, women earn as few as 12% of Ph.D.s, and only about 6% and 4%, respectively, of tenured full professors are women.

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- Jo Handelsman

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"The problem is not with women; the problem is with institutions," said Jo Handelsman, a professor at the University of Wisconsin-Madison, who is the lead author of the Policy Forum article in *Science*. Handelsman is one of 20 HHMI Professors recognized by the Institute as accomplished research scientists who want to infuse undergraduate education with the excitement of research. HHMI provides each professor \$1 million to do something innovative in undergraduate science teaching.

Handelsman's co-authors on the *Science* paper include women scientists and top administrators from academic institutions throughout the country. They are Donna Shalala, former U.S. Secretary of Health and Human Services, now president of the University of Miami; Denice Denton, chancellor of the University of California, Santa Cruz; Sue Rosser, dean of the Ivan Allen College of Liberal Arts at Georgia Institute of Technology; Nancy Cantor, president and chancellor of Syracuse University; Barbara Grosz, Higgins Professor of Natural Sciences at Harvard University; Virginia Hinshaw, provost and executive vice chancellor, University of California, Davis; Cora Marrett, senior vice president and deputy president, University of Wisconsin

System; Molly Carnes, director of the Women's Health Research Center at the University of Wisconsin-Madison and co-director of the university's Women in Science and Engineering Leadership Institute (WISELI); and WISELI research and executive director Jennifer Sheridan and researcher Eve Fine.

The authors of the *Science* article weighed in on the recent controversy about women's intellectual capacity to do science. "There is no ideal constellation of cognitive abilities required to be a scientist," they wrote. "There is no convincing evidence that women's representation in science is limited by innate ability, whereas there is strong evidence of cultural and structural impediments."

Handelsman said that there are a lot of misconceptions about women in science across the scientific community. "Many people think that the problem of the advancement of women in science has been solved, but those people don't know the issues."

Handelsman is co-director of WISELI at the Madison campus, part of the National Science Foundation's ADVANCE program for institutional transformation. Established in 2001, ADVANCE's objective is to promote a more diverse work force in science and engineering by facilitating the career advancement of women in these fields in academia. The 20 universities participating in ADVANCE are working to identify the barriers women face in their quest for academic leadership positions and devising strategies to overcome these hurdles. The policy paper in *Science* is based on their findings and solutions.

Over the past four years, ADVANCE sites have been examining campus demographics and hiring trends, conducting town hall meetings, and interviewing faculty and staff. They have pinpointed some common themes that impede the advancement of women faculty in science and engineering. Handelsman and colleagues reported in *Science*. Chief among them are:

- The educational pipeline.
- The climate of academia.
- Unconscious bias from men and women.
- Difficulties balancing family and work.

The low proportion of women trained in fields such as the physical sciences and engineering is part of the reason so few women faculty exist in these fields. Women earn 24.7% of Ph.D.s in astronomy, chemistry, computer science, mathematics, and physics and only 15.3% of engineering Ph.D.s.

With few role models to inspire them, young women scientists also find it difficult to envision themselves as faculty members, Handelsman observed. And many capable women scientists are not actively encouraged by their advisors to pursue academic careers, she and her co-authors said.

Another barrier women scientists face is the campus climate. Many women faculty describe the academic climate within their fields as "chilly." Interestingly, said Handelsman, department chairs consistently reported a better academic climate than did the women and minorities within their departments, and since the department chair is usually considered integral in shaping this climate, departments in need of improvement are often not perceived as such by the person who has the power to institute change.

ADVANCE investigation revealed that many women also fear that it will be difficult, if not impossible, to integrate family demands with a career in academic science. Meeting or learning about prominent women scientists who have successfully balanced family and career can help, Handelsman said, as can programs designed to reduce conflict between personal and professional life, such as child care, dual-career hiring policies, and tenure-clock extensions for women who have babies.

To turn the tide of gender discrimination, several institutions have implemented interventions to promote women's success in science. Effective solutions include:

- Programs to engage more undergraduate women in science and engineering.
- Educating faculty search committees about unconscious biases prior to hiring decisions.
- Monitoring salaries and teaching loads, as well as women's access to resources such as research space.
- Encouraging the professional development of women and minority faculty through specially designed programs such as the University of Washington's leadership workshops and City University of New York-Hunter College's sponsorship program, a gender equity project that pairs tenured women with female junior faculty.
- Developing programs that promote a balance between family and work life, such as Cornell University's job-sharing for dual-career couples, campus child care provided by the Georgia Institute of Technology, and flexible work hours at The Johns Hopkins University.

Studies have shown that heterogeneous work groups that include minorities and women are more innovative and intellectually savvy than those that are

homogeneous, Handelsman said. Consequently, boosting female representation in science and engineering should improve the quality of the nation's universities and strengthen our ability to compete with other nations, she suggested.

"I hope that when women read this article in *Science*, they will realize that there is a systematic system within academia that reinforces discrimination," Handelsman said. "Many women who experience this discrimination don't realize that what they are suffering is what thousands of other women are suffering.

"Even so," Handelsman added, "this is a great time to be a woman in science. All of the barriers can be removed, if we put our collective mind and will into doing it."