Still a "Chilly Climate" for Women?

Women in astronomy and physics say they face not so much overt discrimination as a pattern of "micro-inequalities." The remedy: more women

THE REALITY IS OBVIOUS AT ANY MEETING OF the American Physical Society (APS) or the American Astronomical Society (AAS). There are plenty of women among the meeting organizers and administrators, but among the scientists themselves—the stars of the occasion—there are hardly any women at all.

Statistics bear out the impression. While women earn 40% of PhDs in biological sciences and more than 35% of the total in chemistry, the share of physics doctorates going to women hovers at only 10%. Women physicists make up only 6.5% of the APS, and women astronomers only 11.4% of the AAS. The latter percentage has edged up from 7.9% in 1972, but it's still well below the fraction of women in other fields inside and outside science.

Conventional wisdom offers a host of explanations: Fewer girls than boys develop an interest in physical sciences—and in the math necessary for those fields—in high school and college, and more women leave science careers to start a family. But conventional wisdom explains only part of the problem. In the past few months, several meetings of physicists and two surveys of astronomers have pointed to an extraordinary level of discontent among women physicists and astronomers, which may be contributing to the scarcity of women in those fields. In general, they complain not so much of overt sexual harassment and discrimination as of something more subtle and elusive, often referred to as a "chilly climate" for women. Women who have felt the chill say it can leave them feeling undervalued, ignored, or alienated. For some women, the surveys suggest, the atmosphere can be unwelcoming enough to keep them from pursuing a physics or astronomy career.

The loss of female talent in the physical sciences—especially when the nation is facing a potential shortage of scientists and engineers—is sparking a lively debate about the desirability of stronger measures to increase the numbers of women. In particular, women scientists themselves are divided on whether affirmative action programs are needed to help reduce the male dominance of the physical sciences, or whether such programs would ultimately be demeaning to the women they are supposed to help.

Perspective on the issue. *Sidney Wolff* (left) *and Margaret Burbidge* (right).

To be sure, things were once much worse for women. As recently as the 1960s, women weren't even admitted to physics and astronomy graduate programs at Caltech, MIT, or Harvard. Margaret Burbidge, a well-known astronomer at the University of California, San Diego, recalls discrimination that was institutionalized and overt—the kind of thing she says has all but disappeared today. She remembers the time, back in the late 1940s, when she applied for a prestigious Carnegie fellowship. She says she was dismayed to get back an angry letter from the director of the program. "He thought I had committed a terrible faux pas by applying," she says. "He thought I should have known women aren't allowed."

Later, she says, the Carnegie Institution tried to bar her from observing with their powerful telescope on Mount Wilson, in California. She had to go up the mountain with her husband, a cosmologist, who covered for her by telling officials he needed the telescope. While other astronomers on Mount Wilson stayed in a heated accommodation known as the monastery—complete with a chef—she recalls having to live in a little cottage and bring her own food.

Even though women are no longer barred from graduate schools or research facilities, some astronomers and physicists think that traces of a clubhouse attitude still linger. Sidney Wolff of the University of Arizona, the director of the National Optical Astronomy Observatories, says the women astronomers she meets often feel their male colleagues inadvertently leave them out. "[Women] feel they are less likely to get invited to social occasions—going out to dinner or drinks," she says. Missing that kind of socializing can mean missing out on inside information about their fields, she adds—although women scientists are now organizing their own social events, she says, creating their own information pipeline.

The recent surveys and meetings make it clear that kind of complaint is far from exceptional. One of the two surveys was done by astronomer Jill Price of Bentley College in Weston, Massachusetts, who sent a questionnaire to 548 women faculty and graduate students. Of the 90 who responded, 71% reported experiencing some kind of harassment or discrimination—most often "being treated like a second-class citizen" and "not being taken seriously," Price says. She notes, though, that since less than a quarter of the women who received the survey answered it, the response probably overstates the incidence of discrimination.

The other survey, done by the AAS, canvassed a wider group. The society polled all 5300 members about sexual harassment and discrimination as part of a wider effort to gather demographic and employment statistics as well as opinions on AAS services and meetings. Some 1900 astronomers, including 250 women, responded to the questions about discrimination. Some 40% of the women reported having experienced discrimination in the category of "general social treatment." In contrast, only 8% of racial minorities reported similar experiences.

The term "general social treatment" isn't very revealing, but many of the respondents wrote comments to clarify their experiences. A few reported overt harassment. "It is painful for me to disclose the sexual harassment I had to endure," said one. Most of the comments, however, described subtle discrimination. "My experience has mainly been that of seeing female colleagues undervalued," said one. "There is as much condescension to females as overt discrimination." Other comments implied that, as a result, women need certain character traits as well as talent to succeed in astronomy: "Women who are less aggressive and self-confident don't stay in this field." Many insisted that the subtle nature of the problem does not minimize it: "Subtle forms [of bias] are prevalent and are the most damaging because they are more difficult to detect."

The prevalence of the complaints probably would be surprising to male respondents to the survey, since only 12.4% of them said they had witnessed discrimination against their female colleagues in "general social treatment." AAS executive officer Peter Boyce says he, too, was surprised by the number of women who reported discrimination. But he thinks the problem is not as alarming as it looks at first glance. Further analysis, he says, showed that most of the complaints came from women astronomers over 35, many of whom may have experienced a lot of discrimination in the past. That tilt toward older women, he says, at least shows things are getting better.

The strong feelings turned up by the AAS survey aren't unique to astronomy. At two meetings devoted to women in physics, one held last November in Chevy Chase, Maryland, by the American Association of Physics Teachers and the American Institute of Physics (AIP), and the other held as a session at the spring meeting of the APS, women at many different levels in physics spoke of discrimination they found troubling and pervasive, though not overt. Cornell graduate student Susan Watson, speaking at the more recent meeting, identified the biggest problem as a buildup of "micro-inequalities."

Watson suggests those inequalities are partly a function of the scarcity of women physicists. She says that she and fellow women graduate students find it hard to fit into the nearly all-male environment, and they miss women professors who could provide guidance and act as role models. As a result, Watson says, women in physics often suffer a lack of self-confidence. "There can be very talented women at the tops of their classes who still feel that their male colleagues are much smarter and that at any moment someone's going to reveal how stupid and incompetent they really are." In Watson's experience, more women drop out of physics from lack of confidence rather than lack of ability.

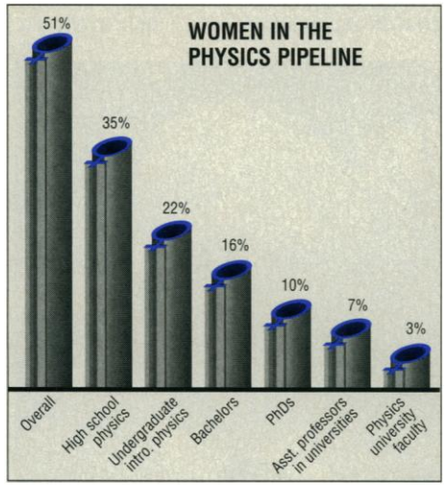
While it's hard to document a connection between these emotional hardships and the shortage of women in physics and astronomy, it is clear that the shortage is not just a result of a scarcity of interested women. Disproportionately more women drop out of graduate programs in these fields: Statistics collected by AIP officer Roman Czujko show that while roughly 50% of male graduate students in physics go on to earn a PhD, the percentage of women who stay the course only reaches the high 30s.

Some of the women who stick it out feel that a chilly climate is not all they have to face. Between 24% and 33% of respondents to the AAS survey reported having experienced discrimination in the areas of hiring, tenure, pay, and promotions. And the AAS survey did confirm that there is an even smaller proportion of women in the top ranks of astronomy than in the field as a whole. But the report accompanying the survey attributed the falloff in the higher ranks and in tenured positions not to a pattern of discrimination but to demography: Most of the women in physics and astronomy are young—further evidence that things have gotten better over the years.

Phillip Schewe, public information director for the AIP, thinks a similar effect is behind the scarcity of women in the highest ranks of physics. He points out that younger physicists, both men and women, now have trouble securing tenured positions because most have already been filled by a big crest of people hired in the late 1960s. "Those people can't be dislodged," he says. And the net effect of this crowding in the upper echelons is greater for women than for men, because the average age of women physicists is 33, while that of their male counterparts is 45.

Whatever the reality of discrimination or harassment, most of the women who responded to the astronomy surveys or spoke to *Science* agreed that the atmosphere in their field would improve if it included more women. But there was sharp disagreement about the best way to increase their numbers.

Vera Rubin of the Carnegie Institution believes that affirmative action programs need to be strengthened, arguing that without advantages for women, men will continue to have the upper hand. Some of the AAS respondents echoed her sentiments, calling affirmative action the only remedy for an imbalance one woman described as "disgusting." But many AAS members—both women and men—disagree. In their comments, 102 of the respondents spurned programs that grant special advantages to women. Some implied that any special advantage propagates the same unfair discrimination they



Source: AIP

Narrow pipeline, broad discontent. *The representation of women in physics, by educational level* (above)*; female and male perspectives on sex discrimination in astronomy* (right).

DISCRIMINATION: VICTIMS AND WITNESSES

	% of women	% of men
General social treatment	**39.9**	**12.4**
Promotions	32.5	7.6
Accommodations – special circumstances	**30.8**	**5.7**
Pay/fringe benefits	29.1	7.3
Tenure decisions	**25.8**	**4.9**
Hiring practices	24.1	7.0
Research opportunities	**21.0**	**3.6**
Accommodations – job mobility	15.6	1.8
Opportunities to give talks, etc.	**15.5**	**.9**
Competition for institution resources	13.7	1.4
Administrative appointments	**13.1**	**1.9**
Admission to graduate programs	12.0	2.4
Nominations, elective offices, etc.	**11.4**	**.8**
Committee assignments	10.7	1.1
Competition for grants/ fellowships	**9.5**	**.7**
Teaching assignments	9.5	.6
Prizes and awards	**9.1**	**.6**
Access to research facilities	7.9	1.7

Source: AAS

oppose. "White males are at a disadvantage in groups and departments with strong affirmative action programs," said one respondent. Declared another: "I object to the depth of discrimination carried out in the name of affirmative action."

Some comments came from women who felt hurt by the very programs designed to help them. One recalled, "I've been told by a major university: 'We have a position for you as a woman.' This discriminates against qualified men and degrades my science reputation as secondary to my gender." Another argued, "Hiring quotas harm their intended beneficiaries, whose competence is more open to question." A third respondent wanted to be judged on her own merit: "Many females, myself included, would not want an appointment in which some perceived minority status was instrumental in the decision."

Burbidge says she was motivated by much the same feeling in 1971, when she rocked the astronomy community by refusing an award given only to women. "If my strong feeling is against any kind of discrimination," she says, "I have to stretch that to include discrimination for women too."

Indeed, Burbidge and other women who have risen to the top of their field are eager to put the issue in perspective. Most of them experience little discrimination themselves, and a few think the problem for all women has been overstated. Margaret Geller of the Center for Astrophysics at Harvard, an expert in the large-scale structure of the universe, thinks it deserves little attention compared to the funding crisis besetting all scientists.

Others accept the existence of subtle discrimination, but exhort their younger peers not to be daunted. "If it's what you want to do," Burbidge says, "when you meet with discrimination you will find some way around it." Sidney Wolff goes even further. "I think by focusing on all the trouble, we may be discouraging young women." She says she has been dismayed to find that many women undergraduates are being scared away from astronomy by the stories of harassment and discrimination they hear.

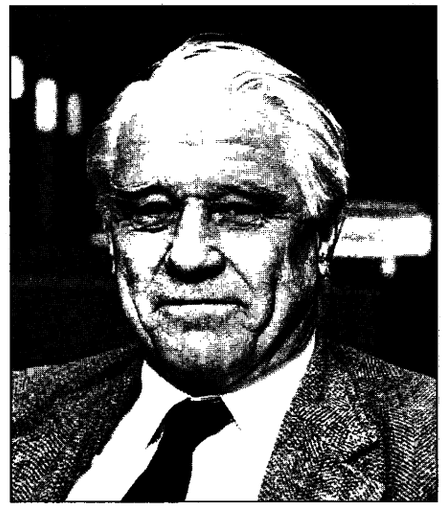
Astronomer Michelle Kaufman of Ohio State University, who spoke candidly about her conviction that sexual discrimination had held her back in a low-paying job, said she was recently caught completely off-guard when a reporter asked her how she could still encourage young women to enter astronomy in the face of such obstacles. She had never questioned the rewards of a career in astronomy, she says. Vera Rubin summed up similar feelings. "Astronomy is great fun," she says. "The tragedy is that thousands of women are being denied a lot of fun." ■ FAYE FLAM

Scientists Get Mad at OSI

NIH's investigative agency is coming under fire in two celebrated cases involving Robert Gallo and David Baltimore

Richards Panel: Out of the Loop?

The office charged with investigating scientific misconduct within the Public Health Service has finally completed its long-awaited draft report on National Cancer Institute (NCI) researcher Robert C. Gallo and his former NCI colleague Mikulas Popovic. What does the report say? A lot of people would like



Frederic Richards

to know, not least those under investigation. But one group that expected a first look is the panel of experts that the National Institutes of Health (NIH) convened to assure that the investigation was both fair and thorough. The panel had planned to meet last month with the Office of Scientific Integrity (OSI), which produced the report, but to the dismay and annoyance of panel members, that meeting was canceled at the last minute, adding the panel members' voices to the growing chorus of critics of the way NIH conducts its inquiries into scientific misconduct.

The OSI had originally intended to give its advisers, headed by Yale University biochemist Frederic M. Richards, first crack at the draft report. A meeting was set for 20 May at NIH headquarters where the panel members (a group drawn from names proposed by the National Academy of Sciences) would be able to critique the proposed version. The accused would be protected from premature leaks—a sore point with David Baltimore's colleague Theresa Imanishi-Kari—because no documents would emerge from NIH headquarters.

But Gallo's attorney, Joseph N. Onek, cried foul, pointing to OSI rules requiring that subjects of investigations be given a chance to review and respond to the case against them before others review it. NIH director Bernadine P. Healy agreed that Gallo and Popovic deserved a first look and, as first reported by journalist John Crewdson in the 17 June edition of the *Chicago Tribune*, she called off the 20 May meeting. In a fax to Richards, sent on 15 May, she also expressed concern that providing the panel with the report would increase the risk that it would be leaked to the news media.

This decision upset many members of the Richards panel. In a letter to Healy dated 21 May, a copy of which has been obtained by *Science*, Richards wrote that, "We are greatly concerned by your decision to provide a copy of the draft report of the OSI Investigation to Dr. Gallo *before* review by the panel. We believe that there is a high probability that all or parts of the draft report will rapidly be made public, and that any future work of the panel may therefore be compromised." Panel members who consulted with one another by telephone following the NIH decision to cancel the 20 May meeting were particularly concerned that if a draft report were leaked by the principals, people might get the impression that their group had blessed the report when in fact they had never seen it.

Healy argues that OSI's responsibilities to those under investigation outweigh any embarrassment the panel might feel. In an interview with *Science*, she said that, "If you have guidelines...then you have an obligation to honor them. The fact that somebody might leak the document isn't a good enough reason to deprive the scientist of the opportunity to review a report that is about that scientist."

At the same time, Healy says she is somewhat sympathetic to panel members who feel excluded from the OSI process because "they have a rather ambiguous role." The initial charge to the panel was to help OSI determine whether an "inquiry" into the work of Gallo and Popovic should be raised to the level of a formal investigation. Once that happened last October, the panel's role was no longer spelled out.