

WOMEN IN PHYSICS CLIMATE STUDY*

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Background

Although the number of women in many science disciplines has risen rapidly, participation of women in physics and engineering has lagged behind. The percentage of bachelors degrees going to women in physics and engineering remains about 15%, while for mathematics and biology it is close to 50%. Women receive only 11% of the Ph. D.s. in physics as compared to almost 40% in the biological sciences.

Evidence that culture has a large influence on the participation of women in physics is can be seen from the large differences among countries in the percentage of physics faculty that are women. While for the U. S., Canada, Japan and Switzerland this percentage is 5% or less; for France, Spain and Poland it is about 15%; and for Russia, Italy and Portugal, it is between 20 and 30%. Since the United States ranks near the bottom, we have a great deal of room for improvement.

At a conference of physic department chairs in 1990, these and other data that indicated that women remain severely under-represented in physics at all levels were presented to the participants. After some discussion, the participants passed a resolution that urged all physics department chairs to do more to encourage the full participation of women and minorities in physics, and that asked the American Physical Society (APS) and the American Association of Physics Teachers (AAPT) for their assistance. As a result of this call for help, the women's committees of the two organizations decided to begin a program of visits to universities to investigate the climate for women, to catalogue the problems that women face, and to suggest improvements that could be made.

The APS agreed to support a small pilot project, and the first visit, which occurred during a physics meeting in Washington, DC, was to the University of Maryland. After several more visits carried out as part of this pilot program, a more formal program was established. Funding from the National Science Foundation was obtained to carry out 10 site visits and to conduct a national survey of undergraduate and graduate physics students on climate issues. The principle investigators were Judy Franz, then president of AAPT, and Mildred Dresselhaus, then chair of the APS Committee on the Status of Women in Physics (CSWP). They were later joined in the leadership of the program by Bunny Clark when she took over as chair of CSWP in 1992.



National Survey

The national climate survey+ was carried out by the American Institute of Physics(AIP) Education and Employment Statistics Department and contains a plethora of information about how students see their relationships with the physics department, faculty, and other students. This information is delineated both by gender and by US or non-US citizenship. Two of the many tables in the AIP report are reproduced below. The first indicates how graduate students view the environment in their physics department. Especially noteworthy and disturbing is the fact that only about 1/3 of the students found their department to encourage self-confidence. U.S. women gave this item particularly low scores. The second table indicates the main reasons that graduate students get discouraged. Long term career opportunities top the list for all students, while department climate was the second most often factor cited by U. S. women but ranked much lower with the other groups. A healthy environment is important for the retention of women in physics.

Percent of Physics Graduate Students Agreeing with Characterizations of the Environment in their Physics Department by Gender and Citizenship, 1993

	U.S.		Non U.S.	
	Female (%)	Male (%)	Female (%)	Male (%)
Friendly	60	67	65	73
Encourages self confidence	27	36	39	38
Rigid/inflexible	18	16	20	11
Makes me feel like an outsider	17	12	15	13
Threatening	11	9	5	6
Total Number of Respondents*	300	338	201	187
No Response	1	5	2	-

* Graduate students responded using a five point scale, where 1 = Very Much, 3 = Somewhat and 5 = Not At All. Percentages listed represent 1 and 2 combined.

**Reasons for Discouragement in Physics for Graduate Students
by Gender and Citizenship, 1993**

	U.S.		Non U.S.	
	Female (%)	Male (%)	Female (%)	Male (%)
Long-term Career Opportunities	42	52	62	69
Department Climate	32	20	18	12
Research	32	35	32	32
Coursework	31	36	21	24
Interaction with Advisor	26	23	19	15
Personal Life	20	19	32	29
Interaction with Students	14	7	11	7
Total Number of Respondents	297	336	200	183
No Response	4	7	3	

Graduate students were asked to identify the two reasons why they felt discouraged in physics.

Site Visitation Program

The site visit program has led to a deeper understanding of the problems faced by women physicists in academia. In all, fifteen visits have been made to the universities listed below.

University of Maryland
Bryn Mawr College
Rensselaer Polytechnic Institute (RPI)
Michigan State University
University of New Mexico
Kansas State University
Harvard University
North Carolina State University

University of Pennsylvania
University of Virginia
University of Illinois at Urbana
SUNY at Stony Brook
University of Texas
Stanford University
University of Rochester

The visitation teams consisted of 4 or 5 women physicists from a variety of physics fields. Prior to the site visit, a considerable amount of background information about the department was solicited, received and reviewed. Visits typically lasted one full day during which the team met with the department chair; an administrator (president, provost, or dean) with some responsibility for science programs; women physics faculty supplemented by those from neighboring fields where necessary; female graduate and undergraduate physics students; graduate and undergraduate advisors; and representative faculty from a different fields of physics. In some cases, the team also met with other groups such as male graduate students, female staff, and female post-docs. An exit interview with the department chair allowed the team to give a preliminary report of their findings. A written report to the chair was later produced. In addition, chairs were asked to respond 6-months later, highlighting what changes had occurred in the department as a result of the site visit.

The teams found that the meeting with female graduate students was particularly useful in understanding the dynamics of a department. This was because these women interact with a large number of the faculty, staff and other graduate students. In addition, graduate students had usually experienced more than one physics department and therefore had the ability to make comparisons. There were usually a sufficient number of female graduate students that it was possible for the team to formulate generalizations so that statements in the report of the visit could not be readily attributed to any particular person.

Although site visits were only made to departments upon written invitation of the chair, the climate for women varied dramatically among the departments visited. The worst departments were those with zero women faculty or perhaps one that had been marginalized; those with few women students who had little interaction with each other; those where students had few or poor interactions with the chair; and those where there was a general lack of respect for students by the faculty. On the positive side were the departments with several active, mainstream female faculty; a good group of female students who interacted regularly with each other; a supportive chair who listened and responded to concerns of students; and a safe physical environment. Several departments had experienced cases of sexual harassment. With one exception, women in these departments believed that the department had not responded properly and resentment remained strong even when the events were several years in the past.

At almost all universities visited, women told us of repeated indignities that they experienced. Some of these are listed here:

- Pictures of nude women on faculty office walls
- Posters and computer printouts with pictures of women in lewd positions in TA communal offices
- Women students being asked to substitute for secretaries during their breaks
- Thesis advisors who call their female students "honey" or the equivalent
- Snide remarks about women made in front of male faculty who remain silent
- Assumption that all rewards obtained by women are "only because you are a woman"

Although none of these indignities is earth shattering, the long term effects of being subjected to such things repeatedly takes much of the enjoyment out of the graduate experience of many female physics students and helps explain why only the very committed and the very tough remain in physics.

By and large undergraduate physics majors had a fairly positive attitude toward their studies. When individual students were disgruntled, it was usually caused by the perception that they had received unfair treatment in a particular course or from a particular faculty member. Stronger feelings could usually be traced to demeaning faculty members or a sense of isolation from the department. Where strong Physics Clubs existed, students were generally upbeat. The existence of undergraduate study rooms, student mailboxes, and student email accounts were also positive factors.



Each visitation team offered many suggestions for changes that would improve the situation at a given university. We explained that the most important ingredient for a positive climate was a department chair who communicates well with faculty and students and female students in particular. The chair needs to listen to concerns, to care enough to act both publicly and privately to effect needed changes, and to clarify behavior that will not be tolerated. Other suggestions that were often included in our reports were inviting more women to the department as seminar speakers and arranging for them to interact with students and organizing social events that build a sense of community among women and among all students and faculty. (Pizza is particularly popular with students of all ages and genders!) Teaching assignments that protect students as much as possible from arrogant faculty members and good TA training programs that include some sensitivity training were also recurring suggestions.

Results

The six-month reports from chairs of visited departments have, on the whole, been very positive. Among the outcomes reported are the following:

- Increased effort to recruit women faculty member; in several cases appointments had been made.
- Increased efforts to recruit female graduate students; this year 40% of the students admitted to Harvard were women.
- Improved communications between women and department chairs; informal meeting and piazza lunches seem to be popular.
- More women speakers had been invited.
- Improvements in the safety of the department had been made.
- Improvements in facilities for students: lounges, computers, and access to telephones.
- Increased activity in career counseling and contacts with industry.
- Improvements in undergraduate advising.

In most cases the climate appears to have improved for men as well as women, and those of us that have worked on this project think that is great!

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+For a copy of the report, contact Roman Czujko at AIP.



