

# Gazette

A Newsletter of the Committee on the Status of Women in Physics of the American Physical Society

## 1988 REPORT OF THE COMMITTEE ON THE STATUS OF WOMEN IN PHYSICS

*Prepared by Ellen Zweibel, assisted by  
Amy Halsted*

In this report I will describe the 1988 activities of the CSWP.

**PERSONNEL:** The members of the CSWP in 1988 were Maha Ashour-Abdalla (UCLA), Janice Button-Shafer (U. Mass.-Amherst), Patricia Dehmer

(Argonne), Melissa Franklin (U. of Illinois-Urbana), Shirley Jackson (AT&T Bell Laboratories), Robert Knox (U. of Rochester), Kenneth Lyons (AT&T Bell Laboratories), Frank McDonald (NASA-Goddard), and Ellen Zweibel (U. Colorado-Boulder), Chair. Miriam Forman and Diedre Hunter were liaisons to the APS and AAS, respectively. Ashour-Abdalla, Button-Shafer, Jackson, and McDonald left the committee as of 1989. The new members will be Elaine Oran (NRL), Lee Pondrom (U. Wisconsin-Madison), Mildred Dresselhaus (MIT), and Jin-joo Song (U. Oklahoma). Lyons will be Chair. We try to maintain diverse representation with respect to field of physics, type of institution, and geographic location.

grams, coordinate existing federal programs and suggest interagency programs aimed at increasing the representation of these groups in science, identify outstanding state, local, and private sector programs in these areas, and develop a long-range plan for increasing the participation of women, minorities, and the handicapped in science. Janice Button-Shafer testified on behalf of the CSWP at a hearing in Boston in April. She presented statistics about the representation of women in physics and described several CSWP projects including the *Gazette*, Roster, Colloquium Speakers List, Symposia at APS meetings, career booklet ("Physics in Your Future"), and attempts to find faculty positions for senior women. She also suggested outreach programs for school-age girls as well as high school physics teachers. She prepared a detailed written report for the Task Force to supplement her oral testimony.

The editor for this issue is Ellen Zweibel; assistant editor is Amy Halsted.

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**DEMOGRAPHY OF WOMEN IN PHYSICS\*:** We placed Sarah Bolton as an intern with the AIP Division of Education and Employment Statistics. Ms. Bolton received her B.A. in Physics from Brown University in 1988 and wanted to work for a year, preferably on issues related to women in science, before entering graduate school. She is currently compiling a list of women physicists in academia in the U.S. (which will be useful in itself), and then plans several studies correlating the presence of these women with enrollment of women in physics courses and numbers of women majoring or pursuing graduate study in physics at their institutions.

**PUBLIC TESTIMONY:** The Task Force on Women, Minorities, and the Handicapped in Science and Technology held public hearings last year throughout the U.S. The Task Force is charged by Congress to examine the status of women, minorities, and handicapped scientists in federal government and federally assisted research pro-

**GENDER, RACIAL, AND ETHNIC SENSITIVITY IN THE WORKPLACE:** In response to a petition forwarded to the CSWP, we considered the issue of sexually, racially, or ethnically obtrusive materials displayed in the scientific workplace. It is undeniable that such items can contribute to feelings of alienation and unwelcomeness among women and minorities, and equally true that most such items are protected by the First Amendment. We addressed the problem by drafting a policy statement for the APS which recognizes the potentially discouraging effect of obtrusive materials and asks for courtesy and sensitivity in the work environment. This statement was approved by Council, with minor modifications, at the April 1988 Meeting.

**ROSTER OF WOMEN IN PHYSICS\*:** The Roster contains nearly 3500 names. It is housed and maintained at

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AT&T Bell Laboratories

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Lowell Observatory

The "CSWP GAZETTE," a quarterly newsletter of the American Physical Society Committee on the Status of Women in Physics (CSWP), is mailed free of charge to all women listed on the computerized "Roster of Women in Physics," all US physics department chairs, and others on request. Because editorial responsibility rotates among CSWP members, please address all correspondence to: "CSWP Gazette," The American Physical Society, 335 East 45 St., New York, NY 10017.

the APS Headquarters, and, since the introduction of a new data format by Lyons, is easily updated. Since Fall 1987, 53 institutions have requested job applicant searches of the Roster, generating \$5300 of income. While such utilization of the Roster is clearly increasing, we have little hard information about how frequently the searches result in job offers to women. The reason for this is that the employer contacts potential candidates through the APS, without learning their names. Because we would like to learn more about the success of the Roster, Halsted has written a letter, to be included (with the employer's permission) when potential candidates are contacted, requesting that CSWP be kept informed

of developments concerning the individual's application for the position.

**COLLOQUIUM SPEAKERS LIST\***: The List is a roster of women physicists together with talks they are prepared to give, either to professional or to general audiences. The List is published in the late Spring issue of the *Gazette*, and the purpose is to increase the visibility of women in physics by promoting them as speakers. In 1988 the List was longer than in previous years, with 93 women volunteering physics colloquium talks and 29 volunteering general talks. Lyons sent a questionnaire to women on the 1986-87 lists in order to gauge its effectiveness; he found (based on a 50% response rate) that most individuals had been invited to give at least one talk as a result of appearing on the list. This is an encouraging result, particularly for women who are not yet well established.

**GAZETTE\***: The *Gazette* is now published three times a year; winter, spring, and fall. It is mailed to everyone on the Roster and to Physics and Astronomy Department Chairs. Editorship rotates among the Committee with considerable help from Amy Halsted. In addition to regular items such as the Roster application and the Colloquium Speakers List, the *Gazette* publishes announcements, reports on conferences, book reviews, and letters to the editor. The *Gazette* is modest, but it seems to be important. At least half a dozen times this year, people have made a point of telling me that they enjoy the *Gazette*: "I throw out most of my mail, but I always read the *Gazette*," is a typical remark.

**SYMPOSIA AND MEETING ACTIVITIES\***: For the past several years the CSWP has sponsored a symposium on an issue relevant to women in physics at the January APS/AAPT Meeting. The 1988 symposium, "Career Re-entry/Retraining: Opportunities for the Midlife Physicist in Transition" was chaired by CSWP Past Chair Joan Kowalski. Israel Jacobs of GE reviewed demographics and projected future needs for physicists, showing that demand is likely to exceed supply, at least for experimentalists, by the mid 1990s. Marie Machacek of Northeastern University described retraining and career upgrade programs developed at Northeastern for engineer-

ing and the physical sciences. Finally, Jean Toth-Allen (George Mason University) and Margot Durrett (AT&T Bell Laboratories) described their personal experiences with re-entry and with changing fields. The CSWP 1989 Symposium, "Women in Physics: Why so Few?" will be chaired by Janice Button-Shafer. In addition to symposia, CSWP has organized teas or wine and cheese parties at the January and November APS Meetings. These events, for which we have obtained financial support from industry, have been well attended by women and men.

**"PHYSICS IN YOUR FUTURE"\***: The booklet "Physics in Your Future" is now out of print. This booklet, which describes various career options in physics in language suitable for junior or senior high school students, is illustrated with photographs of women physicists and men and women working together. CSWP felt strongly (and was advised by representatives of the AAPT and AIP) that some sort of booklet should be available, and we considered rewriting as well as reprinting "Physics in Your Future." We decided that the existing version is sufficiently up-to-date for its purposes, although it should probably be revised in a few years. We have proposed to Council that funds be allocated for printing 30,000 copies.

**PANEL ON EMPLOYMENT FOR SENIOR WOMEN\***: The panel was originally constituted several years ago to aid senior women seeking a change of position. It consists of several prominent male physicists and a CSWP liaison, Janice Button-Shafer. In 1988 the panel dealt with several women physicists who were attempting to relocate. Despite strong advocacy, none of them were offered faculty positions. CSWP made a concerted effort to find both candidates and open senior positions, but did not significantly enlarge either pool. The future prospects of the panel are uncertain. Senior positions at major institutions are not easily won, and senior physicists are understandably reluctant to "network" outside their own areas of expertise and recognition. We intend to explore these issues further in 1989.

\*denotes ongoing project

## CSWP SYMPOSIUM AT SAN FRANCISCO

On 19 January the CSWP co-sponsored a symposium with the AAPT and the AAAS entitled "Women in Physics: Why so Few?" The symposium was primarily organized and chaired by Janice Button-Shafer, University of Massachusetts, CSWP member 1986-1988. In the following article, Ken Lyons of AT&T Bell Laboratories, CSWP Chair for 1989, gives an account of his impressions and thoughts relative to the symposium. The five talks that composed the symposium are listed below:

### **Scientific Resources for the 1990s: Women, the Untapped Pool**

Beverly Porter, AIP

### **Women in Physics**

Vera Kistiakowsky, MIT

### **Social Influences on Girls' Interest in Math and Science**

Jackie Eccles, University of Colorado

### **How Stereotypes about Science Affect the Participation of Women**

Mary Beth Ruskai, New York University

### **Choosing Physics as a Career: Experiments in Social Pressure**

Barbara W. Wilson, AT&T Bell Labs

### **STEREOTYPES IN PHYSICS: SOCIETY, EQUITY, AND NEED** by Ken Lyons, CSWP Chair-1989

The CSWP symposium on 19 January at the APS/AAPT/AAAS meeting in San Francisco was entitled "Women in Physics: Why so Few?" One question asked in the discussion period afterward was "The Audience: Why so Many?" Indeed, the symposium was the best attended session on Women in Physics that I have ever seen. During the five talks, the audience ranged from two-thirds to a full house with people standing in the door. Many people, both men and women, had decided that the issues under discussion were important enough to warrant their time and attention.

This surge of interest was gratifying to see, although it did not change the fact of the dismal statistics presented. Bev-

erly Porter began the session with an in-depth discussion of the workforce statistics and projections. Her principle point was that the issue of women in physics is moving from one of equity to one of need. The projected shortage of physicists in the late 90s looms very close indeed, given the 10-year lead time to turn a high school student into a Ph.D. physicist. The shortage will not be made up by the dwindling pool of young men. Even now the pinch is being felt in some fields, most notably in experimental condensed matter research.

Perhaps the most telling statistic presented by Porter was the comparison between physics and other sciences. While the average for all active scientists has risen to 14% women, the record for physics shows a rise to only about 3%, followed by a *decline* in recent years! Other related fields such as chemistry, math, and engineering show strong growth, but the subfield of engineering physics languishes along with physics.

The dearth of women in physics is often attributed to the fact that they tend to drop out of the math curriculum in higher numbers than men. This argument is belied by the entry of women in other math-intensive fields (including math itself where 46% of the B.S. degrees now go to women). In fact, even when data are *normalized for math ability* there still exists a significant difference in the ability girls see in themselves to succeed in physics *and* in the frequency with which they choose physics as a potential field. The same difference does *not* persist for chemistry.

As explanations of this difference, Porter identified two factors: a need for hands-on experience and a lack of role models on faculty. In response to the question "Have you tried to fix something mechanical?" only 12% of 7th grade girls answered yes (boys 46%). This is bad enough, but the audience reacted even more sharply to the second piece of news: the number is *unchanged* for 11th grade girls (boys 60%). As for role models, women faculty at Ph.D.-granting institutions have increased by only 10% (2.7% to 3%) from 1975 to 1985, while the average of the increases in chemistry and engineering faculty is 215% over the same period. Furthermore, women tend to be stuck

in lower ranks and have not moved upward at the same rate as their male counterparts. Fully 56% of these schools have no women on physics faculty, and only 13% have more than one.

These observations set the stage for Vera Kistiakowsky, who began by presenting some history of the CSWP. She then examined four areas of possible explanation for the paucity of women in physics: innate ability, environmental effects, discrimination, and career conflict. She dismissed the first, since no substantive data has been forthcoming to support the idea. She acknowledged the role of environmental effects, but noted that this effect stems by and large from acceptance of a male-defined idea of success: she challenged her colleagues to question this assumption.

She noted that discrimination has been "driven underground" but is still real, and that career conflicts come down to questions of priority, which are even now considered with far lower frequency by males.

She concluded that successful women have swallowed the male definition of success. She assured her audience that other definitions exist and need to be explored. The latter comment was greeted by a chorus of murmured "thank-you"'s from women around me in the audience. She had clearly struck a well-defined chord.

She also called for honesty in dealing with young women in reference to careers in physics. It is not easy and there are barriers. We must not let our enthusiasm for attracting young women into the field result in deception.

In a natural follow-up to this talk on the response of the physics community, Jackie Eccles discussed the societal responses and the differential socialization that influence female decisions vis-a-vis physical science careers. Her primary point was that much of the problem originates in the *family* environment, but may need resolution in our schools. One of her global points was that more attention needs to be paid to proper scientific study of the social issues surrounding women in physics, and that the people who need to do this are *not* physicists, but social scientists.

The study she described involved 3000 students in Michigan, all of whom were in math courses appropriate to college prep at their grade level. Thus, as grade level increased in the study, so did the selectivity as far as math ability and interest is concerned. Thus, there is a virtually automatic normalization of the study against the “opting out” effect noted above. Moreover, the survey studied not only student attitudes toward physics but also those toward English, a field that more women than men enter, as well as parental attitudes toward both.

From grades 5 to 12, the female students’ self-evaluation of ability in math decreases while that for males increases. The opposite progression occurs for English. Moreover, the value of English was rated higher than math by girls at all levels, but not by boys. These two factors, self-evaluation and value rating, turned out to be the major predictors of 12th grade math enrollment—itsself a primary factor in science career preparation.

A second revealing result is that these responses were more highly correlated to performance (grades and teacher evaluation) for boys than for girls. In fact, girls showed no correlation between task value and performance in math and in English. That is, girls tend to rate English high in value and math lower, but this response is uncorrelated to their performance in either.

The study also evaluated the influence of parental attitudes on these patterns, using parents of the same students. They found, first, that mothers tend to think daughters have less ability in math and physical science, that they have to work harder, and that success is less important. Eccles emphasized that there are no objective indicators that show a difference in ability or performance, rather the difference appears only in response to subjective questions.

The importance of parental views were studied by controlling for teacher evaluation. In general, the study found that parental evaluations as to ability were accurate, but that a strong *negative* correlation existed between evaluation of ability in math and English. The pattern is the same for boys but stronger for girls. Eccles emphasized that we need somehow to break this “zero sum”

idea both in evaluation of ability and also in the estimate of value.

As a useful footnote to the study, attitudes of this same group were rechecked after release of the widely publicized study by Benbow and Stanley, which purported to find gender-linked differences in ability. In an appeal to media representatives to consider the implications of such reports, she noted that exposure to the popular reports of the study had significantly lowered parents’ estimates of their daughters’ math ability in this follow-up study.

Eccles also mentioned an intriguing correlation between social science technique and the real world. She noted that the existence of small differences in the tail of a distribution, such as those noted by Benbow and Stanley, besides having questionable validity, also have no relevance to the development of attitudes of inferiority on the part of girls. The girl in high school sees only a small sample (her class) where such differences, even if real, are completely lost in the noise. Thus, the use of large samples to achieve “statistical significance” can lead to conclusions irrelevant to the real world of a student in a single class. The far greater implications of societal preparation and stereotyping thus emerge as a decisive factor.

In the fourth talk, Mary Beth Ruskai strongly supported the conclusion of Eccles that the Benbow and Stanley study was poorly performed and reported. She suggested that stereotypes play a major role in dissuading girls from careers in physics. Indeed, 84% of girls decide not to study physics before they ever have encountered the subject or even known a physicist. Many who continue have a close relative in science.

Furthermore, she pointed out that, due to culture-based differences in preparation, even a gender-neutral environment can have gender-specific effects. She noted the positive influence on women that stems from gender-neutral summer programs for junior high students, since the hands-on experience is a first for the 88% of the girls who “never repaired anything mechanical.” On the other hand, a computer in a classroom with a teacher who knows nothing about it is likely to benefit the boys, who are more likely to be willing to experiment with it.

In the area of actions to be taken, she advocated exposure of students to science at a younger age, and suggested that industry involvement in this process could make a difference. She asserted that development of role models will not help if society continues to ignore the role models we have. In a series of concluding points, she emphasized the idea of providing a choice of career paths. Likewise, child care, though not only a “women’s issue,” if provided more effectively, would enable a choice for women contemplating family and career involvement. Finally, the ultimate value of role models is to make students aware of the choices they have.

In the final talk, Barbara Wilson developed further the comparison of the U.S. with other countries. She summarized the status of female physicists in the U.S. by noting that of 250 APS-DCMP prizes she studied in 1985, only one had gone to a woman. Further, only 1 woman in 22 is an APS fellow, vs 1 in 7.5 for men. [Author’s note: The situation isn’t improving. Of some 200 fellows granted in 1988, only one was female!] In general, women in physics have higher unemployment, longer post-docs, lower salaries, and less prospect of promotion.

The condition of U.S. physics faculty is especially egregious. In 174 Ph.D. departments in 1985, there were 74 women (out of 4157 total faculty). Two-thirds of the schools had none.

The only major university with a respectable record in this regard is MIT (with 7 female faculty). Wilson recalled that this was largely the result of a decision by a single highly placed man. She suggested that other such individuals need to realize the influence they have and use it for constructive change. The same point emanates, in a different way, from the comparison of the U.S. with other countries. The record for female Ph.D. production here is mediocre, near the median of the countries for which data could be obtained. Even in industrial research, we are just below the norm. However, in faculty population fraction we rank with the lowest! I note the probable relation between this fact and the lack of growth in the female physics population fraction.

She predicted that, while numbers may

continue to increase slowly and restrictions may lessen, there is little prospect for immediate change in the faculty situation. This crucial factor will continue to dampen women's progress in physics for the foreseeable future.

My assessment of the symposium is that it was effective, both in raising the issues and in suggesting ways to attack them. There were common threads that ran through all the presentations. One was the urgent need for progress in moving women into physics faculty positions. The present system is simply not working as it should, and we must find ways to change it.

A second common thread was the effect of stereotyping on women's entry and progress in the field. This very difficult problem, which relates to attitudes deeply ingrained in our culture, is one that will only yield to sustained attention over a generation or more.

Finally, it was clear that a general improvement in physics education, especially with emphasis on lab work and modern physics, would yield a greater benefit to women than to men. Those 88% of the girls who never repaired anything mechanical at home might then gain much needed confidence in their abilities. Along this same line, the entire physics community needs to present a more accurate picture of physics as a science to the public at large. Just as the stereotyping of women reduces their entry into physics, the (nearly opposite) stereotyping of physics as a purely numerical abstract set of rules, devoid of any intuitive sense of discovery, merely serves to strengthen the effect.

These points were not lost on the audience. The discussion afterward was lively and constructive, and continued for close to an hour. This, combined with the high attendance (nearly half male) leads me to believe that this symposium may have made a real impact. On behalf of the CSWP, I thank all the speakers for their substantive contributions and their willingness to confront the difficult issues. We can realistically hope that many women will benefit in the future from their efforts.

## LETTERS TO THE EDITOR

To the Editor:

I am responding to your requests for thoughts on the dual-career problem. Since the person I married was neither a physicist nor someone seeking a position in academia, the particular problem discussed in the *New York Times* article was not mine. However, perhaps I had greater difficulties. Location and job availability for two-career families is always a problem and there may not even be a helpful employer of one person.

There seems to be a somewhat universal interest in encouraging more women to go into the sciences, with a particularly acute problem in physics. Therefore there ought to be some source of funding for the out-of-work physicist, female or male, to expend some real effort on this problem. To keep the person active in physics, part of this funding should also support some physics research. Part of the effort to encourage more women to go into science might be to involve them in this research.

But does the American Physical Society really mean what *they* are saying on this subject? I find this hard to believe when, month after month, I find nothing but pictures of men, men, men in *Physics Today*. Other minority groups have "Coalitions of 100 leading —". I'd like to see the Committee on the Status of Women in Physics form such a coalition of leading women physicists and then ask that their pictures all be published in the same issue of *Physics Today*. This might really startle the general membership of the APS and perhaps encourage some effort on their part to work with this coalition to solve both the dual career problem and the problem of getting more women into physics.

Shirley W. Harrison, Ph.D.  
Chairperson,  
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**[Assistant Editor's Note:** *Physics Today* is published by the American Institute of Physics, not by The American Physical Society. APS has no editorial

control over *Physics Today*. Pictures of women may be rare in *Physics Today*, but articles and letters written by women are quite common, and of course the publication's editor, Gloria Lubkin, is a woman.]

Dear CSWP *Gazette*:

I would advise all unattached women in physics to date men who are *not* in physics. I was once married to a physical chemist (I am a chemical physicist); now I live with an engineer. The difference is astounding.

When I was with the chemist, our associates constantly set us up as competitors and concluded that the man *must* be better. In college, I in fact had better grades, better SAT and GRE scores, did more undergraduate research projects; in short, I was better in every aspect that could be put on paper. Our professors, however, fawned over him and ignored me.

Living with an engineer, I find people can accept us as individuals who are both successful. Further, the job market is more open since we are not competing for similar jobs in the same location. These factors do influence the relationship as well as our career status.

Falling in love is not a purely random process. We choose the people we spend time with, and we weigh a number of factors in choosing a mate. A successful relationship includes rational as well as irrational elements.

And there is a bright side! The two-career family opens possibilities that our grandmothers never dreamed of. If one partner has a secure job, the other can explore entrepreneurial ventures, write books, do political work, or follow any number of interests with no immediate or sure promise of financial reward. Or if both work at Ph.D.-level industrial jobs for 10 to 20 years, the couple can be in a good position to start a joint business venture. Financial independence is a real possibility.

Most reports on two-career couples emphasize the gloom and doom of trying to follow two traditional career paths simultaneously. We are not that limited. I think it is an excellent investment for women in physics to spend time early selecting a mate and exploring career

possibilities which maximize the potential of the couple.

Sincerely,  
Linda Stuk  
Physics Dept.  
Univ. of Texas at Austin

Letter to the editor:

Re: "Practice Nepotism, but Affirmatively," Vol. 8, Issue 3

Finally we (female physicists married to physicists or others of that ilk) have become recognized as statistically significant. Discussing plights such as mine with a sympathetic physicist once, I was asked "Well, but this case is quite rare, isn't it?" He was surprised when I rattled off a list of about six such couples whom he knew. (After that I started a written list which grew longer than even I had suspected.) I never had a chance to experience difficulties as a woman in physics; I had no such problems in graduate school, but from the time I married, shortly after finishing graduate school, being the spouse of a scientist has been a problem.

In the 24 years since receiving my Ph.D., I have had two fellowships, one research associateship on the other side of the ocean from my husband, and one year as assistant professor at the university where my husband was a guest professor. I have continued to be active in research in the meantime (30 publications), since I hoped in the first few years that something would work out. Twenty years ago, it was not so simple to demand jobs for two at the same university; this would have meant jeopardizing my husband's chance of getting a position, and since he was older, he at least had better prospects than I. There must be others who, like me, figured it was better to let at least one career in the family flourish than none, and, under the circumstances, do not regret it. It would be good, however, to change those circumstances.

Living in Germany, I have experienced a more limiting situation than is found in most American universities or research establishments. The problem is of course most acute in provincial university towns which offer no alternative employer. However, I should mention that the German Research Foundation (DFG), in the last few years, has

opened its fellowship program (at the level of a post-doctoral program) to wives in situations such as mine, and the second of my two fellowships was granted to me just a year ago. This recognition, though financially modest, gives me a distinctly different position (at least subjectively!) than when I was a politely welcomed guest in the institute where my husband is professor. I must also mention that the work I have done, as a guest in various laboratories, has been fully recognized by my research colleagues.

It was always difficult, in the APS manpower questionnaires, to define credibly my professional status: unemployed and working full time. It is only due to the family status that this combination was voluntarily—in one sense—maintained for so many years.

The suggestion that couples should be considered as a "package" by prospective employers is a fruitful one. Neither the married professionals themselves nor the prospective employers can today be surprised at the serious career interests of both spouses. The number of such couples will increase, and the employers may get some very good teams.

Brenda P. Winnewisser  
Justus Liebig University Giessen,  
Federal Republic of Germany

### GRANTS FOR CHILD CARE?

In search of inspiration and role models, I have read many biographies of women scientists. Early on, I realized there were special obstacles for women that did not seem to exist for men (I read many of their biographies, too). At a certain stage in all these women's lives, each felt they had to choose between motherhood (perhaps even marriage) and their careers.

Partly to address this problem, Carl Djerassi, a chemistry professor at Stanford, has proposed offering five-year grants for at-home child care to promising young female scientists. He claims most women at the post-graduate level can compete successfully for fellowships or assistant professorships, but what they cannot afford at this crucial period in their careers is raising a child. He hopes this kind of financial support

would attract more women to high-level science.

But is the choice between motherhood and a career in science really a financial issue? And why don't men face the same tough decision? Does the fact that some women opt for motherhood at the expense of their careers really account for the large discrepancy between the greater number of women with graduate degrees in science and the continued scarcity of women in the higher levels of science (tenured professors to Nobel laureates)?

Many women I've talked with feel that money isn't the problem. The conflict between motherhood and career arises out of the all-consuming demands of each. Women want the *time* to spend with their children (especially infants) not money to pay someone else to be with them. Any job that requires a fully committed 60–80 hours a week (whether a laboratory scientist, research mathematician, or business executive) leaves little time or emotional energy for the equally pressing needs of a young child. This probably explains why most men do not face the same dilemma. Although the role of fathers in child-rearing is changing, the expectation that mothers will be the primary caretakers still prevails.

Finally, we come to what many feel is really the heart of the matter. Even women who choose to sacrifice having children to pursue their careers often find sexist biases still deny them tenure, promotions, equal pay and status in what is still primarily a male world. Many who *are* successful are accused of "becoming like men." What we are witnessing here is a conflict of *values*, a hierarchy that selects for those willing to forego their personal lives to attain high-level positions.

Grant money would be better spent making more humane options available to both women and men, more part-time and shared appointments, on-site day care, paid parental leaves, etc. Further, the stigma and lower status accorded those with strong commitments to both career and family, must be removed. We must realize, as a society, that the values embodied in parenting are precisely those lacking in many of our institutions today, and give our full support to those individuals willing to

accept the double burden. Perhaps then we may see these institutions change from the inside out.

[Bonnie Shulman is a Ph.D. candidate in mathematical physics at the University of Colorado and single parent of a 16-year-old daughter.]

## ATTENTION APS FELLOWS

The CSWP is trying to obtain a list of the APS Fellows who are female. This is not as easy as it sounds, since normal APS records do not contain gender information. We have taken the initial step of searching the directory, and have found some 63 Fellows who have names that are relatively unambiguously female. If you are an APS Fellow and have a name that might not be easily recognized as female, or if you are listed by initials only, please contact Ken Lyons, (201) 582-6084, to let us know. If you want to use bitnet, the correct address is kbl@allwise.att.com. (Some people have trouble using that, so you can also try kbl%allwise@research.att.com.)

Please note that this request applies especially to those of you with oriental, Indian, or other unfamiliar names, since it is quite unavoidable that such names were skipped in our initial directory search. Thanks for your help!

## FAMILY SCIENCE PROGRAM: LEARNING TOGETHER

Chevron U.S.A. Inc. announced it will sponsor Family Science, a new national precollegiate science education program involving family participation. The company will make a three-year, \$325,000 grant for the development of the program and its pilot phase.

Designed to address the underrepresentation of female and minority students in science-based careers, the Family Science program will encourage students and parents to learn and enjoy science together in a comfortable atmosphere that fosters communication, group work, and cooperation across age and gender boundaries.

Family Science will be developed in partnership with Northwest EQUALS, a regional affiliate of the national

EQUALS program at the Lawrence Hall of Science, Berkeley. EQUALS programs are aimed at increasing participation of young women and minorities in math, science, and computing. Northwest EQUALS is part of Portland State University's Continuing Education Division.

"Research shows that many female and minority students tend to stop taking math and science classes as soon as these subjects become optional study, and this prevents them from competing on an equal basis in these fields in the job market," said Will Price, Chevron U.S.A. president. "We are pleased to be part of this important effort to help turn the situation around for both students and future employers."

A major partner in the Family Science project is the National Urban Coalition, based in Washington, D.C., an organization of community-based groups dedicated to educating urban minority youth.

Family Science activities will focus on imaginative hands-on learning examples that will supplement the school science curriculum. The program consists of a series of four to six classes for parents and their children and interested adults, at convenient locations and times. More than 50 Family Science class sites will be established across the country.

Program content will be developed and tested through October 1990. A Family Science book, suitable for kindergarten through eighth grade students and their families, will be published in November 1991.

Family Math, a companion program developed at the Lawrence Hall of Science, has been used in 24 states and in Australia, Canada, New Zealand, Puerto Rico, and Sweden.

## WOMEN'S CONFERENCE HELD AT ICTP

A conference entitled "The Role of Women in the Development of Science and Technology in the Third World" was held last October at the International Center for Theoretical Physics in Trieste, Italy (see the CSWP *Gazette*, August 1988). A report on the confer-

ence appeared in the Newsletter of the Kovalevskaia Fund, Volume III, No. 2, November 1988, and is summarized here.

The conference was attended by 247 researchers from 65 countries, and consisted of scientific sessions, as well as sessions on the status of women in science and technology in developing countries. As the *Gazette* has observed before, the experiences and percentages of women in science in other countries differs markedly from what we see in the United States. It seems that the participants may have attended the conference as women first and scientists second, or vice versa, depending on the situations in their home countries. Apparently some tensions resulted.

Some participants said they had not experienced any career difficulties that were not encountered equally by their male colleagues. These participants tended to prefer the scientific portions of the conference. Some conflict also arose concerning the appropriateness of some session topics to Third World concerns. Despite or because of the disagreements in evidence the meeting was called fascinating and productive.

One thing the conference did not produce was a Third World Association for Women Scientists. Some participants were concerned that such an organization would alienate male colleagues, while others argued for the presence of women's organizations in all activities, to guard against discrimination and marginalization. A study group was formed to examine the possibilities for forming such an association, and will report to the council of the Third World Academy of Scientists (TWAS) at its meeting next October.

The following article appeared in the *American Journal of Physics*, October 1988, and is reprinted here with permission. Copyright © American Association of Physics Teachers.

## EDITORIAL: 958 MEN, 93 WOMEN—HOW MANY LISE MEITNERS AMONG THOSE 865?

During the year 1985-86, the most recent year for which data are available, 1051 physics Ph.D.s were awarded by



universities in this country. Of those degrees, 958 were earned by men, only 93 by women; we are “missing” 865 new and talented physicists. I could cite other statistics, such as the number of undergraduate majors or the number of tenured faculty members, but the underlying message would not be very different. The data, familiar to all of us at least in broad outline, are some of the symptoms of a problem that is surely of concern to all members of our profession.

Data such as these are often accompanied by expressions of concern about who will “staff” (or sometimes “man”) our research programs or who will “produce” our research. “The threat of a serious shortage of scientific personnel looms in the years ahead,” reads the lead sentence in an editorial in *Science* (“Women in Science,” 25 March 1988). I find such language extremely depressing, conflating as it does two quite different issues. The implication (unintended, to be sure) seems to be that discrimination against women or minority groups would be quite acceptable if only we had an adequate supply of white males to get the research done. Moreover, talk of “personnel shortages” and similar language brings to mind visions of enormous lofts filled with identically dressed scientists or engineers, who may be producing *something* but are not likely to create many new and exciting ideas and who do not seem to be getting much fun out of what they are doing. Words such as these suggest a view of scientists as interchangeable parts, as if we were not truly dependent on having a wide variety of people with various interests, backgrounds, and expertise.

When I see data on the number of new Ph.D.s or undergraduate physics majors, I cannot help thinking of them as *individuals* who are just setting out, who are being initiated into the intellectual excitement that our subject has to offer, who will make their own individual contributions, as scholars, teachers, or in other roles. That is why the title of this editorial refers to 865 *people*, rather than to the *percentage* (about 45%) of the potential Ph.D.s who seem to be missing. Three months ago, in my first editorial, I wrote about the joy of learning and teaching physics, about my conviction that our subject is the one that is the most fun to teach, to study, and in

which to do research. It saddens me to think that there are 865 individuals, whose names we will never know, who might have shared this joy as our colleagues were it not for irrelevant factors that have nothing to do with talent or interest. To put it in personal terms, if nothing changes during the next few decades, my granddaughter is ten times less likely to grow up to be a physicist than she would be if she were a little boy. I know very well that the probability that any one child, boy or girl, will become a physicist is very small. That granddaughter may not have the talent to be a physicist, or she may well prefer to be a jet pilot or an economist, but I find it very sad to think that her chance of participating in the delights of physics may be so drastically reduced simply because she is a girl.

The data cited at the beginning of this editorial only describe the *outcome*. Here is another isolated statistic that bears on at least one of the *causes* of the problem. A few months ago, as we were putting up shelves in the new AJP editorial office, one of our students spotted a blank space on the wall and tacked up a poster that listed the names of about 130 “Noted Women.” (Candor requires me to admit that this student is the only woman among our current group of majors. Amherst is a small college, to be sure, but by any standard the number of women who choose to major in physics here is distressingly small.) As she and I looked at the list, we realized that of the 130 just one was a scientist. Anyone can guess who that was; no one is likely to overlook Marie Curie. But we found it astonishing that the compilers of the list had not even thought to look seriously for additional scientists. It was easy for us to add quite a few names to the list, beginning with physicist Maria Goeppert-Mayer and six Nobel laureates from other fields, together with luminaries such as Sophie Germain, Emmy Noether, Melba Phillips, and Chien-Shiung Wu. The poster looks better now, but in its original form it simply serves as one more reminder of the fact that when advisers (parents, teachers, and others) are thinking about careers for talented young women, they nearly always overlook the possibilities to be found in science. Of all the academic disciplines, physics is perhaps the one that suffers most from this oversight.

None of this is news. I have no special insights into the causes of the problem, nor do I have new remedies to propose. I happen to be the editor of AJP. In that position, I have the opportunity to use this space from time to time to put some of my own ideas in print. More importantly, I have the obligation, I think, occasionally to call attention to serious problems that I feel should be especially troubling to physicists, even when the facts are well known and my editorial can only serve as one more reminder.

Perhaps limited by my lack of imagination, I do not see any special role that this journal can play in alleviating the situation. I must observe that I am very much aware of another statistic, one that will never show up in any nationwide survey but one which is of particular concern to AJP. During the years 1973–88, the extent of my available database, there have been a total of 71 physicists formally associated with the *American Journal of Physics*—as Editors, Associate Editors, Assistant Editors, Consulting Editors, Book Review Editors, etc. Of these 71, three have been women.

In preparing manuscripts for publication, we will, of course, continue our policy of urging authors to avoid making the implicit assumption that physicists (or the “observers” who frequent our textbooks and articles) are invariably male. There are various ways of dealing with this stylistic problem. Authors who ostentatiously alternate between “he” and “she” simply distract attention from their subject; “he/she” and “(s)he” are, in my opinion, linguistic aberrations; “he or she” is an awkward but sometimes necessary pronoun. With a little thought and some effort at rewriting, judicious use of plurals (“physicists, they” instead of “the physicist, he”), and occasional use of the passive voice, most passages can be gracefully rewritten. We were taught in school to avoid passive constructions, but most of us were not taught the importance of avoiding unnecessary chauvinism in our writing. If a choice must be made, there is nothing wrong with a few passive verbs. I have already found that an editor cannot afford to do much detailed *editing*, and some poorly written sentences in the manuscripts that cross my desk will go into print, even though I wish I had the time to rewrite them.



But I will feel free to use my editorial red pen to exorcise unnecessary and inappropriate masculine pronouns.

Minor stylistic corrections in manuscripts are easy to make. But I find it frustrating not to be able to do much more than to remind readers of facts with which they are all too familiar. What can the average busy physicist do? All of us who are lucky enough to be physicists at least occasionally find ourselves in positions where we can influence, perhaps ever so slightly, the career thoughts of young people. In a male-dominated profession, most of us cannot serve as useful role models for young women. But at least we should all be aware of the situation, and we can lean over backward, we can practice "affirmative action," in taking extra steps to make talented young women aware of the exciting and satisfying possibilities to be found in careers in physics. Perhaps the extra steps are necessary in order to compensate, at least in part, for the unconscious biases that many physicists undoubtedly continue to have.

To guard against the possibility that referees for this journal have such biases—perhaps against women, perhaps against authors from obscure institutions—authors submitting new manuscripts may, if they wish, omit their names and affiliations on two of the copies submitted, so that referees can be kept ignorant of the authors' identities. Many manuscripts, of course, do not lend themselves to such "double blind" treatment. Furthermore, it does not seem feasible for the editor not to know who the authors are; I will simply have to try, as always, not to be influenced in my judgments by such irrelevant information.

Those of us who teach, whether men or women, have special responsibilities. For the women who enroll in our courses, we can do our best to offer encouragement and avoid condescension, we can educate ourselves about the special problems that women have faced and still face. We can try to make sure that women who are, for instance, more comfortable working with other women as lab partners have the opportunity to do so. We can keep aware of summer job opportunities and make sure that all our students are aware of the variety of interesting possibilities. We can make

sure that some of the "help sessions" in our introductory courses are staffed by women from our advanced courses. We can discuss with all our students the fact that there is at least some evidence suggesting that marriage and having children are not of themselves detrimental to a fruitful scientific career. (See Jonathan R. Cole and Harriet Zuckerman, "Marriage, Motherhood and Research Performance in Science," *Scientific American*, February, 1987, pp. 119–125.) We can try to lend support (resources, space, money) to organizations such as AWIS (American Women in Science) and similar but smaller organizations that exist on individual campuses. We can go out of our way to invite established women scientists as colloquium speakers. We can make sure that the women on our faculties are not unfairly burdened with advising and committee assignments but do get a fair share of the best teaching assignments and research students.

Actions such as these will not solve the problem, but it behooves us all to do what we can. I said earlier that I find it sad that, barring changes, a little girl is ten times less likely than a little boy to grow up to be a physicist. I do indeed find that fact sad, but that ten-to-one disparity is not simply unfortunate, a cause for regret and sadness—it is *wrong*. Though neither I nor anyone else knows all the reasons for this inequality of opportunity, what I do know for certain is that its continuation is intolerable.

Robert R. Romer, *Editor*  
*American Journal of Physics*

The following was written in response to Robert Romer's editorial in the October 1988 issue of the *American Journal of Physics* and will be printed in a forthcoming issue of *AJP*.

Dear Sir:

I read your article on "Women in Science" in the October issue of *AJP* with interest. I'd like to offer some comments of my own.

When I was in graduate school I saw a moderately large number of women enter the Ph.D. program, but more than 50% left with only a Masters degree. The percentage of men leaving is much lower. Now I teach in the physics department at my university and I'm

painfully aware of the low morale and lack of self-confidence among women undergraduates and graduate students, and the relatively high rate at which women drop out of physics programs.

I think there are three main reasons for this inequality between men and women in physics. The first is that women are trained from an early age to downplay their intellects, and not attempt "masculine" subjects; the second is that the training women are given most of their lives does not prepare them to compete in a field like physics, and the third reason is that even if a woman stays in physics her life is very often unpleasant and downgrading. I will examine these reasons in more detail.

In this country men and women socialize at an early age—it's not uncommon to find them dating at 10 years of age now. Women learn very quickly that physics is viewed as a masculine subject, and that excelling in such a discipline is considered unfeminine. Even as little children women are conditioned—by television, film, books, and society—to be "feminine"—intuitive rather than analytical, artistic rather than scientific. By college age most women have learned to view physics as something they cannot and should not attempt.

The second reason is more subtle. Once a woman is in physics she's expected to act like a man. If one does a physics problem the answer is usually right or wrong—and one is wrong very often. At the Ph.D. level creativity is expected, and again, one's ideas will be wrong much of the time. A student must be able to cope with this, and with a great deal of argument and criticism much of the time. The trouble is that while a boy is usually taught by his father to attempt problems and simply "do better next time" if he fails, a girl is taught to please people, and if she fails in this she's not just wrong—she has failed as a person. Girls are taught to be gentle, understanding, and accepting; not to be argumentative and competitive. The skills she learns when little do not prepare her to participate in a male dominated discipline like physics. It's significant that women who are successful in physics almost always have a strong relationship with their father, and have perhaps received a more suitable training at an early age.

Lastly, for the woman who stays in physics life can be very difficult. Most of her friends will be men—her fellow graduate students or faculty members, and there are often sexual tensions of many different kinds. One of my girlfriends tells this story: she went to a movie with two close male friends. They wanted to “pick-up” some women, so they asked my friend to sit somewhere else, lest her presence decrease their chances of meeting women! Stories like this are not uncommon, but insensitivity of this kind is incredibly demoralizing to a woman, and leaves

her feeling unaccepted, and also sexless. A woman must also cope with the usual problems impressed by society; most men still need to feel they are “better” than any woman, and will often—inadvertently and subconsciously—put her down. To maintain her self-esteem she must truly be good.

It does not help that women in physics often feel threatened by other women, and end up being very competitive with one another, unfriendly to and not supportive of other women. Women can become extremely isolated in this way.

Many of these problems can be corrected by a little more sensitivity on the part of male colleagues. Society is changing, and we may expect to see more women in male dominated fields in the future, but change is slow, and a greater awareness of the problems facing women must surely help.

Yours sincerely,  
Gayl Cook  
Assistant Professor  
University of Colorado

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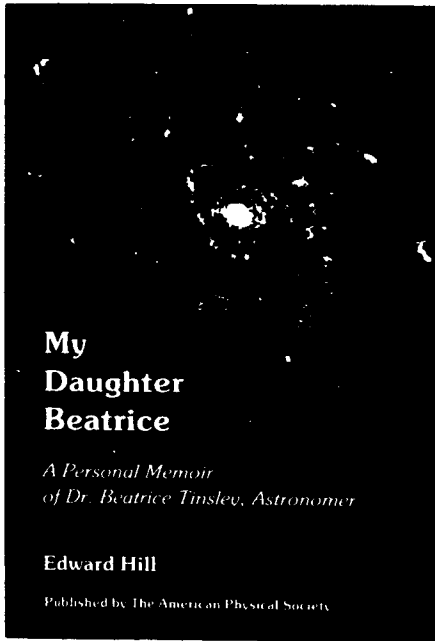
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New from the American Physical Society

# My Daughter Beatrice

A Personal Memoir of  
Dr. Beatrice Tinsley,  
Astronomer  
by Edward Hill

Reprinted from *Physics Today*, November 1986:

## APS PUBLISHES MEMOIR OF BEATRICE HILL TINSLEY

APS has published a memoir of Beatrice Tinsley (1941–81), who was an astrophysicist and professor of astronomy at Yale University. The book, *My Daughter Beatrice*, is by her father, Edward O. E. Hill. Hill says in the foreword that he decided to write this memoir when Sandra Faber of Lick Observatory informed him of the medal and prize that had been established in Tinsley's honor by the American Astronomical Society. He realized that his daughter would be widely remembered as a scientist and that many people would want to know more about her as a person.

In 1984 Hill circulated photocopies of his typescript to a few of Tinsley's friends in astronomy and astrophysics, who in turn shared it with their friends. Last fall the APS Committee on the Status of Women in Physics recommended that APS publish the book as part of the society's program to encourage young people, particularly women, to choose careers in physics and to help their families and teachers understand the preparation and struggles, risks and rewards, such a choice involves.

APS Deputy Executive Secretary Miriam A. Forman, an

astrophysicist at the State University of New York at Stony Brook, says that Tinsley is remembered as a brilliant astrophysicist and professor of astronomy. "In her tragically brief career she revolutionized the study of the evolution of galaxies. She was famous among astronomers for her prodigious creativity, and also as a gracious friend, dedicated teacher, mentor and colleague," Forman says.

In the book's introduction Faber writes, "Fatally afflicted in mid-career by melanoma, she had by that time already produced a body of research worthy of a full lifetime's effort. Her influence extended far beyond the halls of Yale and was felt, literally, wherever galaxy evolution was an active subject."

In the book, her father gives a parent's view of his daughter's growth from a bright and sensitive child into a world-famous astronomer. Hill quotes extensively from letters Tinsley wrote from the age of seven until just before her death. Her own words to her family give an intimate look into all stages of the development of a scientist, including a very candid view of her struggles between home and career.

The introduction by Faber and obituary by Richard B. Larson (Yale) and Linda L. Stryker (Arizona State University, Tempe) put Tinsley's life and personal contributions into the context of her scientific achievements.

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