CSWP GAZETTE

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

September 1984 Volume 4, Issue 3

FOREWORD TO OUR READERS

In this issue we start a new policy of rotating editorship of the newsletter. Dr. Irene Engle continues to be a managing editor. However, primary responsibility will be taken by an editorial board. Editor for this issue is Dr. Julia Thompson, Physics Department, University of Pittsburgh, Pittsburgh, PA 15260.

The theme of this issue is a summary of and reaction to the issues raised in the study: *The Tenure Process for Female and Male Physicists,* carried out by Irene Frieze, Julia Thompson, and Elizabeth Baranger of the University of Pittsburgh under the auspices of the CSWP (full report available from authors on request). A number of other items of interest have been postponed until a later issue because of space considerations.

SUMMARY OF THE TENURE COMMITTEE SURVEY

Introduction

Women who are interested in science face many barriers to establishing a successful career as a scientist. They may not even take necessary mathematics and science courses in high school and college. Attitudes of other students and faculty further discourage those women who do enroll in such classes. Those who overcome these barriers may then face further difficulty in graduate school and in finding jobs after receiving their doctorates.

Recently there has been an increase of women who pursue doctoral degrees in the sciences, but equal early preparation and qualification still does not seem to guarantee equal later advancement. A conference dedicated to this question (Science **221**, 4618) concluded that salary, promotion, and tenure still lag for women and postulated that more limited opportunities to form mentorships and engage in collaborative work may account for some part of the apparent difference in productivity. In a 1981 survey of 1970–74 doctoral recipients, 68% of the men but only 47% of the women had reached tenured positions, while only 17% of the men but 32% of the women were still assistant professors.

The preceding remarks apply across all fields of science, but some comparable figures are known for women in physics. From a description by Roman and Czuiko on American Physical Society members in *Physics Today,* February 1983, and various American Institute of Physics statistical compilations, we note that only 1.5% of senior physics faculty are women. The salary differential between men and women at the full professor level is $1000, or 3% of the average salary. The median age of full professors is four years older for women than for men.

Because the "tenure gap" or increased time to tenure for women seems to reappear often, even for scientists of comparable scientific productivity and visibility late in their careers, this investigation has focused on career patterns of a matched sample of men and women: scientists who are in tenure-stream appointments or have received tenure in research universities. Because tenure is a crude selector for quality, and the men and women are matched by position at the same institutions, our samples of men and women are roughly equivalent in quality. We have not tried to fine tune this quality indicator but have instead studied career patterns, including breaks for child-rearing and moves to accommodate mutual careers in two-career families. Opportunity was given for open-ended comment to expand upon, explain, or take exception to the objective questions and answers which formed the bulk of the study.

Comparison of Tenured Males and Females

There were 46 tenured women and 127 tenured men in the final sample. All of the tenured physicists in the sample had Ph.D. degrees except two of the women. Seventy per cent of both groups were full professors. Ten per cent of the men and 2% of the women were department chairs or directors. Equal percentages of the women and men were in experiment and in theory. Relatively more women were in elementary particle and in teaching, while fewer were in nuclear. Solid state, high energy particle physics, and nuclear physics were the most common specialities overall. High involvement in teaching was cited by some as a necessary accompaniment of career breaks or changes for personal reasons. Only 23% of the sample were no longer working in the field in which they received their degree. Men were slightly less likely to change than women but the difference was not statistically significant.

For both men and women, about 40% of work time was spent on research activities, 44% on teaching, 5% on grant administration, and 10% on other activities. About one fourth reported that this time allocation had changed. The women reported changing to being involved full time in research and getting more involved in administration. More involvement in administration was the primary type of change for the men (46%). Previous findings of women being more interested in teaching were not confirmed in the sample.

One man and five women reported a break in full-time work of more than a year. Two women (and no men) reported working unpaid for some years. Over half the women and 30% of the men reported accepting jobs for personal reasons. The women were most likely to have accepted jobs to be in the same location as their husbands or for other family considerations and more likely to have accepted jobs not beneficial to their careers.

Achieving Tenure

There was a significant difference in the time it took women to achieve tenure as compared to the men. While men took an average of 8.3 years from the time of receiving their Ph.D. degrees, women took an average of 10.9 years. The variance in time for women was also greater, indicating that some women got tenure as quickly as any of the men while others took a good deal of time. Six of the women took over 20 years to achieve tenure while all the men had tenure by 19 years after receiving their degrees.

Men (86%) were more likely to be married than women (65%). Only one man but eight women were single (1% vs 17%). Eleven percent of the women were divorced while 6% of the men were. It appears that not being married is a consequence of high career involvement for many tenured women. The women had fewer children (1.5 vs 2.5) than the men on the average. The women reported assuming 70% (and men 26%) of the care for their children. Thus, child care responsibilities may be contributing to the longer length of time women take to acquire tenure. Changing jobs for personal reasons might also contribute to length of time to tenure.

When a comparison of tenured faculty who had not changed jobs

for personal reasons and who had worked full time since receiving their degrees was made, 17 (out of the original 46) tenured women and 87 (of the original 127) men remained in the sample. In this group, there was no difference in the time it took for men and women to attain tenure. Both averaged 8.2 years. Even in this highly selected sample, however, the men had more children than the women, and those women who did have children spent more time in caring for them than the men. The women also attained their Ph.D. degrees from somewhat more prestigious institutions.

Forty-six percent of the tenured women believed that they had experienced sex discrimination in their careers. Examples of such discrimination given by the women in the study included not being given full credit for publications co-authored with their husbands, not being given a regular position or promoted because their husband was (or was not) on the tenured faculty, not being given as much mentoring or other support by senior faculty, and being told that tenure was not appropriate for a woman. The women also cited numerous difficulties in achieving tenure related to the fact that they had taken nontenure stream positions earlier in their careers, in accommodating to family constraints. Interestingly, only 28% of the untenured women felt that sex discrimination had affected their careers. Either things are changing, or the untenured women have not yet confronted continuing forms of discrimination.

Untenured Physicists

There were also sex differences among the untenured faculty. The women more often were affected negatively by career changes and more of them were working part time. There were no differences in the amount of time spent on research or teaching, but men spent more time on grant administration. The untenured men got their degrees from more prestigious institutions than the women. There were no other statistically significant differences in the untenured males and females.

Conclusions

The results of this study replicate earlier studies in that academic women were found to take longer to achieve tenure than men. However, the fact that women take longer to gain tenure appears to be related to their working part time and making career and job changes for family reasons. When women who followed the "traditional" pattern of working full time after receiving their degrees and not making career changes for personal reasons were compared with similar men, there were no differences in the time to acquire tenure.

EDITORIAL REACTION TO TENURE SURVEY

This summary of demographic characteristics of tenured women physicists illustrates the challenges attending professional physics careers, particularly with respect to two-career families and child care. With this background we bring a sense of perspective to the lively discussion engendered by the letter (from the Los Alamos physicist and mother), printed in our last issue.

Many of the writers in Letters to the Editor eloquently raise the same issues addressed in our Tenure Survey. Here I will observe only that other research indicates that women with scientific productivity equal to that of men are rewarded equally except that it still takes them longer to get tenure. Coupling this information with the results from our survey showing the relatively large number of women who achieved tenure and substantial scientific stature after some break in their scientific career (working part time or taking vacations in summer to accommodate the care of young children, or working unpaid or at less than optimal jobs to accommodate two-career family needs), leads one to a hypothesis that is tentative but startling within the context of the usual folklore: a formal break need not be disastrous for one's scientific career. Provided one is able to keep in contact with one's field, the largest effect may be a delay rather than a loss in scientific productivity and career recognition. One goal of CSWP is to help make such choices freer and better informed by 1) disseminating information about choices other women have made and the consequences of those choices; and 2) suggesting changes in the existing system of scientific work and rewards to alleviate the personal strain and maximize the scientific effectiveness of scientists who are combining the important roles of physicist and family member (often parent). We are struggling with the question of what those suggestions should be. We would like to encourage a discussion of constructive alternatives among our readers who have important experiences to bring to bear on this problem. The dialogue fills this issue of the newsletter. We hope it will continue as we try, together, to grapple with one reader's questions: How much should we change and adapt? How much should our institutions change?

RESPONSES TO LOS ALAMOS PHYSICIST

The letter from the physicist mother of three in Los Alamos has triggered a number of letters to the editor. The first letter, from the present and two past chairs of CSWP, emphasizes a theme returned to by other writers: each person's particular blend of career and family is that person's own choice. CSWP hopes to increase a woman's options in choosing a career in physics, as well as in combining such a career with family responsibilities.

Dear Professor Engle:

We were saddened by the hurt and hostility expressed in a recent letter from the mother of three living near Los Alamos. On reflection, we think the obvious has to be said in response to the letter: the relationship between a career in science (or anything) and parenthood is the decision of the individual. Ideally, this decision is not a default condition but based on choices. Careers in science for women is a slowly emerging reality. CSWP is working towards the goal of making a career in science a viable option for women, including women with children and women in their 40's who still aspire to a career in physics.

The charter of CSWP is not to enhance the careers of women in physics. Rather it is to "initiate activities and projects aimed to develop and bring to physics the talents and intellectual endeavors of women; gather and disseminate information concerning the status of women in physics at all education and career levels and advise (APS) Council on appropriate actions the Society can undertake." We are quoting from the CSWP charter.

For all women who have something to contribute to physics, CSWP wants to help create the opportunity to do so if that opportunity does not already exist. The choice to accept that opportunity is a personal one and not a matter which CSWP addresses.

P. E. Cladis, 1982 Chair CSWP
L. Eisenstein, 1983 Chair CSWP
E. K. Sichel, 1984 Chair CSWP

Note: All succeeding correspondence is severely edited due to space limitations. The editor's apologies to any writer who feels her ideas were distorted.

Dear Dr. Engle,

I found that I was very much troubled by the letter from the unknown writer in the May issue of the *CSWP Gazette.* In it she expressed the feeling that she had made the right choice in putting her family before her career. Why then does she feel such bitterness? This is strictly an individual choice and what is right for one is not right for another. . . .

I'd like to thank you for printing the letter and thus impelling me to write to you and express my views. It has long been my belief that all people regardless of their sex should be encouraged to pur-

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2. Ion Immune CMOS Logic Designs
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sue the lifestyle which is right for them. The *CSWP Gazette* has always been most encouraging for me, who as a graduate student in physics will be starting a family and receiving a Ph.D. at about the same time. I still am not sure which will arrive first, the baby or the degree.

Pamela A. Mitchel

Dear Dr. Engle,
The woman living in Los Alamos seems to feel that career and family cannot coexist, yet they do for many of us. . . .

Having a two-career family can be very awkward. These last two years, we have had a commuter marriage—I am in New York and my husband is in California. Fortunately, he is a computer consultant and will soon be able to move to New York. I do not recommend such an arrangement to anyone—the strain is too great.

Lynn Garren

Dear Copy Editor:
Although this has to be a rather personal account, I feel a compelling impulse to address the issues raised in the letter from the mother in Los Alamos. Superficially my story strongly resembles that of the letter writer. I am also a woman in physics with an M.S., and I expect to receive my Ph.D. during the coming academic year. That there will be an interval of thirty years between the two degrees is a direct result of the fact that I had and raised, not three, but seven children. I have no regrets and with the total lack of objectivity typical of any mother, I see my children, now all young adults, as intelligent, attractive, warm, and intriguing people. It hardly seems fair to blame the physics community or the whole of society for the fact that there are a finite number of hours in a day, or in one's lifetime, and that no one whose ambitions are many and high has enough time to fulfill all goals.

To be able to return to my graduate career in physics, a love I never abandoned while teaching physics at many different levels throughout these years, is good luck beyond imagining. I am terribly grateful that your committee exists and will perhaps make it easier for me to continue my career with a suitable postdoctoral and finally an academic position. I have been undeservedly fortunate in my advisor, my professors, and my fellow graduate students at the University of North Carolina—Chapel Hill, and also in my family, all of whom have contributed immeasurably to my successful return to higher education in physics. While this has been hard work, as was raising seven children, both have been exciting, challenging, very rewarding, and most of all fun.

Everyone makes a decision as to what proportion of time to devote to family and to career. I would hope that there is enough freedom, flexibility, and tolerance in physics that no one would condemn or be condemned by those whose drummer dictates a different proportion.

Tricia M. Reeves

Editor:
Any woman who has worked a day outside the home knows that there are many, many problems to face. Just to name a few: How do two professionals (husband and wife) both find appropriate employment in the same geographical area? Should one have children, wait until later, or not at all? If one has children, does one work full or half time? . . . Most of us love our children dearly and they have not grown up to be psychologically twisted because we worked. Historically, women have worked both inside and outside the home as a matter of course until the twentieth century. The whole point of this letter is that our readers should have more tolerance and compassion for their fellow women. Maybe we cannot have it all, but we can have a bit more than some people believe. I speak from experience as a mother of three boys, a Ph.D. in physics, and a full-time working scientist.

Dr. P. S. Gillespie

Editor's Note: However, in responding to the Los Alamos physicist's misunderstanding of CSWP and the values of many working female physicists, we should not overlook a valid point emphasized by the next writer.

Dear Dr. Engle:
I want to report on how useful I found the bibliography of material prepared by Prof. Eugenie Mielczarek which was included in the Feb. 1984 issue of the *CSWP Gazette*. **[ed. note**: An updated version is available through CSWP from Julia Thompson (Univ. of Pittsburgh)]. I wrote for a number of items which I then used to prepare for a luncheon discussion on "Women in Science/two-career families" which I led recently at Otterbein College. I would also like to share the following bit of information which was provided by Dr. Philip Barnhart during this discussion. He gave us the results of a questionnaire he presented to his incoming physical science students: if they had a negative attitude towards science, what did they feel was the most important event or cause? More than anything else, it was the lack of encouragement and/or the negative attitude expressed by the teacher (*especially in the elementary grades*) which had turned off the student to science rather than the subject matter itself.

I would also like to comment on the concern of "Name withheld by Editorial decision" in the May 1984 issue of the *CSWP Gazette* with a quote from Jill C. Bonner's contribution on "The Cult of Objectivity in the Physical Sciences" to the Bunting Institute Working Paper on "Choices for Science" (pp. 56 and 57):

"An even more serious problem for women scientists lies in the very structure of the science profession. The whole profession is tailored to the life-style of the (white) male. . . . women, far more than men, have their mobility and therefore also their bargaining capability restricted by spouse and family. Women are all too frequently big losers in the scientific race through this factor alone. Male scientists . . . assert that obviously and objectively 'that's the way that science is run.' Women and any others who do not or cannot fit in must pay the inevitable price."

"Name withheld," Jill and I ask the question: Is the present system necessarily the best and only way to operate the scientific profession? May one not be equally committed to fatherhood or motherhood and one's profession? Can there not be more flexibility in the employment situation to the benefit of both males and females?

Dr. Hélène R. Dickel

Editor's Note: Changing our larger society or even our smaller physicist society is no easy job. One reader has some suggestions, and a problem. Can we help her?

Dear Editor:
How about prizes for outstanding physicist father or mother of the year? Also how about travel expenses for entire families to physics meetings? And how about managing to teach little kids about physics without turning them off physics completely? The physics profession is notorious in my opinion for managing to turn people off at the introductory level. . . .

We could develop a tolerance for toddlers in the classroom and certainly develop baby-tending and possibly elementary school classes run by the laboratory or university where mothers and fathers are close to their children. But we may be rapidly approaching a point where bringing the children along to work won't be necessary. With our rapidly developing communication and computing networks, why can't parents stay home (at least sometimes) and communicate with other physicists over a computer network?

And as the first small step toward solving that problem, *is there any way that some university with a decent Ph.D. program in physics will*

or can let me study electrodynamics without leaving home?

Teresa Gordon

Editor's Note: The May 1984 *AAPT Announcer* editorial strongly agrees that good science teaching in the early grades, as well as supportive physics faculty, are important in making physics as a career more accessible to women. CSWP agrees with the importance of early education and choice; witness our booklet for middle and high school students: *Physics in Your Future*, and our offer to put elementary/high school science teachers in touch with physics researchers interested in science. Would any of our readers like to volunteer to be part of that network?

Finally, as another step toward role models, see the article below.

SENIOR POSITIONS IN PHYSICS AND ASTRONOMY

Women interested in moving from industry to academia or interested in changing geographical location are urged to contact Prof. Mary Beth Stearns at Arizona State University, Tempe, AZ or Dr. Carol Jo Crannell, NASA-Goddard Space Flight Center, Greenbelt, MD (301-344-5007), of the APS Panel on Faculty Positions for Women Physicists and Astronomers. The Panel was formed to facilitate the movement of women to senior University faculty positions.

Presently women receive approximately 12% of the B.S. degrees in Physics, comprise 10% of entering graduate students in Physics, and receive 13% of terminal master's degrees but only 7% of Ph.D.'s. The Ph.D. pool is estimated at 3% women, reflecting degree patterns of previous years. However, only 1.5% of senior physics faculty are women. As discussed eloquently in Jack Wilson's editorial in the May 1984 *AAPT Announcer,* early education factors not normally within the range of responsibility of University faculty clearly influence young women's high school choices about high school preparation which in turn may constrain their choice of careers at the college level. However, visibility of and easy access to women in senior positions raises the expectations of young women as well as strengthening their network of informal contacts for advancement and supports in nonacademic crises. Strengthening of this network could well increase the number of women who continue to the Ph.D.

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