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CSWP Gazette

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

INSIDE

Letter from the Editor

By Alice E. White, Bell Laboratories, Lucent Technologies

Welcome to the Fall 1999 issue of the CSWP Gazette! I've just returned from a wonderful weekend on Nantucket, where I accepted the Maria Mitchell Association Women in Science Award on behalf of the Bell Laboratories Graduate Research Program for Women (see accompanying article). The ceremony was very moving, with inspirational talks by Mara Alper, founder of the award and, until recently, curator of the Maria Mitchell Museum, Paula Rayman, an economist and Director of the Radcliffe Public Policy Institute, and Betty Letvin, director of the Math/Science Network, which is located at Mills College. I found the Maria Mitchell Association to be a group of dedicated, thoughtful people who, through their individual contributions, were making a real difference. Paula Rayman made the excellent point that, although the legislation has been passed to allow women equal access, there is still a very long way to go. Awards like the Maria Mitchell Award help to promote awareness by recognizing programs that are effectively addressing the problems. The ceremony was followed by a buffet dinner in Hinchman House, part of the Maria Mitchell complex, which includes her birthplace and her observatory. After dinner, they opened the observatory and we had a chance to view Jupiter and 4 of her moons through the telescope that Maria Mitchell used. What a thrill!

I hope that you will enjoy the other articles in this issue of the Gazette. Meera Chandrasekhar, who recently won one of the 1999 Presidential Mentoring Awards, describes the Newton Summer Science Academy, another program that is seeking to interest more girls in science. Monica van der Garde discusses the situation for women in the Netherlands and an initiative by FOM to improve things. Ann Orel shares what she has learned about childbearing leave policy as applied at her institution, UC Davis. Meg Urry reviews the history behind the Baltimore Charter and has some thoughtful recommendations for positive action. Finally, Stew Gilmor gives us an historical perspective with his article on the teaching of physics at women's colleges a hundred years ago.

As a new member of the CSWP, I've been impressed with the energy and dedication of the people on the committee. Issues that are being considered include broadening the site visit program to national labs, childcare at APS meetings, the roster of women and minorities in physics, and increasing visibility for women throughout the APS. We discussed possible venues for the Women in Physics display that was created for the Centennial meeting and encourage suggestions. In addition, the CSWP supports and advises Judy Franz and the Council on issues involving women, including the creation of a IUPAP Working Group on Women in Physics. As always, we welcome your input and your involvement!

Presidential Award Honors Meera Chandrasekhar

Dr. Meera Chadrasekhar of the University of Missouri, Columbia recently received one of the 1999 Presidential Awards for Excellence in Science, Mathematics and Engineering Mentoring.

In 1992, Dr. Chandrasekhar developed Exploring Physics, an afterschool program to introduce physics to female students in grades 5-7. It has grown to be part of elementary schools' curricula, impacting about 300 students annually. While maintaining an active research laboratory where she studies the optical characteristics of semiconductors, Chandrasekhar also developed three additional programs: (i) Families Exploring Science and Technology, where students in grades 6-7 and their parents build a drawbridge; (ii) Saturday Science, students in grades 8-9 visit local industrial sites and participate in hands-on activities; and (iii) Newton Academy, a ten-day residential science and technology program for female students in grades 9 through 11 (see story on page 10).

Ten individuals and five institutions were honored this year. The mentoring awards recognize those whose personal and organizational activities have increased participation of underrepresented groups in mathematics, engineering and science from kindergarten through graduate level.

Both the individual and the institutional awards, which are administered and funded through the National Science Foundation (NSF), include a $10,000 grant which is to be directed back into the recognized mentoring activity, and a Presidential commemorative certificate.

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Kathryn McCarthy Fellowship

By David Weaver

The Department of Physics and Astronomy at Tufts University wishes to announce the Kathryn A. McCarthy Lectureship in Physics.

Kathryn A. McCarthy has achieved a remarkable span of academic, advising, research and administrative contributions to Tufts University, the scientific community and the private sector. It is with these accomplishments in mind that we are honoring Kathryn with the endowment of the Kathryn A. McCarthy Lectureship in Physics at Tufts University. The Lectureship will be awarded annually to a woman scientist, preferably in the field of condensed matter physics or a related field, who has been chosen by the Lectureship committee to represent the professional and personal qualities that Kathryn has stood for at Tufts during the past 57 years. The awardee will visit Tufts for several days and give the Kathryn A. McCarthy Lecture to a general audience open to the entire University community. The awardee will also give a technical colloquium to the members of the Department of Physics and Astronomy and interact, in particular, with the members of the condensed matter group in the Department and groups in related fields at Tufts. The awardee will receive an honorarium and have her name engraved on a plaque which will hang in the Department's condensed matter group area in the Science and Technology Center.

Kathryn received her undergraduate education at Tufts College, where she graduated Phi Beta Kappa with an A.B. in Mathematics in 1944 and a M.S. in Physics in 1946. She began her career as a teacher in the Department of Physics, becoming an instructor in 1946 (the youngest in Tufts history). In 1953 when she returned to graduate school, receiving a Ph.D. in applied physics from Radcliffe College in 1957, while continuing to teach at Tufts as an Assistant Professor. During this time Kathryn began her work on the physical, optical and thermal properties of optical crystalline materials, which she continues to this day. Kathryn's professional recognitions include elections as a fellow of the Optical Society of America and of the American Physical Society.

Kathryn's administrative talents were recognized early and she was asked, first, to be Dean of the Graduate School of Arts and Sciences from 1969 to 1974 and then Provost and Senior Vice President, a responsibility which she carried out with great success from 1973 to 1979. Her colleagues in the Provost's office have said that she made working for her at this level a great experience and made that often used expression "consciousness-raising" a reality for many during her five and a half years in the post. Baseball, stuffed animals and nerf balls were introduced at the highest levels as a part of the fun times after a busy week!

In addition to physics research and teaching and academic administration, Kathryn has always sought to apply her talents to the wider academic and professional community with membership and high office in the Tufts chapter of Sigma Xi, The New England Optical Society, the Radcliffe Institute, the New England Rhodes selection committee and the Visiting Committee for Applied Sciences of Harvard University. Kathryn has been a Trustee of Southeastern Massachusetts University, of Merrimack College and of the College of the Holy Cross, where she is Vice-Chairman of the Executive Committee. The latter two colleges have recognized Kathryn with honorary doctorates.

The private sector has also asked Kathryn for her time and energy. Kathryn has made a particular commitment to the Lawrence Memorial Hospital of Medford, where she served first as a member of the Institutional Review Committee, becoming a director in 1978. Kathryn was elected Vice Chairman of the Board in 1986 and became Chairman of the Board in 1991, one of the many activities which she continues.

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Get exposure for yourself and your research while serving as a role model for women in physics!

Add your name to the Women Speakers List at http://www.aps.org/educ/cslwip.html or see page 17 of this issue!

The Baltimore Charter and the Status of Women in Astronomy

By Meg Urry, Space Telescope Science Institute

The following article is based on an invited talk at the Centennial meeting of the American Physical Society (March 1999), in a session called "Patching the Pipeline: Issues and Actions" sponsored jointly by the APS Committee on the Status of Women in Physics and the APS Division of Astrophysics.

The Status of Women in Astronomy

To be a women in physics or astronomy is to feel out of place, consciously or subconsciously. This was especially true when I was just starting out, some 20 years ago. The professors were mostly men, the graduate students were mostly men, speakers at meetings, prize winners, committee members—all mostly men, sometimes only men. The subliminal message was "women don't belong here, there's no place for you".

Some ten years later, in the early 1990s, after 10-20 years of supposedly enlightened "non-discriminatory" times, women still didn't seem to be progressing at the same rate as men. For a very clear example, I could look to my own institution, the Space Telescope Science Institute (STScI) which aspires to be an elite academic institution, in the top five or ten astronomy departments in the US. Unlike Harvard or Caltech or Princeton, however, STScI had been founded only very recently (to run the Hubble Space Telescope science program). As a result, its faculty reflected very recent hiring patterns, not the vestiges of massive hiring of science faculty in the 60s (which is often given as the reason men dominate physics departments). The first STScI staff were hired in 1981, and the astronomy "faculty" (a tenure-track completely analogous to University faculty) had grown to more than 30 by 1990, when I was hired, only the second woman.

Thus, STScI was a pristine "experiment" illustrating the slower advancement of women in the profession. Throughout the 1980s, the percentage of Ph.D.s in astronomy (and physics) awarded to women was 10-20%

Photo courtesy of Meg Urry

Cecilia Payne-Gaposchkin

(which has been true for the past 100 years!) yet only ~5% of the **newly hired** tenure-track faculty were women. I'm happy to say this has changed dramatically. Because of affirmative steps taken by an enlightened management, women now hold 7 of the 42 tenure-track positions. At 17%, this is the highest percentage and highest absolute number in any major U.S. astronomy department. Altogether, there are 11 women of 76 total faculty, plus another half dozen Ph.D. women in technical roles. My female colleagues, especially in physics, may be envious of the idea of a dozen female colleagues in the same department, when many universities barely have that many women across all the physical sciences. Having been in both situations, I must say my present environment is much better, much less stressful, at least for me.

The 1992 STScI survey of 32 major US astronomy departments and institutions showed a similar situation throughout the field (Schreier, Proc. Meeting on the Status of Women in Astronomy, 1992, see http://www.stsci.edu/stsci/meetings/WiA/). In 1992, the percentage of women in astronomy decreased from nearly a quarter of the graduate students to less than 5% of the senior faculty. Although the data represented a snapshot of the profession at only one epoch, it was alarming that only 1/3 of the women in elite graduate schools appeared to find postdocs in the same elite institutions, compared to 1/2 of the men.

The field of astronomy grew in the 1980s, so the climate was a positive one. Why were women not moving from graduate school to academia at the same rate as men? It certainly wasn't an absence of qualified, interested women—there is a long and glorious tradition of women in astronomy making fundamental contributions. In the last 100 years alone, Cecilia Payne-Gaposchkin established that stars consist primarily of hydrogen; Henrietta Leavitt discovered the period-luminosity relation in Cepheid variable stars, a key element of determining the distance scale of the Universe; and Beatrice Tinsley created the field of stellar population synthesis to understand galaxy evolution. Moreover, "women have made most of the fundamental contributions to cosmology in the postwar era," according to Jerry Ostriker, a distinguished professor of astronomy at Princeton University. Astronomy today would be very different without these critical contributions, yet women as a group have not benefited from the conspicuous successes of their predecessors.

There is considerable evidence that women advance more slowly than men do across almost all professions, particularly science, as discussed by Gerald Sonnert and Virginia Valian in the January 1999 issue of STATUS. Dr. Valian summarizes the extensive literature on this phenomenon across academia and the professions in her recent book "Why So Slow?" (*The Advancement of Women*, 1998, MIT Press; see also *STATUS* January 1999 issue). She concludes there is no one reason for the gender disparity; rather, that women are held back by the accumulation of

"Women have made most of the fundamental contributions to cosmology in the postwar era."

Studies and statistics clearly show women falling behind in science at all levels—the "leaky pipeline"—and there are many different ideas for what is wrong. What to do?

Harvard College Observatory

Henrietta Leavitt

many micro-disadvantages, such as tougher evaluations, lack of mentoring, limited access to crucial resources, and exclusion from leadership positions. As just one small example of the latter, the recent statistics from the National Academy of Science are disturbing. Women constitute only 6% of the NAS (132 women, 2067 men). It gets worse—in the last 20 years, 302 men and only 13 women have been elected (4%), and in the last 5 years, 89 men and only 2 women (2%) have been elected. The trend is going in the wrong direction!

Studies and statistics clearly show women falling behind in science at all levels—the "leaky pipeline"—and there are many different ideas for what is wrong. The disparity isn't fair, and science undoubtedly suffers from missing half the talent pool. What to do?

The Baltimore Charter

In 1992, we at the Space Telescope Science Institute decided to do something to address the apparently low status of women in astronomy. Following a suggestion from Goetz Oertel, the head of AURA, our parent organization, we decided to hold a meeting about the issue. Riccardo Giacconi, then Director of the STScI, supported the idea enthusiastically. He first looked for an existing solution, some "code of behavior" that would make things right. When he couldn't find one, he suggested that we write our own. This was the origin of the "Baltimore Charter," a document that would describe the actions needed to turn things around. It is important to note that, because these two men were in powerful positions, they could make things happen—the meeting, the Charter, and, in time, a significant increase in the number of women scientists working at STScI.

The 1992 meeting at STScI on The Status of Women in Astronomy was aimed at our "sphere of influence," meaning women in the US at the undergraduate level or beyond, although much of what we discussed, and the Charter itself, applies to minorities as well. More than 220 people attended the meeting, 3/4 women and 1/4 men, divided roughly equally among students, postdocs/junior faculty, and senior faculty/observatory directors/funding agency representatives.

The consensus was that there was no one problem inhibiting the success of women in astronomy. It was certainly **not** a lack of interest, lack of ability, or even the formal lack of opportunity. Instead, there was a complex set of micro-problems, including overt discouragement of women; perception of women as less talented, less capable, less authoritative; lack of faculty/role models; frustration at lack of advancement; physical safety; family issues (logistical difficulties more likely to affect the women); sexual harassment; and "climate" (language, pictures).

The purpose of the Baltimore Charter (text at www.aas.org/~cswa/bc.html) was to suggest concrete steps to improve the status of women in astronomy. A key assertion is that positive action is required to change the status quo, hence the five major recommendations of the Charter. The most important of these, and the most controversial, is the statement that "Affirmative action is a necessary part of the solution." This means establishing, publicizing, and honoring objective standards for any evaluation (hiring, prizes, etc.); bringing women into the evaluation process; encouraging men to take responsibility for the success of women; and monitoring progress through demographic data. Other recommendations address family issues, sexual harassment, climate, and physical safety. The Charter ends with a call to action for all our colleagues to facilitate the full participation of women.

After the Baltimore Charter: Changes in U.S. Astronomy

There was no mass movement to endorse the Baltimore Charter or to implement its recommendations widely, although it appears to have helped some individual women, especially those isolated in small departments. The most profound impact, however, was probably the meeting itself—its effect on the 220 people who attended. The experience of listening, learning, thinking positively, reinforcing one another, and forming a consensus for action affected many participants profoundly. Students felt fortified in their ambitions, junior astronomers felt hopeful and determined, and senior astronomers and officials felt renewed determination to make change. More than two hundred highly informed and enthusiastic people dispersed from the meeting throughout American astronomy, into positions of power from which **they** made change happen.

Or so it appears. For the APS talk in Atlanta, we updated the STScI statistics on women in astronomy, re-surveying the same top institutions as in 1992. The preliminary results are very encouraging. There appear to have been two major changes in the past 7 years, during which the field grew by roughly 25%. 1) The progress of women and men from graduate school to postdoc positions is now equal, with 1/2 making this transition. Promotions from associate professor to full professor (well sampled in this 7-year period) appear equal for women and men, within the statistics (nearly ~100% throughput). A full report on the new statistics will appear in the next issue of STATUS.

Photo courtesy of Meg Urry

Beatrice Tinsley

Ten Things You Can Do

Clearly the field of astronomy is changing. But even with **equal** progress of men and women (and we're not there yet), change at the top (most astronomy faculty are full professors) will take decades, so it's imperative to maintain the momentum. In the spirit of the Baltimore Charter, I close with a list of ten positive steps everyone can take:

1. Do what you **can** do. No one person can solve every problem, or even one problem, but we all have our own sphere of influence. Start locally, and take on some aspect you're particularly interested in. Be careful not to pass the buck! For example, if you are a University professor, concentrate on what you can do for undergraduate and graduate students. (Even if you think it all starts in kindergarten, leave that problem for someone else.) Mentor women, invite women scientists to give colloquia, conduct exit interviews when students or postdocs leave your department, encourage support groups — whatever it takes in your particular situation. There is no one answer and no simple formula but everyone can contribute.

2. Mentor. The research is clear: mentoring makes an enormous difference. Watch out for those coming up behind you, support your peers, and stick up for those ahead of you. Encourage discussion groups, listservs, special dorms, the CSWP and CSWA. Keep a list of bright women scientists — people are always looking for suggestions for talks, prizes, refereeing, committees, etc. And there is no reason women should bear the brunt of the mentoring burden — men can be effective if they make the effort.

3. Maintain a positive climate. Use "he/she" instead of "he", make sure women are pictured in publicity brochures, get rid of "pin-up" images, avoid male-dominant language, make clear that behavior contributing to a hostile climate is unacceptable.

4. Ask questions. Hold your colleagues accountable. Ask how many women are included in recruitment for jobs, prizes, committees, APS fellows, NAS, etc. Ask how many women are giving science talks at the next meeting you organize or attend. The Special Symposia at the APS Centennial meeting were filled with esteemed scientists giving talks on fascinating topics, but, if you exclude the "sociological" sessions on women or minorities in science, I counted only 1 woman speaker of perhaps 100 or more men.

5. Affirm, don't defend. You don't have to address other people's agendas or their definitions or misconceptions (e.g., "quotas," "lower standards," "reverse discrimination"). Instead, emphasize that standards should **never** be lowered, that it is the evaluations, the rankings, that are subjective and therefore flawed. The goal is not to "help" women but to equalize opportunity.

6. Involve others. Tell them stories—yours, and what you know. We are the products of our individual histories, so sharing experiences gives us new insights. Talk to students, give an extra talk when invited to give a colloquium, offer to meet with women students. When talking to senior faculty, ask how many women students there are, what the retention rate is, how many women faculty there are, etc. Small efforts multiplied by many people can have a significant impact.

7. Be goal/outcome oriented. Don't get bogged down in the whys, or which is the major problem, or what is the (perfect) solution. When you talk to your Department Chair or division head, don't let them sidetrack you with their theory of why women "fall behind" or with their story of all their heroic efforts on behalf of women in the past. **Ask about the outcome.** You (individually) are not responsible for the solution; you are raising the question, and the people in power (mostly men) are responsible for the solution. Without men we cannot effect significant change in our scientific institutions because they hold the reins of power.

8. Admit your own subjectivity. Examine your own perceptions — is there anyone, male or female, who has escaped the indoctrination of societal attitudes? Recognize that many of us automatically "give authority" more easily to men (speaker/teacher/colleague), whereas women start with a deficit (we doubt their abilities) until they prove them.

9. Listen. The concerns of young women today are not what they were 10 years ago, much less 40 years ago. As in all of life, if we extrapolate from our own personal experiences, we can help only those who are just like us. Many of us have argued for affirmative action, and have seen it help women move forward. But some young women object to "affirmative action" because they have bought into the notion that it gives preferences to women and therefore devalues their worth. So listen to men and women with diverse experiences and views—ultimately, there has to be "room at the Inn" for all these different outlooks.

10. Be pessimistic **and** optimistic. There will be (there is!) a backlash, but many things are far better than they were 30, 20, even 10 years ago. Discrimination has gone underground — it is no longer overt, and, while subtle discrimination may be harder to fight, it's also less effective. There are more women in all fields, there is greater acceptance of women, and there is greater support for working families. Remember the claim of the Baltimore Charter: "Improving the situation of women in astronomy will benefit [*all*] astronomers".

NOTE: The Proceedings of the STScI Meeting on the Status of Women in Astronomy are online at www.stsci.edu/stsci/meetings/WiA. The Baltimore Charter can be found on the Web at www.aas.org/~cswa/bc.html, and is also available as a letter-sized or full-sized poster from the Space Telescope Science Institute (email outreach@stsci.edu).

Ten positive steps everyone can take

Academic Careers and Babies, AKA "The Baby Book"

By Ann E. Orel, Department of Applied Science, University of California, Davis

What I discovered was that there was no "normal", that everyone had different experiences and different problems.

My institution, the University of California, Davis, has a formal childbearing leave policy. It outlines a variety of options, including stopping the "tenure clock" for assistant professors, as well as the possibility of reduced teaching loads for up to a year following the birth of a child.

Before my third child was born, I was trying to use the policy to arrange a reduced teaching load. Knowing that practice is sometimes different than policy, I tried to find out what was the "normal" arrangement, contacting other faculty members I knew who had had children. What I discovered was that there was no "normal", that everyone had different experiences and different problems.

As a result of my experiences, I asked Robin Whitmore in the Women's Resources and Research Center at UC Davis to help me assemble some first hand reports of what women faculty did to handle having children, especially as far as the UC Davis childbearing leave policy goes.

Robin helped me get a list of faculty that had young children. I e-mailed them, asking for their experiences and their permission to share their stories (with names and departments removed). Robin did a wonderful job helping to turn the rough data into a polished result. Without Robin and the Women's Resources and Research Center, the project would never had gotten off the ground. The result was distributed around campus and posted on the web at http://wrrc.ucdavis.edu/babybook.

My original purpose in beginning this project was to supply a source of information for other faculty. For example, when negotiating with your department chair, it helps to have a starting point, showing what has been done in the past, what is reasonable. Also, department chairs often have not dealt with this particular situation, so past history is useful. One amusing example concerned teaching and due dates. The usual assumption and one that I had made, even though my first child was two weeks early, was that you could teach up to your due date. Several of the stories involved pregnancies with twins, where the faculty woman could not fulfill her teaching duties early in the pregnancy, leaving the department chair scurrying for backup!

However, this project led to some other discoveries. The first and probably most important, was the uneven way the childbearing leave policy is interpreted and applied across campus. Each faculty member must negotiate with her department chair. Depending on that individual, but also on factors beyond their control, such as number of faculty and staffing issues, the outcome of the negotiation was vastly different. This issue, and what to do about it, if anything, is still being discussed at UC Davis. Other issues were, for example, twins(!), and practical matters, such as delaying review for standard merit advancement, not just tenure, if requested by the individual faculty member.

On the whole, the project raised more questions then it answered, and I have no idea what the final outcome will be. It has been useful to other faculty, and has raised a number of issues for discussion on campus, issues that are being addressed. It has also been useful when female graduate students (and sometimes the men too) ask me about balancing children and a career. I can now offer a source of information that complements my experience. If you are interested, I urge you check out the web site.

The Teaching of Physics at Women's Colleges in the United States a Century Ago

By C. Stewart Gillmor, Wesleyan University, Middletown, CT

At the close of the nineteenth century, the role of women in science, and especially in physics, was in a transitional period. This short note is based upon data from twelve women's colleges, seminaries and academies in nine states.

In the early and mid-nineteenth century, "Physics" was usually taught as part of Natural Science or Natural Philosophy, which was closely linked to Natural Theology. This was a pattern that went back as far as the early eighteenth century—demonstrating "God's handiwork and Design in Nature". Physics began to be a laboratory course about 1875, with pulleys, pendula, gravimetry, and some optics and electrical machines involved. As women's seminaries evolved into colleges in the decades after the Civil War and as high schools and Normal (teacher training) schools opened up, there was an increasing demand for secondary school teachers who could teach physics and chemistry. From about 1890 to 1915, there was a large growth in equipment and allocations of funds for construction of new physical laboratory buildings.

In general, the women's physics courses did not differ much from courses at the men's colleges. A commonly used text after the Civil War was Denison Olmsted's "Compendium" for the general reader or "Olmsted's Natural Philosophy" written for his students at Yale College. This was re-issued by Amherst Professor Ebenezer Snell in the 1860s and 1870s. The text assumed knowledge of algebra, geometry and trigonometry, but magnetism, sound, electricity and heat were still presented largely as descriptive and qualitative. The trend in physics texts was evolutionary, not revolutionary. Olmsted's text was often replaced by Ganot's "Elements

of Physics". The 14th edition (1893) at 1115 pages rivaled freshman texts used today. Entropy was not mentioned in the chapter on heat, but considerable attention was given to spectral analysis, fluorescence, phosphorescence, polarized light, Crooke's machines, Geissler's tubes, the microphone, loudspeaker and telegraph, and the aether. By 1900, reference texts included Carhart, Watson, Crew, Reed and Guthe, Kimball, and Spinney.

During these years, the early "Pioneer" Mistresses of science often took special courses at men's colleges or were individually tutored by male professors. Sarah Frances Whiting at Wellesley took an individual year of study at MIT with Edward C. Pickering and visited laboratories at numerous institutions, including at least three trips to visit noted physicists in Europe. Women's schools often invited distinguished male visitors to give annual series of lectures in the sciences to accompany the teaching of the Mistress; some of these men served also as college Trustees.

In the early years, physics classes were usually given in a building housing all of the sciences and mathematics. Laboratory classes began in chemistry about a decade earlier than in physics. As the physics faculties grew, the year of general physics gave way to an expanded schedule, often with a general introductory course in the sophomore year and another, more intensive, course in the junior year. By 1899, the pattern was set with a rather large number of students taking one year of physics, a considerably smaller number taking a semester of astronomy, and a mere handful taking further physics courses. Among the dozen schools I studied, three had a full time equivalent of three to four persons teaching physics, including a graduate assistant. The rest had about one full time person. With the new century and the desire for PhD-level physics teachers, the more intensive programs also sought to hire a trained machinist. Doubtless, salaries were lower and work was harder at some of the women's colleges, but salaries at the better-known colleges rivaled those at men's colleges.

Photo courtesy of Vassar College Archives

Vassar Professor of Physics and Chemistry, Leroy C. Cooley and women students outside the Vassar Brothers building, 1888. The Vassar family funded the construction of this building for physics and chemistry in 1879.

A few universities were friendlier to women in physics, allowing them to earn graduate degrees. By 1900, the new twentieth-century "Professional" with a PhD degree was entering the women's academic scene—Elizabeth Rebecca Laird at Holyoke, Louise Sherwood McDowell at Wellesley, Edna Carter and Frances Wick at Vassar. These women were members and later Fellows of the American Physical Society and other societies and each carved out a research niche. They were helped by the Sarah Berliner fellowship award for research. With the arrival of the "Professional", a number of "Transitional" women (those who followed the "Pioneers", but who had only a teaching credential, or the B.S. degree, and retired or dropped out of teaching around 1910) faded away. The twentieth century brought changes AND problems to women physics teachers. The women's colleges faced a dilemma: hire PhDs or hire Women? Unlike in French literature or in English, in Physics around 1910 it was difficult to do both.

The twentieth century brought changes AND problems to women physics teachers.

FOM Acts to Support Women in Physics in the Netherlands

By Monica van der Garde, e-mail: garde@fom.nl

"If a woman has a special gift for the practice of theoretical physics and has the ambition to develop her talent, which seldom occurs, I find it unjust to refuse her in principle categorically all possibilities to study. On the other hand, I hold on to the idea that such a case should always be considered an exception. Nature has predestined women for the occupation of mother and housewife." Signed, Max Planck, one hundred years ago.

Planck seems to have seriously underestimated the female capacities and ambitions. Even in the Netherlands—and our country is not exactly leading in an emancipatory respect—over 10 percent of the graduates in physics since 1992/93 are female. Ten years ago this was still a meager 3 percent. Also, the number of female Ph.D.s employed by the Dutch Foundation for Fundamental Research on Matter (FOM) has been 10 percent or more for the last few years. But of the female Ph.D.s, only 27 percent take up a post-doc-position, versus 39 percent of the men. For the permanent academic staff employed by FOM, the situation has been the same for many years: one woman for every one hundred men. Overall in the Netherlands, only two women have worked their way up to a professorship in physics. This year, FOM has almost $2.4M to start a program to end this waste of talent.

"The lack of female staff (and professors!) is not only a consequence of the small number of female students, but also a cause for the unattractiveness of the field for women. To break through this vicious circle, specific measures could be considered," wrote the international committee that evaluated the Dutch physics research in 1996. Wim van Saarloos, a professor in physics in Leyden and member of the Advisory Board of FOM, used his personal experience to plea for measures. In his years with Bell Labs in America, Murray Hill, NJ, he had learned that it is indeed possible to make a change. "By systematically trying to get and keep good women, the atmosphere changed indeed. Partly because of that, a number of talented female scientists have moved on to management positions." Why does he bother to work to increase the number of female physicists? "I have three daughters and, if one of them would consider to study physics, I'd have a problem convincing myself to recommend that to her unreservedly." "Actually," he continues,

"Women shouldn't worry too much about stigmatization. What matters is, if the ultimate goal is important."

"this is a strange question. At our universities, the ongoing decline in first-year students and the success rate of our curriculum is constantly on everybody's lips. But, when you observe that something is fundamentally wrong with the education of women in physics in the Netherlands and you try to improve that, it suddenly seems as if you have to justify yourself. As if that means that, as a man, something must be the matter with you."

Rachel Rietdijk, researcher with Shell in Rijswijk, has, until she had her first child, experienced her sex as an advantage rather than a disadvantage. "Everybody knows who you are and the presence of women changes the atmosphere in a group. Men tend to appreciate that."

However, after being a post-doc for three years in Great Britain, she decided she did not want to continue her academic career. The most important reason was the uncertain future.

"Officially Dutch universities claim they really want to employ more female scientists, but they don't act pro-actively and aren't flexible at all," observes Berend Smit, a professor at the Universiteit van Amsterdam. "I have worked a couple of years with Shell and there, if necessary, a position was created when a talented woman came around."

The committee that advised FOM about measures to keep more female physicists aboard, estimated that being a post-doc creates more personal problems for women than for men, says its chairwoman, Els de Wolf who is a researcher at the Institute for Subatomic Physics/Nikhef. In response, FOM created personal post-doc positions for women. These positions enable women to plan their career for four or five years. The position consists of an appointment of three years with FOM, to be carried out at a Dutch university or research institute. The candidate is required to work as a post-doc abroad for at least a year as well.

Under the program, universities can also get temporary funding from FOM to appoint or promote female physicists with the condition that the university will take over the appointment in some years. In addition, funding is available for various activities such as guest positions for foreign female physicists, attending a summer school, and so on. Every two years, a prize will be awarded for the best publication of a female physicist. Lastly, from the FOM program, research proposals from women that were were not funded by the usual channels for budgetary reasons can now be funded. "The proposal must meet all requirements of the 'regular' program," stipulates De Wolf, "but, the budget of programs is limited. Therefore an unaccepted proposal is not necessarily not good enough." The insistence on undisputed good quality is necessary to prevent stigmatization, because, as NIKHEF researcher Els Koffeman states: "A group of male physicists thinks that for a woman things are easier. That everything you achieve results from your being female. The irritating thing is that you can't answer that. You can work till you drop down, but you have never done it by yourself." Berend Smit replies, "Women shouldn't worry too much about stigmatization. What matters is, if the ultimate goal is important. Statistically, obviously women are hindered and FOM finds it so important to change that situation, it invests $2.4M in a program."

Silvia Völker, one of the two female physics professors in the Netherlands, emphasizes that in countries like France and Spain more women are active in physics, also in higher positions. "The mentality in those countries differs from that in the Netherlands and Germany, it's much more accepted that mothers work full time." "You can make up a lot of beautiful regulations, but if women can't combine work and care, they will not be interested," agrees Els de Wolf. That FOM, at this point, improves the terms of employment, is therefore for her a precondition for the success of the program. She is pleased to notice the atmosphere in physics is already slowly changing. "Also men now sometimes express a wish to work part time for a while to take care of the children." For example, since his son's birth, Berend Smit works four days a week, an unusual situation for a professor. "Not being possible to work one day less is a sort of carefully cultured myth in science. Science demands such passion, you *shouldn't* want to work one day less. But if a professor spends one day on, say, being a member of the Board of FOM, nobody wonders if that is possible."

Nonetheless, Els de Wolf has a cautious optimism: "It's such a shame that so few women choose physics. But female Ph.D. students fortunately are very enthusiastic about their work." Hopefully, this new FOM program will improve their prospects for a satisfying career in physics.

AAUW Scholarships Available for Dissertation and Postdoctoral Research

Compiled by Nancy Levinger, Colorado State University

The American Association of University Women (AAUW) is a national organization that promotes education and equity for all women and girls. One way that the AAUW achieves its goal is through its American fellowship program. This program, conceived in 1888, provides funding for dissertation completion by women in the last year of their doctoral studies, for postdoctoral studies and also gives women short-term assistance with writing projects. For many years, the AAUW Educational Foundation fellowships were one of the few paths to funding for academically qualified women. Particularly in the early years, recipients represented a cadre of exceptionally qualified women who wished to be judged on the basis of merit without concern for gender discrimination. More recently, applicants and recipients have remained exceptionally well qualified despite a greater ability to compete with men for other funding sources.

One mission of the AAUW is to increase the numbers of women in areas where they are severely underrepresented. As such, the physical sciences present a challenge to the organization. Despite the rising number of women in some fields of science, the physics discipline remains an elusive area. The American fellowships program rewards excellent performance by women thus supporting and encouraging representation in the given field. The AAUW encourages women studying physics to apply for these fellowships to increase the number women in the field of physics.

The AAUW American Fellowships support women doctoral candidates completing dissertations or scholars seeking funds for postdoctoral research leave. Applicants must be U.S. citizens or permanent residents. There are no restrictions on the location, field of study, or age of the applicant. Candidates are evaluated on the basis of scholarly excellence, teaching experience, and active commitment to helping women and girls through service in their communities, professions, or fields of research. Three types of American Fellowships are available:

Dissertation fellowships are available to women who are in the final year of a doctoral degree program, and are completing the writing of dissertations before June 30, 2001. There are no restrictions on the field of study. To qualify, applicants must have completed all course work, passed all required preliminary examinations, and received approval for their research proposals or plan by Nov. 15, 1999. Students holding any fellowship for writing a dissertation in the year prior to the AAUW Educational Foundation fellowship year are not eligible. Scholars may reapply once for a dissertation fellowship on the same topic. Open to applicants in all fields of study, except engineering. (For engineering, please see Selected Professions Fellowships.) Scholars who are engaged in research on gender issues are encouraged to apply. Fifty-one Dissertation Fellowships are available; approximately one third will be awarded to life or physical scientists.

Postdoctoral Research Leave Fellowships offer one-year support for women who will have earned a doctoral degree by Nov. 15, 1999. Fourteen postdoctoral fellowships are available: four each in the arts and humanities, social sciences, and natural sciences; one unrestricted; and one designated for a woman from an underrepresented group in any field. Limited additional funds beyond the $27,000 stipend may be available for postdoctoral support. The Foundation will match institutional support, dollar for dollar, up to $5,000, for a limited number of the 14 selected fellows. Upon receiving notification of the fellowship, interested fellows will be asked to submit an Institutional Letter of Agreement, signed by an authorized official of their institution and specifying the amount of institutional support provided. Notification of any additional funds will be sent by June 1, 2000.

Summer/Short-Term Research Publication Grants fund women college and university faculty and independent researchers to prepare research for publication. Applicants may be tenure track, part time, or temporary faculty or may be independent scholars and researchers, either new or established. Time must be available for eight weeks of final writing, editing, and responding to issues raised in critical reviews. Funds cannot be used for undertaking research. Scholars with strong publishing records should seek other funding or apply for a one-year postdoctoral research leave fellowship. Six publication grants are available.

For more information about the fellowships or for an application, please see the AAUW website, www.aauw.org.

APS Fellowship Nomination Deadlines for 2000

DIVISIONS		Physics of Beams	03/15/2000	Precision Instruments & Measurements	04/01/2000
Astrophysics	05/01/2000	Plasma Physics	04/01/2000	Shock Compression	04/01/2000
Biological Physics	06/01/2000			Gravitation	04/01/2000
Chemical Physics	02/15/2000	***FORUMS***		Magnetism and Its Applications	03/30/2000
Computational Physics	03/15/2000	Physics & Society	04/01/2000	Statistical & Nonlinear Physics	04/01/2000
Atomic, Molecular, Optical	02/15/2000	History of Physics	04/01/2000		
Condensed Matter	01/30/2000	International Physics	04/01/2000		
Fluid Dynamics	02/15/2000	Industrial and Applied Physics	02/20/2000		
Polymer Physics	04/15/2000	Education	04/15/2000	***APS GENERAL***	
Laser Science	04/01/2000			APS General Nominations	06/01/2000
Materials Physics	02/15/2000	***TOPICAL GROUPS***			
Nuclear Physics	04/01/2000	Few Body	04/01/2000		
Particles & Fields	04/01/2000	Fundamental Constants	04/01/2000		

Newton Summer Science Academy

New Experiences for Women in Science and Technology

By Meera Chandrasekhar and Rebecca Litherland

The goals of the Academy are to provide hands-on integrated physical science experiences for female students.

The Newton Summer Science Academy is a ten-day residential institute for young women who have completed grades 9-11. It is held on the campus of the University of Missouri in Columbia, and is part of a project entitled *Promoting Young Women in the Physical Sciences*, funded by the National Science Foundation. While other programs in this project focus on students in grades 5-9, the Newton Academy is geared toward female high school students.

The goals of the Academy are to provide hands-on integrated physical science experiences for female students, opportunities to meet women scientists who may serve as role models, and a peer group of female students who are interested in the physical sciences. The academy staffs are university faculty and graduate students from the departments of Chemistry, Physics, Math and Industrial Engineering, and Science and Industrial Technology teachers from local schools. Female graduate and undergraduate students serve as live-in counselors. The 1997 and 1998 academies were offered at no cost to the participants, while the 1999 academy charges a modest fee. Recruitment brochures are distributed to students through area science teachers. The academy is limited to 40 participants, and is targeted to students in an 80-mile radius around Columbia. However, students from outside the area are accepted on a space-available basis. About two thirds of the students are rising sophomores, and the rest are divided between rising juniors and seniors.

Photo courtesy of Merra Chandrasekhar

(Left to Right): Sarah Heerboth, Kari Childers and Heidi Beardslee at the Newton Summer Science Academy for female students in grades 9-11, July 1998.

Realizing that the students use many products on a daily basis, but rarely appreciate the multiple components that are required to produce them, the Newton Academy has them design and build a polymer ball toy factory in order to learn about the integration of physics, chemistry, math, engineering and business. While the basic ingredients of the polymer balls are simple and familiar (gel glue and borax), the automation of a production line requires an unexpected array of conceptual and hands-on skills. Students encounter:

- **Mathematics** in determining the optimal mix of glue and borax required getting the highest bounce out of their balls. This problem is solved graphically.
- **Engineering** in designing their systems and in factory layout.
- **Physics** in the construction of a material handling system that involves gears, pulleys, circuits, switches, and motors.
- **Chemistry** in understanding polymers, acid-base chemistry, absorbance spectrophotometry, and waste generation.
- **Economy** and **cost-benefit analysis** in budgeting materials needed to build their factory. Students purchase items they need from a construction store with Newton dollars.
- **Legal issues** of intellectual property in posting and buying patents of equipment they have designed.

The students are grouped in teams of four. Each team is named after a prominent woman scientist or engineer and builds its own factory. The first five days of the academy are spent on hands-on chemistry, math and physics "lessons", focusing specifically on aspects that are relevant to polymer balls and mechanization. A very popular preparatory activity is to take apart Xerox machines, typewriters and stereo equipment, using reverse technology to understand the design and layout of an instrument. Students eagerly salvage small devices, particularly gears, motors, and pulleys, and paper feeders for conveyor belts. They also tour real assembly lines to collect design ideas for their factories. They visit the University's Engineering Manufacturing Laboratory (which has a basic conveyer belt and a programmable robot) and a manufacturing facility (Cheeseborough Ponds' Unilever in 1997, Sigma Chemical in 1998).

After these preparatory activities, the hard part is to reign in the urge to start building right away and to design the factory first. Engineering design is a new concept to many

students, and provides them an unexpected learning experience. Part of a weekend is spent drawing plans for the factory, assisted by design consultants (an industrial technology teacher and a "handy" graduate student). Teams present their designs to the faculty and other teams, which is a wonderful sharing experience, allowing students to question and critique their peers in an unusual domain.

Evening sessions feature e-mail training, team building, self-esteem, and gender awareness activities. Students view the Dateline NBC video featuring the Illinois Math and Science Academy all female physics course and discuss their experiences as females in math and science classes. They also view excerpts of women scientists' talks from the December 1995 NSF Women in Science Conference.

Two activities outside the classroom stood out as the highlights of the 1998 academy. The first was a weekend visit by Bridget Landry, Systems Engineer at the Jet Propulsion Laboratory in Pasadena, who spoke to the students on the Mars Pathfinder Mission. Ms. Landry is also a science fiction fan, and a screening of the movie 'Contact' and a discussion of science fiction themes followed her talk and dinner. The second was a formal dinner with local women scientists and engineers, and several university and school system administrators. The dinner featured a presentation by a woman engineer from a local company. Students invariably express surprise that there are "so many" women in science and engineering professions.

On the last day of the academy, families are invited to pizza and a demonstration of the factories. We find that each factory has a unique design. Some factories focus on mixing and extruding, others on rolling and packaging. Some are vertical, others horizontal and still others glitter with lights. Color and glitter in the polymer balls is a major theme. Students sell their polymer balls to their families, who are provided with Newton dollars for that evening — a big hit among the younger siblings!

- The response to the academy has been overwhelmingly positive. From responses immediately following the academy and interviews conducted four months later, the highlights repeatedly mentioned are the female peer group and the day with the JPL visitor. Enduring benefits for the students include an increase in confidence level and participation in science classes, and the positive impression of the many female scientists they met during the academy.

The University faculty found the first academy to be a major learning experience. We found that factors that were crucial to the success of the academy were:

- Collaboration among different departments, starting at the planning stage.
- Collaboration with the school district and involvement of classroom teachers in recruitment, planning and running the academy.
- A full-time person coordinating the activities of the academy. An equivalent of at least two months of full-time planning was necessary, starting about five months before the academy.
- Keeping the time commitment reasonable for collaborating faculty.
- A particular regard to making the application obvious to students teaching the lesson: this is particularly important in a short academy that integrates several disciplines.
- Activities where students could meet professionals in a social environment.

We are currently in the process of following up on students and the career paths they have chosen. We are aware of a few young women who intend to enter Engineering programs. Since the bulk of the students are still in high school, we will not know of the final impact of the academy for a few years.

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Have you moved? Changed jobs? Changed fields? Take the time now to update your name/address/qualifications on the Roster of Women in Physics (this database also serves as the Gazette mailing list). See pages 15-16.

Trying to reach more women and minority candidates for job openings in your department or institution? Consider a search of the APS Roster of Women and Minorities in Physics.
(see www.aps.org/educ/reqform.html)

1999 Maria Mitchell Association Women in Science Award Goes to the Bell Labs Graduate Research Program for Women

By Alice E. White, Bell Laboratories, Lucent Technologies

"The Maria Mitchell Women in Science Award continues her legacy by encouraging women in science."

When astronomer Maria Mitchell was a professor at Vassar in the nineteenth century, little did she know that her teaching, her discoveries, and her dedication to understanding the cosmos would become the catalyst for encouraging women to pursue scientific careers over a century later.

The Maria Mitchell Women in Science Award, now in its third year, has been awarded to the Lucent Technologies' Bell Labs Graduate Research Program for Women (GRPW). The winner was selected from a nationwide pool of nominees by a distinguished panel of jurors who based their winning selection on the outstanding results of the GRPW. Since its inception 25 years ago, more than 80 women pursuing science, math, and engineering earned doctorates at leading universities with the help of the GRPW. Jurors also saw the GRPW as a model for other corporations.

The GRPW got its start back in the 1970's. At that time, there was a visionary management team at Bell Labs that recognized that the shortage of women and minorities in science was a serious problem. In 1972, they started the Cooperative Research Fellowship Program (CRFP) for under-represented minorities in science and math. In 1974, Sam Morgan, then director of computer science (and the father of four daughters!), suggested that the CRFP be expanded to include women. Bill Brinkman, then Director of Chemical Physics, created the GRPW that year, and Dr. Morgan was selected to chair the first GRPW committee. There were 7 applicants and the committee made two awards—a fellowship to Lynn Detweiler and a grant to Ursula Gibson. Lynn ended up getting an M.D. rather than a PhD, but Ursi finished her PhD in physics at Cornell and, after several years at the University of Arizona, joined the faculty of the Thayer School of Engineering at Dartmouth where she received tenure in 1996. By the second year of the program, the committee received 40 applications. The number of awards was increased substantially and the program was established.

Both the CRFP and GRPW have been in existence for the intervening 25+ years, supported by a dedicated committee of volunteers and a network of mentors. It was the mentoring aspect of the GRPW that particularly impressed the Maria Mitchell jurors. Each fellowship winner is assigned a mentor who is a staff member at Bell Labs. The student works with the mentor during the summer before graduate school, learning about research and building a relationship. The program provides for yearly visits back to Bell Labs for mentoring support, which we think is an important ingredient in helping women stay in graduate school. In my experience as a GRPW fellow, interaction with my mentor, Doug Osheroff (who recently won the Nobel Prize in Physics), was a lifeline during the tough times. Visiting Doug was a chance to recharge my batteries, listen to a different point of view, and remind myself that there was a whole world outside my laboratory. In large measure because of his support, I received my PhD in physics from Harvard in 1982 and am enjoying a satisfying career at Bell Labs. The program also created a network of female physicists that continues to this day. To encourage this networking, Bell Labs is holding bi-annual reunions of GRPW and CRFP alums.

Photo courtesy of the Maria Mitchell Association

Avi Silberschatz and Alice White from Lucent Technologies' Bell Labs accepting the 1999 Maria Mitchell Women in Science award from Dan Drake, President of the Maria Mitchell Association Board of Managers. Oct. 2, 1999, Nantucket, MA

Unique to this years' award is that Bell Labs and the Lucent Foundation offered the award's $5000 prize to the jurors' second choice. The second place winner was the nonprofit Math Science Network for Expanding Your Horizons in Science and Mathematics, located at Mills College. Also established in the 1970s, the Horizons program is designed to encourage your women, grades six through twelve, to pursue careers in mathematics, engineering and science.

"The spirit and essence of Maria Mitchell's career as America's first woman astronomer and professor of astronomy lay in her commitment as a teacher, mentor, and role model to young women seeking careers in science and technology," said Mara Alper, founder and coordinator of the award program. Alper recently served as curator of the Maria Mitchell House, the astronomer's birthplace, which is one of the museums of the Maria Mitchell Association on Nantucket Island, Mass. "The Maria Mitchell Women in Science Award continues her legacy by encouraging women in science and provides important recognition for individuals and organizations who encourage girls and women to pursue careers in science and technology," continues Alper. The award is funded by the William R. Kenan, Jr. Fund for Engineering, Science, and Technology.

To learn more about the Bell Labs GRPW and CRFP fellowships, visit their web site: www.bell-labs.com/fellowships

Women in Science: Meeting Career Challenges

Edited by Angela M. Pattatucci (Sage Publications, Inc. 1998)
Review written by Vickie Frohne (Western Illinois University)

Life is tough for women in the sciences. We not only have the "normal" challenges associated with science, we have to put up with a lot of "extra stuff" as well. And, according to Angela Pattatucci, it is this "extra stuff,"not the rigors of learning or practicing a scientific discipline, that causes women to leave science in disproportionate numbers.

The "extra stuff" starts in childhood and gets worse as women move up the scientific career ladder. Girls are raised with lower expectations and are discouraged from considering science or engineering careers. Women endure crushing isolation, blatant harassment, subtle discrimination, lack of professional support, and the enormous weight of a thousand slights and insults, both intended and unintended, that causes one to question one's own motivation and ability. Double standards prevail. Women are assumed to be inferior unless they repeatedly and spectacularly prove otherwise. Often their colleagues simply refuse to recognize women as serious scientists.

The premise of Pattatucci's book is that if one wants to know the actual reasons why women are leaking out of the scientific career pipeline, one should talk to the women. This common-sense approach forms a thread through the book. Pattatucci places the blame for women's under representation in science squarely on "the academy," meaning the scientific establishment, which fails to question the validity of assumed "facts" and stereotypes regarding women in science. She demonstrates that the logic behind many familiar "facts" is so absurd that it would be laughable were the consequences not so destructive.

Those who are already familiar with women-in-science issues will find few surprises in this book. However, it is good to see most of the major problems neatly addressed in one compact volume. Most chapters begin with short scholarly discussions written by the editor, followed by three or four often autobiographical essays written by women scientists and engineers. The book is a good read, and I found it difficult to put down. This book would be an excellent choice for a discussion springboard in a women-and-science course. Graduate students should definitely read this book. It gets the issues on the table and lets them know why they may be feeling isolated, irritated, and depressed. Identifying the problem is half the battle.

As I read this book, it began to echo my own experiences. I began to seriously wonder why I or anyone would put up with the "extra stuff" associated with a scientific career. No matter how much we love it, is science really worth it? For some it is, but for far toomany it is not. Sometimes the "extra stuff" does become too overwhelming, and good scientists and engineers do get forced out of their professions. By reading the stories of women who "leaked out of the pipeline" at various stages as well as those who stayed in, one learns that it is possible to quit the pipeline without being a failure. This, I think, is an important lesson.

The final chapter of this book is entitled "A reason for optimism." In it, several programs for recruiting young women into scientific careers are discussed. Although, the first chapter explains why achieving a "critical mass" is not a cure-all, one hopes that with more women in the profession, the professional climate should improve. Women are making inroads, even if progress is glacially slow. But I am forced to wonder about recruiting young women. It is good for society, but is it good for the individual? Perhaps not, unless she has a passion for the discipline and the extraordinary determination, courage, and strength needed to dare the "extra stuff." Reading this book might discourage some undergraduate recruits, but it may help others prevail. Let the young women come — with their eyes wide open, and fully aware of what to expect. They deserve no less.

Vickie Frohne worked seven years as a beam line physicist at Fermilab, the next seven years earning a Ph.D. in atomic physics at Kansas State University, and is now teaching physics and astronomy at Western Illinois University.

Has Feminism Changed Science?

By Londa Schiebinger
Reviewed by Emily Fisch, currently a semiconductor process engineer at IBM Microelectronics. Education includes a Ph.D. in physics from Dartmouth College (1992) and AB in physics from Bryn Mawr College (1985).

Londa Shiebinger immediately challenges the reader of her new book with its title: "Has Feminism Changed Science?". It is a bold question in its own right. Her use of the politically-charged term 'feminism' adds to the challenge, evoking personal politics and prejudices. Her title asks the reader to understand whether feminism has changed 'science'. Science is the second difficult word in her title. Here it is neither the definition nor the connotations that are problematic. It is the immense scope of 'science' which creates a rough sea of context for the study of feminist change. Fortunately, the reader is provided with tools to navigate the book's thesis. A definition of terms is given in the introduction, clarifying, for instance, the difference between 'feminism' and 'feminine', 'gender' and 'sex'. While no corresponding lexicon can minimize the enormity of what science is, the author does give individual treatment to various branches in the central portion of the book.

Given the question which is the book's title, a neat conclusion is anticipated. Yes or no. The book itself should be the path to either. The final answer to the question, 'Has feminism changed science'?, is probably: 'Yes, but not enough'. This is never

Reviews

This book would be an excellent choice for a discussion springboard in a women-and-science course.

Reviews

specifically stated, but emerges naturally. The book undertakes three relatively independent tasks and accomplishes each. It presents an interesting history of women in science, including a wealth of statistics and references. It also provides a good introduction to feminist study of science without predicating the theory on prior knowledge. Finally, an outline for changing science for society's good is given. The 'how to' portion of the book is presented succinctly in the final pages of the conclusion. Overall, this book should be of interest to many people, from the scientist to the sociologist.

The general organization of the book is clearly outlined in the introduction. There are three main sections: the history and sociology of women in science, gender in the culture of science, and gender in the content of science. Each section is well-researched and supported by carefully-referenced statistics and studies. As a woman in science, I found myself constantly reviewing my experience in the context of the statistical findings and sociological studies and I was startled by how neatly it fit the research. Consequently, I was more inclined to believe the author's presentation of less familiar data, for example, her treatment of 'soft' science.

The author proposes that a feminist science must bring up new questions and change the scientific priorities. Two variables help to follow the progress in these areas: the number of women participating ('women in science') and the ability to attribute how gender affects what is studied ('gender influencing content'). The chapters in section III give an interesting account of both. Clearly participation varies by field: about 38% of biological science Ph.D.s are currently awarded to women while only 13% of physics Ph.D.s are. Unfortunately, assessing the gender content is not always possible. A good example of gender bias in the content of a scientific field is given in the chapter on Medicine. Women were routinely omitted from drug trials and health studies. They were considered to be either miniature men, or difficult subjects (because of menstrual cycles). This clearly illustrates a male bias. The fields of medicine, primatology, biology and archaeology present numerous examples of gender content. However, the problems found in fields like math, physics, and chemistry are not obviously of more interest to one sex than another; interpretive biases, and gender-driven research choices will not be evident.

The uniqueness of each field of science brought out a personal reservation. It is not clear to me why all arms of science are lumped together to form a thesis. Why do physics and primatology have more in common than physics and history? Isn't any rigorous field of study subject eligible for the feminist restructuring proposed in this book? I did not find an answer to these questions. The chosen demarcation of 'science' seems less logical than either a broader (all rigorous research), or more refined (medicine) field of study. The chapters in Section III, Gender in the Substance of Science, only underscore this problem. Medicine, Primatology, Archaeology , Human Origins, Biology, Physics and Math are each treated individually. Differences are evident and well-explained making the global treatment impractical.

Gazette/Roster of Women in Physics Enrollment Form

The Roster is the basis for statistical reports on women and minority physicists; mailing lists corresponding to announcements, publications of the APS Committee on the Status of Women in Physics (CSWP) and Committee on Minorities (COM); and confidential searches. The Rosters will not be made available to commercial or political organizations as a mailing list, and all information provided will be kept strictly confidential. Although the Roster is employed to serve women and minority physicists, enrollment is open to anyone interested in issues affecting these groups. Please give a copy of this form to others who might be interested in joining the Roster, or in receiving the newsletters.

Please complete all entries on BOTH SIDES OF THE FORM and indicate changes if this is an update of a previous entry. After completing this form, please return to:

The Roster of Women and Minorities in Physics ◆ The American Physical Society ◆ One Physics Ellipse ◆ College Park, MD 20740-3844

Please indicate whether you are interested in receiving:

❒ **The *Gazette,* CSWP (women's) newsletter**

❒ ***C.O.M....MUNICATIONS*** **(minorities) newsletter** ❒ **Employment Announcements**

Is this a modification of an existing entry?:

❒ **yes** ❒ **no** ❒ **not sure**

NAME: _____

(last) (first) (middle)

Previous last name (if applicable): _____ Date of Birth _____/_____/_____

GENDER:
❒ Female
❒ Male

Ethnic Identification

❒ Black ❒ Native American ❒ Caucasian (Non-Hispanic) ❒ Other (please specify)
❒ Hispanic ❒ Asian or Pacific Islander _____

Mailing Label Information (Foreign addresses: Use only the first three lines, abbreviating as necessary.)

In this section, please print information exactly as it is to appear on your mailing label. Where boxes are provided, print one character within each box, abbreviating where necessary.

NAME AND TITLE

ADDRESS Line 1:

ADDRESS Line 2:

ADDRESS Line 3:

CITY/STATE/ZIP

Daytime Phone – –

Fax or email Number: _____

Educational Background

Degrees	Year Received (or expected)	Name of Institution
BA or BS	_____	_____
MA or MS	_____	_____
Ph.D.	_____	_____
Other _____	_____	_____

Thesis Title (Highest Degree) (Abbreviate to 56 characters total)

_____

PLEASE REMEMBER TO COMPLETE SIDE II OF THIS FORM

Current Employment Information (28 Characters per line)

Employer: _____

Department/Division: _____

Position: _____

Professional Activity Information

FIELD OF PHYSICS

Current Interest (check up to 4)	Highest Degree (check up to 4)	
1 ____	1 ____	Astronomy & Astrophysics
2 ____	2 ____	Acoustics
3 ____	3 ____	Atomic & Molecular Physics
4 ____	4 ____	Biophysics
5 ____	5 ____	Chemical Physics
6 ____	6 ____	Education
7 ____	7 ____	Electromagnetism
8 ____	8 ____	Electronics
9 ____	9 ____	Elementary Particles & Fields
10 ___	10 ___	Geophysics
11 ___	11 ___	High Polymer Physics
12 ___	12 ___	Low Temperature Physics
13 ___	13 ___	Mathematical Physics
14 ___	14 ___	Mechanics
15 ___	15 ___	Medical Physics
16 ___	16 ___	Nuclear Physics
17 ___	17 ___	Optics
18 ___	18 ___	Plasma Physics
19 ___	19 ___	Physics of Fluids
20 ___	20 ___	Thermal Physics
21 ___	21 ___	Solid State Physics
22 ___	22 ___	General Physics
23 ___	23 ___	Condensed Matter Physics
24 ___	24 ___	Space Physics
25 ___	25 ___	Computational Physics
26 ___	26 ___	Accelerator Physics
27 ___	27 ___	Superconductivity
28 ___	28 ___	Surface Science
29 ___	29 ___	Non-Physics
30 ___	30 ___	Quantum Electronics
99 ___	99 ___	Other (please specify)

_____

CURRENT WORK STATUS (Check One)

1 ____ Full-time Studies
2 ____ Part-time Studies
3 ____ Part-time Studies/Employment
4 ____ Post Doc./Res. Assoc.
5 ____ Teaching/Precollege
6 ____ Faculty, tenured
7 ____ Faculty, non-tenured
8 ____ Long-term/Permanent Employee
9 ____ Inactive/Unemployed
10 ___ Retired
11 ___ Self-employed
12 ___ Other (please explain)

_____
_____

TYPE OF WORKPLACE FOR CURRENT OR LAST WORK

1 ____ University
2 ____ College - 4 year
3 ____ College - 2 year
4 ____ Secondary School
5 ____ Government
6 ____ National Lab
7 ____ Industry
8 ____ Non-Profit Institution
9 ____ Consultant
10 ___ Other (Please explain)

_____
_____

TYPE OF WORK ACTIVITY

Please check four numbers from the list below of the activities in which you engage most frequently.

1 ____ Basic Research
2 ____ Applied Research
3 ____ Development and/or Design
4 ____ Engineering
5 ____ Manufacturing
6 ____ Technical Sales
7 ____ Administration/Management
8 ____ Writing/Editing
9 ____ Teaching - Undergraduate
10 ___ Teaching - Graduate
11 ___ Teaching - Secondary School
12 ___ Committees/Professional Org.
13 ___ Proposal Preparation
14 ___ Other (please specify)

_____
_____

DEGREE TYPE (Highest)

1 ____ Theoretical
2 ____ Experimental
3 ____ Both
4 ____ Other (please explain)

_____
_____

APS Membership Information

Are you an APS member?:

❒ No Check here if you wish to receive an application - ❒

❒ Yes Please provide your APS membership number, if available, from the top left of an APS mailing label:

___ ___ ___ — ___ ___ ___ ___ ___ ___

Office Use Only

Date of entry: _____

Roster#: _____

Initials _____

Thank you for your participation. The information you have provided will be kept strictly confidential and will be made available only to CSWP and COM members and APS liaison personnel. Please return this form to the address on the reverse side.

Women Speakers List (WSL)
Enrollment/Modification Form 1999-2000

Additions/Modifications may also be made on the Internet at www.aps.org/educ/cslwip.html
An online copy of the WSL is available at www.aps.org/educ/women-speaker.html

The *Women Speakers List* is compiled by The American Physical Society Committee on the Status in Physics (CSWP). The list is updated continuously online and published each summer. Comments, questions and entries should be addressed to:

Women Speakers List · APS ·One Physics Ellipse · College Park, MD 20740-3844 · (301) 209-3232

To enroll or update your current entry, please fill out this form completely and return it to the address above.
Please print clearly or type.

Title/ Name ❒ Dr. ❒ Prof. ❒ Mrs. ❒ Ms. _____ **Date** _____

Institution _____ **Telephone** _____

Address _____ **Fax** _____

_____ **Email** _____

City _____ **State** _____ **Zip Code** _____

If you have moved out of state, list previous state: _____

❒ **New Entry** ❒ **Modification**

For which audiences are you willing to speak? (Please check all that apply)
❒ Middle school ❒ High school ❒ General Audiences ❒ Colloquium

To register a new title, give the title as you want it to appear in the left column below. Then check the section(s) where it is to be inserted. To delete a title, indicate the title and check the appropriate box below. A limit of four total entries will be imposed. You may use additional pages if you are submitting more than four modifications. PLEASE TYPE OR PRINT LEGIBLY PAYING PARTICULAR ATTENTION TO FORMULAS. WE REGRET THAT WE ARE UNABLE TO INCLUDE ILLEGIBLE ENTRIES.

TALK TITLE			PHYSICS SUBFIELD (limit 4)		
1.	❒ Add this title	❒ Delete this title	❒ Accelerators ❒ Astrophysics ❒ Atomic ❒ Biological/Medical ❒ Chemical/Statistical ❒ Computational ❒ Condensed Matter	❒ Education (pedagogy etc.) ❒ Environmental/Energy ❒ Fluid ❒ General ❒ Geophysics ❒ History ❒ Industrial	❒ Interface/Device ❒ Molec/Polymer ❒ Nuclear/Particle ❒ Optics/Optical ❒ Plasma
2.	❒ Add this title	❒ Delete this title	❒ Accelerators ❒ Astrophysics ❒ Atomic ❒ Biological/Medical ❒ Chemical/Statistical ❒ Computational ❒ Condensed Matter	❒ Education (pedagogy etc.) ❒ Environmental/Energy ❒ Fluid ❒ General ❒ Geophysics ❒ History ❒ Industrial	❒ Interface/Device ❒ Molec/Polymer ❒ Nuclear/Particle ❒ Optics/Optical ❒ Plasma
3.	❒ Add this title	❒ Delete this title	❒ Accelerators ❒ Astrophysics ❒ Atomic ❒ Biological/Medical ❒ Chemical/Statistical ❒ Computational ❒ Condensed Matter	❒ Education (pedagogy etc.) ❒ Environmental/Energy ❒ Fluid ❒ General ❒ Geophysics ❒ History ❒ Industrial	❒ Interface/Device ❒ Molec/Polymer ❒ Nuclear/Particle ❒ Optics/Optical ❒ Plasma
4.	❒ Add this title	❒ Delete this title	❒ Accelerators ❒ Astrophysics ❒ Atomic ❒ Biological/Medical ❒ Chemical/Statistical ❒ Computational ❒ Condensed Matter	❒ Education (pedagogy etc.) ❒ Environmental/Energy ❒ Fluid ❒ General ❒ Geophysics ❒ History ❒ Industrial	❒ Interface/Device ❒ Molec/Polymer ❒ Nuclear/Particle ❒ Optics/Optical ❒ Plasma

The American Physical Society 1999-2000 Travel Grants for Women Speakers Program

Funding Still Available for the 1999-2000 Academic Year! Apply online at www.aps.org/educ/women-app.html

The APS Committee on the Status of Women in Physics (CSWP) is pleased to announce that the "Travel Grants for Women Speakers" Program is entering its seventh year. This program is designed to increase the recognition of women physicists.

Purpose

The program is intended to expand the opportunity for physics departments to invite women colloquium/seminar speakers who can serve as role models for women undergraduates, graduate students and faculty. The program also recognizes the scientific accomplishments and contributions of these women physicists.

Grant

The program will reimburse U.S. colleges and universities for up to $500 for travel expenses for one of two women colloquium/seminar speakers invited during the 1999-2000 academic year.

Qualifications

All physics and/or science departments in the United States are encouraged to apply. Canadian and Mexican colleges and universities are also eligible, provided that the speakers they invite are currently employed by U.S. institutions. Invited women speakers should be physicists or in a closely related field, such as astronomy. Speakers should be currently in the U.S. The APS maintains the Women Speakers List which is available online (www.aps.org/educ/women-speaker.html) or from the APS. However, selection of the speaker need not be limited to this list. Neither of the two speakers may be a faculty member of the host institution.

Guidelines

Reimbursement is for travel and lodging expenses only. Honoraria or extraneous expenses at the colloquium itself, such as refreshments, will not be reimbursed.

Application

The Travel Grants for Women Speakers Application Form (www.aps.org/educ/women-app.html) should be submitted to APS identifying the institution, the names of the two speakers to be invited and the possible dates of their talks. Please note that funds for the program are limited. The Travel Grants for Women Speakers Application Form should be submitted as early as possible, even if speakers and dates are tentative, or if the speakers are scheduled for the spring semester. The application form will be reviewed by APS, and the institutions will be notified of approval or rejection of their application within two weeks. Institutions whose applications have been approved will receive a Travel and Expense Report Form to submit for reimbursement.

For Further Information:

Travel Grants for Women Speakers Program

Attn: Arlene Modeste Knowles
The American Physical Society
One Physics Ellipse • College Park, MD 20740-3844
Tel: (301) 209-3232 • Fax: (301) 209-0865 • Email: travelgrant@aps.org

1990-2000 Travel Grants For Women Speakers

♦ Application Form ♦

This form is also available on the Internet at www.aps.org/educ/cslwip.html

This form must be filled out and approval received from the APS in order to be eligible for up to $500 travel reimbursement. Please note that submitting this application form does not guarantee reimbursement. You will be notified within two weeks of receipt of this application whether or not it has been approved.

DATE: _____

INSTITUTION: _____

ADDRESS: _____

APPLICATION PREPARED BY (VERY IMPORTANT):

NAME: _____ **TITLE:** _____

PHONE: _____ **FAX:** _____

EMAIL: _____

Please list information on the speakers below. If speakers, dates or titles of talks are tentative, please indicate.

DATE OF COLLOQUIUM: _____

SPEAKER'S NAME: _____

HOME INSTITUTION: _____

ADDRESS: _____

PHONE: _____ **FAX:** _____ **EMAIL:** _____

TITLE OF TALK: _____

_____

DATE OF COLLOQUIUM: _____

SPEAKER'S NAME: _____

HOME INSTITUTION: _____

ADDRESS: _____

PHONE: _____ **FAX:** _____ **EMAIL:** _____

TITLE OF TALK: _____

_____

Please return this form to:

Arlene Modeste Knowles, Travel Grants for Women Speakers Program
The American Physical Society
One Physics Ellipse
College Park, MD 20740-3844
Tel: (301)209-3232 • Fax: (301)209-0865 • Email: travelgrant@aps.org

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