

CSWP Gazette

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

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Letter from the Editor: Speeding up the Long Slow Path to Change

Meg Urry, Yale University, Guest Editor



Meg Urry

It's 2002 and there are still physics departments with no women faculty (and many more with no minorities). Why? Progress is not impossible: the trends are generally in the right direction, but change is painfully slow, in marked contrast to progress in the equally demanding disciplines of biology, chemistry, engineering, mathematics, and medicine. Why has physics proved so resistant to change?

When I (gently) ask my colleagues around the country why they hire mostly or only men, they say there simply are no women available to hire.

But the top 10 physics departments graduated 138 women with PhDs in physics in the 5-year period 1988-1992 (10.7% of total PhDs). Twenty to thirty of

the top physicists produced each year are women. In 2000, 13% of physics PhDs went to women. Women are indeed available.

Recruitment is often targeted, however, perhaps more so in the more elite universities. They want the best, and they are sure they know the best people; they don't expect them to float up through the applications process. In such a situation, hiring women requires (a) valuing their talents, and (b) thinking of them when a job (or talk or prize) is at hand. This does not appear to happen automatically.

Why should we care about the number of women in physics? People agree on several good reasons:

- Physics departments want more majors, better graduate students, and more public (federal) support of physics.
- Women (and men) want and deserve challenging, interesting work, and many women love physics.

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The Status of Women in Physics – What, Why, and How to Change. A Report on the IUPAP International Conference on Women in Physics

Meg Urry, Yale University and Aparna Venkatesan, University of Colorado-Boulder



Meg Urry and Aparna Venkatesan

Why Change the Face of Physics?

The number of women in physics is low, in the U.S. and globally, and has been increasing only very slowly. The best physics demands the best brains from more than just half of humanity; excluding women weakens physics — and all of science. Just as important, women deserve the same opportunity as men to have a stimulating and rewarding career in physics. Also, a more scientifically literate public — one that includes girls and women educated in physics — will lead to more public support of science. For all these reasons, the dearth of women in physics is recognized as an urgent concern.

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Speed up the Long Slow Path to Change, continued

- No physicist believes, "We already have all the brains we need in our field."
- The law says there shall be equal opportunity.

So where are we falling down? My physics colleagues are good people, who want to do the right thing. They do not discriminate, they would not deny opportunity to women because they are women. So where is the problem? Let me try to answer this question with three stories.

(1) The powerful act powerless — the system worked for them, and they expect it to work for everyone.

At the March 2002 APS meeting in Indianapolis, the chair of a large physics department at a major Midwestern university points out what he sees as the problem. "At the beginning of my introductory physics class," he explains, "I ask which students are planning to major in physics, and the women do not raise their hands!" His department is responsible for graduating many physics majors and PhDs, yet he is convinced that women simply don't like physics and there is nothing he can do to change their minds. He and his colleagues feel powerless to affect gender imbalance. Another physicist nods his head in agreement, convinced that women are simply more interested in other fields, like biology and chemistry — "they just don't have an interest in physics." Subtext: there is nothing we can do to change this.

But the young students in the physics chair's class are new to the discipline. Perhaps they have never had a physics class before, or perhaps their high school class did not catch their imagination. Is it necessary that they know they love physics before they've studied it? Is early certainty of one's vocation a sign of one's talent for it? Should physicists come only from the ranks of those who enjoy what may have been a boring, rote-like class with little connection to modern physics research? Shouldn't physics professors take as their responsibility the mission of showing students how very interesting and rewarding physics can be?

Ah, but most professors teach physics the way they were taught; after all, it caught their imaginations 20, 30, 40 years ago, so surely it will do the same for today's students — or at least, they believe, it will attract the very best students.

This is where the problem starts to become clear. The students in class today — especially the women (and minorities) — are not junior versions of their professors. Their paths in life have been different, their interests may be different, their approaches to science may be different. (Or may not; this is controversial, but no doubt there is a much larger range of styles among today's student body than there were in that professor's cohort of physics majors.) Sheila Tobias described this phenomenon in her fascinating book "They're Not Dumb, They're Different."

Well, should we say, never mind, I only want the best students, and those are the ones like me, by definition?! This solipsistic approach is a danger in contemporary physics. It stems from the relative homogeneity of our physics faculty, and it reinforces that homogeneity. Yet diversity historically has led to intellectual breakthroughs — the greatest new ideas are born in the roiling waters at the confluence of different rivers of thought. A narrow set of views and styles in physics will benefit no one — not women and minorities, and most importantly, not the science. If that doesn't persuade you, read the work of Elaine Seymour and Nancy Hewitt, which demonstrates that many of the best students are leaving science — the notion that "the cream automatically rises to the top" (and majors in physics) — is simply wrong.

(2) "You're not a member of my club."

Story number two is also from the March 2002 APS meeting. A young woman physicist, an assistant professor at a small but excellent 4-year college — energetic, smart, talented, attractive, and with a friendly personality — goes to the March meeting in Indianapolis to give a talk. From the airport she takes a taxi directly to the convention center, eager to register and find the room where she will speak the next day. Pulling her suitcase behind her, she wanders through the convention center. She separately encounters three women physicists; they all smile and offer to help her, as she is obviously just arriving and looking lost. But they don't have the program, which is what she needs, and the registration desk has closed for the night. She walks over to a group of young men about her age, who are sitting and talking nearby. She stands politely waiting for them to acknowledge her. She stands for a while. She clears her throat. The men are making fierce eye contact with one another — tunnel vision — and apparently what they are discussing is so earthshaking that they fail to notice her presence. Finally, after a much longer than normal wait, she butts in and asks if anyone has the program for the next day. "Certainly not," answers the first guy, evidently annoyed at the interruption. "Why would I carry that around? That's the second half of the meeting! It's heavy, of course I don't have it." The second guy chimes in and lets her know how stupid her question is and how her continuing presence is interrupting their important discussion. She turns away, uncomfortable and upset, and the next day is still fretting about this episode.

What is the point of this story? That some young male physicists can be boors, perhaps, but more that it is all too easy for women physicists to feel ill at ease, out of place, in the wrong place altogether. There are few role models for most of us. There are few women faculty and few fellow female students. Women physicists have no clear path in front of them, no clear connection between where they are — pursuing physics — and where they want to be — advancing in the profession.

It is no wonder that women physicists tend to have greater self-doubt than men. In a study at MIT, graduate students in male-dominated science and technology

Speed up the Long Slow Path to Change, continued

fields were asked to rate their own abilities, and their professors were asked to rate them as well. The actual distributions of ability for men and women did not differ, according to the professors, but the self-evaluations did. On average, the women rated themselves below average and the men rated themselves above average. (Perhaps all the men were from Lake Woebe-gone?) The men were sure they were better than the next guy, and the women were sure they were worse.

Look at the difference when male and female students do poorly on a test. The women are likely to say, “Oh God, I blew that test, I am so stupid!” and the men are likely to say, “That test sucked, and that professor is a jerk!” They blame external factors, women blame internal factors. These are gross generalizations; there are men who act like the women I am describing, and women who act like the stereotypical man. But I think most of you will recognize the aptness of the generalization.

It may not even matter whether the problems women experience are perceived or real. Last spring’s Caltech report on the status of women faculty¹ found no gross statistical disparities between male and female faculty, such as had been found at MIT three years earlier. At Caltech, both men and women voiced similar complaints about the institution, but women faculty were markedly more dissatisfied, stemming at least in part from their lack of a voice in the administration. Conclusion: women may feel bad even if, objectively, they are not treated any worse than the men. Perceptions define reality for the women.

In physics departments around the country, women are feeling ill at ease, out of place, not at home. Often it’s as simple as statements about what makes a good scientist, or what some famous scientist was like. Think of our heroes: read Feynman’s autobiography and tell me what you thought. Maybe you liked him, maybe you hated him, maybe you envied him — but probably you didn’t

feel as uncomfortable as his women readers did. Women appeared to play a remarkably small role in his life — several wives go unmentioned or at least undescribed — except for the ones he’s dating or trying to date. (Here the biologists can apparently give the physicists a run for their money, with James Watson’s latest book *Genes, Girls, and Gamow*, which, I confess, I can’t bring myself to read.)

What of the women who pass these barriers who somehow manage to avoid having their love for physics eroded by feelings of inadequacy or not belonging? What happens to them? When the internal battles are won, what influence is exercised by the external factors? This brings me to my third story ...

3) Sociology holds some of the answers, if physicists would only listen.

... which is really a series of stories about statistical studies and sociological experiments. Some were done some years ago, and it may be that the situation in physics has improved. However, there is rather more evidence that improvement, if any, is glacially slow.

a) Referees judge gender of author, not quality of work.

In 1983, Paludi and Bauer² published a revealing study about the influence of gender on perception of excellence. Three-hundred-sixty referees, half men and half women, were each sent a mathematics paper to rate, with the author’s name given variously as John T. McKay, Joan T. McKay, or J. T. McKay. On a scale of 1 to 5, 1 being excellent, the reviewers found that the man’s paper was considerably better than the woman’s! (See Table.) The neutral, initials-only designation was also rated rather lower than the man’s paper (though higher than the woman’s), apparently because many referees believed the initials to represent a woman (as they indicated in response to follow-up questions).

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Perceptions define reality for the women

Order your FREE copy of the “Celebrate Women in Physics” poster!

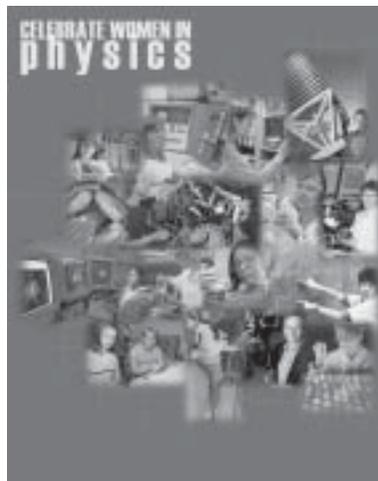
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Speed up the Long Slow Path to Change, continued

	John T. McKay	Joan T. McKay	J. T. McKay
Men	1.9	3.0	2.7
Women	2.3	3.0	2.6

Note that both men and women found the paper written by the woman to be markedly less good than the man's paper. It isn't just men undervaluing women's work, it is all of us.

b) Gender-based bias in the literary/artistic world.

The Modern Language Association is the professional organization for English professors. Unlike the American Physical Society, abstracts submitted to the annual MLA meeting are refereed before being accepted. In 1974, the MLA began "blind" refereeing, in which the referees were no longer told the authors' identities. Prior to this, women had given very few papers at MLA meetings. Shortly after the change, within a few years, women were giving many more papers, in roughly the same percentage as in the submitted abstracts.

A similar shift to blind auditions for the world's great orchestras has greatly increased the number of female musicians accepted.³ Despite blatant prejudice from prominent male musicians — the well-known conductor Zubin Mehta, formerly of the New York Philharmonic, was once quoted as saying, "I just don't think women should be in an orchestra" — women turn out to be perfectly equal to men in their musical talent, once the listening ears no longer know the musician's gender.

c) But science is objective, not subjective like art or literature! Can there really be gender bias in science?

A few years ago Nature published several articles about gender bias in applications for research support from the Swedish Medical Research Council.^{4, 5} Two researchers obtained the applications and the grades and comments. They found that women had to have published much more, and had to have been rated much more highly, in order to have an equivalent chance at the fellowship. In quantitative terms, a woman had to be more than twice as good as a man to rank equally on the final list.

These results agree well with longitudinal studies of women and men Ph.D. scientists, closely matched in ability and field, which found strong evidence of lesser advancement for even very talented women. Even taking into account all sorts of variables like family status and productivity, the overwhelming predictor of success was gender.^{6, 7} Women were paid less, were less likely to be hired into faculty positions, took longer to get tenure, and fewer got tenure than the men. My own recent study of the astronomy profession — statistical, not longitudinal — suggests that at best, women are doing as well as men, and consistently they are doing about 1 sigma worse.⁸ (Ironically, the Catch-22 of this discussion is that the numbers of women are so low that the statistical significance of any discrepancies is also low.)

d) Who are the leaders?

Another sociological experiment: subjects are shown a series of photographs of people sitting around the table and asked to identify the leader of each group. They overwhelmingly pick the man, regardless of whether a woman sits at the head of the table, or has a pile of documents near her, or is pictured speaking authoritatively. Independent of contrary visual cues, the man is seen as a leader in preference to the woman.

e) Men stand taller.

Even more abstract: subjects of an experiment are shown photographs of men and women and asked to estimate their heights. The photos include some common reference object, such as a doorway or desk, to set the scale. The men and women in the photographs were selected to have the same average height, yet the subjects consistently guess the men are taller. Their expectations (in this case, correct expectations) that men are on average taller than women strongly influence their evaluation of an absolutely objective quantity, height.

Your female colleagues are subjects of sociological experiments every day, when they are interrupted and their speech occupies a smaller fraction of the discussion, when their idea is dismissed or overlooked but lauded if a man suggests it a few minutes later, when students are skeptical of their expertise but unhesitatingly assume male professors are fully competent.

We should not be surprised — the popular image of success, of competence, of science, is male (think Einstein, not Tinsley or Rubin or Wu). We are almost all prejudiced — against women, against minorities — in the sense that we have absorbed the gender and race stereotypes that prevail in our society. As the Paludi and Bauer study shows, women are not immune from feeling this kind of prejudice. The best any of us can do is to recognize it and correct for it, long enough to change the face of science, and thus to render obsolete the present stereotypes.

Toward a Better Future

So what is the strategy for moving forward? We aren't going to change society, or at least, not rapidly, which means substantial inertia in these damaging stereotypes. Instead, we need to raise awareness about the extra barriers for women. Remembering that every physicist has his/her own theory about why women are scarce in physics, we must somehow make them aware of the relevant data, which show overwhelmingly that our expectations and evaluations of women's abilities are lower than they should be, and that this has a negative feedback effect on the participation of women.

These sociological barriers affect many other arenas besides physics, of course, so I return once more to the question of why physics is so much worse — that is, lower in the percentage of women and slower/harder to change. My own speculation is that physics is more hierarchical, more elitist (most physicists would simply say

Speed up the Long Slow Path to Change, continued

“elite”), than other professions, and thus women’s feelings of inadequacy (and men’s of “over-adequacy,” if I may coin that term) are exaggerated. The effect on women is therefore harsher in physics than in, say, medicine, where there are many more opportunities for women. Astronomy has a milder culture, less overtly elitist than physics, and it has about twice the percentage of women at all levels. Two exceptions are the elite sub-fields of cosmology and theory, which have far fewer women. Medicine: many women. Surgery, the elite sub-field? Far fewer women. Law: many women. Big-shot law professors? Very few women. And so on. It’s an hypothesis that bears testing, if we can find an objective way to assess elitism.

Meanwhile, the three earlier stories suggest at least a few common sense recommendations:

1) Let us not assume others are like us. Interest in physics comes at different stages and manifests in different ways. Female talent is out there — let’s look for it and nurture it. If girls and women come forward less readily, let’s not interpret that as disinterest or reluctance or lack of skill.

2) We must compensate for the lack of role models, offer better support, and teach parents, teachers, guidance counselors to encourage interest from girl proto-scientists. Today such mentors should already know better than to push girls away from the natural sciences and toward domestic science, but they may still offer subtle cues that have the same effect.

3) Women who have persisted past the barriers may well feel isolated, invisible, and marginalized. (There are highly visible exceptions.) No women or men should imagine the playing field ever really levels out — we hope it will someday, but there is no evidence that it has done so yet.

I believe there is good reason for optimism. The percentage of physics Ph.D.s going to women is increasing, albeit

slowly. Some senior male colleagues are taking this challenge as their own, and have helped effect change. The number of women hired as junior faculty may be even be “right,” in the sense that women are the roughly the same percentage of assistant professors as of postdocs. Finally, the dearth of women in physics is receiving serious, concentrated attention, as in the national CAWMSETE report (Commission on the Advancement of Women and Minorities in Science, Engineering, and Technology Development; see www.nsf.gov/od/cawmset/start.htm) and the International Conference on Women in Physics (see www.if.ufrgs.br/~barbosa/conference.html). But we cannot wait complacently for physics to enter the modern era in gender equality — it’s too hard a problem and only persistent pressure will make the big beast move.

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Female talent is out there-let’s look for it and nurture it.

Status of Women in Physics, continued

Paris Conference on Women in Physics

On March 7-9, 2002, the International Union of Pure and Applied Physics (IUPAP) held an International Conference on Women in Physics at the UNESCO headquarters building in Paris, France. This meeting, the first of its kind, was organized with two major purposes in mind:

- (1) to understand the severe under-representation of women in physics and related fields worldwide, and
- (2) to develop and implement strategies to increase the participation and representation of women in physics.

A large number of international institutes and organizations sponsored the meeting and associated activities,

with those from the U.S. including the National Science Foundation, the National Academy of Science, the Department of Energy, the National Aeronautics and Space Administration, the National Institute for Standards and Technology, the American Physical Society, the American Institute of Physics, the Office of Naval Research International Field Office, and the Lawrence Livermore National Laboratory. These organizations united in recognizing that an understanding of the status of women in physics will likely provide insights and approaches that could be applied to other fields and professions where women are inadequately represented.

The situation of women in physics differs widely from country to country, but there is a remarkable consistency

This U.S. delegation's report on the IUPAP meeting serves as a means to re-start a national dialogue about the status of women in physics in the U.S.

Status of Women in Physics, continued

in one sobering pattern: the percentage of women in physics decreases markedly with each step up the academic ladder or with each level of promotion in industrial and government laboratories. The lack of women physicists in the upper echelons has a negative feedback on the health and diversity of the field. Since a number of physics faculty positions should be coming open as faculty hired in the sixties and seventies retire, it was especially timely and important to have an international forum to address the under-representation of women in physics.

More than 300 participants in delegations from 67 countries attended the conference. The delegates came from academic institutions, national laboratories, industry, and other sectors. The U.S. delegation was organized under the auspices of the American Physical Society and selected by the APS Committee on the Status of Women in Physics (CSWP). Its 12 physicists represented a diversity of backgrounds and expertise and had expressed a firm commitment to following up on recommendations that emerged from the conference.

This U.S. delegation's report on the IUPAP meeting serves as a means to re-start a national dialogue about the status of women in physics in the U.S.

Conference Dialogue

The IUPAP conference included significant input from the participants, who brought to bear their enormous diversity of backgrounds on issues discussed at the meeting. As an introduction to the status of women in their countries, each delegation wrote a 2-page contribution for the proceedings, as well as a conference poster on the topics concerning women in physics in their country. The conference itself included plenary sessions with invited speakers and small group discussions on six specific topics ranging from attracting girls into physics to balancing family and career.

The discussion groups generated many ideas for improving the status and representation of women in physics. These were distilled into a set of resolutions ratified by the conference, plus an additional set of more detailed recommendations for use in participants' home countries as appropriate. Specific resolutions were directed at individuals, schools, universities, research institutes, industry and industrial employers, scientific and professional societies, national governments, granting agencies, and the IUPAP itself. These consensus guidelines will be used by individual delegations to stimulate change in their own countries, with the exact language modified according to the culture and conditions of each country.

The resolutions and recommendations represent one of the key results from the IUPAP conference. IUPAP also plans to provide extensive online resources related to women in physics, including the materials from the conference, a database of women physicists worldwide, opportunities for global exchange and collaboration, and links to international organizations for women in physics and science, as well as to other international institutes

and conferences on related topics. Complete information may be found at <http://www.if.ufrgs.br/~barbosa/conferen ce.html>.

Findings, Results, and Highlights

Prior to the conference, the IUPAP Working Group on Women in Physics, in collaboration with the Statistical Research Center of the American Institute of Physics, undertook an international benchmark study on women in physics. They collected demographic information from more than 800 women in 50 countries. The data included individual experiences and concerns as well as education and employment histories. Results were presented at the conference and are available online (Ivie, Czujko, and Stowe, <http://www.aip.org/statistics/trends/reports/iupap.pdf>).

The statistics show that women around the world face similar barriers to their success in physics. Even in countries where it is as common for girls to study physics as for boys, the number of women physicists drops sharply with advancing level. At the top of the profession — meaning senior faculty and directors of research institutions — women are typically only a few percent or less of the total. This cannot be explained entirely by history (i.e., the lower numbers of women studying physics in past years), since women continue to leak out of the profession at every level even today. To a large extent, the absence of women from physics is an invisible problem; it is not commonly discussed in the international physics community, and few resources are devoted to improving the situation.

The large variations from country to country, and in particular, the 50/50 mix of young men and women at the undergraduate level in many countries, indicate that there are no intrinsic intellectual barriers to women's participation in physics. Rather, the barriers must somehow be cultural, i.e., related to societal norms and educational practices in the individual countries.

Critical Factors Leading to Low Representation of Women in Physics

The conference identified some critical factors leading to the low representation of women in physics throughout the world. *First*, societal and individual family pressures often dissuade women from becoming or staying involved in physics careers. Both the survey data and the conference discussions made clear that support from women's families, husbands, teachers, advisors, and colleagues is crucial in attracting women to physics and keeping them in the field.

Second, the long apprenticeship period in some countries encourages the disproportionate attrition of women in going from undergraduate and graduate studies to permanent positions in their sub-fields of physics. In particular, the "post-postdoc" phase appears to be the most leaky stage of the pipeline, regardless of the greatly differing representation of women in the various countries. Many delegates speculated that this was because of the overlap of the early-career years with the peak marriage/childbear-

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ing years, and because of the requirements for frequent relocation and travel.

Third, two serious concerns for women in physics across almost all nations were the dual career or trailing spouse problem (because most women physicists are married to other physicists or scientists), and balancing career and family. These issues tend to affect women's careers far more than men's, with women physicists reporting broken or commuting marriages, and deferred or no childbearing. (From the AIP report, two-fifths of respondents had no children, with one-fifth of those older than 45 years having had no children.) Many conference participants emphasized the importance of choosing one's spouse to ensure mutual understanding and support of each other's careers, and equal participation in family duties.

It is worth noting, however, that family issues cannot be the major barrier to success for women already in physics. For one thing, women without children do not appear to have more success in physics than do women with children. For another, countries with strong family support systems (daycare and maternity leave), like some Scandinavian countries, have in fact some of the lowest representations of women physicists. Finally, women are present in higher numbers in biology, medicine, chemistry, mathematics and other very demanding professions — there is nothing specific to physics about the conflict between work and family. At least one study (in Germany) has showed that male physicists with children tend to have more influential and well-paid jobs than those with no children, whereas the exact opposite is true for women physicists, showing that male physicists are directly rewarded for factors that their female counterparts are penalized for.

Fourth, women have little exposure to physics early in life; many societies believe that physics is not for "normal" people, and if for anyone, then for men. In addition, there is a general lack of appreciation of the usefulness of physics and a lack of awareness of the excellent job prospects for physicists and specifically for women. These issues, complicated by the fact that young women lack role models and female peer groups in physics, lower the numbers of women in physics in very early stages of education and begin to explain why physics has so many fewer women than sciences with similarly demanding lifestyles, such as biology or medicine.

Fifth, "nepotism" (the support of one's own students) and "cloning" (the selection and nurturing of students who resemble the professor) lead to the ongoing exclusion of women in male-dominated environments, of which physics is one of the most extreme examples.

Sixth, the lack of transparency in recruitment and hiring tends to work against women. Shifting or poorly articulated standards for hiring and promotion lead to uneven reviews, which are particularly detrimental to those without strong advocates within the system. These inequities can also serve as a deterrent, making science far less attractive for women.

Seventh, sexual harassment and overt discrimination strongly discourage women from pursuing physics and related fields. While perhaps rare, such events are devastating when they occur.

Together these issues begin to explain the dramatic under-representation of women in physics relative to other scientific fields. At the IUPAP conference, much attention was paid to concerns about balancing career and family, including childbearing and the two-body problem, but it was also noted that these issues are common to women pursuing any demanding career. So why are women better represented in other scientific and technical fields than in physics? A closer examination of those factors that are particular to physics must be undertaken. Both the structure of physics education and the "chilly climate" for women in physics may be contributing factors, and indeed may be coupled. Simply increasing the number of women in the physics educational pipeline will not improve the professional situation if women continue to leave the field at a high rate at each juncture in their careers.

When women are represented at all levels of the decision making, many of these issues are effectively addressed, a point made decisively by U.S. professor of biology Nancy Hopkins, speaking at the conference about her institution, the Massachusetts Institute of Technology. Sustained cultural change occurs when women are fully integrated at all levels in an institution. This appeared to be the case in France, for example, where representation of women is much better than in the U.S., and where the presence of women in leadership roles is seen as commonplace. When women are marginalized and when a culture is not under pressure to change, the aggressive, competitive, non-collaborative atmosphere that some call "combat physics" can prevail.

Across Many Nations

The IUPAP conference revealed regional differences arising from social, cultural, and economic considerations. Although there were no clear pan-national solutions, an ambitious first step in that direction was the identification of common deterrent factors, as well as of the differing needs of women physicists around the world. For example, marriage and childbirth occurred far earlier in developing than developed countries. From the AIP report, about one-third (one-fifth) of women physicists in developed (developing) countries are not married, with about 38 percent (60 percent) of marriages occurring during their education. There were also significant differences in the timing of having children: far more women physicists in developed nations delay or forgo having children compared to those in developing nations.

There were some socio-statistical surprises. Scandinavian countries, whose employment systems reduce some of the family-related barriers to women, nevertheless

Simply increasing the number of women in the physics educational pipeline will not improve the professional situation if women continue to leave the field at a high rate at each juncture in their careers.

Status of Women in Physics, continued

less have some of the lowest female physics Ph.D. rates. Several countries stand out as having large undergraduate enrollments in physics, notably India, Iran, and Italy. In India there are roughly equal numbers of men and women physics students through the Master of Science level. Iran had the highest percentage of female college-level enrollment in physics, whereas Sweden was almost last in the world. In several developing nations, women were free to use their maiden name on their publications but, perhaps surprisingly, in a well-developed country like Belgium, women physicists are required to use their husband's last name on their publications. It was also found that developing nations often led developed ones in providing flexible working hours and state support for couples trying to balance the needs of family and career.

Conference Recommendations

A primary focus of the conference was to articulate ways to create a better future for women in physics — a future in which the physics culture is more inclusive of difference, whether it be gender, race, or class. Some proposed steps to achieve this future are listed here.

1. Recognize the positive benefits of a diversity of perspectives to physics as a discipline.
2. Include women in the power structure, to help make the decisions that shape the field.
3. Ensure that key decision-making processes are transparent — i.e., policies are well-known and outcomes are clearly reported. Key decisions include those related to hiring, salary, promotion, resource allocation, peer review, and speaker selection.
4. Work for the positive portrayal of physics and physicists. Increase the visibility of women physicists in the media and press, and in the next generation of physics textbooks.
5. Ensure a grant system and academic path that do not discriminate against women. In regions or sub-fields where the numbers of women are particularly low, institute special incentive scholarships for girls and awards or prizes for women.
6. Abolish a source of age discrimination by using academic age (years since Ph.D.) rather than biological age in competitions for prizes, positions, and grants/fellowships.
7. Recruit more women into national and international collaborations.
8. Emphasize the value of doing physics early in science education. Improve physics teaching, and provide talented enthusiastic physics teachers for schools.
9. Encourage interaction between universities/labs and schools.
10. Provide mentoring programs for young girls in physics. Counsel parents, teachers, and career counselors to encourage girls to pursue physics.
11. Establish flexible career paths from the Ph.D. through the tenure phase in order to integrate the demands of family and career more easily. Provide an option to stop the career clock while women (or men) are preoccupied with family. Organize flexible grant structures that can adjust to non-traditional career paths. Possibly offer permanent positions earlier to women.

12. Provide convenient and affordable day care. Make work-related travel easier during the years when children are young.

A complete list of conference resolutions can be found at <http://www.if.ufrgs.br/~barbosa/conference.html>

“Let Us Do Physics – As Women!”

The IUPAP delegates shared a sense of excitement and solidarity, generated by the presence of so many outstanding women physicists. Many delegates, men and women both, described how empowering it was to have an international forum in which to discuss the integration of their love for doing physics with their values and goals as human beings and as members of society. Despite the fact that most of the women had overcome severe obstacles in order to reach their present positions, they communicated a sense of hope and a positive vision of the future, with a shared message of “Let us do physics: as women!”

This article is adapted from one which appeared in the June 2002 issue of Status, a publication of the American Astronomical Society Committee on the Status of Women in Astronomy. The complete conference report is available from the American Institute of Physics at <http://www.aip.org/statistics/trends/reports/iupap.pdf>.

Members of the US Delegation

Meg Urry, Chair, Yale University

Astrophysics, active galaxies, jets, black holes

Kimberly Budil, LLNL

Condensed matter and shock physics

Howard Georgi, Harvard University

Particle theory

Kristine Lang, NIST/Boulder

High-temperature superconductors, scanning tunneling microscopy, superconducting devices

Dongqi Li, Argonne National Lab

Experimental condensed matter, magnetic thin films and nanostructures

Laurie McNeil, U. North Carolina, Chapel Hill

Condensed matter/materials physics, optical spectroscopy of semiconductors and insulators

Peter Saeta, Harvey Mudd College

Condensed matter, nonlinear optics, semiconductor physics

Jennifer Sokoloski, CfA-Harvard

Astrophysics, accreting binaries, asteroseismology

Sharon Stephenson, Gettysburg College

Experimental nuclear physics

Sheila Tobias, Author

Expert in science education, feminist

Aparna Venkatesan, U. Colorado/Boulder

Astrophysics, cosmology, the first stars

Yevgeniya Zastavker, Franklin W. Olin College of Engineering

Experimental biological physics

“Let us do physics:
as women!”

Russian Diary

Sharon Stephenson, Gettysburg College

I have long been impressed by Russian physicists. When I was in graduate school I worked at Los Alamos, where I worked with TBR, a seasoned veteran of experimental neutron physics. (I have changed his initials for his privacy.) TBR would work back of the envelope calculations literally on the back of an envelope or on some even smaller scrap of paper with tireless precision, and his argumentative style, while frightening at first, at least showed respect. He was one of the first to treat me as an equal.

Sponsored by an International Research Fellowship through the National Science Foundation, I worked this spring with TBR at the Joint Institute of Nuclear Physics, a lab lush with birch trees in the small town of Dubna, on the banks of the Volga River. We are part of a relatively new project that involves many more Russians than Americans. We plan to measure directly, for the first time, the strength of the interaction between two neutrons. The experiment will be done at the YAGUAR reactor in Snezhinsk, a city that was top-secret until the 90's.

To keep my family and friends informed of my activities, I kept an e-mail journal for part of my stay. Below are some excerpts.

May 2, 2002

Subject: [Russian phrase] "I am here and it is no big deal!"
Greetings from Dubna.

On the plane I sit beside a very wealthy Muscovite with her daughter Marsha. They had been in France for the week. Olga offers to show me the Russian ballet in Moscow and gives me her cellphone number. She thinks I am British until she sees I am vegetarian. Once she discovers I am an "Americanka" she asks me about Afghanistan, since she never hears about it in the news anymore. I tell her Americans don't hear about it either. I tell her now some people in Washington want to invade Iraq.

So, I arrive in Moscow. We schlep off the plane, stand like cattle at customs. Eventually I am reunited with my mammoth duffle bag. A porter approaches me, assuming I am Russian. The mistake is common; I've been here enough times to know how to blend. I maintain eye contact longer, I stop smiling or even tilting my head in acknowledgement with strangers. My walk is more pur-

poseful, and I dress in materials that once had a place on some animal. To a newcomer, Russians might appear stonefaced and a bit harsh, but I find that they are more hospitable than most Americans, and they laugh at least as much as we do.

The porter and I go through customs, and there behind the bulletproof glass, is TBR. He is pacing. I am two hours late. Forgetting the ruble exchange rate, I also undertip the porter, who yells loudly and is appeased by TBR.

Soon we are off in a GA3 white Volga with a chain smoker at the wheel. He has a notepad stuck to the dashboard that indicates the influence of the US in this noble land – the notepad cover has a tan blonde woman in a red, white, and blue bikini. She appears to be realizing her own chest for the first time. I would weep for her but I am too busy trying to make peace with my God as our maniac driver passes cars at full speed on the right shoulder. TBR is gripping the door handle, his arm rigid. He appears ready to leap from the car. Very loud music plays on the radio. This continues for two hours. Along the road I see huge summer houses built by Muscovites like my fellow passenger on the Moscow flight. These houses are in stark contrast to the old flats occupied by the scientists I work with — class stratification is becoming more and more obvious.

At the Hotel Dubna I eat at 10 pm and move into the nicest room I have ever had in Dubna. It is the May holiday, and instead of sleeping I listen to patrons at the hotel's outdoor bar yell out the words to "Do You Believe in Life After Love". Cher, it seems, is universal.

May 6, 2002

Yesterday I shopped silently. Two women working in the shop and I gestured and pointed for about an hour. They trusted me completely. I paid in US dollars, doing the conversion in my head, and received rubles in change.

May 9, 2002

In America, there is dignity in labor. Communism supports dignity in labor equality. Both countries celebrate hard work, but there are subtle differences. The infrastructure at the lab in Dubna has been crippled by

continued on page 10

To a newcomer, Russians might appear stonefaced and a bit harsh, but I find that they are more hospitable than most Americans, and they laugh at least as much as we do.

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 15-18.

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/roster.html)



One of the attractions of doing physics in Russia is their ability to do physics when the going gets tough.

Russian Diary, continued

economics. There are no longer any rest room attendants. There is no one to call to fix leaky windows. Either the tendency to dignify all forms of labor is not as deeply-rooted here as it is in America, or these leaky windows have been around so long as to no longer warrant any attention. My rationale is that I actually don't know if such things were any better under communism. Maybe the toilets were just as horrid when an attendant was on the payroll.

If you were here, you would buy your own office computer, since you are quite tired of haggling for keyboard time in the computer lab. The printer is ancient. Bring your own paper, and if you want to print transparencies, you can get them only by asking permission from a man who was once your colleague. Transparencies are too expensive for you to buy by the box, and may not even be available in Dubna.

In the same situation, many would feel justified in not producing high-quality research. However, one of the attractions of doing physics in Russia is their ability to do physics when the going gets tough. Some of the best, Hall-of-Fame experimental results in nuclear physics come from this lab. All physicists here are "MacGyvers", and I want to be one too.

There are women at the lab, though very few in high positions. I am told that some women have taken jobs in Europe and in the US, where the economy is better. The young women who are still here are here by choice, and they seem content. I meet more than a few couples where both husband and wife are physicists.

The younger men who are both working at the lab and in a relationship with someone seem quite content. However, if you are a young male scientist at the lab and are single, then you are sure to ask the visiting American woman scientist to coffee twice a day, every day. When she refuses, as she always does, you go into your office and play Brittany Spears very loudly to show you are wise to the ways of American courtship.



Gettysburg College students, Cory Dallas and Marc Morris, enjoy homemade blinis. Photo courtesy of Sharon Stephenson

If you are a male who is unemployed and not in a meaningful relationship, then you risk becoming one who wanders the town, vodka bottle in plain sight. I have yet to see a drunk woman in Dubna. I can sometimes see as many as ten drunk men on a weekend during the day.

May 15, 2002

This morning I was shocked on my walk to hear a boy who looked about four years old on a teeny bike say to his father "Forty-one." It took me a moment to realize I had actually translated something without trying. Once at work, I was elated. I told TBR of my translation, and he bellowed "You are completely wrong! He said 401!" He then proceeded to tell me all my work from yesterday was wrong and the real fun started. When I am wrong (which is not that infrequently) his voice is very loud "YOU ARE ABSOLUTELY INCORRECT!" But when I am right, he whispers, as he did this morning after realizing my work was 90% correct, not 100% incorrect, "OK, yes. This is okay." This is cultural, and requires an adjustment in the way issues are discussed.

May 16, 2002

Put on 'dem mittens – it's snowing! Yes, comrades, yesterday and today we have had a biting wind and snow flurries. Since radiator heat (the only kind these buildings have) is turned off in mid-April, we dress accordingly indoors and out. TBR works at his computer in his overcoat.

Here you may ask yourself, "why not just turn on the boiler in each building and get the heat back on?" Where do you think you are, comrade? In Soviet Russia, heat was shared. All houses, flats, lab offices are on the same heating system, connected to some monster boiler outside of town. The system may seem strange, but if done right it might make good environmental sense.

I believe I have discovered why Communism was so attractive to the Russian people in the first place, and why they let it go on for so long in spite of the corruption. They were too thirsty to think it through. The people were much too dehydrated to thoroughly debate the ramifications of a Soviet state. No one here drinks anything but hot tea and compote, and only in small amounts. Soup is popular, but why not boil a little water, let it cool, and introduce your body to the joys of hydration? There are no water coolers, no water fountains. I told TBR's family that in the US, we learn about the health benefits of drinking eight glasses of water every day. They looked at me as if I had said "In America we eat shards of glass!" Later that same day they watched me down a measly 0.5 l bottle of water *all by myself!*

May 30, 2002

So, since my last installment, my American colleagues have arrived. Gettysburg College students Marc Morris and Cory Dallas with my departmental colleague (and husband) Bret Crawford arrived from France, Greece, and the US, respectively. We have seen St. Petersburg and been twice for daytrips to Moscow. St. Petersburg has the potential to rival Paris, but it needs more street

Russian Diary, continued

musicians. It has canals everywhere, like Venice, but good food is only located in secret places. Fortunately, we had a guide. Of course, she yelled at me when I forgot the population of St. Petersburg (“I have already told you! I told you once before!! Five million! Why do you not remember?!”). It was fortunate because she knew the only place in the city that served breakfast.

The weather is gorgeous, the workload huge, the time going by quickly. Yesterday was my first day to really get homesick, and that was after a very long day in Moscow. I was tired and not in the mood to take a second-class shower and wander to a restaurant. I am ready for decent showers, laundry services, and fast network connections.

June 2, 2002

TBR and some of his colleagues, along with his daughter, coordinated a Sunday drive. We packed in cars that are driven only a few times a year, to keep them from wearing out, and see small towns that most of us have never seen, including life-long residents of Dubna. We are only Sunday driving, but it is a rare treat. Everyone is relaxed, jovial. It is one of those days I won't forget.

June 3, 2002

Soon I return to my own computer, free of Cyrillic letters that make my head hurt. I return to sushi, salsa, and warmer temperatures. I will miss Dubna. It was liberating to have no responsibility to communicate with anyone except at work. The long hours of daylight and the lack of

cars meant long walks every single day. At work I could focus on single issues instead of multitasking. Most of all, I will miss the people and the excitement that comes from new relationships within different cultures.

TBR and his family are the most hospitable people I have ever known.

See y'all soon,
Dosvadanya,
Sharon



TBR and Cory at the family farm, getting water from the well.



Cory, Marc, and Sharon, in front of a recently-rebuilt cathedral in Moscow, which had been torn down by Stalin in 1931.

Women, Math, and Stereotype Threat

Diane M. Quinn, University of Connecticut-Storrs



Diane M. Quinn

For many years, social scientists have tried to explain the gender gap on standardized mathematical tests. Explanations have ranged from biologically based to developmentally socialized. For example, researchers have examined differences in brain formation and exposure to neonatal hormones, as well whether girls are less likely to be encouraged to experiment with math and science outside of the classroom. I am not wholly disputing these or other related possibilities, however, I would like to suggest that when examining why the best and brightest of women underperform on math tests or drop out of math related fields, the subtle effects of cultural stereotypes have been largely overlooked.

Few would argue that the American culture abounds with stereotypes. When I ask students in my undergraduate psychology classes to name stereotypes, they can spout ten to twenty stereotypes with ease. One stereotype that all know is that boys/men are better at math and science domains, whereas girls/women are better at English and reading domains. These stereotypical beliefs are transmit-

ted throughout the culture via mass media, books, parents, peers, and teachers.

How might these negative stereotypes account for a gap between men and women on tests of mathematical ability? My colleagues Steve Spencer, Claude Steele, and I believe the answer lies in the interaction between cultural stereotypes and the test taking situation, what we call a “stereotype threat” situation. Stereotype threat occurs when a person is in a situation in which a negative stereotype about that person (or that person's group) could be applied to the person and used to judge the person's behavior. In the case of gender and math, imagine a boy and girl sitting down to take the SAT for the first time. They have equivalent math experience. Taking the SAT is a tense, sometimes frustrating experience for both of them. However, as the girl is taking the test she has an extra worry to contend with that the boy does not: A stereotype that she, as a girl, has inferior math skills. As she experiences frustration and difficulty with the problems, she has the burden of knowing that her difficulty could be judged as proof of the veracity of the stereotype. The boy has none of these doubts or thoughts to interrupt his performance. It is important to note that in

“I would like to suggest that when examining why the best and brightest of women underperform on math tests or drop out of math related fields, the subtle effects of cultural stereotypes have been largely overlooked.”

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Women, Math, and Stereotype Threat, continued

this situation neither the girl nor the boy have to believe that the stereotype is true. Stereotype threat is not an explanation based on internalized inferiorization. Just the knowledge of the stereotype itself is enough to affect performance in the situation. How do we know this occurs?

My colleagues and I have tested the stereotype threat hypothesis in a series of studies. In all of our experiments we bring university men and women matched for equivalent math backgrounds and interest in to the laboratory. In the first of these studies we simply gave participants an easy or difficult math test. We found that women only performed worse than men on the difficult math test. To demonstrate that it was the threat of the stereotype that caused this underperformance, we gave a second group of men and women the same difficult math test. In order to make stereotypes about math explicit, half of the participants were told that the test had shown gender differences in the past. In order to eliminate a stereotype based interpretation of the situation, the other half of the participants were told that the test had been shown to be gender fair — that men and women performed equally on this test. In line with our predictions, when the stereotype was not applicable to the situation, when men and women were simply told that they were taking a gender fair test, men and women performed equally on the test. When told that the exact same test had shown gender differences in the past, women scored lower on the test than men. Just a simple change in the situation — a different line in the instructions — changed an outcome that many believed intractable. Notably, and perhaps more ominously, we have also conducted studies where we have a condition in which we do not mention gender at all—we simply describe the math test as a standardized test. In this situation, women also score lower on the test than men, suggesting that standardized mathematical testing situations are implicitly stereotype threat situations. Follow-up research in our own and other laboratories has replicated these findings and explicated some of the boundaries of stereotype threat. Stereotype threat occurs most strongly for women who are highly identified with math and are taking a test that is pushing the limit of their skills. When a test is easy or the women no longer care

about how they perform on the test, changing the stereotype relevance of the situation is unlikely to affect performance.

We have found some provocative clues to how stereotype threat works to undermine women's performance. Stereotype threat situations lead to both increased feelings of anxiety and more cognitive activation of female stereotypes. Both anxiety and stereotype activation have been linked to worse performance. When we look at what women and men are actually doing when working on the difficult test, we found that women and men primarily used the same strategies to solve the problems, however, women in stereotype threat situations were less likely to think of any way to solve a problem. That is, women were more likely to “blank out” or “choke” on a problem when they were in a stereotype threat condition. Thus research results so far point to the following scenario: When women with a strong interest and identification with math are in a situation in which their math skills could be negatively judged, their performance is undermined by the cognitive activation of gender stereotypes combined with some feelings of stress or anxiety.

Although more research is needed to fully delineate the stereotype threat process, we do know that women are not alone in being affected by negative stereotypes. Research on stereotype threat has demonstrated its effect on African-Americans and Latinos in intellectual situations, on the elderly in memory testing situation, and even on White men in sports situations.

What can be done about a cultural stereotype? Some might argue that if the stereotype is “out there” in the culture, there is nothing that can be done to stop its effects. However, we are not so pessimistic. In our studies we make very simple changes — adding a line in the instructions communicating that a test is gender-fair or non-diagnostic — that have a dramatic effect. If girls and women encounter fewer situations in which they experience stereotype threat, their increasing performance may one day break the ugly cycle of the stereotype leading to poor performance and the poor performance in turn feeding the stereotype.

“Expanding Your Horizons” Surveys Former Participants

Did you attend an Expanding Your Horizons in Science and Mathematics Conference as a student anytime since 1976? If so, please complete the brief survey at the website below to record the effect it had on you and your subsequent career path:
<http://echo.gmu.edu/survey/scontribute.php?survey=horizons>

CSWP to Offer Survival Skills Workshop at APS April Meeting

The CSWP will offer another “survival skills workshop” at the APS April 2003 meeting in Philadelphia. This informational workshop will be similar to the one offered in March 2002, and will feature a panel discussion followed by an interactive session. The half-day workshop will be aimed at technically competent women physicists who seek to balance career and family while improving their skills in communication, networking, and negotiation. Both men and women are invited to participate. Further information on times, registration, and costs will be available at a later date on the APS Meetings website at <http://www.aps.org/meet/> as well on the CSWP's website at <http://www.aps.org/educ/cswp/index.html>

The March 2002 program and handouts from the panelists, as well as some photos of the event, can be found at <http://www.aps.org/educ/cswp/skills.html>

Committee on the Status of Women in Physics Establishes Friends of the CSWP

The APS Committee on the Status of Women in Physics (CSWP), established in 1972, consists of nine members selected to rotating 3-year terms from APS-wide nominations by the Committee on Committees. Most members are women. Although about 3,500 individuals now receive the CSWP Gazette, the twice-yearly newsletter, this is mostly a one-way communication.

To make it easier for interested members of APS to participate in the work of the CSWP, the Committee has established a Friends of the CSWP listserve to assist the committee in understanding and improving the status of women in physics. With this moderated listserve, APS members may easily send suggestions to the Committee and receive news of Committee activities. Friends is open to all interested APS members, both men and women.

Suggestions from Friends might include issues for CSWP to address and topics and speakers for symposia at APS

meetings. The Friends listserve could facilitate nominations of qualified women physicists for APS Fellowship, awards, invited talks, and leadership roles in APS. CSWP will ask Friends to suggest new approaches for the Committee and to help carry out the work of the Committee in their own scientific communities and workplaces. All suggestions will be forwarded to the CSWP for comment and/or action.

In turn, Friends will receive by mail the CSWP Gazette, the twice-yearly newsletter of the CSWP. (note: past issues of the Gazette are available in pdf format at <http://www.aps.org/educ/cswp/gazette/>). Friends will also receive e-mail notices of the twice-yearly meetings of the CSWP as well as breaking news and reports related to women in physics.

To subscribe to Friends, please go to <http://www.aps.org/educ/cswp/friends.html>

The Committee has established a Friends of the CSWP listserve to assist the committee in understanding and improving the status of women in physics.

“Physics in Your Future”

Sue Otwell, APS Staff



The Committee on the Status of Women in Physics is pleased to announce publication of the updated edition of the booklet, “Physics in Your Future”.

“Physics in Your Future” is a 16 page, four-color booklet featuring profiles of young women scientists engaged in

various jobs in industry, government labs, and academia. Each vignette includes an interview as well as numerous colorful photos. There is also a section showing some of the achievements of women who have achieved long and successful careers in physics.

The booklet is aimed at middle and high school students who are about to make decisions about how much mathematics and science to take in high school. It shows the exciting possibilities for physics-related careers and ad-

vises students that strong preparation in mathematics and science is needed to enter such careers.

The author is Dr. Dinah L. Moché of Queensborough College of CUNY. Dr. Moché, who wrote the original “Physics in Your Future”, has written numerous books on space and astronomy for young people, including “Astronomy Today” and “Amazing Rockets”.

The booklet is available at no charge to students, educators, guidance counselors, and groups who work with young women. To view an electronic version, please to <http://www.aps.org/educ/cswp/future.html>. Information on ordering is also included.

This effort was generously supported by the American Physical Society, Bell Labs-Lucent Technologies, IBM, the Xerox Foundation, NEC, and GM. The CSWP is also grateful to all the women scientists who so willingly shared their time and expertise during the making of this booklet.



New Minorities in Physics Poster Created

Arlene Modeste Knowles, APS Staff

American Physical Society is pleased to offer this striking 15" X 20" color poster created by the APS Committee on Minorities in Physics. Although aimed at minority middle and high school students, it will encourage all students to master physics and gain a better understanding of their physical universe. This beautiful poster would make a great addition to any classroom, study hall, or any place where students are learning. Interested in obtaining a free copy? Send an email to knowles@aps.org

The APS Fellowship program was created to recognize members who made have made advances in knowledge through original research and publication or made significant and innovative contributions in the application of physics to science and technology.

Nominate a Woman for APS Fellowship!

The Committee on the Status of Women in Physics encourages APS members to nominate a woman for fellowship in the American Physical Society. You can easily check and see if someone is already a fellow by searching on their name in the APS online member directory at www.aps.org/memb/enter-directory.html. Fellows are clearly marked "[Fellow]" after their name.

The APS Fellowship program was created to recognize members who made have made advances in knowledge through original research and publication or made significant and innovative contributions in the application of physics to science and technology. They may also have made significant contributions to the teaching of physics or service and participation in the activities of the Society. Each year, no more than one-half of one percent of the then current membership of the Society is recognized by their peers for election to the status of Fellow in the American Physical Society. More than 200 women have been elected to fellowship in the APS. *All APS Members are eligible to nominate, and all APS members are eligible for nomination.*

Complete information on how to nominate a women to fellowship can be found at <http://www.aps.org/fellowship/> or you may write to

Executive Officer, American Physical Society, One Physics Ellipse, College Park, MD 20740
ATTN: Fellowship Program, *Phone:* (301) 209-3268, *email:* fellowship@aps.org

Nomination Deadlines

Fellowship nominations may be submitted at any time, but must be received by the deadlines listed below for the next review. All nominations should be sent to the above address. Deadlines are approximate as we go to press. Please check the APS website at <http://www.aps.org/fellowship/deadlines.html> for the most current information. The names of new Fellows will be announced in the March issue of the APS News.

DIVISIONS			
Astrophysics	05/01/2003	History of Physics	04/01/2003
Biological Physics	04/01/2003	International Physics	04/01/2003
Chemical Physics	02/15/2003	Industrial and Applied Physics	02/20/2003
Computational Physics	04/14/2003	Education	04/15/2003
DAMOP (Atomic, Molecular, Optical)	03/31/2003	TOPICAL GROUPS	
DCMP (Condensed Matter)	01/30/2003	Few Body	04/10/2003
Fluid Dynamics	02/15/2003	Precision Measurement & Fundamental Constants	04/01/2003
Polymer Physics	04/15/2003	Instrument & Measurement Science	04/01/2003
Laser Science	04/01/2003	Shock Compression	04/01/2003
Materials Physics	02/15/2003	Gravitation	04/01/2003
Nuclear Physics	04/01/2003	Magnetism and Its Applications	04/01/2003
Particles and Fields	04/01/2003	Statistical & Nonlinear Physics	04/01/2003
Physics of Beams	03/15/2003	Plasma Astrophysics	04/01/2003
Plasma Physics	04/01/2003	APS GENERAL NOMINATIONS	
FORUMS			06/01/2003
Physics & Society	04/01/2003		

WIPHYS (Women in Physics Listserve)

Interested in the topic of women in physics? Consider joining WIPHYS, the Women in Physics listserve. WIPHYS is a moderated listserv, open to anyone with an interest in such matters. Examples of postings include notices of conferences and events, newly published reports, job openings, on-line mentoring, and advice on teaching. More information can be found at <http://www.aps.org/educ/cswp/wiphys.html> You do not need to be a member of the American Physical Society to subscribe to WIPHYS.

The American Physical Society 2002-2003 Travel Grants for Women Speakers Program

The APS Committee on the Status of Women in Physics (CSWP) is pleased to announce the 2002-2003 "Travel Grants for Women Speakers" Program. 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 2002-2003 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 at (www.aps.org/educ/women-speaker.html). 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/cswp/travelgrant.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

See last page for application form.

Women Speakers List

Need a speaker? Consider consulting the American Physical Society Women Speakers List (WSL), an online list of over 300 women physicists who are willing to give colloquium or seminar talks to various audiences. This list serves as a wonderful resource for colleges, universities, and general audiences. It has been especially useful for Colloquium chairs and for those taking advantage of the Travel Grant Program for Women Speakers. To make the WSL easy to use, we have made the online version searchable by state, field of physics, or speakers' last names.



If you'd like to search the list to find a woman speaker, go to <http://www.aps.org/educ/women-speaker.html>

Women physicists who would like to be listed on the Women Speakers List or those who'd like to modify their existing entries can do so at <http://www.aps.org/educ/women-speaker-enroll.html>

APS also has a companion program for minority speakers. Information on the Travel Grant Program for Minority Speakers can be found at <http://www.aps.org/educ/com/travelgrant.html>. The Minority Speakers List can be found at www.aps.org/educ/minority-speaker.html.

Women Speakers List (WSL)

Enrollment/Modification Form 2002-2003

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

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. <input type="checkbox"/> Add this title <input type="checkbox"/> Delete this title	<input type="checkbox"/> Accelerators <input type="checkbox"/> Education (pedagogy etc.) <input type="checkbox"/> Interface/Device <input type="checkbox"/> Astrophysics <input type="checkbox"/> Environmental/Energy <input type="checkbox"/> Molec/Polymer <input type="checkbox"/> Atomic <input type="checkbox"/> Fluid <input type="checkbox"/> Nuclear/Particle <input type="checkbox"/> Biological/Medical <input type="checkbox"/> General <input type="checkbox"/> Optics/Optical <input type="checkbox"/> Chemical/Statistical <input type="checkbox"/> Geophysics <input type="checkbox"/> Plasma <input type="checkbox"/> Computational <input type="checkbox"/> History <input type="checkbox"/> Condensed Matter <input type="checkbox"/> Industrial
2. <input type="checkbox"/> Add this title <input type="checkbox"/> Delete this title	<input type="checkbox"/> Accelerators <input type="checkbox"/> Education (pedagogy etc.) <input type="checkbox"/> Interface/Device <input type="checkbox"/> Astrophysics <input type="checkbox"/> Environmental/Energy <input type="checkbox"/> Molec/Polymer <input type="checkbox"/> Atomic <input type="checkbox"/> Fluid <input type="checkbox"/> Nuclear/Particle <input type="checkbox"/> Biological/Medical <input type="checkbox"/> General <input type="checkbox"/> Optics/Optical <input type="checkbox"/> Chemical/Statistical <input type="checkbox"/> Geophysics <input type="checkbox"/> Plasma <input type="checkbox"/> Computational <input type="checkbox"/> History <input type="checkbox"/> Condensed Matter <input type="checkbox"/> Industrial
3. <input type="checkbox"/> Add this title <input type="checkbox"/> Delete this title	<input type="checkbox"/> Accelerators <input type="checkbox"/> Education (pedagogy etc.) <input type="checkbox"/> Interface/Device <input type="checkbox"/> Astrophysics <input type="checkbox"/> Environmental/Energy <input type="checkbox"/> Molec/Polymer <input type="checkbox"/> Atomic <input type="checkbox"/> Fluid <input type="checkbox"/> Nuclear/Particle <input type="checkbox"/> Biological/Medical <input type="checkbox"/> General <input type="checkbox"/> Optics/Optical <input type="checkbox"/> Chemical/Statistical <input type="checkbox"/> Geophysics <input type="checkbox"/> Plasma <input type="checkbox"/> Computational <input type="checkbox"/> History <input type="checkbox"/> Condensed Matter <input type="checkbox"/> Industrial
4. <input type="checkbox"/> Add this title <input type="checkbox"/> Delete this title	<input type="checkbox"/> Accelerators <input type="checkbox"/> Education (pedagogy etc.) <input type="checkbox"/> Interface/Device <input type="checkbox"/> Astrophysics <input type="checkbox"/> Environmental/Energy <input type="checkbox"/> Molec/Polymer <input type="checkbox"/> Atomic <input type="checkbox"/> Fluid <input type="checkbox"/> Nuclear/Particle <input type="checkbox"/> Biological/Medical <input type="checkbox"/> General <input type="checkbox"/> Optics/Optical <input type="checkbox"/> Chemical/Statistical <input type="checkbox"/> Geophysics <input type="checkbox"/> Plasma <input type="checkbox"/> Computational <input type="checkbox"/> History <input type="checkbox"/> Condensed Matter <input type="checkbox"/> Industrial

2002-2003 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



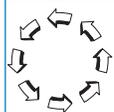
AMERICAN PHYSICAL SOCIETY

Committee on the Status of Women in Physics

One Physics Ellipse

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