

Gazette

CSWP

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

By David Wolfe, University of New Mexico

There were many pernicious, even deadly, myths spread by the former Soviet Union. The social ones, while not necessarily ending in the Gulag, were highly destructive. One of these was the myth of the equality of women in Soviet society. The status of women, particularly in the professions, was low and morale was terrible. The economic hardships of the past decade have not done much to improve the situation.

I have spent the last two years working in and with Russians, primarily in the closed nuclear cities, on programs of defense conversion and non-proliferation. This has brought me into contact with scientists and engineers throughout many regions of the country. I have visited several of the best technical universities and have spent much time in the Ural Mountain region as well as in Moscow and St. Petersburg. Throughout I have found dedicated professors and excited students with exceptional training. But their numbers are smaller than they were and their prospects are not bright. The situation is that much worse for women. For example, in one Physical-Technical Institute that I visited, there were 17 students – no women. This is not unusual but terribly sad and wasteful.

St. Petersburg is one of the most beautiful and wonderful cities I have ever had the privilege to visit. While there I met with a wonderful group of women who have formed an NGO, **The St. Petersburg Women Association in Science (SPWAS)**. They held a meeting at the very end of June, *The Role of Women as an Intellectual Reserve for the 21st Century: An Interdisciplinary Investigation into the Challenges and Perspectives*, which I was, unfortunately, not able to attend. But in our meeting I discovered the very large injustices under which they suffer. They are fighting problems of discrimination, salaries, job placement, childcare – at levels against which we struggled at least fifteen years ago. They have no legal structures in place to which they can appeal. So many problems, so little recourse!

We can help. They are creating a Web page and we can provide links to that. But my appeal to all our readers would be to help with students and post-docs! They have very bright students, many of whom have attended school *entirely in English* for up to **nine** years. I can testify to the English ability of such students because I have met many of them. **My plea would then be for all us to try to recruit at least one student or post-doc from the SPWAS area.**

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1999 Nicholson Medal Honors

Fay Ajzenberg-Selove and Mildred Dresselhaus

By Barbara Goss Levi, Senior Editor, Physics Today

The APS Nicholson Medal for Humanitarian Service was created in 1993 to honor Dwight Nicholson, a physicist and humanitarian. The criteria for the award mirror the special contributions that Nicholson made: He had a vision for the improvement of the quality of life in our society, he had a particularly caring and giving relationship with students and colleagues, and he worked to promote international human rights and international ties in science.

Like Nicholson, both Fay Ajzenberg-Selove and Mildred Dresselhaus have been exemplary teachers and mentors and have actively supported international collaborations in science. The citation for the medal given to each of them reads:

“For being a compassionate mentor and lifelong friend to young scientists; for setting high standards as researcher, teacher and citizen; and for promoting international ties in science.”

Fay Ajzenberg-Selove has been a professor of physics at the University of Pennsylvania since 1970. Before then, she taught at Haverford College (1957-1970) and at Smith College and Boston University. She has had a distinguished career as a nuclear physics experimenter, specializing in nuclear spectroscopy. Her series of review papers on energy levels of light nuclei



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1999 Nicholson Medal Honors *Continued*

have been invaluable to the field. She began them in 1952 with Thomas Lauritsen of Caltech and, after he became ill, she continued them alone from 1970 until 1991. Those review papers are considered a "citation classic." She was a founder of the Nuclear Physics Division of the American Physical Society in 1966 and when she was elected as chairman of the division, she served during 1973-74 as the first female officer of APS.

Ajzenberg-Selove believes strongly that physics and in fact science in general, should be international. To that end, she has been active in the International Union of Pure and Applied Physics, serving as chairman of the Commission on Nuclear Physics from 1978-81. She was instrumental in the founding of the DOE/NSF Nuclear Science Advisory Committee and served as a member from 1977-80.

Ajzenberg-Selove has striven to communicate her excitement and love of physics at all levels, from students in the introductory physics course to junior colleagues. Her devotion to students is legendary; she invites students in her classes to call her at home if they have trouble with the homework problems. She was awarded the Lindback Foundation Award for Distinguished Teaching in 1991.

Ajzenberg-Selove has actively encouraged, mentored and convinced many students to pursue a degree in physics when they wanted to move into other fields. One case she mentions in her memoirs is that of Joseph Taylor, who wrote her a letter telling her he didn't feel he was capable enough to do physics. She replied telling him he did have the ability and convinced him to continue. Taylor subsequently earned both the Wolf and Nobel Prizes.

Ajzenberg-Selove has been very active in her efforts to improve the status of women physicists. In 1971, she organized the first session at an APS meeting to deal with the concerns of women scientists, inviting as participants not only women physicists but also male physicists (Charles Townes and Allan Bromley) who could be helpful to the equitable treatment of women in physics. On that occasion, Ajzenberg-Selove said, "I believe that most of us want for everyone, of whatever race, religion or sex, a full flowering of each individual's personality and attainment to the limit of that person's ability and commitment." She subsequently became a charter member of the committee that became the APS Committee on the Status of Women in Physics.

Former students speak gratefully of times that Fay helped them over a professional difficulty and encouraged them to do what they could to continue pursuing the physics that they loved. One former student described the warm atmosphere her office, which was furnished with a well-worn overstuffed chair. That student praised Fay for letting her students into her professional life and even a bit into her personal life. In so doing, says this student, she exposes them to an outstanding scholar and genuinely compassionate person: This is education beyond the classroom and the very reason one goes to a university to learn.

Mildred S. Dresselhaus is an Institute Professor (one of twelve) at MIT, where she holds appointments in the department of physics and the department of electrical engineering and computer science. She was recently sworn in as Director of DOE's Office of Science. Dresselhaus is internationally known for her work on graphite, graphite intercalation compounds, carbon fibers and, more recently, on fullerenes and carbon nanotubes. The excellence of her work led to her membership in the National Academy of Science and the National Academy of Engineering. Skilled in leadership as well as research, Dresselhaus served as president of the American Physical Society in 1984 and of the American Association for the Advancement of Science in 1997-98.



Dresselhaus has worked hard to develop wider opportunities for women in science and engineering. Not only has she provided a wonderful role model, but she organized the first Women's Forum at MIT (in 1971) dedicated to exploring the roles of women in science and engineering; she chaired the APS Committee on the Status of Women in Physics and the National Research Council's Committee on Women in Science and Engineering; and she co-chaired with Judy Franz a joint APS-AAPT panel that evaluated the climate for women in various colleges and universities.

Dresselhaus has extended her reach around the world. She has been a visiting professor in Israel, Brazil, Japan and Venezuela, and she has participated in exchange programs with several Japanese, Belgium and French universities. While president of APS and AAAP, she was heavily involved with promoting US international science linkages. She has been awarded honorary degrees from 17 universities around the world.

But most of all, "Millie" has taken a personal interest in many young people, especially her students. Her students give glowing reports of her special influence on them, telling of a relationship that combines emotional support with intellectual respect. By example she has shown her students not only the scientific excellence needed to succeed in science but also provided a model of how they might nurture such excellence in their own students.

Dresselhaus' students say that she created a working environment centered around collegiality. Visitors, postdoctoral fellows and students frequently shared the Dresselhaus family's dining table and music parlor. This sense of belonging was especially important for the many students who had come from abroad.

Most of Millie's more than 60 PhD students have remained in contact with her and continue to ask her for professional advice. One student noted that she has had an impact on the careers of multiple generations of physicists. One might see her at a professional meeting, for example, expressing delight at a good presentation given by a student of one of her former students or postdocs.

Improving the Climate for Women in Physics

Site Visit Program

Barbara L. Whitten, CSWP Site Visit Coordinator, Physics Department, Colorado College

Women's participation in science has risen rapidly since Affirmative Action legislation in 1972 removed formal barriers. But the percentage of women in physics lags behind most other sciences; women have consistently earned 25% of the Ph.D.'s in mathematics, 30% in chemistry, and 45% in life sciences. Only 13% of physics Ph.D.'s have been women. Engineering, which used to produce a smaller number of women doctorates than physics, has caught up in the last decade. (Ivie and Stowe, 2000, pp 4–5)

Women opt out of physics at every stage of the academic ladder. According to a 1992 report by Fehrs and Czujko, the percentage of women in physics drops from 40% in high-school physics classes to 25% in introductory college classes, to 16% of bachelor's degree recipients to 10% of new Ph.D.'s to 3% of college and university faculty.

Many reasons have been suggested for this. It is important to note that that data do *not* support a lack of ability on the part of women. When men and women are matched by scores on a standardized math test, women leave physics at a larger rate than men for all score categories. (Fehrs and Czujko, 1992, p 35) The wide variation in women's participation in different countries, from 47% of physics faculty in Hungary to 3% in Korea and the US, suggests that some of the reasons are cultural. (Fehrs and Czujko, 1992, page 40).

A survey of attitudes in first year physics graduate students showed that many more women than men expressed unhappiness over the "climate" in their department. (Franz, p. 2) The CSWP site visit program is designed to address this issue.

The History of the Site Visit Program

In 1990, The Conference of Physics Department Chairs asked the American Physical Society and the American Association of Physics Teachers to recommend ways to encourage fuller participation by women in physics. The women's committees of the two organizations carried out a pilot program to evaluate the climate for women in five physics departments at public and private institutions. Based on this pilot, Mildred Dresselhaus and Judith Franz received NSF-funding to visit an additional ten physics departments. The final report is posted on the CSWP Website (<http://www.aps.org/educ/cswp/index.html>).

This project was so successful that the APS has continued a site visit program, conducted by CSWP and funded by APS and the participating physics departments. Every year we conduct two or three site visits to departments who invite us, and make recommendations on a variety of formal and informal ways to create a more comfortable environment for women faculty and students.

Until now the CSWP has restricted itself to schools which have graduate programs, but recently we decided to extend the program to research laboratories. This summer a CSWP site visit team will visit National Center for Atmospheric Research (NCAR) in Boulder. We are also working on the possibility of extending the program to physics departments without graduate programs.

How site visits work

A site visit is requested by the chair of the physics department. Frequently women faculty members initiate the idea and do the preliminary work, but the invitation must come from the department chair. While the committee realizes that departments that are not willing to undergo site visits may be those who need it most, we also recognize that without the cooperation of the chair, very little can be done. This is an entirely voluntary program; we need to conserve our resources.

When we have agreed to conduct a site visit, the coordinator puts together a team consisting of a chair plus two to four physicists. We consult the department for advice, but select the team ourselves. We try to choose physicists who are in subfields represented by the department, both so that we will understand the politics of the subfield, and so that our team can speak with authority. We try to balance experienced people with rookies, to expand the population of potential team members. Most team members are women, though we have asked male physicists to participate.

Prior to the visit, the team reviews information about the department, including basic demographic information about the number and gender of various categories of faculty and students. We also ask the department to administer a survey to measure student satisfaction. The site visit itself typically lasts one to two days. The team interviews members of the administration responsible for science programs, the department chair and graduate and undergraduate advisors. We meet with members of the faculty, graduate and undergraduate students. We meet with both male and female faculty and students, but make sure that women have an opportunity to talk to the committee in the absence of men, and that students can talk to us in the absence of faculty. The results of these interviews are confidential, and neither the names of interviewees nor direct quotations are used in the final report.

The team composes a report on their findings and suggestions for improvements. This report is sent to the department chair, with the recommendation that it be shared with administration and faculty. We ask for a follow-up report in six months, to let us know if any of our suggestions have been implemented and have proved useful.

Every year we conduct two or three site visits to departments who invite us, and make recommendations on a variety of formal and informal ways to create a more comfortable environment for women faculty and students.

At the triennial joint meeting of the AAPM and IOMP in July 2000, the IOMP Officers approved the establishment of the “*Maria Sklodowska-Curie Award*”

Women Medical Physicists in AAPM Report on Task Force On Women

By Azam Niroomand-Rad, Georgetown Medical Center, Washington, DC

American Association of Physicists in Medicine (AAPM) is a scientific, educational, and professional organization of more than 4,000 medical physicists. Headquarters are located at the American Center for Physics. AAPM publications include a scientific journal (“Medical Physics”), technical reports, and symposium proceedings.

Medical Physics is an applied branch of physics concerned with the application of the concepts and methods of physics to the diagnosis and treatment of human disease. Most medical physicists have an MS or Ph.D. in medical physics, physics, radiation biology, or a related discipline, and training in clinical medical physics. Clinical training may be obtained through a residency traineeship or a postdoctoral program of one or two years in a hospital. Clinical medical physicists are employed in medical schools, hospitals or clinics, or in private practice. They may divide their time between clinical service and consultation, research and development, and teaching, or they may work in industrial or research positions. Further information on the roles of medical physicists may be found on the AAPM website at www.aapm.org

The total membership of women medical physicists in the AAPM is about 700 (out of 4700 total members). There is no committee in AAPM addressing women’s professional concerns. A few years ago, the number of women participating in the leadership of AAPM Organization was very few. To rectify this situation, a Presidential Ad-Hoc Committee was established to address some of the concerns. This situation has been improved, but it still needs more improvement.

In February 1997, a two-page Professional Questionnaire was sent out to 692 women members in AAPM by the Ad Hoc Committee on Women. We received 286 responses from members. Based on the statistical analysis that was performed by the AAPM consultant we learned that 216 (86%) of the respondents were in favor of and 35 (14%) were against formation of a “committee on women”. We also received 126 written comments in favor of and 33 written comments against formation of a “committee on women” in AAPM. From the questionnaire data we also learned that in a period of five years (1992-1996), women’s involvement in the activities of the Science Council was not on par with their membership (about 16%). For a period of five years (1992-1996), the activities of the Science Council, on the average, were about 71% of the activities of all three Councils combined.

To identify and resolve this situation, in 1998, a Task Group on Women, chaired by myself, with seven members both male and female, was established under the Professional Information and Clinical Relation Committee of the Professional Council. The Task Group’s objectives were to establish educational programs to encourage women’s participation in the activities of the AAPM, particularly those under Science and Education Councils; to identify opportunities for women’s participation in the activities of the AAPM, particularly those under the Science Council; and to create networks for sharing resources with women in the AAPM.

To achieve these goals, a Symposium on Women in Medical physics was organized during the AAPM Annual Meeting in summer, 1998. This Symposium, which was well attended, helped to raise awareness for our colleagues. We also organized a dinner in honor of Madam Curie during the AAPM Annual Meeting for the centennial celebration of the discovery of radium. Moreover we proposed the formation of an Award entitled the “*Maria Sklodowska-Curie Award*” by the AAPM Awards and Honors Committee. We suggested that our newly established “*Award for Achievement in Medical Physics*” be modified and renamed as the “*Maria Sklodowska-Curie Award*”. We argued that such an award would honor a great scientist. Unfortunately this proposal was not approved, basically because of concerns regarding Madam Curie’s nationality (she was not an American) and concerns that this award might overshadow the “William D. Coolidge Award”, the highest AAPM award. Interestingly, since the establishment of the AAPM Coolidge Award in 1972, only one woman (Edith Quimby, 1977) has received this award.

I continued a parallel effort to establish the Marie Curie Award with the International Organization of Medical Physics (IOMP). At the triennial joint meeting of the AAPM and IOMP in July 2000, the IOMP Officers approved the establishment of the “*Maria Sklodowska-Curie Award*” which was presented for the first time to Professor John Cameron of the University of Wisconsin-Madison.

At the same meeting, I was elected as the Vice-President (President-Elect) of IOMP. I will serve as Vice-President from 2000-2003 and President from 2003-2006. For the first time, our international organization will have a woman as an IOMP Officer. In addition, the AAPM Electronic Committee agreed to create a link with the APS Committee on Status of Women in Physics.

Letter from the Editor, continued

My experience at the University of New Mexico has shown me that recruiting foreign undergraduate students is not always easy. I am investigating various scholarships and exchange programs and have contacted our chapter of the Society of Women Engineers. Graduate students are much easier for those of us at research institutions. Working through our Department, I can reserve one Teaching Assistantship per year for these transfers. My hope is, of course, that we can find opportunities for many such students throughout our contacts in the US. Post-docs are more specialized and need to be treated on a case-by-case basis, as they graduate. I know many of the problems of dealing with foreign students. But, where there's a will, there's a way. I am quite sure we can get help from our Forum on International Affairs. My experience at UNM shows that determination in the face of bureaucracy goes a long way. The only serious problem I have found (besides money of course) is with the INS and the requirement for English proficiency. This is non-trivial but can be handled. The TOEFL test that is most commonly used for English proficiency is both expensive and strange. I use the word *strange* because of the number of good speakers of English who cannot pass this test. For example, I met a Professor from the Ioffe Institute who has taught for approximately four years in American Universities. A fluent speaker of our language, she took the TOEFL exam and failed parts of it. This only adds to my own experience with students being unable to pass this

test although fluent in English (and vice versa by the way!). With this knowledge I went to our Director of Foreign Admissions and reached an agreement with her. If I (or another American physicist) would speak to these people personally and directly, both in general and about our subject, she would certify them for entrance. They still have to take the "Michigan Test" when they arrive but that is much easier than the TOEFL. I recommend this policy as a possibility at other schools.

My plea, then, is that we work in some coordinated fashion to try to help these bright young women. Russia is a country in a deep economic mess but one full of potential. There will be jobs in this country for these young people, they will almost certainly want to return to their own country (despite the INS, I do not believe everyone in the world wants to live in the USA), and they will contribute. I will volunteer to coordinate any contacts that anyone might need finding names, specialties, arranging interviews, etc. My e-mail is dwolfe@unm.edu. I am often in Russia and can try to be one of the people who do the interviewing for language and physics skills. But I want and need as many other ideas as possible. In our creative community this should not be too hard. The American Physical Society has a long history of helping our colleagues in other countries. Here is yet another way in which we can cooperate. Please help!

My plea, then, is that we work in some coordinated fashion to try to help these bright young women.

Letter to the Editor

Christine M. Wehlburg, Sandia National Laboratories

By chance I was given a copy of the Spring 2000 Gazette and read Elizabeth MacDonald's article regarding "...measures for work and family balance in graduate school." While a physical chemistry Ph.D. student, my husband (a nuclear engineering Ph.D. student) and I decided to start a family. I remember the day I told my advisor I was pregnant. His first reaction was to mention how it was going to interfere with my research. I knew then that having a family was going to be challenging than I initially thought. I worked until the very day I delivered -- two weeks OVERDUE. Rachel was born on December 14th, 1994.

To avoid any potential criticism from my advisor, I deliberately returned to work over the Christmas break (less than two weeks after delivering). I was completely in the dark as to whether there would be any possible loss of income if I did not promptly return to work. I feared that if I asked, some bureaucrat would decide that I should be docked wages. The last month or so of pregnancy I knew that my time in the lab had been shortened, but I really thought that I had made a good effort at keeping up with my responsibilities. I was very disappointed when my advisor gave me a below acceptable rating on my fall performance review in the category of time spent in the lab.

I made the decision to nurse the baby and, without even asking my advisor, started bringing her to work in the mornings. She slept in her stroller in a nice dark, unused lab, while I did my research. I nursed her twice before I

returned her home at lunch to be cared for by a nanny. When she started getting a little older, I set up a playpen in an office shared by a post-doc, another grad student and myself. They were very understanding folks. Again, I did not ask my advisor. I was so afraid he would say no, and then what would I do. We eventually received additional financial aid loans to pay for a full-time nanny, but that meant I had to stop nursing.

Ms. MacDonald's article was right on the money. I cannot even begin to count the number of times I almost quit grad school. Her article also made me smile. Fond memories of our first child, combined with the security of having now received the degree, allow me that pleasant recollection. I am a hard-nosed person who had a husband actually willing to do half the work. It should not be so hard for women who decide to start families in grad school to find formalized institutional and financial support. It would be helpful not only to the grad students, but to faculty and advisors, many of whom have been surrounded by men for so long they have not given proper thought to the idea. One possible wrench in the wheel, though, is that department formalities might have limited some of my more ambitious, self-imposed policies.

Thanks for publishing such a timely article. It actually helped me realize that I did the best I could to start and raise a family under imperfect circumstances as a graduate student.

The Gazette welcomes letters to the editor. Opinions expressed in letters are the readers' own and do not necessarily represent the opinions of the CSWP or the APS.

Real women doing real physics is one phenomenon that many people don't have a chance to absorb visually.

Women Doing Physics: Past, Present, Future

By Marjorie Olmstead, University of Washington, former Chair, CSWP

The human brain excels at assimilating visual information. To really believe something, one often needs to “see for yourself.” Real women doing real physics is one phenomenon that many people don't have a chance to absorb visually. Most of us, both male and female, work in environments where the number of woman physicists can be counted on one hand. If you want visual proof that “It's not just Marie Curie,” then check out the CSWP Display, *Women Doing Physics: Past, Present, Future.*”

The CSWP, in an effort led by Beverly Berger (current CSWP chair), assembled a collection of photos, both historical and modern, of women physicists. These photos were assembled into a beautiful full-color display for the APS Centennial Meeting in March 1999. The historical photos were selected from the collection of AIP's Emilio Segrè Visual Archives. They include pictures showing, of course, Marie and Irene Joliet-Curie, and also Annie Jump Cannon, Kathryn Blodgett, and many other famous women physicists and astronomers. The modern photos are snapshots contributed by readers (and their friends) of the CSWP Gazette and WIPHYS, the CSWP listserve. Some of the subjects are well-known, others were unknown even to the person sending in the photos. However,

all photos show women physicists actively pursuing their craft. The display is a great conversation starter, as people look for familiar faces.

The display is modular and can easily be shipped to any appropriate venue. Its life began with the APS Centennial. It has already been displayed at the APS annual meetings in Minneapolis and Long Beach and the Northwest and Southwest APS Sectional Meetings, as well as at Oakland University, SUNY-New York, and the University of New Mexico. While in the Northwest, it also made an appearance at a reception for women and minority science faculty at the University of Washington. Please contact Sue Otwell (women@aps.org) if you would like to borrow the display for an appropriate venue.

Several of the “modern” photos were also used to create a beautiful full-color poster, now viewable on the CSWP web site at <http://www.aps.org/educ/cswp/index.shtml>. Several thousand copies of the poster have been distributed – if you need one or more copies, please contact Sue Otwell.

2000 Dissertation in Beam Physics Award to Mei Bai

“For her work in the theory, experimental demonstration, and clear explanation of a method using an RF dipole for overcoming intrinsic spin resonances in polarized proton acceleration.”

Mei Bai received her B.E. in engineering from University of Electronic Science & Technology of China in 1989. She earned her MS in accelerator physics from University of Science & Technology of China in 1992. In the next two years, she worked for National Synchrotron Radiation Laboratory, an 800 MeV electron storage ring facility. In 1994, she came to the United States and entered the Ph.D. program of Indiana University. Two years later, she went to Brookhaven National Laboratory to work on her Ph.D. thesis. She conducted her thesis research at the Alternating Gradient Synchrotron under the guidance of Professor S. Y. Lee. Dr. Mike Syphers and Dr. Thomas Roser are her

local advisors at BNL. In 1999, she received her Ph.D from Indiana University. Her thesis “Overcoming Spin Intrinsic Resonance By Using an RF Dipole”, centered on a novel method of avoiding depolarization due to intrinsic spin resonance by adiabatically exciting a large coherent motion.



Currently, she is a Research Associate at BNL and working on the project of using RF dipole for linear & non-linear beam dynamics studies and spin manipulation at the Relativistic Heavy Ion Collider.

CORRECTION

Our sincere apologies to Dr. Ani Aprahamian, whose name was inadvertently omitted from the 1999 List of Women Fellows of the APS. Her nomination reads:

Ani Aprahamian

University of Notre Dame, Nuclear Physics

For showing the existence of multiphonon vibrational excitations in the low-energy spectra of both spherical and deformed nuclei.

Murname Named MacArthur Fellow

Margaret Murnane, Professor of Physics at the University of Colorado, has been named a 2000 MacArthur Fellow. The MacArthur Fellows Program awards unrestricted fellowships to talented individuals who are chosen for their exceptional creativity, promise for important future advances based on a track record of significant accomplishment, and potential for subsequent creative work. Currently, each fellowship comes with a “no strings attached” stipend of \$500,000 to the recipient, paid out in equal quarterly installments over five years.

Murnane works at the leading edge of applied optical physics. She has made important strides in three aspects of laser pulse generation: brevity, power, and frequency. These advances hold significant implications for understanding the physical basis for the interaction of light and matter, as well as practical engineering applications.

Although ultra-short laser pulses were first observed several decades ago, Murnane and Henry Kapteyn optimized the design of a titanium-doped sapphire laser cavity in order to make routine the generation of pulses on the order of 10 femtoseconds. This modification, combined with advanced techniques for measuring pulse duration accurately, creates a reliable system for generating light pulses 2 to 3 cycles long. Further experimentation has resulted in laser pulse generation with peak power in the Terawatt range. Murnane’s research takes advantage of a unique property of short duration, high power light pulses—when directed at atomic gases, these pulses produce higher frequency harmonic emissions in the X-ray range. Her re-

search group has shown that X-ray generation efficiency improves dramatically as the stimulating pulse duration decreases. Developing such X-ray sources provides enormous practical benefits. These X-rays have been used in high temporal resolution atomic spectroscopy, and to probe chemical reactions on surfaces and in materials. These X-ray sources may also find future application in high resolution imaging of living biological specimens.



Murnane is a professor of physics at the University of Colorado and is a Fellow of JILA, an interdisciplinary research group composed of scientists from the University of Colorado and the National Institute of Standards and Technology. She received a B.S. (1981) and M.S. (1983) from University College in Cork, Ireland, and a Ph.D. (1989) from the University of California, Berkeley. Murnane has held faculty positions at Washington State University (1990-1995) and the University of Michigan (1996-1999). She received two awards from the American Physical Society: the Simon Ramo Award (1990) and the Maria Goeppart-Mayer Award (1997). She was selected as a Presidential Young Investigator (1991) and Presidential Faculty Fellow (1993) by the National Science Foundation. In 1998, she was named a Fellow of the Optical Society of America.

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

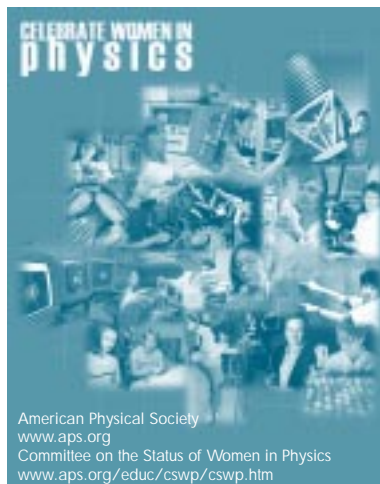
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AIP Publishes Report on Women in Physics

By Rachel Ivie, *American Institute of Physics*

The Statistical Research Center of the American Institute of Physics recently published a report on the status of women in physics. The report documents the representation of women in physics over time and at different levels (from high school to university faculty). It also compares women's representation in physics to women's representation in other fields. Included in the report are lists of PhD physics departments that had four or more women physicists during 1998, departments that awarded more than 40% of their physics bachelor's degrees to women, and women's colleges that grant bachelor's degrees in physics.

The report discusses how the representation of women on physics faculties compares to the percentages of women earning PhDs in physics in the past. Salary differences between female and male members of AIP Member Societies are also discussed. Finally, the report evaluates various hypotheses that attempt to explain women's low representation in physics. You can view highlights of the report or download a copy of the report at www.aip.org/statistics. Or write to Statistical Research Center, American Institute of Physics, One Physics Ellipse, College Park, MD 20740, 301-209-3070.

Noteworthy

Neal Abraham, *DePauw University, Greencastle, IN*

Materials that recently have come to our attention, which may be of interest to readers, include:

"An MIT Professor's Suspicion of Bias Leads to a New Movement for Academic Women: Faculty members at other universities seek to apply her approach to promote gender equity", by Robin Wilson, *The Chronicle of Higher Education*, December 3, 1999, page A16.

"Has Feminism Changed Science?", by Londa Schienbinger (Harvard University Press, 1999) ISBN 0-674-38113-0

"Coming Into Her Own: Education Success in Girls and Women", edited by Sara N. Davis, Mary Crawford, and Jadwiga Sebrechts, Jossey-Bass, San Francisco, 1999) ISBN 0-7879-4490-4

"Talking Leadership with Powerful Women" (including Mildred Dresselhaus), edited by Mary S. Hartman (Rutgers University Press, 1998) ISBN 0-8135-2560-8

"Marie Curie and the Science of Radioactivity". A major new exhibit has been mounted on the Web to explain the life and work of Marie Curie. The site is offered by the

Center for History of Physics at the American Institute of Physics and may be seen at www.aip.org/history/curie.

Reports and studies from the Online Ethics Center for Engineering and Ethics on confidentiality, diversity and other ethics issues in educational and workplace settings. <http://Onlineethics.org/ecsel/info-brochure.html>

"Tech-Savvy: Educating Girls in the New Computer Age". AAUW's two-year study recommends a variety of improvements in teacher training, computer games, and the high-tech workplace to attract women and girls to high-tech careers. <http://www.aauw.org/2000/techsavvy.html>

"Promise and Limits of Mentoring in Academic Science: a look at research on impact and effectiveness", by Linda Grant, PhD, and Kathryn B. Ward, PhD, plus an interview with Rita Colwell, first woman Director of the National Science Foundation. *AWIS Magazine*, vol. 29, no. 1, Winter 2000. <http://www.awis.org/html/magazine.html>

"Taking Women Seriously". Elizabeth Tidball's new study on the success of women students, reviewed by Joyce Hackett. This article was posted on Friday, January 7, 2000 <http://www.salon.com/books/it/2000/01/07/wellesley/index.html?CP=POI&DN=310>

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 13-14.

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)



Site Visit Program, continued

What do we learn from site visits?

Departments differ wildly in their climate for women, but we can see some common themes. For undergraduate students, good advising can help first-year students find the right place to start. Different entry points to the physics major are helpful for students with different backgrounds in physics. Women students value interactions with professors; department social events can be helpful. A student lounge and a chapter of SPS facilitate interactions with peers.

For graduate students the first year is most critical. Beginning graduate students are often confused and isolated, while advanced students who are integrated into a research group feel more connected to faculty and other students. Often orientation activities for new students are concentrated in the first week of school, when students are overwhelmed with new information. Spreading these activities out over a semester is helpful. A seminar series to introduce students to the different research groups helps new students feel a part of the department and find an appropriate research group.

Most male physicists are supportive of women, but there can be a few male students and faculty who behave inappropriately – “girly” calendars in TA offices or sexist remarks, for example. It is important that the department chair deal makes it clear to male colleagues and students that such behavior is unprofessional and inappropriate. It should not be left for women students or junior faculty to deal with such incidents. A good way for the department chair to learn about women students’ concerns is to schedule regular meetings – perhaps once a semester – with women students. This makes it clear that women’s issues are important, and problems can be corrected in a timely manner. These meetings should be informal in tone and often enough and long enough for students to speak their concerns. Modest refreshments (e.g. pizza) can set a friendly and casual tone.

All women students benefit from the presence of role models – departments with more women faculty almost always have a better climate for women. Departments with few or no women faculty should make vigorous recruiting efforts. In the interim, women can be invited as seminar speakers, — the CSWP keeps a list of women who are available as speakers (<http://www.aps.org/educ/cswp/index.html>). The APS provides small grants to help physics departments bring in women colloquium speakers. Many departments have “Women in Physics” groups of varying degrees of formality – sometimes organized by faculty, sometimes student-initiated, sometimes partly professional, sometimes purely social. The department can encourage such a group, and subsidize modest refreshments.

Many of these suggestions do not apply only to women, but would improve the climate for all students. A chilly climate impacts women more than men because of their relative isolation.

Women faculty can also be plagued by isolation and can benefit from interaction with other women scientists. But institutional policies on family issues – in particular the “two-body” problem, maternity leave, and child care – are usually most critical to women faculty. Creative job sharing can be helpful for scientific couples, though it must be done with great care. Expectations for part-time faculty must be scaled back, and explicitly agreed upon. Generous maternity and childcare policies make it clear that the institution is committed to women’s issues. These policies are usually determined by the university, and beyond the control of a department. But a site visit team of senior women physicists can be very effective in persuading a dean or provost that family-friendly policies are vital to the recruitment and retention of female faculty.

Women faculty can be overburdened with advising, mentoring, and committee work. The department chair must make it clear that advising students is the responsibility of *all* faculty, not just women. The chair can also help protect a young woman from too many all university committees and see that her service to the department and university is rewarded.

How to arrange a site visit

If you would like CSWP to visit your department, you must first obtain the cooperation of the department chair. The chair can contact any member of the CSWP (names and email addresses are listed on the front of this issue), or Sue Otwell, our APS liaison (otwell@aps.org). A member of the committee will respond to you and we’ll begin to put together a team and find compatible dates. Please be patient, remember that this program is carried out entirely by volunteers who have many many other things to do.

References

Information on APS Women Speakers Program, Travel Grants for Women Speakers Programs, and Site Visit Program is available on the CSWP web site at <http://www.aps.org/educ/cswp/index.html>

Judy R. Franz, “Improving the Climate for Women in Physics.” Available on the Web at <http://www.aps.org/educ/cswp/index.html>

Mary Fehrs and Roman Czujko, “Women in Physics, Reversing the Exclusion,” *Physics Today*, August 1992, pp. 33–40.

Rachel Ivie and Katie Stowe, *Women in Physics, 2000*, AIP Publication Number R-430, June 2000. (Available from AIP or on the Web at <http://www.aip.org/statistics/trends/wmtrends.htm>)

All women students benefit from the presence of role models – departments with more women faculty almost always have a better climate for women.

Further information on the nomination process can be found online at <http://www.aps.org/fellowship/index.html>

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 APS. 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 may 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 are recognized by their peers for election to the status of Fellow in The American Physical Society.

All APS Members are eligible to nominate, and all APS members are eligible for nomination.

To Submit Nominations:

- Insure nominee is a member of the Society in good standing.
- Obtain signatures of two sponsors who are members of the Society in good standing.
- Submit signed Nomination Form, Curriculum Vitae, and Supporting Letters prior to unit deadline as a complete packet to:

Executive Officer, American Physical Society,
One Physics Ellipse, College Park, MD 20740-3844,
ATTN: Fellowship Program

Although there is no required number of supporting letters for each nomination, typically 2 - 3 letters from individuals outside the nominee's institution who are familiar with the nominee's work are submitted.

Note: Nomination forms may be obtained by:

- writing the above address,
- sending an email message to: fellowship@aps.org,
- telephoning: (301) 209-3268 or faxing: (301) 209-0865,
- downloading electronic version of the nomination form from <http://www.aps.org/fellowship/form.html>

Supporting letters should be included with nomination forms to insure attachment to the correct nomination package.

Nomination Process:

1. Submit nomination to the APS prior to unit deadline.
2. Nominations reviewed at the Unit level by the Unit Fellowship Committee. **(By July 1, 2001)**
3. Recommendations reviewed by the APS Fellowship Committee. **(By September 1, 2001)**
4. Final approval given by full APS Council. **(By November 31, 2001)**
5. Notification of newly elected fellows as well as sponsors of nominees deferred or dropped.
6. General announcement of new fellows in March issue of the APS News.

Further Nomination Information

For further information regarding Fellowship Nominations, please email: fellowship@aps.org or telephone: (301) 209-3268.

APS Fellowship Nomination Deadlines for 2001

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: Executive Officer, American Physical Society, One Physics Ellipse, College Park, MD 20740, ATTN: Fellowship Program.

UNIT DEADLINES: Deadlines are approximate as we go to press. Please check the APS website at <http://www.aps.org/fellowship/01fellde.html> for the most current information.

For further information regarding the APS Fellowship Program, please email: fellowship@aps.org or telephone: (301) 209-3268.

DIVISIONS		Physics of Beams	03/15/2001	Precision Measurements & Fundamental Constants	04/02/2001
Astrophysics	05/01/2001	Plasma Physics	04/02/2001	Instruments & Measurements	04/02/2001
Biological Physics	04/02/2001			Shock Compression	04/02/2001
Chemical Physics	02/15/2001	FORUMS		Gravitation	04/02/2001
Computational Physics	04/14/2001	Physics & Society	04/02/2001	Magnetism and Its Applications	04/02/2001
Atomic, Molecular, Optical	03/31/2001	History of Physics	04/02/2001	Statistical & Nonlinear Physics	04/02/2001
Condensed Matter	01/30/2001	International Physics	04/02/2001	Plasma Astrophysics	04/02/2001
Fluid Dynamics	02/15/2001	Industrial and Applied Physics	02/20/2001		
Polymer Physics	04/15/2001	Education	04/15/2001		
Laser Science	04/02/2001			APS GENERAL	06/01/2001
Materials Physics	02/15/2001	TOPICAL GROUPS			
Nuclear Physics	04/02/2001	Few Body	04/10/2001		
Particles & Fields	04/02/2001				

The American Physical Society 2000-2001 Travel Grants for Women Speakers Program

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 2000-2001 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/cswp/index.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/cswp/index.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

AMERICAN PHYSICAL SOCIETY

2000-2001

WOMEN *Speakers List*

Colloquium Talks by Women Physicists

The 2000-2001 Women Speakers List (WSL) of Women in Physics (pictured to the left) is published by The American Physical Society. This list, compiled by the Committee on the Status of Women in Physics, contains the names of over 200 women physicists who are willing to give colloquium or seminar talks. The WSL serves as a resource for middle school, high school, university and general audiences. Information on the speakers is listed by state and by field for easy reference. To receive your free copy, please complete this form and return it to APS, or access the forms on-line (www.aps.org/educ/cswp/index.html.)

Name: _____

Institution: _____

Address: _____

City: _____

State: _____ Zip: _____

Phone: _____

Email: _____

2000-2001 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

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: _____ <div style="display: flex; justify-content: space-around; font-size: small;"> (last) (first) (middle) </div> Previous last name (if applicable): _____ Date of Birth ____/____/____	GENDER: <input type="checkbox"/> Female <input type="checkbox"/> 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 e-mail 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 WORK STATUS (Check One)	TYPE OF WORK ACTIVITY
Current Interest	Highest Degree		
(check up to 4 in each column)			Please check four numbers from the list below of the activities in which you engage most frequently.
1 ___ 1 ___ 2 ___ 2 ___ 3 ___ 3 ___ 4 ___ 4 ___ 5 ___ 5 ___ 6 ___ 6 ___ 7 ___ 7 ___ 8 ___ 8 ___ 9 ___ 9 ___ 10 ___ 10 ___ 11 ___ 11 ___ 12 ___ 12 ___ 13 ___ 13 ___ 14 ___ 14 ___ 15 ___ 15 ___ 16 ___ 16 ___ 17 ___ 17 ___ 18 ___ 18 ___ 19 ___ 19 ___ 20 ___ 20 ___ 21 ___ 21 ___ 22 ___ 22 ___ 23 ___ 23 ___ 24 ___ 24 ___ 25 ___ 25 ___ 26 ___ 26 ___ 27 ___ 27 ___ 28 ___ 28 ___ 29 ___ 29 ___ 30 ___ 30 ___ 99 ___ 99 ___	Astronomy & Astrophysics Acoustics Atomic & Molecular Physics Biophysics Chemical Physics Education Electromagnetism Electronics Elementary Particles & Fields Geophysics High Polymer Physics Low Temperature Physics Mathematical Physics Mechanics Medical Physics Nuclear Physics Optics Plasma Physics Physics of Fluids Thermal Physics Solid State Physics General Physics Condensed Matter Physics Space Physics Computational Physics Accelerator Physics Superconductivity Surface Science Non-Physics Quantum Electronics Other (please specify) _____	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, nontenured 8 ___ Long-term/Permanent Employee 9 ___ Inactive/Unemployed 10 ___ Retired 11 ___ Self-employed 12 ___ Other (please explain) _____ _____	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) _____ _____
		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) _____ _____	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 2000-2001

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
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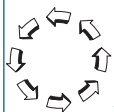
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