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## GUEST EDITORIAL: *Stand by Me*

*By Yevgeniya V. Zastavker/ Franklin W. Olin College of Engineering*

*Yevgeniya V. Zastavker*

I recently attended the Third International Conference on Women in Physics held October 8–10, 2008, in Seoul, Korea. This was also *my* third international conference on women in physics. Each of these three meetings seemed to mark another step in my professional development and academic career: starting as a visiting assistant professor during the first conference, followed by a permanent position as an assistant professor during the second meeting, and advancing to an associate professor for the third. These important conferences served as an opportunity for me to learn and grow as a scholar, teacher, and mentor. Each of these meetings opened a door for deep and profound self-reflection, the last provoking contemplation about my academic career as a woman physicist and the careers of many others interested in pursuing physics whom I had the luxury of mentoring.

As did the previous two conferences, the Third International Conference culminated in a set of recommendations, one of which addresses the importance of mentorship and role models in attracting and retaining women in physics.[1, 2] Clearly, this is an internationally relevant issue, which pertains to all professionals and academics alike, regardless of school of thought, level of education, experience, age, culture, or persuasion. After this conference, I reflected mostly on the specific issue of mentorship and role models. This is undoubtedly because, as my career develops, I touch the lives of more and more young men and women, some of whom may become scientists, possibly physicists, mathematicians, or engineers. What is my role in this process? How do I follow the recurrent recommendations of the International Conferences on Women in Physics? And, what did I learn from these three meetings about mentorship and the presence of role models in physics?

When thinking about this, I couldn't help but remember bringing my infant home for the first time. I held this tiny warm bundle in my arms and felt both limitless joy and enormous fear. How does one become a mother? Everyone kept telling me that it was just

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# The Third International Conference on Women in Physics: Lessons Learned

*By Yevgeniya V. Zastavker/Franklin W. Olin College of Engineering & Elizabeth H. Simmons/Michigan State University*

### The Third International Conference on Women in Physics (ICWIP2008): Description

The Third International Conference on Women in Physics (ICWIP2008) was held in Seoul, Korea, October 8–10, 2008. The leader of the local organizing committee was Prof. Youngah Park of Myongji University, who also serves as the Chair of the Working Group on Women in Physics of the AAPPS (Association of Asia Pacific Physical Societies) and was recently elected to Korea's National Assembly. The conference details can be found online at http://icwip2008.org/.

The overarching purpose of the Third ICWIP2008 was three-fold: (i) to analyze the international status of women in physics, including recent progress in promoting their participation; (ii) to provide an international arena for women in physics to share their scientific accomplishments and create scientific collaborations; and (iii) to build each participating country's capacity to improve women's advancement in physics and related fields. By bringing together teams of physicists (mostly, but not exclusively, women) from across the globe, the Conference facilitated important tasks:

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# Funding, Grant Writing, and Leadership Workshop at the Third ICWIP2008

*By Amy Cassidy/University of Southern California*

*Amy Cassidy*

Adequate funding and leadership are both critical to successful scientific pursuits. One of the workshops at the Third IUPAP International Conference on Women in Physics, which I attended as a part of the U.S. delegation, focused just on those two issues. This workshop consisted of three sessions. The first session presented an international perspective on funding sources. Women scientists from different nations identified funding sources and resources available in their region. In addition, information about opportunities for international collaborations was shared with the workshop participants. In the second session, Beverly K. Hartline, Delaware State University, presented tips on grant writing and obtaining funding. This session drew a lot of comments and questions that clearly highlighted the range of challenges facing scientists in different parts of the world. The final session emphasized the importance of leadership. J. Grace Lin from China-Taiwan presented major principles behind successful leadership and discussed her experience as a leader. She stressed that good leaders are made, not born, and that effective leadership is a learned skill.

Each of the above sessions involved active discussions among workshop participants. It was noted that the considerable amount of travel that accompanies international collaborations might be a potential obstacle for young women. Attendees discussed remedies for "writing proposal burnout," and how to establish relationships with financial sponsors. Participants also brought up the importance of the inclusion of women on grant review panels. In the final session, the workshop attendees composed a list of recommendations for IUPAP and national physical societies as well as advice for individuals about successful securing of funding and project leadership.

I had an opportunity to make a presentation during the first session of this workshop. In preparation for my talk, I researched opportunities for international collaborations provided by U.S. funding agencies. These included programs of the Office of International Sciences and Engineering at the National Science Foundation, the Office of Naval Research Global and USAID. As a young scientist with little grant writing experience, I was unaware of many existing opportunities, which include funding for establishing international collaborations. This information opened a door for new possibilities that I had not seriously considered before.

It was valuable to gain knowledge about the grant writing process, to hear about some of the challenges women face in obtaining funding, and to learn from those who have become successful. Many points were brought up regarding funding, but a few stuck out to me. These include:

- Finding a match: when searching for a funding agency, consider how their mission matches your interests.
- Preparation: when submitting a grant, follow all instructions!
- Deliver: do what you say you are going to do.
- Feedback: if your proposal is not accepted, find out why.
- Follow-up: once you have obtained a grant, keep your grant officer informed of your progress.
- Network, network, network.

Perhaps one of the most interesting aspects of the conference for me was meeting scientists from the developing world and learning about the challenges they face. These include lack of equipment, funding, and local training opportunities, as well as scarcity of opportunities to publish. The differences in available resources are great. For example, I spoke with a woman from the Sudanese delegation who would like to continue her physics studies, but does not have the resources to travel to get the training she needs.

While I learned a lot of useful information about obtaining funding, I also left the Conference with some questions: What are the best ways to help scientists in the developing world? How can scientists in the U.S. connect with those in the developing world to share their scientific interests while also benefitting from international collaboration? Much work remains to be done internationally to answer those questions.

More details about the workshop and resulting recommendations can be found in the conference proceedings. In addition, the workshop presentations and other resources can be found at the website of the IUPAP Working Group on Women in Physics at http://wgwip.df.uba.ar/.

*I would like to thank Christophe McCray, Research Staff Member at the Institute of Defense Analysis, for his valuable feedback during the development of this article.*

## IUPAP Conference, *continued from page 1*

- reviewing the data on women in physics,
- discussing barriers that impede women from entering and advancing in physics-related careers,
- sharing success stories,
- proposing ways to improve women's participation in physics worldwide,
- sharing physics research and implementing international research-based collaborations, and
- encouraging international teams to refine and accelerate strategies for improving the status of women in physics in their countries or regions.

Conference participants included nearly 300 scientists from 60 nations. Nearly 15% of the Conference attendees were men. To the extent possible, each country strove to be represented by a well-balanced team composed of both early-career and well-established physicists, featuring a diversity of physics subfields, career trajectories, and geographical location within their homeland. Each country also attempted to include one representative from prior Conferences in Paris (2002) or Rio de Janeiro (2005) so as to provide continuity and assist in educating newer team members about the range of issues faced by women physicists across the globe. ICWIP2008 teams also included scientists from other technical fields and some social scientists. Representatives from engineering and biology, for example, shared success stories of women in their fields and learned from the experiences of physicists. Social scientists reporting on their research about the physics community added a valuable perspective to the Conference discussions. Finally, to spread the women-in-physics agenda more broadly through the physics community, ICWIP2008 brought together some of the top decision-makers and practitioners interested in the challenges encountered by women in physics.

As one of the largest teams attending the Conference, the 27-member U.S. delegation attempted to span all dimensions of diversity (http://uswip.org). The team included women and men of different generations, career stages, racial/ethnic identities, and geographic affiliations. The physics fields of the delegates ranged from biological physics to atomic physics to particle physics to high-school teaching; non-physicist delegates included a social scientist, a biologist, a chemist, and a biomedical engineer. Delegates included today's leaders in universities, national labs, and industry, those training tomorrow's leaders in the classrooms and labs, and those who will be leading physics and physics-related fields in the future.

One important specific goal of this Conference was to have each delegation report on the actions and progress in its nation/region since the Rio de Janeiro Conference of 2005 as well as to learn from the experiences of other countries. Each delegation prepared a paper and a poster describing the recent progress of women in physics in their country and highlighting the extent to which recommendations and/or resolutions from the First and Second International Conferences have been implemented to address remaining hurdles. The first poster session of the Conference focused on these topics, while the second poster session enabled individual physicists from around the world to present their own scientific research. Both sessions were crowded, vibrant, and joyful events, yielding the opportunities for fascinating conversations about physics and/or life as a woman physicist.

The major work of the Conference was accomplished in parallel breakout groups and workshop sessions. The professional development workshops aimed to provide attendees with resources and skills that would empower them to advance professionally or help colleagues to do so. Topics covered in these workshops included writing successful proposals, leading projects, performing fund-raising, and organizing local women in physics working groups. In contrast, the breakout groups focused on community-sized topics such as attracting girls to physics, improving the climate for women physicists, project leadership, and strategies for women in physics working groups. These smaller gatherings included formal presentations, chances to try out hands-on demonstrations made of simple materials, and wide-ranging discussions of societal factors that impact women's ability to participate fully in scientific careers in particular countries or regions. Each breakout group formulated specific recommendations that were debated and refined in a lively plenary session at the end of the conference; the amended recommendations formed the core of the resolutions that were unanimously adopted by the Conference attendees in the final session and forwarded to the IUPAP General Assembly (http://icwip2008.org/2008/resolution.php).

ICWIP2008 made tangible progress towards long-term goals of the women-in-physics commu-

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**"I believe the positive effect of ICWIP2008 will go beyond the physics community and will have a strong effect on women leaders in all fields of science and technology."**

*—Dr. Youngah Park, Chair of the ICWIP2008 Organizing Committee*

*U.S. Delegation to the Third ICWIP2008.*

# RUNNING IN CIRCLES LOOKING FOR A GREAT SCIENCE JOB OR HIRE?

The American Physical Society (APS) Career Center is the best niche employment site for physical science and engineering jobs, with hundreds of jobs viewed by thousands of the finest scientists each month.

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**http://careers.aps.org**

- > Research Physicist
- > Department Chair
- > Principal Scientist
- > Postdoctoral Fellowship
- > Plasma/Laser Engineer
- > Optical Physicist
- > Mechanical Engineer
- > Electrical Engineer

The APS Career Center is part of the *Physics Today* Career Network, a niche job board network for the physical sciences and engineering disciplines. Jobs and resumes are shared with four partner job boards – *Physics Today* Jobs and the American Association of Physics Teachers (AAPT), AVS: Science and Technology of Materials, Interfaces, and Processing, and IEEE Computer Society Career Centers.

# Women in Physics in the United States: Reporting on Past and Looking at the Future

*By Yevgeniya V. Zastavker/F. W. Olin College of Engineering, Paul Gueye/Hampton University, Kelly M. Mack/University of Maryland Eastern Shore, Rachel Ivie/American Institute of Physics, Elizabeth H. Simmons/Michigan State University, Lea F. Santos/Yeshiva University, Luz J. Martínez-Miranda/ University of Maryland, Arthur Bienenstock/Stanford University and American Physical Society, Jacob Clark Blickenstaff/University of Southern Mississippi, K. Renee Horton/University of Alabama, Anne J. MacLachlan/University of California Berkeley, Nora Berrah/Western Michigan University, Beverly K. Hartline/Delaware State University*

## Women In Science and Engineering in the U.S.

The last decade marked the emergence of several important studies and workshops that focused attention on women in science, technology, engineering and mathematics (STEM).[1-5] By examining the current status of women and other minorities under-represented in STEM, these studies assembled a set of step-by-step recommendations for academic institutions, professional societies, funding agencies, and Congress. Finally, a call for "substantial and overarching reform of [the] academic enterprise" was made by the National Academy of Sciences, National Academy of Engineering, and Institute of Medicine.[1] The proposed reform aims to eliminate gender bias and bring women's participation in STEM to parity. As a follow up to this call, in May 2008, the U.S. House of Representatives held a hearing on gender equity in science.[6] These initiatives have resonated within the physics community in significant ways.

## Recent Trends

The proportion of women attaining bachelor's degrees in physics has risen steadily to a high of 23% in the early 2000's.[7] Unfortunately, the percentage of women earning PhDs has been fluctuating between the low values of 14% and 18% (Figure 1). As shown in Table 1, only 13% of physics professors were women in 2006.[8] However, the percentage of female professors in each faculty rank has been steadily increasing and appears to be equal to or greater than the percentage of PhDs awarded to women in the relevant years.[9] This indicates that young women have as good a chance at a physics academic position as their male peers. Nevertheless, a statistical snapshot of the representation of girls and women in physics in 2006 reveals the following story:

- 47% of high school students taking physics in 2005 (data for 2006 not available); [10]
- 21% of bachelor's degrees; [7]
- 23% of master's degrees; [7]
- 17% of PhD's; [7]
- 6% of full professors; [8]
- 43% of all departments with no women on faculty. [8]

Comparison with related fields shows physics lagging significantly: 42% of bachelor's degrees in astronomy and 31% of those in materials engineering were earned by women in 2005, and 31% of all science and engineering faculty were women in 2003.[11] As shown in Figure 2, physics has the lowest representation of women at the doctoral level.[11] Women are most prevalent in psychology and sociology with 77% and 70% of women students at the bachelor's levels. In all fields, women earn a smaller proportion of graduate than bachelor's degrees.

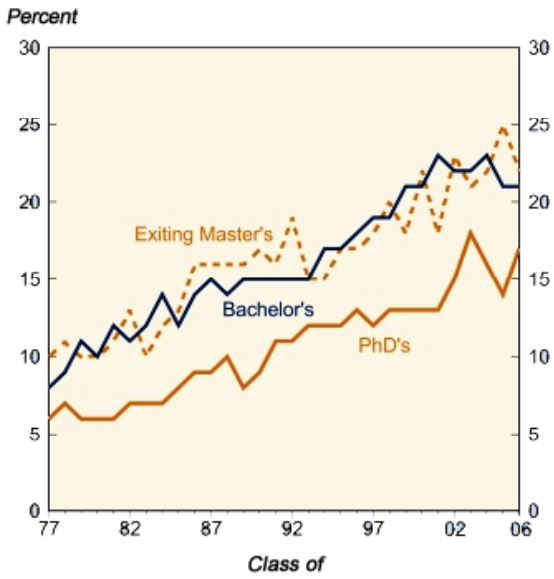


**Figure 1.** *Percent of bachelor's, exiting master's, and doctorates in physics earned by women, 1977-2006.* [7]

Women of color (WOC) continue to be under-represented in physics and related fields, and little progress has been made in recruiting or retaining them in the last decade. Fewer than 5% of faculty members in the "top 50" U.S. physics departments are from under-represented minority populations.[12] Specifically, five years after her initial survey, Donna J. Nelson's survey of the "top 50" U.S. physics departments found similar dismal representation of WOC in physics, with 31 Asian, 5 Hispanic/Latina or Chicana, 1 African-American, and no Native-American or Native-Alaskan women.[12] Without a doubt, being at the intersection of two minority statuses, WOC are even further marginalized in physics.

The under-representation of women and, specifically WOC, in physics and related fields is attributed to factors such as the tiny numbers who enroll and graduate in physics, poor high school education, unsupportive and unwelcoming curricular and pedagogical structures in college, a lack of self-confidence and stereotype threat, absence of knowledgeable and enthusiastic teachers, dearth of role models and mentors,

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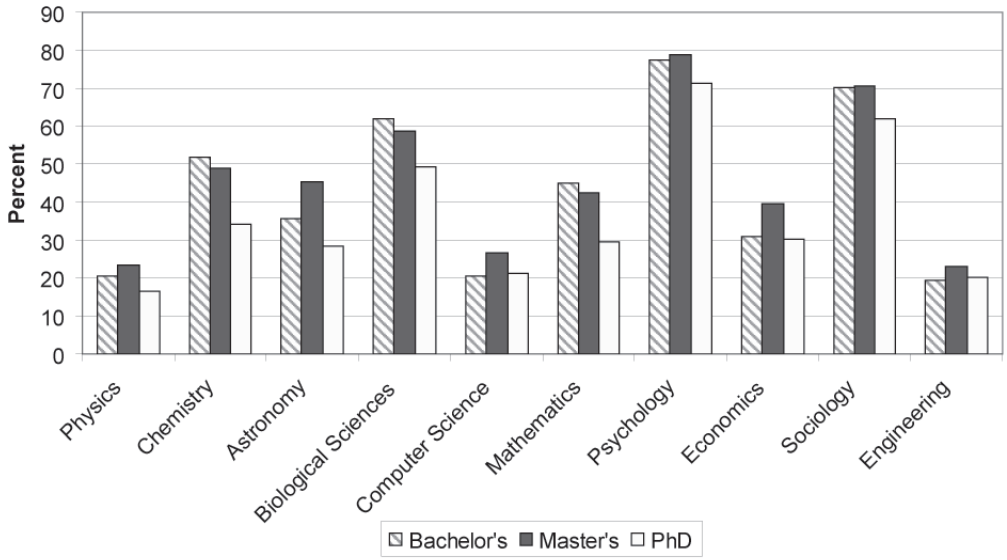
**Figure 2.** *Percent of bachelor's, master's, and doctorates held by women in various fields, 2005.* [11]




family and financial issues, a "chilly climate," and a "glass ceiling" in employment, along with the inherent masculinity of the scientific enterprise among many others.[1-4, 6, 9] Balancing family and career continues to serve as one of the major obstacles for women in physics.[13] Moreover, because there are so few, women in general and WOC in particular are in high demand as role models and committee members—service which takes time, but does not help in career advancement or tenure achievement.[14] This is very concerning, since persons of color will form the majority of the U.S. population by the year 2050.[15] Unless significant improvement is made, the overall presence of WOC will progress much too slowly in the next 40 years.

## Actions for Improvement

In the United States, physics, as a community, has promoted a number of activities for women. For example, in May 2007 the Committee on the Status of Women in Physics of the American Physical Society (APS) brought together chairs of 50 major academic physics departments and 15 managers of major national laboratories to the Gender Equity Workshop. The purpose of the Workshop was to double the number of women in physics in the next 15 years "by informing, educating and providing … the tools to achieve this goal." [16] Starting in 2002, APS has been offering a series of workshops for women physicists at the doctoral, post-doctoral, and faculty levels to provide them with negotiation, communication, leadership, and networking skills.

**Table 1.** *Percent of women physics faculty.* [8]

| Academic Rank | 1998 | 2002 | 2006 |
|---|---|---|---|
| Full Professor | 3 | 5 | 6 |
| Associate Professor | 10 | 11 | 14 |
| Assistant Professor | 17 | 16 | 17 |
| Instructor/Adjunct | N/A | 16 | 19 |
| Other Ranks | 13 | 15 | 12 |
| **Overall** | **8** | **10** | **13** |

Various grants and scholarships have also become available in the last few years for women physicists. Mildred H. Blewett scholarships became available in 2005 to enable early-career women physicists to return to research following a career interruption for family reasons. Consisting of a one-year $45,000 financial support, this scholarship has been presented to 6 women to date. APS has also won funding from the Elsevier Foundation to support modest grants of $400 to help defray the costs associated with childcare during attendance of the society's annual meetings.

The last two decades have seen the rise of a site visit program to college and university physics departments as well as national laboratories. Co-sponsored by CSWP and the Committee on Minorities (COM), the aim of the site visits is to identify, intervene, and address "generic problems commonly experienced by minority and/or women physicists [to] help improve the climate … in the facility." [17] As a result of this program, 45 institutions have been visited since 1990. The ensuing improvements in the overall status of women and minorities in those departments became a clear sign of the success of the program.

The last few years have also seen specific efforts on the part of APS and CSWP to promote physics as a field to be celebrated. A recent "Celebrate Women in Physics" poster, speakers program, as well as a number of activities and products geared towards students of all ages have been developed and distributed to encourage further participation of all students in physics, and particularly women and minorities. Summer 2005 also marked the launch of a "female-friendly physics departments" site, which now has 151 entries from graduate programs across the U.S. describing their efforts to welcome and accommodate women graduate students.

Committees addressing the situation of WOC in physics include: the National Society of Black Physicists (NSBP) Women in Physics (WIP) Section and the

American Association of Physicists in Medicine Minority Recruitment Sub-Committee (WMRSC). The American Association of Physics Teachers (AAPT) seeks more effective means of recruitment and retention of women in physics and related careers. To unite the efforts, NSBP WIP, National Society of Hispanic Physicists (NSHP), WMRSC, AAPT, and APS recently initiated a collaboration to advocate for women in physics. Additionally, the National Science Foundation, through its ADVANCE Program, has financed efforts to support the advancement of women in academic science and engineering careers.

## Future Developments and Actions

Significant, yet insufficient, progress has been made in the U.S. in the last decade. Women, and particularly WOC, remain under-represented in physics and related fields and the current as well as projected trends of participation of these populations in physics continue to be troublesome. Many physical societies are committed to addressing the issues. A number of national policies and activities are currently underway. There is no single cause and no unique solution to the complex problem of women's under-representation in physics. However, working as a nation and in collaboration with other countries, we continue searching for ways to cultivate, promote, and advance all people, and particularly those who are currently under-represented and underserved in physics. In the words of Evalyn Gates, we need to do this "because we want to create and work within a system that identifies, encourages, and supports the brightest and most motivated scientists and science students." [18]

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*Article adapted from "Women in Physics in the United States," to appear in "Women in Physics: Proceedings of the Third IUPAP International Conference on Women in Physics; Seoul, Korea, October 8-10, 2008," in press, AIP Conference Proceedings Series.*

## IUPAP Conference, *continued from page 3*

**"I returned home with a greater sense of belonging to the larger physics community, a feeling I hope to share with other young women I interact with in the U.S."**

*—Bonna Newman, member of the U.S. Delegation*

nity. The teams returned home with a renewed focus on specific actions to increase women's participation and advancement in physics. Judging by the response of the IUPAP General Assembly to the Conference resolutions, ICWIP2008 also strengthened the robust international support network nucleated at the two previous international conferences, which is helping catalyze systemic change. Finally, ICWIP2008 was instrumental in publicizing women's already substantial contributions to physics research and education.

### Status of Women in the Developed World: Europe, North America, Australia, Japan, Korea, China, and Taiwan

Many of the developed countries accord men and women equal rights under the law; a significant fraction has laws mandating gender equity in employment opportunities and pay. At the same time, a number of the countries report significant employment or pay disparities disfavoring women — even in some of the very countries whose formal policies require equality. As reported by the delegates from Armenia, China, and Russia, it appears that trends toward a cultural Westernization have also included trends towards increasing gender discrimination and differential career outcomes. In some cases, this is because employers feel emboldened to use discriminatory hiring practices while in others it is because a loss of social safety nets makes combining career and motherhood more difficult.

Indeed, work-family balance is cited by many country delegates as a key difficulty faced by women physicists. For example, Estonian delegates state, "In Estonia, women and men have equal legal rights. Women are expected to earn their living like men — and unlike men to be the main (often the only) provider and caregiver for children." Delegates from Canada report that "Canadian women that have higher education may not encounter gender discrimination until they encounter the so called 'maternal wall' that hinders advancement in their professional careers." The Albanian delegation notes that women who study science in their country find that their "duties as mothers, wives, daughters and homemakers take a great deal of time away from their science." Several delegations note their nation's attempts to ameliorate such difficulties by providing re-entry fellowships for physicists who have taken career breaks for family reasons; e.g., efforts of this kind are being tried in Japan, the U.K., and the U.S., where the M. Hildred Blewett Scholarship was established in 2005 to support early-career women who want to return to physics after an interruption due to family circumstances.

The percentage of women physicists in these countries ranges roughly from 5% to 35%, with the proportion being highest at the lowest ranks; the fraction of women is generally higher among physics graduate students and still higher among undergraduates. While some countries have seen modest increases in the fractions of women students and professionals in physics, the trends in many are stagnant. A number of countries explicitly mention existence of a "glass ceiling" impeding women's advancement to higher ranks over the course of a career. Of particular note is the paucity of women at the very highest levels of scientific administration, including the councils and boards that set science policy, control hiring, or determine awards. This goes hand-in-hand with the frequent mention of cultural biases against women's participation in the hard sciences; e.g., the Lithuanian delegation mentions "stereotypes existing in the society where physics is assigned to the masculine area of activity", and the Estonian delegation shares that "physics and engineering are perceived as male areas and women active in these areas are often treated as exceptions."

The delegates generally identified the most pressing challenges as (a) attracting and retaining girls and women in science (the latter also known as a "leaky pipeline" phenomenon); (b) encouraging students to transition into scientific careers; and (c) enabling women to advance appropriately over the course of their careers without maternity being a significant barrier. Several countries are reported to be taking steps to address these issues at the national or regional levels. The most common steps are (a) providing special funds to support women students or researchers through scholarships, prizes, research awards, or reserved positions; (b) disseminating information about science career opportunities for girls through large-scale exhibits, print materials, or educational programs; (c) publicizing women's scientific achievements to increase their visibility; (d) sponsoring conferences on issues related to women in science; and (e) creating women in physics working groups whose charge is to oversee progress of women physicists in their countries. Assessments of these efforts are generally in an early stage; many appear to be taken positively by the scientific community and the public — with the exception that the introduction of explicit quota systems for hiring women is sometimes resented.

### Status of Women in Physics in the Developing World: Africa and Latin America

Perhaps surprisingly, the general issues faced by women in physics in the developing countries are not terribly different than those of women in the developed world. The same major concerns plague the advancement of women in physics: (a) recruitment of girls and women; (b) attrition of women from the field (the "leaky pipeline"); (c) lack of transparency in hiring and promotion; and (d) difficulty to move up the academic and professional ladder (also known as a "glass ceiling" phenomenon). The cited reasons for these concerns in the developing countries, as for the developed world, range from socio-cultural attitudes to religious beliefs to difficult regional economic conditions to poor education and lack of job opportunities (including those in the research and academia) to "chilly climate" within science communities. These general descriptors, however, do not quite give justice

to the intensity of the concerns, the graveness of personal stories, and severity of the statistics.

As an example of the gravity of the situation, here are some sobering data: the level of female literacy in Sub-Saharan Africa ranges from 16% in Burkina-Faso to 22% in Ethiopia to 62% in Tanzania, and from 40% in Morocco to 65% in Tunisia for Middle East and North Africa (http://web.worldbank.org). This, in turn, affects the maximum possible levels of female participation in physics. The entire nation of Ethiopia has no women physics faculty, no women holding a PhD in physics, and only 2 women holding an MS degree; the nations of Kenya and Sudan have zero female faculty in their universities; Tanzania has had only 1 female student graduate with a PhD since 2002. Although somewhat better, the percentage of women in physics in more developed African countries (e.g., Egypt, Senegal, both boasting national politics without gender discrimination) remains low with only 7.5% of women in faculty positions in Senegal and a maximum of 1 female faculty in any Egyptian university physics department.

Most of the African nations cite socio-cultural and religious factors as the most important ones to drive the recruitment and retention rates of women in physics to low numbers. The Namibian delegation shares the common belief of their citizens that "Physics is a man's subject, it's too difficult for the fragile girl's head to handle." Cultural lore in Kenya goes so far as to say that "women who pursue male dominated careers, like [that of] physics, tend to develop masculine characteristics, such as hairy body, kinky hair. … [Furthermore,] women become barren and … look ugly, the feminine body structure disappears." These myths arise from the long-standing traditions, often routed in religious beliefs, that women's "mission is to give birth" (Ethiopia) and that women "have the responsibility of housework and taking care of children. There is no housework sharing between men and women. Traditionally, it is forbidden [for] men to do the housework" (Senegal). This tension between career and family responsibilities results in women leaving science, which often requires many years of academic preparation, long hours at work, and potentially post-doctoral work abroad. As the Ethiopian delegation explains, "the learning of physics is adding challenge to [the women's] existing challenge." Finally, the lack of support, mentorship, and guidance, all contributing to the "chilly climate," combined with a paucity of research funding, and an absence of job opportunities, turn women away from physics. The personal story of Zohra Ben Lakhdar, a Tunisian female physicist, who single-handedly built the first research laboratory in the country in early 1980's is not only touching but empowering.. In the words of delegates from Burkina Faso, "women have to face multiple obstacles and barriers and have to arm themselves with a strongest willpower."

With some exceptions (e.g., Argentina and Brazil), the story of women in physics in the developing countries of Latin America is not all that dissimilar to that of women in Africa. This is despite the fact that the female literacy levels here are much higher than in Africa (ranging from the lowest of 63% in Guatemala to 97% in Argentina) and the cultural/religious belief system does not have as strong a hold on women as it does in Africa. In addition, physicists in some countries of Latin America struggle with the fact that they "do not have a role in changing the social or economic situation of the nation" (Colombia) and that "research in pure and applied sciences is far from being a government priority" (Ecuador). Yet, women in physics here are making strides, albeit small ones, toward equity and equality. For example, the percentage of women physicists in El Salvador increased from 2% to 15% just in the last 15 years. Cuba annually graduates up to 40% women physicists with MS degrees and up to 30% women with PhDs in physics. 2007 was the year that the first woman from Ecuador earned a PhD in physics. This is certainly an awesome honor and responsibility that Paola Ayala holds along with many other women physicists in the developing world, each of whom "arms [herself] with a strongest willpower" on a daily basis.

## Take-Home Messages and Lessons Learned

What can we in the United States learn from the experiences of women in these countries? First, the situation of women in physics in these countries is quite similar to ours in many important respects and therefore we should adapt solutions tried elsewhere to make progress here at home. Second, in several cases, regional alliances (e.g., via the European Union, among the Baltic states, in the African Women Scientific Network, and through the Latin American Women in Exact and Life Sciences) have pushed progress faster than it might have occurred in one isolated country. Perhaps, alliances among various universities or states within our sprawling country would prove fruitful. Third, women and men must continue to collaborate on the issues of status of women in physics. As our colleagues in the Czech Republic remind us, "when men are in higher number in decision making bodies, women have much less chance of improving [their] numbers... unless men support the cause of women." Finally, these issues have been around for decades world-wide and will not be solved quickly; the paper from Spain sums this up nicely, "Although the problem is now recognized, solutions to overcome problems such as women promotion and under-representation need constant actions from the women groups at the different institutions." We have made great strides but we have yet much to conquer. We can do it!

**"I had never felt so comfortable in a conference before. We talked about science, but we also made friends from all continents…"**

*—Dr. Lea F. Santos, member of the U.S. Delegation*

**ICWIP2008 Unanimous Resolutions:**

1. **Promote through the IUPAP Liaison Committees and physical societies the formation of additional regional or national working groups for women in physics.**
2. **Publicize site visits as an effective tool for improving the "climate" of physics workplaces, and encourage their implementation to help the workplaces become more supportive of both women and men.**
3. **Actively encourage organizers of IUPAP-sponsored conferences to provide, associated with the conference programme (a) professional development workshops for attendees and (b) outreach activities aimed at the public and to engage both girls and boys from an early age in the excitement of physics.**
4. **Charge the IUPAP Working Group on Women in Physics (a) to oversee the administration of a global survey of physicists in 2009, (b) to continue to assess the progress of women in physics, (c) to make useful resources available globally through the internet, (d) to organize the 4th International Conference on Women in Physics in 2011, and (e) to report at the 27th IUPAP General Assembly in 2011.**
5. **Urge IUPAP Liaison Committees and physical societies to take leadership in their countries to encourage broad participation of their members in the global survey of physicists.**

# How the High Energy Community Can Help Women Succeed in Physics

*By Christine Nattrass/Yale University*

*Christine Nattrass*

Attending the Third International Conference on Women in Physics (ICWIP2008) in Seoul, Korea, October 8 – 10, made me think about some of the ways in which the high energy community could help ensure that women in physics have the same opportunities as men. High energy physics experiments often require large collaborations that include scientists from all over the world, which necessitates close working relationships between all members of the experiment, all of whom spend significant amount of time sharing laboratory facilities. This presents an opportunity for the international collaborators to share the career development resources from various nations, a wealth of knowledge intended for use by all. Clearly, these resources need to be widely publicized and the high energy community needs to take advantage of the frequent meetings to ensure that women gain networking opportunities.

As an example, one of the most common problems experienced by women physicists from developing countries is the lack of resources to organize women in physics groups. These are important organizations that allow women to communicate with each other, to network, to get career advice, etc. Other resources that may help addressing many issues faced by women in physics are frequent travel opportunities and meetings necessary to perform relevant experimental work. As an example, the next collaboration meeting of STAR (Solenoidal Tracker At RHIC, Relativistic Heavy Ion Collider) will be incorporating career panels and advice on how to give talks. The RHIC/Alternating Gradient Synchrotron User's Executive Committee is organizing career panels and a job fair at the next Quark Matter in March 2009, the largest conference in heavy ion physics. While not targeted exclusively at women, these efforts will certainly benefit everyone.

Other examples of potential resources for women include women's lunches that may also be incorporated into meetings and conferences thereby creating opportunities for early-career women to meet senior women who may eventually serve as role models. Specifically, in countries with a small physics community, early career physicists may not know any senior women scientists in their field. In some countries, there may be no senior female faculty in their field at all. The networking opportunities provided by such lunches may be important for junior women to meet their more senior colleagues who may share career advice with them. These lunches may also allow women to trade strategies for working together on any existing issues, be it discrimination, isolation, or "chilly climate."

High energy physics is a microcosm of the international physics community. This microcosm provides high energy scientists with some unique opportunities to reach out to foreign physicists and assist in providing necessary resources. These are just a few of the multitude of things that are easy to do while potentially making a big difference in supporting women around the world.

# Global Survey of Physicists Backed by IUPAP Delegates in Seoul

*By Rachel Ivie/Statistical Research Division, American Institute of Physics*

The delegates at the Third IUPAP International Conference on Women in Physics, that took place in October of last year in Seoul, Korea, unanimously supported a global survey of physicists. The survey data will be collected this summer by the Statistical Research Center (SRC) at the American Institute of Physics.

The SRC also conducted surveys for the first two IUPAP Conferences on Women in Physics. The first survey was conducted in preparation for the 2002 conference in Paris, and the second survey was conducted for the 2005 conference in Rio de Janeiro. Each time, well over 1000 women physicists from more than 50 different countries replied to the survey. While the first two surveys were conducted in English, the new survey will allow respondents to see the questions in other languages.

The third survey also will be sent to men, so that their answers can be compared to those of women. If you receive an invitation to answer the survey, please do! Results will provide the international physics community with data about the situation of women in physics worldwide. To view results from the first two surveys, please visit http://www.aip.org/statistics.

# Science for All

*By Lea F. Santos/Stern College for Women, Yeshiva University,*

Until May 2008 I was unaware of the existence of the IUPAP International Conference on Women in Physics (ICWIP2008). A colleague and senior faculty told me about the Conference in Seoul, Korea, and suggested that I apply to join the U.S. delegation. At that time, I had not even completed a full year as an Assistant Professor at Stern College for Women, and my lack of experience made me believe I would not qualify. However, this was only a symptom of my ignorance. The delegate selection was based not only on previous activities, but also on one's potential and willingness to contribute to the Conference and to follow-up on its success in the United States. At the end, I came to find that several members of the delegation were energetic and idealistic students and postdocs.

From the moment of my selection, I came across a sequence of delightful surprises and maturing experiences. It was touching and revealing to see the reaction of my female relatives and friends, most of them housewives and of advanced age. They celebrated my selection more than I did myself and were thirsty to learn every detail about the event. How was it? It was fantastic! I had never felt so comfortable at a conference before. We talked about science, but we also made friends from all continents. We learned about each other's problems and shared ideas on how to solve them. We discussed the conference recommendations and voted on its resolutions in a completely democratic assembly. Personally, I learned about grant writing, pedagogy, statistics on women and minorities in science all over the world. I also received good advice on my own scientific works and had an opportunity to meet a number of women who became my role models. Curie, Meitner, Noether, and Wu always have been and will continue living in my heart. However, ICWIP2008 caused it to expand in order to accommodate Bergman, Kawai, Kim, Leduc, and Ritsch-Marte.

On my return to Stern College for Women, I found that the effects of my trip were overwhelming. I was interviewed and photographed; an article about the Conference appeared on the college homepage; students came to my office and stopped me in the corridors to learn more about the event. I gave a 30-minute-talk (available at http://www.yu.edu/faculty/santos/page.aspx?id=9088) to the dean and science professors. Starting with the creation of the IUPAP in 1922 and ending with the resolutions of the ICWIP2008, I covered the history of the IUPAP Women In Physics Working Group, its mission, and plans for the future. In my two physics courses, in addition to describing the Conference, I also took the opportunity to compare the situation of women physicists in the U.S. with that of women in other countries and to mention the delicate balance between family and career. Some of my students marry very early, and it is not uncommon to find among them those who still believe their duty is to follow their husbands, even to the detriment of their own individual goals. It seemed appropriate to talk about freedom of choice, the choice to study or not and what subject, to get married or not and when to pursue a career or not, to fight for changes or not. Happy are the people who can take these ideas for granted, and happy will I be when gender equality in science and society is reached so that a conference on women in physics becomes unnecessary.

*Lea F. Santos*

**New!** *The Career Development Speaker Travel Grant Program provides assistance to physics departments that are trying to increase their career development activities and to raise the career awareness of students seeking undergraduate and graduate physics degrees.*

*The Committee on Careers and Professional Development will reimburse up to $600 for one of two speakers invited to give presentations at colleges or universities on topics concerning careers in physics. Act quickly as there are a very limited number of Travel Grants available!*

*For more information and to fill out the online application, please visit www.aps.org/careers/educator/travelgrant/index.cfm.*

## Stand By Me, *continued from page 1*

**"Mentor is an unobtrusive guide; Physicist + Mother = Role Model."**

*—Anonymous*

natural, that it would come to me all by itself, that I could not help but be a great Mom. But I was terrified! Of course, I had incredible parents who have become my greatest mentors and role models, and I was sure to use the lessons I learned from them. But this was so new and frightening. I hadn't had any lessons or hands-on practice on how to be a Mom, or a lecture on good 'mothership,' or any mentoring through laboratories (canned or not). And this was not an experiment that I could repeat. This was a new life that I was about to develop! This was it!

In many ways, I feel that becoming an academic mentor is similar, if not identical, to becoming a parent. As soon as we walk onto our campuses as faculty, we become mentors. From that moment on, we face our academic or research advisees who expect us to teach them, lead them through their academic paths, guide them in their quest for knowledge, and be their wise counselors and gurus. We are responsible to give our students the best experiences possible. And yet there is nobody out there to teach us how to do this, beyond having good mentors of our own and attempting to follow their paths! Of course, we can figure this out! How difficult can it be? Surely, being a mentor is not a "rocket science!" But is it?

As I traveled back home from Korea, I kept asking more questions and finding fewer answers. What is mentoring and what is it not? What does it mean to be a mentor, a good mentor, potentially a great one? What does it mean to be a *physicist* mentor (vis-à-vis engineer or artist)? What does it mean for me, as a *woman* physicist, to be a good mentor? Does it make a difference whether I mentor young *women* or young *men*? Do they have different needs, different expectations? Do they see me, a woman physicist differently than if I were a man? (Literature shows that students express gender bias while evaluating their instructors.[3]) Does it matter that I have an international cultural background? And why do I get a nagging feeling that somehow, in addition to being a mentor, I am expected to be a role model? *What* do I do better? *How* do I do it better?

Upon coming home, I did what any self-respecting scholar would do: I googled "mentor," "mentoring," "role model," etc. After thoroughly reviewing Wikipedia, Webster's Dictionary, and thesaurus, I followed up with Google Scholar, and so on and so forth. The literature on this subject is abundant and answers abstract questions with little difficulty.[4-9] However, most of these resources read either as an intimidating list of chores one must do to be a good mentor/role model, or as very generic self-help guides. Thus, my questions, the most personal ones, remained unanswered.

Therefore, I turn to you, my colleagues, from the U.S. and overseas to seek your collective wisdom on the issues of mentorship and role models, so that we, mentors of the next generation of scientists, mathematicians, and engineers, can learn together. Let us collectively look at these issues and learn from each other. Let us not just proclaim that our students need good mentors, but let's learn how to be good mentors. Who knows, maybe in the process many of us will become those great models that we, as kids, aspired to.

I believe that we, as an international physics community, can and must do a great deal in this direction. We have an amazing potential to do so! (See a few anonymous quotes from my colleagues who responded to the question of what it meant to them to be a good mentor and/or a role model.) For example, we could use "Ask the Physics Mentor" section of the Gazette to begin the conversation and share our ideas. We could offer workshops during the March and April APS meetings to get a more personal conversation going. We could use the CSWP web pages to host an international forum on the issue. These are just a few of endless possibilities. But let's think of more! Let's do more! Let's talk! Will you Stand By Me?

***"Good mentor is a guide or a coach.*** He/she knows where his/her charge needs to go, he/she points out the things to be thankful for and the things of which to be wary. He/she does not make decisions, but presents the potential consequences of the decisions which may not be apparent to the charge. He/she lets the charge know whether the objectives have been met, and gives guidance on failings that need to be addressed."

*—Anonymous*

***"Mentors must be colleagues*** and form a partnership, having similar interests, philosophy, careers paths, life situations, etc. (hence the possible need for more than one mentor!). Most of all, the relationship should be one of mutual respect, the mentor has valuable experiences and advice while the new faculty allows the mentor to reengage with the newest generation of faculty. Trust is paramount."

*—Anonymous*

***"Good mentors support individuals' sense of self-determination.*** Too often, faculty mentors adopt authoritarian tactics — an 'I'll tell you what you must, should, or ought to do' approach. They believe with full conviction that they know the right path to success and what's best for the less experienced individual. Good role models are not the exemplars to which all should aspire, nor are they the hard knocks, 'don't do what I did' cases. Effective mentors have a strong sense of self and good awareness of the system in which they operate, but they avoid tendencies to control, constrain, and pressure. Rather, they aim to create autonomy-supportive environments that bolster others' self-efficacy and facilitate individual development of vision and passion."

*—Anonymous*

**Acknowledgement**

*I would like to thank my wonderful international colleagues who have already contributed to this conversation either by offering their quotes or by enduring my multiple monologues on the topic, as well as those who read over this editorial prior to its publication.*

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# Update: CSWP Receives Elsevier Funds for Childcare Grants

*By Sue Otwell/APS Staff*

The Committee on the Status of Women in Physics has received a grant from the Elsevier Foundation's New Scholars program which will allow it to make awards of up to $400 to APS meeting attendees who bring small children or who incur extra expenses in leaving them at home (i.e., extra daycare or babysitting services). Details can be found at http://www.aps.org/meetings/april/services/index.cfm.

This is the second year that CSWP has made these grants available. The grant from Elsevier will allow the committee to increase both the number and the amount of the awards. These funds will augment those already provided by the American Physical Society. The intent of the grant is to help explore the needs of caregivers in attending APS Meetings and to make these meetings more open to parents of small children.

Within the New Scholars program this year, the Elsevier Foundation has awarded five grants to enable scholars to balance childcare and family responsibilities during the early stages of their demanding careers in science and technology. The grant winners represent a range of international institutions pioneering new approaches to childcare, mentoring, and networking.

The Elsevier Foundation is funded by Elsevier, a leading global publisher of scientific, technical and medical information products and services (www.elsevierfoundation.org).

# Career Transition: From Optics to Biophysics

*By Andreea Trache/Texas A&M Health Science Center, College Station, TX*

*Andreea Trache*

My story starts back in the late 90's when I chose to switch my field of interest from pure physics — mainly optical thin films — to biophysics. As a PhD student in a typical Physics Department, biology classes were not an option in the curriculum. So, I had to start all over again, switching my status from Senior Engineer in a high-tech optics company to postdoctoral fellow in a Medical Physiology Department of a medical school.

What made you do this, you may ask? In one word 'marriage.' I loved my previous field of research, but I decided to compromise and find a middle ground between family and career. However, there was another reason for this change — I had seen the potential for new discoveries opening up in biology through the application of physics techniques. The scanning tunneling microscope developed by Binnig and Rohrer in the early 1980s earned them the Nobel Prize for Physics in 1986. Binnig, Quate and Gerber invented the atomic force microscope in the same year (AFM). Soon after that, several groups started to apply AFM to the study of single-molecule interactions and to scan cells. The 1997 Nobel Prize in Physics was earned by Chu, Cohen-Tannoudji and Phillips for their use of optical tweezers for cooling and trapping of atoms. This was followed by the introduction of the optical trap to the biological research scene, where it was applied to measure the forces and dynamics of nanoscale motors at the single-molecule level.

So, there I was, a physicist at heart, a medical school postdoctoral fellow in reality, informally sitting in cell biology and physiology classes to learn these subjects and to learn them fast. This was no easy path, but a willingness to succeed does miracles. I started by learning a completely new language, that of biology. This meant learning new words, learning what a biological hypothesis is, and learning that the accepted error bar can be 20-25% of the measurable quantity due to the variability of the living systems.

Pretty quickly, I realized that my skills as a physicist, with lots of experience in optics, can be used to develop new microscopy techniques for the study of live cells in real-time, a subject of major interest in biology. Moreover, the power of being able to impose constraints and develop models for description of biological phenomena was a great asset. With this asset one is able to systematically quantify the biological processes of interest.

Four years later, I chose to accept an Assistant Professor position in the Department of Systems Biology and Translational Medicine at Texas A&M Health Science Center. What would a physicist do there, you may ask? As a junior faculty, I held an independent position that required the development of original research, with the luxury of having my own lab, staff, students, and funding. Funding here is the magic word. I started by applying to the American Heart Association, which is a traditional funding agency for a medical school environment. It was quite a steep learning curve as I had to discover not only how to write a grant proposal that fit the specific mission of the agency, but also how to develop a hypothesis and coherent research plan sensible to a biologist. First, I was awarded a Beginning-Grant-in-Aid from AHA-Texas. This little grant gave me the confidence that I would be able to make it in the world of biology. However, I also wanted to aim higher, I wanted to win an NSF CAREER award, the most prestigious grant for all of us.

Taking this into consideration, I started researching the NSF website to find the best directorate and basic information about what a CAREER award meant. Being in the medical school, I had to find creative ways of obtaining necessary information. I asked for help outside my immediate circle: I attended a series of seminars for young investigators on how to apply for funding. Next, I visited with several Program Directors at NSF to find the best home for my grant. After I had all the necessary details on hand, I started writing. This proved to be a difficult task, especially since for the last several years I had trained myself to think like a biologist, but I had decided to apply to NSF's Mathematical and Physical Sciences Directorate. One of my specific challenges was to blend physics with biology fields in a coherent research plan that would help to sustain the early stages of my career as a biophysics researcher.

Using the skills and knowledge I acquired through my postdoctoral training in cellular biology, combined with my background in physics, the natural path of my original research was to continue to apply knowledge from physics to study live cells. I chose to continue some of my postdoctoral work on instrument development and apply it to investigate the real-time mechanical transduction pathway in live cells. The goal was to observe changes in the cell body resulting from cell stimulation by mechanical forces. To do that, I proposed to integrate the capabilities provided by atomic force microscopy with those of high-speed confocal and total internal reflection fluorescence microscopy. Although these instruments are commercially available as individual units, they are not designed to work simultaneously, and their integration was bound to be a challenging task.[1] However, the capabilities provided by this system were indispensable. The unique configuration of this integrated microscope was meant to allow me to use it as the platform for further developing novel applications for live cell studies.

In addition to the scientific component of the grant proposal, I found that, as is true with the rest of NSF proposals, CAREER grants require a special

Educational/Outreach component that defines one as an educator of future generations. Additionally, this component of the grant proposal must be well integrated with one's research activity. Even though I have always loved teaching and am currently teaching courses at the graduate level, writing the education/outreach section of the proposal turned out to be difficult. I wanted to create an outreach project that would help others learn about an interdisciplinary career at the interface between physics and biology. The importance of recruiting a more diverse pool of students into careers in science is broadly recognized; however, physics lags behind other sciences, especially the biological sciences, in recruiting women into its ranks. Based on my research program, I decided to bring all of these concerns together by developing The Saturday Morning Biophysics: Image Life! Program, a series of events in the fall semester, with the goal of stimulating interest in science among high school girls and communicating the excitement of research while also providing information on career paths in biophysics.

It took three months to write the grant proposal. I have to say that I enjoyed working on it! I had excellent advice from the Proposal Development Office of my University. I had several senior faculty and some new CAREER awardees read over my draft. Each time I received my draft back, it was filled with useful comments. I analyzed every suggestion, and incorporated as many corrections as were pertinent to the subject. I had the draft read by colleagues completely outside my field of research, and I was amazed at how valuable their input was. Most of their suggestions were related to the form and structure of the text, presentation and clarity. I am very grateful for the time all these people put into reading my proposal. The grant proposal has to be logical and concise, yet with enough details that reviewers who may not be experts in one's narrow field of research can understand the proposed work, its merit and broader impacts.

I did my best in writing the grant: I put in all my enthusiasm and tried to communicate the excitement of my proposed research. And then I sent it off. And waited…a long time…The 'High Priority' score I eventually received for the first CAREER grant submission was a great pay-off for all my efforts. This award was 'the dream come true,' the award that any physicist dreams of having in his/her portfolio. The prestige of being an NSF CAREER awardee resides in the recognition by the scientific community of the PI's potential as a researcher and educator at a very early stage of his/her academic life.

Since then, my research has taken a new path in exploring real-time dynamics in live cells. By now, the integrated instrument is almost completed and I submitted a paper describing its construction and applications. The graduate students attending my course module on advanced nano-optical imaging techniques had the opportunity to see the integrated instrument in action. The postdoctoral trainees and graduate students in my laboratory have been extensively trained and are now actively working with this unique instrumentation, developing protocols for new experiments and analyzing the combined AFM-optical imaging data.

Pretty soon after grant submission, I realized that I might need help with one of the important items placed in the grant proposal: the outreach activity. Due to a lack of extensive experience in working with high-school students, I decided to have an Advisory Committee consisting of faculty from the Department of Teaching, Learning, and Culture, and a high-school teacher. To access the pool of high-school girls whom the program intended to target, I had to recruit from the rural Texas area, some 30 miles away from the College Station University campus. Even though I had a provision in the grant budget for this activity, the budgeted funding would not have been able to cover all the necessary efforts. One of my immediate ideas was to supplement my funding and eventually get more help organizing the event. Thus, I partnered with the Girl Scouts USA, and together we submitted a proposal to Lockheed Martin/Science, Technology, Engineering, and Math (STEM) Career Exploration Fund Grant. I was very excited when we received the award. This supplemental funding made it possible to bring a total of twenty girls from three different towns by subsidizing the required transportation and meals. With the help of my Advisory Committee, I was able to recruit several undergraduate women who were the first in their families to attend college and are presently PhD students at Texas A&M University. I invited them to talk with the girls in the program about their career paths and how they decided to go to college and to pursue a PhD degree. The 2008 fall semester was the first time that I offered the Outreach Program.[2] The activities were very well received by the girls, and all of us, invited speakers and organizers alike, had lots of fun.

This is just the beginning of a very exciting journey. Being a woman role model for these young high-school students as well as for graduate students and other trainees is a very challenging job that goes beyond the every-day research activity. I believe that mentoring future generations in the spirit of success for women and gender equity in science must include such training in quantitative sciences and technical skills, so that women can be successful in the interdisciplinary research of the future.

**I had seen the potential for new discoveries opening up in biology through the application of physics techniques.**

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# Special Events Focusing on Women in Physics

## APS Annual Meeting • Pittsburgh, Pennsylvania

### Sunday, March 15, 2009

**8:00 am–5:00 pm .....Professional Skills Development Workshop for Women Physicists (Westin Hotel)** Workshop for developing communication, negotiation and leadership skills, for post docs and tenure-track/newly-tenured women physicists. Reception for participants to follow (participants must be pre-registered).

### Tuesday, March 17, 2009

**7:30 am–9:30 am .....CSWP/FIAP Networking Breakfast (Westin Hotel)**
Enjoy a full breakfast and network with colleagues! Cost: $15; $5 for physics students, thanks to FIAP's generosity. All are welcome, both men and women, however pre-registration strongly advised by March 2 as only limited walk-ins are accepted. Pre-register at www.aps.org/meetings/march/events/receptions/index.cfm.

**11:14 am–2:15 pm..... Panel Discussion J4: "Around the World in 180 Minutes" (Convention Center)**
Sponsored by the Committee on the Status of Women in Physics and the Forum on International Physics.

**6:00 pm–7:30 pm .....COM/CSWP Reception (Westin Hotel)**
Learn about the work of the Committee on Minorities in Physics and the Committee on the Status of Women in Physics, network with colleagues, and unwind after a long day of sessions. All are welcome to join us.

## APS Annual Meeting, Denver, Colorado

*All events will be held in the Sheraton Denver Hotel*

### Friday, May 1, 2009

**8:00 am–5:00 pm .....Professional Skills Development Workshop for Women Physicists**
Workshop for developing communication, negotiation and leadership skills, for post docs and tenure-track/newly-tenured women physicists. Reception for participants to follow (participants must be pre-registered).

### Sunday, May 3, 2009

**10:45 am–12:33 pm .....Invited Session**
Committee on the Status of Women in Physics and the Division of Particles and Fields (three women talking about experimental high energy physics collaboration)

**12:00–1:30 pm .....CSWP/DPF Networking Luncheon**
Buffet luncheon, opportunity for networking with colleagues! Cost: $20 ($5 for students). All are welcome, both men and women, however pre-registration by April 15 is strongly advised as there will be only limited space for walk-ins. Pre-register at www.aps.org/meetings/april/events/receptions/index.cfm.

### Monday, May 4, 2009

**1:30–3:18 pm .....Invited Session: "Women and Minorities in Gravity and Astrophysics I"**
Sponsored by the Committee on the Status of Women in Physics, the Committee on Minorities, the Division of Astrophysics and the Topical Group on Gravitation.

**7:30-9:00 pm.....COM/CSWP Dessert Reception**
Learn about the work of the Committee on Minorities in Physics and the Committee on the Status of Women in Physics, network with colleagues, and unwind after a long day of sessions. All are welcome.

### Tuesday, May 5, 2009

**1:30–3:18 pm .....Invited Session: "Women and Minorities in Gravity and Astrophysics II"**
Sponsored by the Committee on the Status of Women in Physics, the Committee on Minorities, the Division of Astrophysics and the Topical Group on Gravitation.

*Please check dates and times of all events on the Meetings and hotel calendars, as they may change nearer the time!*

# BOOK REVIEW: "Motherhood, The Elephant in the Laboratory," edited by Emily Monosson

*By Kristine Lang/Colorado College*

For some weeks now *Motherhood, The Elephant in the Laboratory*, edited by Emily Monosson, has been on my desk amusing me with its title. You see, as I write this review I am six months pregnant with my second child, and I can't help feeling that as I grow in size, increasingly I literally become the elephant in the laboratory. However, this book has not only an amusing title when seen in this light as a double entendre. This book also provides new insight into the intensity of the women's personal interrelationship between the metaphorical elephant of motherhood and their identities as working scientists.

The book begins with an introduction by Monosson discussing previous work on the topic of women and mothers as scientists. With its references, this introduction provides a very succinct and yet extensive introduction to some of the academic literature on this topic. In addition, Monosson presents a very thought provoking, but all too short, discussion of the definitions of "success," a "scientist," and a "career." Such seemingly academic definitions are nonetheless quite personal, laying as they do at the heart of decisions about career and family balance. Consideration of these definitions previews the personal tone that dominates the remainder of the book.

The book primarily consists of vignettes written by women who have pursued a wide variety of career paths. The vignettes are organized by decade of degree attainment beginning with women who earned their PhD's in the 70's and continuing on to include women still in graduate school.

It is both heartening and discouraging to read the many and varied career trajectories of these women. It is heartening because there are so many trajectories; the women represented in these pages are consultants, writers, lab researchers, high school teachers, and university faculty; they direct science policy and environmental advocacy groups, and they work in industry. The variety of career paths represented gives a wonderful sense of the possibilities for a career in science, and for this reason alone the book should be recommended to both women and men as they consider their own career trajectories.

However, even while these women succeed in a variety of chosen trajectories, it is discouraging to learn just how often career paths are determined not by choice, but by the necessities of balancing family and career. The two-body problem, the demands of parenting or the desire to spend more time with children, inflexible bureaucracy and bosses, part-time work that leaves women somewhat marginalized — these and other factors play as much a role in shaping the careers of these women as do their own choices. And while most navigate these choppy waters to achieve a sense of both career and personal success, for me the stories in the book highlight the social and policy changes that could still make any woman's career path much smoother.

Discussion of the personal stories of career trajectories is not new however. In my own career, I have been to several conferences on women in physics and have been to almost every CSWP session at the March APS meetings during which women discuss their life stories. Like the narratives in this book, I have found the stories told in such venues to be exceedingly helpful in considering my own career. However, such venues do not lend themselves to discussion of the emotion surrounding balancing motherhood and career.

This book has something very new to add…the overwhelming contribution of this text lies in the intensely personal discussions of the feelings about motherhood the authors of the vignettes bravely put forth. One author boldly says, "I never doubted my own intelligence or skillfulness. But I have always known I wanted children and a happy family more than I wanted a successful career…" In contrast, another author says, "Although it may sound cold-hearted, I did not want to be at home with kids 24/7, and I selfishly chose to leave them while I escaped the world of babies and toddlers for the stimulation of the adult world."

Who among us has not seen ourselves in both of these women? I'll raise my hand first to say that after a long weekend at home with a whiny two year old I am represented by the latter voice, but when my son puts his head on my shoulder and asks for a mommy "nuggle" I am represented by the former voice, and all this within the span of a few minutes. The frequent and intense emotional turmoil engendered by balancing motherhood and career is, in my experience, echoed by the women's voices throughout this book. I found the heretofore private emotions expressed publicly in this book to be deeply moving, enlightening, discouraging, and inspiring. That this book provides a forum for such voices to speak these private thoughts aloud will, I know, be helpful to many women in science as they navigate their own personal journeys through career and family life.

*"Motherhood, The Elephant in the Laboratory", is available from Cornell University Press, ISBN: 978-0-8014-4664-1. http://www.cornellpress.cornell.edu.*

**The frequent and intense emotional turmoil engendered by balancing motherhood and career is, in my experience, echoed by the women's voices throughout this book.**

# Saskia Mioduszewski Named MGM Award Winner

*By Ernie Tretkoff/APS Staff Writer*

*Saskia Mioduszewski*

Nuclear physicist Saskia Mioduszewski is the recipient of the 2009 Maria Goeppert Mayer award, which recognizes outstanding achievement by a woman physicist in the early years of her career. The award consists of $2,500 plus a $4,000 travel allowance to provide opportunities for the recipient to give lectures in her field of physics at four institutions and at the APS meeting where the award is bestowed.

Mioduszewski is cited for "her pioneering contributions to the observation of jet quenching and her continuing efforts to understand high- p_T phenomena in relativistic heavy-ion collisions." Her current research continues to focus on ultra-relativistic heavy-ion collisions at the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory.

Mioduszewski first became interested in the topic during a summer research project while she was an undergraduate. After receiving her PhD in physics from the University of Tennessee in 2000, she became a Postdoctoral Research Associate at Brookhaven National Laboratory, where she worked on the PHENIX experiments at RHIC.

In those experiments heavy ions were collided to create a new phase of matter in which quarks and gluons are deconfined. This phase requires that the matter is extremely dense. Mioduszewski contributed to the observation of jet suppression. She and her colleagues found a factor of five suppression in the number of hadrons that emerge from the matter created in the collision and are detected at high transverse momentum. The high energy jets lose energy through interactions with the medium, providing evidence that the medium itself is indeed the extremely dense matter the scientists were trying to create.

In 2005, Mioduszewski became an assistant professor at Texas A&M University and joined the STAR Collaboration at RHIC, where she is continuing to look at high- p_T phenomena. "Now I'm looking at a photon in coincidence with a jet to see what happens to the jet in the dense medium. This is a more calibrated probe in the sense that we know the initial energy," she explains. A photon produced together with a jet does not lose energy through interactions with the medium, which in turn provides a measurement of the jet energy. "It's a difficult measurement and the experiment is just beginning to get results," Mioduszewski says.

Mioduszewski enjoys the excitement of discovery, which she has found plenty of in her work at RHIC. "Working at an experiment that was just starting to take data was very exciting because we didn't know what the data would tell us," she says. Working with a large international collaboration also gives her the possibility of meeting people from various cultures and backgrounds, an opportunity that Mioduszewski greatly enjoys.

Mioduszewski lived with her family in Germany before moving to Tennessee when she was eight years old. She began her college career at North Carolina State University with a major in mathematics. Finding that she especially liked her physics courses, she decided to also major in physics and pursue graduate work in this field.

Mioduszewski's father is a physicist, and that made her more aware of the career possibility as a research scientist, she says. Mioduszewski further explains that she always knew she wanted to get a PhD, though she thought it would be in math.

When she isn't working, Mioduszewski enjoys gardening (although right now "the weeds are out of control and I don't have enough time to keep up with them," she laughs) and hiking.

Mioduszewski's husband is also a physicist at Texas A&M. "He's a theorist in the same field, which is nice because then we can talk about physics. We don't talk about physics all the time, but we have that in common. We've been very fortunate," she says.

# Women Named to Fellowship and Prizes and Awards

*By Sue Otwell/APS Staff*

Each year, APS members are nominated by their peers to prizes and awards and to fellowship in the society. The nomination and selection procedure, involving APS-appointed selection committees, guarantees their high standards and prestige.

**Women Prize/Award Winners**

More than forty APS Prizes and Awards recognize outstanding achievements in research, education and public service. This year, two women are among the recipients.

### Patricia Lewis

*James Martin Center for Non Proliferation Studies of the Monterey Institute of International Affairs*

Recipient of the Joseph A. Burton Forum Award

For her contributions to arms control and international security, through experiments to demonstrate verifiability of arms control treaties and through her leadership of two international institutes, VERTIC and UNIDIR.

### Saskia Mioduszewski

*Texas A & M Cyclotron Institute*

Recipient of the Maria Goeppert Mayer Award

Citation: For her pioneering contributions to the observation of jet quenching and her continuing efforts to understand high- p_T phenomena in relativistic heavy-ion collisions.

**Women Fellows 2008**

New Fellows of the APS are elected after careful and competitive review and recommendation by a fellowship committee on the unit level, additional review by the APS Fellowship Committee and final approval by the full APS Council. Only 1/2 of 1% of the total APS membership is selected for Fellowship in the Society each year.

Of the 225 physicists named to Fellowship in 2008, eighteen are women.

### Peggy Cebe

*Tufts University*

For use of heat capacity, dielectric relaxation, and X-ray scattering to study semicrystalline polymer and biopolymer materials, and for work with Deaf and hard of hearing students.

*Nominated by: Condensed Matter Physics (DCMP)*

### Bulbul Chakraborty

*Brandeis University*

For important theoretical contributions to diverse areas of condensed matter physics, including frustrated magnets, diffusion of light particles in metals, the glass transition, and jamming in granular systems.

*Nominated by: Condensed Matter Physics (DCMP)*

### Christine Coverdale

*Sandia National Laboratory*

For exceptional experimental achievements in both laser and z-pinch plasma physics, dedicated service to the professional community, and leadership in promoting laboratory and university collaborations.

*Nominated by: Plasma Physics (DPP)*

### Elisabeth Guazzelli

*CNRS-Paris*

For extensive and careful experiments revealing complex phenomena in mobile particulate systems.

*Nominated by: Fluid Dynamics (DFD)*

### Anna Hasenfratz

*University of Colorado*

For her studies of nonperturbative behavior in quantum field theory, including quantum chromodynamics and models for electroweak symmetry breaking, using lattice discretization and renormalization group methods.

*Nominated by: Particles and Fields (DPF)*

### Ann Heinson

*University of California, Riverside*

For leadership in the search for single top quark production and significant contributions to experimental single top quark physics.

*Nominated by: Particles and Fields (DPF)*

### Vassiliki Kalogera

*Northwestern University*

For fundamental contributions to understanding the structure, formation and evolution of compact objects in binary systems, using X-ray and radio observations to study their importance for gravitational wave detectors.

*Nominated by: Astrophysics (DAP)*

### Alessandra Lanzara

*University of California*

For important contributions to the physics of highly correlated materials using photemission spectroscopy.

*Nominated by: Condensed Matter Physics (DCMP)*

### Qi Li

*Pennsylvania State University*

For seminal contributions to the development and understanding of high Tc superconducting superlattices, novel magnetoresistance in strained ferromagnetic oxides, and superconductivity in magnesium diboride thin films.

*Nominated by: Materials Physics (DMP)*

### Alenka Luzar

*Virginia Commonwealth University*

For elegant and pioneering contributions to fundamental theory of aqueous interfaces, dynamics of hydrogen bonds in condensed phase systems, phase behavior of confined water, and kinetics of aqueous self-assembly.

*Nominated by: Chemical Physics (DCP)*

**Information on the APS Prizes and Awards program, with details on how to nominate someone, can be found at http://www.aps.org/programs/honors/index.cfm.**

**A listing of all 2008 Fellows, as well as information on the fellowship program and how to nominate, may be found at www.aps.org/programs/honors/.**

**A listing of all women Fellows of APS can be found at www.aps.org/programs/honors/fellowships/women.cfm.**

**Carmen Menoni**
*Colorado State University*
For advancing nano-scale imaging using extreme ultraviolet laser light and seminal contributions to the understanding of the physics of semiconductor optical materials and laser diodes.
*Nominated by: Laser Science (DLS)*

**Kathryn Ann Moler**
*Stanford University*
For important developments in scanning SQUID microscopies, and for pioneering applications to unconventional and mesoscopic superconductivity.
*Nominated by: Condensed Matter Physics (DCMP)*

**Amy Mullin**
*University of Maryland*
For innovative and significant contributions to the understanding of reactive and inelastic collisions of high energy molecules.
*Nominated by: Atomic, Molecular, & Optical Physics (DAMOP)*

**Giulia Pancheri-Srivastava**
*INFN Lab Natl of Frascati*
For her leadership in establishing an international network in theoretical and experimental particle physics at the DAPHNE phi-factory, and for her leading several networks of researchers from European universities for the training of young researchers.
*Nominated by: International Physics (FIP)*

**Amanda Petford-Long**
*Argonne National Laboratory*
For incisive electron microscopy and atom probe microscopy studies of structure-property relationships in thin films and nanostructures, with emphasis on magnetic nanostructures with applications in information storage technology.
*Nominated by: Materials Physics (DMP)*

**Norna Robertson**
*Stanford University*
For pioneering work in the field of interferometric gravitational wave detection, especially in the domain of the suspension and isolation of the test masses.
*Nominated by: Gravitation (GGR)*

**Annabella Selloni**
*Princeton University*
For her pioneering first-principles computational studies of surfaces and interfaces, which made possible the interpretation of complex experiments, and successfully predicted the physical, and chemical properties of broad classes of materials, including materials for photovoltaic applications.
*Nominated by: Computational Physics (DCOMP)*

**Lucy M. Ziurys**
*University of Arizona*
For forefront contributions in molecular spectroscopy leading to new discoveries and understanding of molecules in interstellar and circumstellar environments.
*Nominated by: Atomic, Molecular, & Optical Physics (DAMOP)*

## PLEASE UPDATE YOUR ADDRESS!

*Dear Gazette Reader,*

*We have converted the APS Roster of Women and Minorities, which is also used as the Gazette mailing list, to a new web-based system. The new Roster system has been purged of outdated records. If you did not receive the email we sent out to you last summer, your record may have been purged from our system and you will no longer receive the Gazette.*

*If you are a Gazette subscriber who did not receive an email from us, but who would like to continue receiving the Gazette, please visit* **www.aps.org/programs/roster/enroll.cfm** *to re-register and select The Gazette Mailing List as your Roster group.*

*Questions? Contact Arlene Modeste Knowles at roster@aps.org.*

***We'd love to keep you reading the Gazette!***

# The American Physical Society 2008-2009 Travel Grants for Women Speakers Program

Limited funding is available for the 2008–2009 academic year! Apply online at www.aps.org/programs/women/speakers/travel-grants.cfm

**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 2008–2009 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/programs/women/speakers/enroll.cfm. 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/programs/women/speakers/travel-grants-app.cfm) 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.

**See following 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: www.aps.org/programs/women/speakers/index.cfm.

Women physicists who would like to be listed on the Women Speakers List or those who would like to modify their existing entries can do so at: www.aps.org/programs/women/speakers/enroll.cfm or see page 23.

APS has a companion program for minority speakers. Information on the Minority Speakers List and the Travel Grant Program for Minority Speakers can be found at: www.aps.org/programs/minorities/speakers/index.cfm.

# 2008-2009 Travel Grants For Women Speakers

## ♦ Application Form ♦

This form is also available on the Internet at www.aps.org/programs/women/speakers/travel-grants-app.cfm

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:** _____

**DEPARTMENT:** _____

**ADDRESS:** _____

**CITY:** _____ **STATE:** _____ **ZIP:** _____

**APPLICATION PREPARED BY (Required):**

**NAME:** _____ **TITLE:** _____

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

**EMAIL:** _____

Please list information on the speakers below and indicate if speakers' dates or talk titles are tentative.

**DATE OF COLLOQUIUM:** _____

**SPEAKER'S NAME:** _____

**HOME INSTITUTION:** _____

**HOME DEPARTMENT:** _____

**ADDRESS:** _____

**CITY:** _____ **STATE:** _____ **ZIP:** _____

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

**EMAIL:** _____

**TITLE OF TALK:** _____

**DATE OF COLLOQUIUM:** _____

**SPEAKER'S NAME:** _____

**HOME INSTITUTION:** _____

**HOME DEPARTMENT:** _____

**ADDRESS:** _____

**CITY:** _____ **STATE:** _____ **ZIP:** _____

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

**EMAIL:** _____

**TITLE OF TALK:** _____

Please return this form to:

Pahola Elder, 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

# Women Speakers List (WSL)

## ♦ Enrollment/Modification Form ♦

Additions/Modifications may also be made on the Internet at www.aps.org/programs/women/speakers/enroll.cfm
An online copy of the WSL is also available.

The *Women Speakers List* is compiled by the American Physical Society Committee on the Status of Women in Physics (CSWP). The list is updated continuously online. Comments, questions and entries should be addressed to:
**Women Speakers List • APS • One Physics Ellipse • College Park, MD 20740-3844 • (301) 209-3232**

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

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

**Institution** _____ **Telephone** _____

**Address** _____ **Fax** _____

_____ **Email** _____

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

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

❒ **New Entry** ❒ **Modification**

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

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

| TALK TITLE | | | PHYSICS SUBFIELD (limit 4) | | |
|---|---|---|---|---|---|
| 1. | ❒ Add this title | ❒ Delete this title | ❒ Accelerators<br>❒ Astrophysics<br>❒ Atomic/Molecular<br>❒ Biological/Medical<br>❒ Chemical<br>❒ Computational<br>❒ Condensed Matter<br>❒ Diversity | ❒ Education<br>❒ Fluid Dynamics<br>❒ General<br>❒ Geophysics/ Environmental/Energy<br>❒ History<br>❒ Interface/Device<br>❒ Materials | ❒ Nuclear<br>❒ Optics/Optical<br>❒ Particle<br>❒ Physics & Society<br>❒ Plasma<br>❒ Polymer<br>❒ Statisical/Nonlinear<br>❒ Other |
| 2. | ❒ Add this title | ❒ Delete this title | ❒ Accelerators<br>❒ Astrophysics<br>❒ Atomic/Molecular<br>❒ Biological/Medical<br>❒ Chemical<br>❒ Computational<br>❒ Condensed Matter<br>❒ Diversity | ❒ Education<br>❒ Fluid Dynamics<br>❒ General<br>❒ Geophysics/ Environmental/Energy<br>❒ History<br>❒ Interface/Device<br>❒ Materials | ❒ Nuclear<br>❒ Optics/Optical<br>❒ Particle<br>❒ Physics & Society<br>❒ Plasma<br>❒ Polymer<br>❒ Statisical/Nonlinear<br>❒ Other |
| 3. | ❒ Add this title | ❒ Delete this title | ❒ Accelerators<br>❒ Astrophysics<br>❒ Atomic/Molecular<br>❒ Biological/Medical<br>❒ Chemical<br>❒ Computational<br>❒ Condensed Matter<br>❒ Diversity | ❒ Education<br>❒ Fluid Dynamics<br>❒ General<br>❒ Geophysics/ Environmental/Energy<br>❒ History<br>❒ Interface/Device<br>❒ Materials | ❒ Nuclear<br>❒ Optics/Optical<br>❒ Particle<br>❒ Physics & Society<br>❒ Plasma<br>❒ Polymer<br>❒ Statisical/Nonlinear<br>❒ Other |
| 4. | ❒ Add this title | ❒ Delete this title | ❒ Accelerators<br>❒ Astrophysics<br>❒ Atomic/Molecular<br>❒ Biological/Medical<br>❒ Chemical<br>❒ Computational<br>❒ Condensed Matter<br>❒ Diversity | ❒ Education<br>❒ Fluid Dynamics<br>❒ General<br>❒ Geophysics/ Environmental/Energy<br>❒ History<br>❒ Interface/Device<br>❒ Materials | ❒ Nuclear<br>❒ Optics/Optical<br>❒ Particle<br>❒ Physics & Society<br>❒ Plasma<br>❒ Polymer<br>❒ Statisical/Nonlinear<br>❒ Other |

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