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CSWP Gazette

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

INSIDE

Letter from the Editor:

An Inclusive Approach for Women in Physics

Dongqi Li, Argonne National Laboratory, Guest Editor, 2003 Chair of CSWP

Dongqi Li

According to a USA Today article on June 10, 2003, in stark contrast to the old days, women are now outpacing men in college degrees. "In 1999-2000, women received 133 bachelor's degrees for every 100 to men." And the number is projected to keep increasing at least in the next 10 years. I know virtually nothing about sociology. But by playing with the numbers alone, I wonder if it is necessarily good news for a traditionally male-dominated field like physics. Imagine that only the same low percentage of women bachelors applies to graduate schools in physics. The increase in the percentage of women among all college graduates would mean that the supply of physics Ph.D.s would not keep pace with the other more female-friendly fields, or we would have to lower our standards to settle for "not so great" students. Either way, it could hurt physics as a field, unless we change our culture to welcome women's participation.

Most people that I have talked to understand the women-in-physics issue as an equal opportunity issue — and it indeed is — partly. Not many people, however, see that it is also about the health of our profession. As Meg Urry and Aparna Venkatesan put it in the Fall 2002 issue of the Gazette, "the best physics demands the best brains from more than just half of humanity". A diverse workforce is likely to bring out the best in everyone and be more creative. Perhaps the critical issue for the field and for every one of us physicists is to gain much needed public support and funding for physics. How can support and funding

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Arrogance-A Dangerous Weapon of the Physics Trade?

J. Murray Gibson, Argonne National Laboratory

J. Murray Gibson

Ask a scientist who is not a physicist and you might hear that we physicists are an arrogant bunch. And to a layperson, scientists in general often seem arrogant. No, we shrug, we're not really arrogant, we are just very objective and thus usually right! We are certainly a group with admirable strength in our convictions. Could there be a problem with well-tempered arrogance? I have worked in a number of high-quality research institutions and have learned that arrogance is, for good reason, a prized commodity. During my early career at Bell Labs, a senior executive asserted that arrogance was something to be proud of, something to be nurtured. And since Bell Labs has had such phenomenal historic success, we should not dismiss his point lightly. Now, 20 years later, I am a senior manager at a large research laboratory, and I understand better what he was trying to get at. But do we understand the downside of arrogance? I have come to believe that while arrogance is a tool that can be powerfully used when cutting through the misconceptions that surround the natural world, it is a double-edged sword. The problem with arrogance is the subject of this article, and I hope that I may convince you that we should keep this weapon in its scabbard much of the time.

The power of ignorance

Many physicists believe that physics is the pinnacle of science, since it can tackle the completely unknown. In the experimentalist's lab or on the theorist's scribbling pad, unhesitating questioning of assumptions, dismissal of previous models or confidence in a naive

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Publication Information

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An Inclusive Approach for Women in Physics, continued

increase, if the field seems to alienate half of the population? Indeed, there is a real need for the physics community overall to recognize and act on this issue.

We can get a glimpse of the current status of women in physics from a few APS statistics: women now comprise roughly10% of the total APS membership. Only 4.5% of the total number of APS Fellows are women. Thus,13.8% of male members are Fellows compared to only 5.8% of female members. (APS Membership Growth, http://www.aps.org/memb/growthchart.pdf; http://www.aps.org/educ/cswp/women-fellows.html) It should be noted that in the past 3 years the percent of women among newly elected Fellows has indeed begun to reflect that of the membership, though still not enough to drastically change the total composition. In 2003, 7 out of 51 APS awards/prizes went to women. This represents a major increase from 2002, when, out of a total of 52 awards/prizes, only the one specifically for women, the Maria Goeppert Mayer Award, went to a woman! One could argue that the women members tend to be younger and less well established. But a tentative count of the invited talks at the 2003 annual meetings, which focus more on recent, instead of cumulated contributions, also yields a low, single-digit percentage of women speakers.

If you have been reading the Gazette, chances are that you are aware of the climate problems and are already pushing for change. Some of you might have fought for so long and so hard that you start to wonder if the change will ever come. But it would be a mistake to assume the same for the majority of APS members, most of whom are quite open-minded. At the other end of the spectrum, some even get angered by any mention of women-in-physics, and fear reverse discrimination. In between, there is a broad range of sentiments about this issue. I still hear the argument that "women are either not capable or not interested in physics". Some feel that the system is "already fair", and do not realize the subtle, yet deep rooted nature of the problem. Others understand the issue but lack good strategies to combat the problems. While some women report outright discrimination, more complain about being isolated, marginalized, and having few mentors to teach them "the rules of the games".

I know first-hand how hard it can be to acquire a good understanding of the issue. For years I could not tolerate the term "women physicists" since I firmly believed that being a woman and being a physicist, while incidentally coexisting in me, are totally unrelated. After all, one never hears the term "men physicists." As I got more mature, I started to notice some problems that correlate with being women. Then I looked for that"simple, elegant solution", just as a physicist normally does when facing a problem. Only by serving on the Committee on the Status of Women in Physics (CSWP) during the past three years have I discovered the complex nature of the issue, which has so many facets and is deeply rooted in the culture. It is humbling to recognize that there is no such thing as "THE solution".

Even though there is no simple answer, there are indeed many ways to effect progress. To address people with such varied viewpoints and at different stages of understanding, we have to take a multiplicity of approaches, and to provide a range of information. The goal is to get many on board, not just a few activists. In other words, be inclusive.

In the spirit of being inclusive, CSWP has always tried to sponsor a range of activities to attack different aspects of the problem. For example, to help women learn "the rules of the games", we launched a "survival skills workshop" in 2002. The CSWP receptions and networking breakfasts at the March and April Meetings have been favored venues for many women physicists, and enlightened men, to network with each other. Our popular and effective Site Visit program not only helps to raise the awareness in the universities and national labs visited, but also offers practical strategies to improve the climate. To promote women, we periodically send messages to APS divisions/forums and among to networks to remind people to consider qualified women for invited talks, fellowships, and awards/prizes. In collaboration with technical divisions, we hosted invited technical sessions with women speakers, which not only highlight the women's contributions to the fields, but also offer role models for women students in the audience. Our "Physics in Your Future" booklet and "Celebrate Women in Physics" poster were sent to more than 1000 school-girls, their parents, teachers, counselors and others to encourage young women to consider physics as their career. At the coming 2004 March Meeting, a CSWP invited session, in collaboration with Forum on Education (FED), and the Forum on Graduate Student Affairs will focus on how to keep girls and women in physics at all levels. We also discuss controversial issues, such as the pros and cons of enforcing Title IX in the classrooms and labs, i.e. linking eligibility for federal funding to the inclusion of women in science. Many of these activities were met with great enthusiasm, and are indeed making an impact. For a more complete list of CSWP activities, please check our web page at www.aps.org/educ/cswp/index.html.

In the same spirit of being inclusive, this issue of Gazette presents articles on a wide range of subjects and viewpoints. They touch upon history, education, the culture in our profession, and useful information. While they not necessarily reflect CSWP's and APS's view, I hope that the discussions of the different facets among a broad range of people can lead to better understandings and real progresses.

In summary, the issue of women in physics is not a conflict between men and women, between women and

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An Inclusive Approach for Women in Physics, continued

reluctant administrators, or between the people who have "got it" and the ones who "haven't gotten it". Instead, it is a campaign for an inspiring and inclusive future for physics, which must transcend the older culture that is ingrained in our society and dominates our profession. It takes the continuous efforts of generations of people, tackling different aspects of the issues. Together, we can indeed make a difference that will benefit both women and men, and secure a bright future for our beloved field: physics.

Arrogance – A Dangerous Weapon of the Physics Trade?, continued

approach have repeatedly proven successful. Rodney Hodgson, an ex-colleague of mine from IBM's Thomas J. Watson Research Center, once counseled me that "ignorance is a powerful weapon." Although Charles Townes had argued that it would be increasingly difficult to build lasers as one approached very short wavelengths, Hodgson was unaware of that argument. Instead, he tried to produce a vacuum ultraviolet hydrogen laser—and succeeded. (His creative approach included hammering a nail through a capacitor to create a discharge.) That was a wonderful lesson for a young postdoc, as I was at the time. Since then I've observed that newcomers to a field have often been able to see a solution that experienced scientists were unable to see. I firmly believe in the value of arrogance and controlled ignorance in the pursuit of science, and have often counseled my students on this. However, from other experiences, I believe that ignorance and arrogance can be dangerous weapons, and we must take care where we are pointing them.

The trap with arrogance is that you don't leave home without it. We must distinguish the profession of physics from physics itself. Unfortunately, the success of arrogance in the lab breeds in many physicists an attitude that one can construct one's own independent and completely objective model of all human behavior and act it out. There is often miscommunication when an "objective" scientist attempts to argue with, for example, an axiomatic humanist. The scientific method has only limited value in many important fields of human thought. The real danger, I believe, comes if we are deceived that our objectivity about the natural world applies to our views on society and our workplace. Such mistaken attitudes are partly to blame for several difficult problems faced by the physics profession. These maladies include severe underrepresentation of women and minorities, and imperfect relations with the public whose support for physical science is so important to us.

Of course, physicists are not the only scientists or engineers who are guilty of this arrogance. And arrogance extends to many professions, including medicine and finance. Yet, in some respects, arrogance amongst scientists is particularly insidious because it is so easily justified, and thus so difficult to expel.

Let me examine the negative implications of arrogance in the physics profession.

Education

It is now widely recognized that we must improve communication between scientists and the public. Such communication overwhelmingly takes the form of education. The intrinsic relationship of "me teacher, you student" is in itself arrogant. It fails to emphasize that a part of scientific progress occurs by questioning authority and conventional wisdom. To be provocative, let me exaggerate my perception of the physics education that I received and have in turn doled out to undergraduates. First, the student is shown the relatively boring classical physics of Newton and Coulomb. This is a test. A real physicist will see the beauty in this tedious stuff and will seek out further, more interesting knowledge. For the real physicist, this trial by fire is not quite enough to extinguish interest in the field, and he or she can move on to the good stuff, become a physicist and inherit the secrets of the kingdom. Meanwhile, those students who have lost interest in physics, due to intellectual stimulation by other subjects that have been better presented, feel "chewed up and spit out." Are these people friends of basic physics when they later become captains of industry or political leaders?

Obviously we need a system that can train our expert successors. But this system must also train the intelligent nonscientist to support and value science, and to take pleasure from science. I believe that the burgeoning of pseudoscience can be partly attributed to the public's hunger for things scientific and to inadequate exposure to the real stuff. Nonscientists have sometimes criticized the arrogance of scientists as a means of discrediting scientific ideas such as evolution. So arrogance can be an Achilles heel, preventing us from winning the arguments we need to win.

In a great democracy such as the United States, the people's elected representatives are entrusted with the decisions about resource allocation, including science funding. It is likely that there will always be very few trained scientists who are members of Congress. If too few people in Congress are educated well enough to make sensible decisions about

Arrogance amongst scientists is particularly insidious because it is so easily justified, and thus so difficult to expel.

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Arrogance-A Dangerous Weapon of the Physics Trade?, continued

To solve these problems, we must clearly separate our personal limitations from our physics, and be more aware of our lack of objectivity.

science, then that should absolutely be viewed as a criticism of us, rather than of them. We have failed in our role as teachers of nonscientists.

Ethics

Since the recent withdrawal by Bell Labs scientists of highly cited papers about charge transport in organic field-effect devices, a lot of attention has been paid to ethical issues in our profession. That case received great attention because of the potential importance of the results. However, I believe that there are many more cases involving ethics abuse that do not see the light of day. I think our approach to ethics has been a symptom of our arrogance as physicists—we easily forget that we are all too human. We usually do not explicitly teach ethical guidelines to our students, because we feel those guidelines are self-evident and are somehow "automatic" in physicists. As a result, honest physicists are perhaps relatively gullible victims of those who do not feel restricted by ethics. Open discussion about the importance and challenges of ethical behavior, such as the guidelines for coauthorship (see *Physics Today*, January 2003, page 20) is a very positive outcome of the unfortunate organic device case. Although the scientific method finds the right path in the end, it is healthier when we openly recognize that ethical weakness is as common in physicists as in others.

Underrepresentation

Arrogance has been a barrier to the inclusion of underrepresented groups in physics. I am a member of the majority white male group, and I can recount how our group culture values arrogance and creates an obstacle to the inclusion of others. The old Bell Labs was an organization with few levels of management and a genuine open door policy. I believe many perceived that environment as the ideal "fair" workplace since "there were no rules." And I found it a wonderful place to work. However, the arrogant,aggressive (assertive) behavior patterns of white males created a set of super-rules that are nearly impossible for outsiders to learn. As a white male, I know just how to shout at my white male boss and get what I want without offending him. This is a sophisticated behavior pattern that one learns only from the inside. Even if outsiders can learn how to do this, they may not get the same reaction when they act it out. If a black male is shouting at me, I may not emotionally react as well to it because of cultural stereotypes. And a shouting woman may evoke a negative stereotype. But a shouting white male can be just a "tough" character, whose success we admire. This is a classic "Catch-22" and contributes to a glass ceiling for success of minority groups. A classic example of the problem is seen in mentoring. Of course white males need and get mentoring. I know that I get it, even today, from my peers and superiors. Mentoring taught me how to get what I want, and what I should want to get. But it happens naturally and informally for me. It is difficult for mentoring to happen naturally for those who are in the minority. In fact, mentoring is a classic example of the need for affirmative action to achieve equality. Unfortunately, many reject a formal mentoring program as a sign of weakness. After a mandatory mentoring program was introduced by management at one institution, I heard some white males boast that they had never met their mentors. In that way, they sent a clear message that to need formal mentoring was weak. The games people play!

I have heard otherwise rational and intelligent scientists argue about the problems of under-representation, who say, "Just show me a well qualified XXX and I will hire him or her on the spot—I have no bias." This is classic arrogance at work. How do such people rationalize the fact that the status quo has barely changed for many years? Since I do not believe that white males have an intrinsically higher ability in physics than other groups have, I think we have a problem in our profession. Perhaps that problem lies in the hidden barriers I am emphasizing here.

To solve these problems, we must clearly separate our personal limitations from our physics, and be more aware of our lack of objectivity. Admission of limitations is the first step to progress (just like repenting is the key to forgiveness in Christians). We are human. It is important for us to teach the danger of arrogance to our students and avoid the traps it provides.

My thesis, that physicists suffer from an abundance of misused arrogance, is presented in the hope that in the future we physicists can separate our profession from our science. Let us hope we can keep our razor-sharp "no axioms allowed" intellects at their most productive level while becoming humbler in our interactions among ourselves and with the public. Although we may be privileged to appreciate and discover the secrets of nature, we have no right to claim any ownership over them or to exclude others from decisions about what to do with our knowledge.

I have taken an extreme perspective by asserting that arrogance is a two-edged weapon. In the lab, where we physicists are thrilled as we learn about nature, arrogance can be a very powerful, positive force. But in the workplace and society at large, I believe arrogance can be blamed for some of our professional woes, even though such behavior is not usually intended to be malicious. I am not proposing a new "soft and cuddly" approach, but I think we should appreciate and mitigate the downsides of arrogant behavior.

J. Murray Gibson is the associate laboratory director of Argonne National Laboratory, and is responsible for the Advanced Photon Source. The opinions expressed in the article are his own. *This article previously appeared in Physics Today, February 2003. Physics Today is a publication of the American Institute of Physics, College Park, MD 20740*

AIP Center for History of Physics Highlights the Role of Women in Physics

Katherine Hayes, Associate Archivist, American Institute of Physics, Center for History of Physics, Niels Bohr Library

When you think of a scientist, what image comes to mind? Isn't the person in the picture usually male? What does this say about our social attitudes towards women in the sciences? How can we learn more about women in fields dominated by men? The Center for History of Physics is trying to document the history of physics and its related fields, including women and minorities, and offers numerous examples of individual women, both historical and contemporary, who have made important contributions to science.

One of the earliest women noted for her knowledge of mathematics, astronomy, and Platonic philosophywas **Hypatia** of Alexandria. She led Alexandria's Platonist academy about 400 AD. By 412 AD conflicts between Christians and non-Christian Romans led to riots in which Hypatia was murdered as a heretic.

Monasteries and convents served as centers of learning during the Middle Ages. In the 12th century, **Hildegard von Bingen** wrote works on medicine, natural history and cosmology. Early universities in the 12th-15th centuries provided little opportunity to women, and by the time of Henry VIII and the Reformation, convents and monasteries were closed. During the Renaissance, the setting for learning shifted to the royal courts and academies. Here women of rank and title lent a feminine influence to the pursuit of knowledge. Intellectual discourse, like music and dance, was considered a suitable pastime for women. The study of science didn't conflict with a lady's traditional virtues, such as modesty and religious reverence. Learning lead to moral virtue, and natural philosophy epitomized the wisdom and glory of God.

By the 17th century the Parisian salons, usually presided over by women, came into vogue. They took up where the Renaissance courts left off, elevating learned discussion to a complex form of entertainment, while promoting the spread of ideas. In Italy, **Laura Bassi** held a chair of physics at the University of Bologna from the 1730s until 1778. At the same time scientific academies appeared: the Royal Society of London (1662); Parisian Academie Royale des Sciences (1666); Societas Regia Scientiarum in Berlin (1700). This first step toward professionalism in learning marked the beginning of the exclusion of women from science. Although no formal statutes existed barring women from election, no women were invited to join any academies until the mid-20th century.

At the same time, women were encouraged to learn mathematics. The Ladies Diary, published from 1704 to 1841 was designed to teach "Writing, Arithmetick, Geometry, Trigonometry, the Doctrine of the Sphere, Astronomy, Algebra, with their Dependents, viz. Surveying, Gauging, Dialling, Navigation, and all other Mathematical Sciences." In 1709 the editor opined that since "ladies seemed to prefere mathematics to cookery," the Diary would "dedicate itself exclusively to 'enigmas and arithmetical questions'."

Because of this interest in mathematics, women became active in early astronomy, starting as counters or tabulators, later known as computers. They measured the positions of stars on a grid and then calculated their relative locations. Institutions welcomed married couples as two-for-one arrangement in which the women seldom got paid. **Caroline Herschel** served as private assistant to her brother

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Future Plans

Once again, CSWP will sponsor or co-sponsor a variety of special events at the APS Annual Meetings in 2004. Please join your colleagues for invited talks, opportunities for networking, and receptions! As we go to press, these events include …

March Meeting – Montreal, Canada, March 22-26, 2004

Sunday, March 21 – Workshop on Survival Skills for Women Physicists

Tuesday, March 23 – Networking Breakfast for Women in Physics (co-sponsored with the Forum on Industrial & Applied Physics)

Wednesday, March 24 – Symposium/panel discussion, "Keeping Girls and Women in Science" (co-sponsored with the Forum on Education and the Forum on Graduate Student Affairs)

April Meeting – Denver, Colorado, May 1-4, 2004

Symposium, "Keeping Girls and Women in Science" (co-sponsored with the Forum on Education)
Networking Breakfast for Women in Physics

Dates and other details will be available in the Spring Gazette, which will be published in February-March, and on the CSWP's website at http://www.aps.org/educ/cswp/index.html.

AIP Center for History of Physics Highlights the Role of Women in Physics, continued

Wellesley College, Physics Lab

Helen Hogg

William, astronomer to King George III, calling herself a "tool" for his use. She learned to scan the heavens in search of comets through his telescope when he wasn't using it. Between 1786 and 1797 she discovered 8 comets, with priority claim on 5 of them, and 3 nebulae. In spite of describing herself as a "well-trained puppy dog," she was the first woman to publish her findings, a catalog of stars, for the Royal Society, which elected no women members until 1945.

Important gains made by women toward the end of the 19th century were lost shortly thereafter. There are examples of women in scientific marriages who were able to break social barriers in this period, such as Marie and Pierre Curie. But by the 1930s, policies against nepotism proscribed women from taking paying positions where their husbands were employed.

The Center for History of Physics strives to document and preserve the history of physics and allied fields (astronomy, geophysics, crystallography, optics, etc.) with books, photographs, film, audiotape, oral histories, biographical and institutional history files, manuscript collections and institutional and organizational records.

Examples from the collection frequently shed light on the obstacles these women faced and their tenacity in persevering in their careers.

Wellesley College, founded to give women the same quality of education as men, has graduated and employed many notable female physicists, including **Sarah Frances Whiting**. She wrote on her experiences as a woman physicist at Wellesley in 1913, stating that there were only 17 women of the 619 members of the Physical Society of America. She had "the some-what nerve-wearing experience of constantly being in places where a woman was not expected to be, and doing what women did not conventionally do." **Louise McDowell** also wrote a history of physics at Wellesley that was published The American Physics Teacher in 1936. In it she describes the curriculum and facilities, including courses in automobile mechanics, using a lathe, making lantern slides, and simple glassblowing and silvering, as all students in the labs were expected to build the equipment they would need. **Dorothy Walcott Weeks** studied from 1912-16 under Louise McDowell. She wanted to work at the National Bureau of Standards, but they weren't hiring women, even as secretaries, at the time of her graduation. Instead she went to U.S. Patent Office where she was hired as an assistant examiner (the third woman). She reflects that opportunities for women always seemed to appear during wartime, "which is no way for women to get their opportunities." During WWII, she went to work for the government in research, and at 71 years old retired to continue working as a spectroscopist at Harvard College Observatory until age 83½. Although she recognized the lack of opportunities for women during her life, she also suspected that women were not perceived as a threat, thus not subjected to the same level of competition as men.

Many women have made their mark in the field of astronomy. In an interview with **Charlotte Moore Sitterly** she describes her background in mathematics and her work as a computer for Henry Norris Russell at Princeton in 1920. Russell was notoriously difficult to work with, and an acknowledged genius. She helped edit his manuscripts, maintained a high standard of accuracy in her calculations, and lent structure to his brilliant ideas. This left her little time for her own original work. She went to graduate school at UC-Berkeley because "Princeton wouldn't have anything to do with women under any circumstances." After WWII she went to the National Bureau of Standards to work in spectroscopic analysis under William F. Meggers, with whom she had collaborated previously. He allowed her to do her own work and was more supportive of her research. Her tone is very self-effacing, even negative and reflects a lack of self esteem. In response to many questions she repeatedly claims, "I had nothing to do with that". At the end of her interview, when asked if she had anything to add, she replies, "I think you've covered me more thoroughly than I deserve." Yet her research was instrumental in laying the groundwork in astronomy and spectroscopy for many postwar advances in physics.

Helen Hogg trained at Mt. Holyoke in the 1920s with Anne Sewell Young. She went to Harvard after Annie Jump Cannon mentioned a possible scholarship there. She married an astronomer and moved with him to Canada where she had to hunt for compensation as few institutions provided salaries for both parties in a couple. She taught summer school at Harvard after her husband died and took her children to the observatory, where some of them helped her in the office.

English astrophysicist **Cecilia Payne Gaposchkin** went to Cambridge (1919-23) where women could follow the same courses of study as men but were not given degrees until 1940s. She was the only woman in her classes to finish; it was more difficult because there were no women tutors in physics. Other professors were more supportive, and encouraged her to go to Harvard. She had published one paper and been elected to the Royal Astronomical Society by graduation. Her dissertation was published and highly reviewed. Payne gained an international reputation in astrophysics, at age 56 finally getting a promotion from a lectureship to the rank of professor of astronomy, the first woman to do so. Payne married a Russian astronomer, had 3 children, and wrote an autobiography. In the chapter entitled "On being a woman" she talks at length about how her gender affected her life as a scientist.

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AIP Center for History of Physics Highlights the Role of Women in Physics, continued

In an interview, **Nancy Grace Roman**, an astronomer and early female division chief at NASA, speaks very little about how or if her gender affected her career. When asked about the woman's role in astronomy and at NASA, she said that she could only recall one person who had problems with her as a woman, perhaps because he was very ambitious and saw her as a competitor. But she goes on to say that, while she's not aware of anything, that doesn't mean it doesn't exist. "Maybe I'm blind. But I think I've been treated pretty much the way a man would be treated in this job. I've had no problems working with people that I'm aware of because I'm a woman. I think I've been accepted as one of the team and felt good about it." However, when asked if she had that feeling earlier at Yerkes Observatory, she responds only "No." There is a notation of deleted text in the interview. In her manuscript collection, some documents contain personnel information from Yerkes that may shed light on this comment.

In an interview **Lise Meitner** tells of her participation in the discovery of nuclear fission. Female students at her time were regarded as freaks in college and treated with rudeness, even while teachers encouraged them. She was the second woman in Vienna to complete her doctorate in physics by 1905. While shy and avoiding publicity, she also craved the recognition of her colleagues. She expresses concern for the rightful place of women, especially scientists, and spoke and wrote about it in her life.

Maria Goeppert Mayer born in Germany in 1906, was a family friend of Max Born. She started out in mathematics and learned quantum mechanics from Born, and studied physics with Paul Ehrenfest. She came from seven generations of university professors at Gottingen. Women could only go to a private girls' school to prepare for university entrance exams. Goeppert completed her PhD in 1930 in theoretical physics, with 3 Nobel prize winners on her committee. After emigrating to the U.S. she married Joseph E. Mayer from Johns Hopkins University, but couldn't get a paying job there. She continued working anyway, going to Columbia in 1939, and taught at Sarah Lawrence for a year while working in a lab on side projects. In 1946 she went to University of Chicago, the "first place where I was not considered a nuisance" and was in fact greeted with open arms. Now a full Professor of Physics, she worked with Edward Teller and Enrico Fermi. In 1960, she became a professor of physics at UC-SD. In 1963 she shared in a Nobel in physics for nuclear shell theory, becoming the second woman to win a Nobel in physics and the third to win in a science. The origins of this work started in a discussion with Fermi in 1948 during which the phone rang. Before answering it he asked her a question. When he hung up 10 minutes later she had done the mathematics that became the foundation of this theory.

Interviews with or autobiographies of men sometimes shed light on how women have fared in the field. One man remembers the number of women at the University of Chicago after WWII who married fellow meteorologists. Another reflects on his career, much of it spent working with his wife. He remembers the "deeply rooted belief in academic institutions that marriage and scholarship don't mix, particularly for the girl." There is a lot of cross referencing between collections; one might mention others to look up. Oral histories are an excellent source on women's history for several reasons. Women are under-documented, or not represented at all, in traditional historical sources. Networking has always been important to women in helping each other succeed and interviews reveal this. Interviews also show how important personal attitude is to a woman's perception of her past. Many of the women had backgrounds heavy with academic traditions and family encouragement, or at least they were never discouraged from pursuing their interests. Most successful women scientists were tenacious and either ignored social barriers or were oblivious to them.

The electronic age, with digital collections and the possibilities for finding sources through the Internet may help expand research in women's history. Electronic reference widens our pool of researchers. We loan photocopies of oral history interviews and microfilm by mail, and try to offer additional searching in manuscript collections for those unable to visit. Last year I received a letter from a researcher looking for material on Henrietta Leavitt, an astronomer at Harvard Observatory. He had borrowed interviews of Melba Phillips and Harlow Shapley and found some relevant information there. He went on to say: "It is my humble opinion that Henrietta Leavitt is an unsung heroine in the history of astronomy and although an occasional mention has been made about her discovery of the Period-Luminosity relationship of Cepheid stars, she remains still largely unknown to most. Shapley as well as Hubble used her discovery in their work and I feel some louder acknowledgment of her contributions needs to be made." I believe that such letters are part of what keep us archivists and historians all going.

This article is adapted from a paper which was originally presented in April 2003 at the annual meeting of the Mid-Atlantic Regional Archives Conference in Trenton, NJ. All photos are reproduced courtesy of the American Institute of Physics, Emilio Segrè Visual Archives. For further information, please contact the library at (301) 209-3177or visit http://www.aip.org/history/

Nancy Grace Roman (center)

Lise Meitner and Otto Hahn

Enrico Fermi and Maria Goeppert Mayer

Teaching Physics at a Community College: Letter From a Teacher

Geraldine Karpel, Professor Emerita of Physics, El Camino College, Culver City, CA

I would encourage young women excited by the beauty and logic of physics, but who are not inclined toward research, to consider a career teaching at the community college level.

I have been teaching physics at a community college since 1955. When I was working on my doctorate, I was offered a position and I never returned to graduate school. I had found my place in the world. Teaching physics has been one of the great joys of my life.

I have often been asked why I chose physics, a question few men ever hear. Of course I often joked that this was a good way to meet boys but more seriously admitted that physics was the most interesting subject to me. Why do people rarely ask a history or psychology major why she has chosen her area of study?

Women do not choose physics for a number of reasons which would be the same for a man: it's too hard; I can't do math; I don't know what a physicist does; etc. But in addition to these gender neutral comments are the remarks specific to women and especially to girls: I' m no good at math; I don't know if women can do this; my teachers have said I couldn't do the math and physics because girls can't; it's a man's field so boys wouldn't like me; etc. So I was very lucky. I never had to overcome the obstacles that young women then and now encounter.

The high school I attended, Hunter College High School in New York City, was an all girls' school with high academic standards. Among the subjects required were four years of math and a year of physics. All my teachers were women. From the first day in class I fell in love with the subject of physics. Math, too, was at the top of my list. So what better major than physics?

My family moved to Los Angeles, and I began UCLA as a physics major. My family, European immigrants, had no idea what I was studying except it had something to do with math. The only important thing was that I went to college. No one had ever tried to discourage me. Even at college, where I was one of the few women in my physics classes in lower division and the only woman in my classes in upper division, faculty ignored me just as they did the male students. My peers treated me as an equal.

When I finally left the program at UCLA to take a teaching position, no one on the faculty seemed to notice, even though the Physics Department had awarded me Highest Honors in Physics, a fact I learned when I picked up my bachelor's degree.

There were a few other women in the graduate program but we were rarely in the same class. There certainly was no support system. I think I would never have received any degree in physics had I not gone to the high school I have already mentioned.

When I began teaching I knew that I would treat my students differently and, most especially, encourage the women, whom are always in the minority in the "engineering physics" I taught. In the early days of my teaching career, there were often no women in my classes. Recently, the numbers have reached as high as 25% women, but there is rarely a physics major of either sex. (This spring I began my class with thirty-six students, only three of whom were women.) Women physics teachers, at all levels, are role models, not only for females in the class, but for the males as well. Perhaps we can break the stereotype for all of our students.

So what is the point of this lengthy biography? I majored in physics, not just because I loved the subject, but because no one put barriers in my way. Those barriers are not just negative remarks by the people who influence us in our teen years, but often unspoken attitudes of those around us, our peers, our teachers, our parents. I was just very lucky. But many girls still have to contend with the sense that they cannot do the difficult subjects of math and physics simply because of what they are not, namely boys. The CSWP seems to be emphasizing what can be done by the time a young women enters the university. It is my contention that this approach, while useful in the later stages of a female physics major's education, is simply not going to convince many young women to choose a career in this field. What we must do is to convince women to teach physics, particularly at the high school level. An undergraduate degree in physics or even a minor in physics, is all that is needed in most states. Not everyone who loves physics wants to be, or is able to be, a physicist (defined as having a PhD in the subject). Unless college physics classes are small enough, and taught by individuals, especially women, who wish to mentor women students, some of the enthusiasm for the subject may wane. People with doctorates in physics seem interested only in mentoring future physicists, a practice which I feel is self defeating. Unless we have more female high school physics teachers who are role models for the women students, we aren't going to get many women physicists. This elitist attitude toward any physics degree less than a doctorate will have to go.

On a final personal note, I would encourage young women excited by the beauty and logic of physics, but who are not inclined toward research, to consider a career teaching at the community college level. It is a dream job for those of us who also love teaching. It is an opportunity to work with serious students, to inspire some and to make an admittedly difficult subject comprehensible. Some of your women students may even become physicists.

Editor's note: CSWP indeed values attracting girls to physics. For details see the CSWP plans for the 2004 March Meetings, and April as well as other activities on the CSWP web page, including the "Physics in Your Future" brochure for high school girls.

Opinion: Induction Versus Deduction – Clues to Understanding Gender Differences in Approach to Science?

Peter Foukal, Heliophysics, Inc.

Inductive reasoning as the "different perspective" on science?

Discussions of gender differences in science often suggest that women approach the subject from a "different perspective". This different perspective is considered to underlie the lower worth placed on science produced by women, and their associated frustrations with slower advancement and lower pay.

It is interesting that, in parallel to the discussion of gender differences, scientists of both genders are re-examining the traditional premise of the primacy of physics. Physicists have often looked down upon chemistry, astronomy and biology, as subjects that could in principle, be derived from the mother lode of all science–physics. Now, increased dialog between physicists and biologists focuses on the mutual benefit to both disciplines, if their "different " but seemingly complementary perspectives on science were better recognized and applied to common problems (2).

What then are these "different perspectives", and is it possible that the two parallel discussions are grappling with a common theme? Biologists (3) describe their approach to research as proceeding from the particular to the general. That is, a biologist tends to be faced with a wealth of facts to digest and turn into a generalization. The difficulty biologists find in communicating with physicists, they feel, stems from the emphasis in physical sciences on working in the opposite direction. A physicist tends to deal with fewer unassimilated facts, but more with fitting relatively mature generalizations to particular cases. This reasoning from the general to the particular is most pronounced in mathematics, which focuses entirely on the deduction of certain consequences from a small number of initial propositions or postulates.

So far, it seems to have gone unnoticed that these two complementary approaches correspond rather closely to the long-recognized distinction between *inductive*, and *deductive* reasoning. Perhaps well-known differences between the inductive and deductive approaches might be applied to illuminate the gender-in-science discussion.

Deductive power

Essentially all teaching of physical sciences emphasizes *deductive* skills. We tell students about Newton's Laws and Maxwell's equations, and ask them to deduce their consequences in well-defined exercises. Those who exhibit greatest skill at such deductive exercises get high grades and are considered clever. Students are expected to do laboratory exercises, and some write undergraduate theses. But throughout, a well supervised student is exposed primarily to situations where deduction from limited data is the most useful and prized skill.

Such deductive capability closely mirrors math aptitude, so it is no surprise that success in acquiring physics and math skills are closely correlated. In this context, it is significant that statistical studies (4) show a startling over-representation of males over females, at the highest levels of math aptitude. Although the mean SAT values show no significant gender difference, males outnumber females by over 10:1 at math SAT levels exceeding 700. Individuals headed for physics graduate schools tend to come from this cohort of high achievers in math. So this finding helps to understand the much larger number of men in the physics pipeline. Other factors may well play a role and even amplify this underlying discrepancy in deductive aptitude. But its existence needs to be given much broader recognition, because it may well be the underlying reason for the gender gap in physical sciences.

The emphasis on deductive skill goes well beyond education in physical sciences. The academic pecking order has been largely a ranking by deductive ability. The most brilliant mathematicians occupy the loftiest throne of this Pantheon, flanked by the next most deductive academics – the theoretical physicists. Lower on the scale are the astronomers who have to grapple with more messy data, and lowest until recently were botanists, who classify flowers without seeking to connect them to a broader cosmology. Recently, this applecart has been upset by the embarrassingly huge funding bestowed upon the inductively powered biosciences by a grateful electorate of aging and ailing baby boomers. But, were matters left to the deductively talented physical scientists, this is how things would continue to stand.

Therefore, it is not surprising that, when selective physics departments hire, they tend to seek out individuals internationally renowned for their deductive prowess. After all, both the educational structure and

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Have you moved? Changed jobs? Changed fields? Take a moment to update your name/address/qualifications on the Roster of Women in Physics. This database also serves as the Gazette mailing list. See pages 15-18.

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

Opinion: Induction Versus Deduction, continued

academic status have traditionally hinged on this attribute, so it makes sense to give it preference in hiring. It is this approach to physical sciences, rather than an unreasoned bias against women, which probably explains why women are under-represented in physical sciences departments.

Beyond deduction

What does this emphasis on deductive ability leave out? When students move beyond their graduate courses, they are faced with choosing a research project worthy of a PhD. Now they recognize that most of the well-posed problems in their field have either been solved, or lie beyond their reach. The typical astronomy student, for example, is faced with a need to start looking for a Problem To Solve in undigested data from someone's observing runs a few years ago. Raw deductive brilliance becomes less important than the ability to assimilate reams of unrelated facts, and stitch them together into a hypothesis.

Judging from the equal (actually – over) representation of successful women in the biosciences (5), highly developed powers of *inductive* reasoning are more equally represented in both genders. This conclusion is strengthened by the increasing popularity of bioscience as a faster path to fame and fortune than the physical sciences. If there were a male-advantaged ability gap, men would have filled it by now. This suggests that the relative emphasis placed on deductive and inductive reasoning skills deserves a closer look in areas such as astronomy, where both play important roles. More explicit respect for inductive skills would seem to favor the status of women in such disciplines.

Placing more emphasis on inductive skill raises the question whether we can select for it, as we do for deductive ability. It also leads us to wonder whether inductive skills can be taught. These are interesting, but challenging questions that deserve much more attention. To the extent that individuals with such skill have managed to get into the ranks of researchers, it is mainly by being "spotted" by sympathetic and supportive professors, willing to overlook weak marks and impressed by enthusiasm and desire to learn.

Bob Kirschner, Chairman of the Astronomy Department at Harvard, for instance, admits candidly in his recent book "The Extravagant Cosmos" that his undergraduate grades would never have launched him into grad school at CalTech and onto his brilliant career had he not been "spotted" by his research supervisor, Bob Noyes. There are many other cases similar to this, and they suggest that, unlike our carefully crafted approach to selecting for deductive ability, selection for inductive talent is much more haphazard.

Where do we go from here?

The increasing openness of physicists to an inductive approach to science is driven by the intellectual excitement of new discoveries (and their attendant increased funding) in biosciences, and in astronomy - fields where inductive skill has played a major role. This new openness to a "different perspective" on science offers an important opportunity for advancement of women in the physical sciences, since the gender distribution of inductive skill may favor women.

Recognition of this opportunity is particularly important given recent statistical findings suggesting that women are under-represented by an order of magnitude at the highest levels of deductive skill. This finding deserves closer study. But if it holds up, it will make it harder to base future efforts to seek gender balance in academic employment on traditional criteria still emphasized in the physical science community.

References:

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4. D. Lubinski, C. Benbow, "Gender Differences Among the Gifted" Current Directions in Psychological Science, 1, #2, 61 (1992).
5. C. Benbow et al., "Sex Differences in Mathematical Reasoning Ability" Psychological Science 11, 6, 474, (2000).

Peter Foukal is the Founder and past-President of Cambridge Research and Instrumentation, Inc. Woburn, MA. He is presently a member of the Editorial Board of Solar Physics Journal and of the Corporation of Wheelock College, Boston.

Academic Career Workshop Offered for Women and Minorities

By Elizabeth Freeland, School of the Art Institute of Chicago, Illinois

This past May I attended a two and a half day workshop called "Forward to Professorship" funded by an NSF ADVANCE leadership award. The workshop targeted women and minorities from senior graduate students to new tenure track faculty. The experience was GREAT! Just being in a room of scientists where there are far more women than men was a breath of fresh air.

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Academic Career Workshop Offered for Women and Minorities, continued

FORWARD in SEM: Focus on Reaching Women for Academics, is a joint program of the George Washington and Gallaudet Universities, and is funded by a National Science Foundation ADVANCE leadership award. This workshop is provided for women and minorities who may be considering, or are currently in, a tenure track position in science, engineering or mathematics. The workshop sessions focused on how to get a tenure track job and then tenure. Talks were geared towards the three aspects of this career track: teaching, research, and service. An underlying theme was how to do all this while attending to family responsibilities.

The most important result of this workshop for me was a great boost in self-confidence. Raising two small children I've been struggling to reconcile the image of the 24-7 scientist with the realities of my personal life. In spite of the presence of children AND one pregnancy, I never heard any negative or questionable comments. Not one person(woman) questioned any mother's intelligence, ability, or commitment to science. Being a mom and a scientist was actually assumed to be normal! For me that created a very relaxed atmosphere and it allowed my confidence as a scientist to expand.

I also learned a lot! Some of the many topics we covered were: contract negotiations, including startup funds, service commitments, and teaching techniques.

There was a very helpful presentation by an NSF program officer on the ins and outs of NSF grant applications. And, we had the chance to talk with tenured women professors, women department chairs and women deans.

I would strongly recommend that anyone eligible for the workshop check the website this winter. If you are currently advising students, supervising students and/or postdocs, let them know about this workshop. There is no cost to attend the workshop, and travel and housing was covered in many cases. The workshop took place in Washington, D.C.

In addition, the website has a resource list which could help any scientist working towards that first job or tenure. Please visit http://student.seas.gwu.edu/~forward/advance/

Elizabeth Freeland received her PhD in physics in 1996. Recently, she has been raising two small children while teaching physics at the School of the Art Institute of Chicago. She attended this workshop in order to get advice, ideas, and support for re-entering the full-time academic career track.

Book Review: "As She Climbed Across the Table"

Margaret P. Hill, Southeast Missouri State University

While perusing the library shelves in search of some light and interesting summer fiction, my eyes ran across this intriguing title. Imagine my surprise to come across a rare physics novel. Though speculative physics plays a large role in many sci fi novels, it is unusual to find a story set in an academic physics environment, and even more unusual to find one of the main characters a woman in physics!

The story is told by a young anthropology professor, Philip Engstrand, who is completely in love with Alice Coombs, a young and ambitious particle physicist in the midst of a momentous discovery. She and other members of the physics department have crafted an experiment that produces a bubble in space-time, a void that they call "the Lack." As the Lack develops Alice becomes more and more engaged in her work and Philip discovers that he is loosing her.

Alice and her colleagues share time conducting experiments on the Lack and soon find that it swallows things. Not just anything, mind you, it has preferences: it swallows an argyle sock, light bulbs, a sheet of yellow construction paper, a photograph of the president, a pair of mirrored sunglasses, and a duck's egg, fertilized, but refuses aluminum foil, a batter's helmet, a bow tie, an ice axe, and a duck's egg, scrambled. Alice is convinced that this is evidence of Lack's intelligence and she is determined to make contact.

Alice's subsequent loss of objectivity, according to her colleague and competitor, Professor Soft, a senior physicist, makes her physics 'crappy,' but soon it becomes evident that each of the physicists studying this hole in the universe believes he is on the right track to the truth and all the others are hopelessly misled. On this score Lethem offers interesting insights into the nature of academic physics and into the ways in which we see ourselves and how others see physics and physicists. In fact, *As She Climbed Across the Table* is in many ways a novel about the philosophical issues surrounding observation, discovery and knowledge, particularly as those issues relate to observation, discovery and knowledge about ourselves.

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Book Review: "As She Climbed Across the Table", continued

Through the development of this strange assortment of characters the story skillfully raises such complex questions as, what do we mean when we say we "know" something? Do we really have any objective reality in common with each other? How much of what we understand about an object or theory is simply a projection of our desires and prejudices? And, where does passion for one's work overtake and cloud one's objective assessment of it?

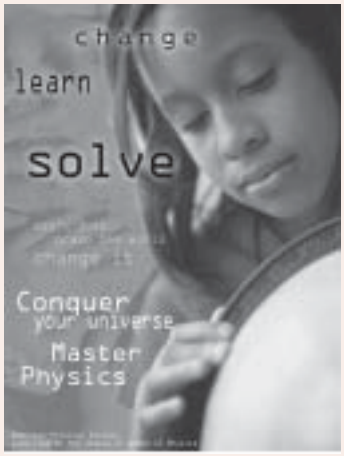
Lethem's careful crafting of scenes, situations and stereotypes had me both smiling and wincing as I caught myself identifying with his depiction of university life, politics, and physics culture. An Italian professor Braxia ("Soft introduced him with a name that began morphing so crazily the moment I heard it—Crubbio Raxia? Carbino Toxia? Arbino Cruxia?—that I didn't dare try to say it aloud.") is given observation time on Lack in return for a share of hours on their supercollider in Pisa; a group of physics graduate students construct an impressive detector to investigate the Lack; and a campus group mounts a protest rally because the Lack has swallowed a campus cat, "a grizzled lab veteran, piebald from scratching at taped-on electrodes, named B-84."

Lethem's world is familiar, amusing and loveable. His descriptions are clever and poetic, and at times a bit corny. And thank goodness Alice is portrayed neither as an extremely successful woman in physics, nor as a less competent researcher than the men in the story. She comes across as profoundly human-or is that just my projection of her character?

Lethem, Jonathan. *As She Climed Across the Table*. New York: Vintage Books, Random House, Inc. 1997

"Physics in Your Future"

Available at no charge to students and their parents, educators, guidance counselors, and groups who work with young women. To order or to view an electronic version, please go to http://www.aps.org/educ/cswp/future.html. Shipping is free, however we reserve the right to limit quantities.



Minorities in Physics Poster

This beautiful color poster was created by the APS Committee on Minorities in Physics. This striking 15" X 20" poster is particularly aimed at minority middle and high school students, but will encourage all students, to master physics and gain a better understanding of their physical universe. To obtain a free copy of the poster, send an email to knowles@aps.org with your mailing address and a brief explanation of how you plan to use the poster. Copies are limited.

Nominate a Woman for APS Fellowship!

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

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

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

Executive Officer,
American Physical Society,
One Physics Ellipse,
College Park, MD 20740

Nomination Deadlines

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

DIVISIONS	
Astrophysics	04/30/2004
Biological Physics	04/02/2004
Chemical Physics	02/13/2004
Computational Physics	04/12/2004
DAMOP (Atomic, Molecular, Optical)	04/16/2004
DCMP (Condensed Matter)	01/16/2004
Fluid Dynamics	02/13/2004
Polymer Physics	04/16/2004
Laser Science	04/02/2004
Materials Physics	02/13/2004
Nuclear Physics	04/02/2004
Particles and Fields	04/02/2004
Physics of Beams	04/02/2004
Plasma Physics	04/02/2004

FORUMS	
Physics & Society	04/02/2004

History of Physics	05/01/2004
International Physics	04/02/2004
Industrial and Applied Physics	02/13/2004
Education	04/16/2004

TOPICAL GROUPS	
Few Body	04/02/2004
Precision Measurement & Fundamental Constants	04/02/2004
Instrument & Measurement Science	04/30/2004
Shock Compression	04/02/2004
Hadronic Physics	04/30/2004
Gravitation	04/02/2004
Magnetism and Its Applications	04/02/2004
Statistical & Nonlinear Physics	04/02/2004
Plasma Astrophysics	04/02/2004

APS GENERAL NOMINATIONS	06/01/2004

Listserves for Women in Physics

APS members are invited to join **Friends of the CSWP**, a moderated listserve for those interested in working more closely with the committee. Friends are invited to suggest topics/issues for discussion by the committee, speakers for invited sessions, names of well-qualified women physicists for fellowship/awards/prizes, etc. Friends will receive e-mail notices of Committee activities, reports, and will receive copies of the Gazette, the CSWP's newsletter. Details at http://www.aps.org/educ/cswp/friends.html.

Not a member of APS? Consider joining WIPHYS, the Women in Physics listserve which is open to anyone who is interested in the topic of women in physics. Examples of postings include notices of conferences and events, newly published reports, job openings, on-line mentoring, and advice on teaching. More information can be found at http://www.aps.org/educ/cswp/wiphys.html

The American Physical Society 2003-2004 Travel Grants for Women Speakers Program

The APS Committee on the Status of Women in Physics (CSWP) is pleased to announce the 2003-2004 "Travel Grants for Women Speakers" Program. This program is designed to increase the recognition of women physicists.

Funding is Available for the 2003-2004 Academic Year! Apply online at www.aps.org/educ/cswp/travelgrant.html

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 2003-2004 academic year.

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

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

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

See page 15 for application form.

Women Speakers List

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

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

Women physicists who would like to be listed on the Women Speakers List or those who'd like to modify their existing entries can do so at http://www.aps.org/educ/women-speaker-enroll.html or see page 18.

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

2003-2004 Travel Grants For Women Speakers

♦ Application Form ♦

This form is also available on the Internet at www.aps.org/educ/cswp/women-app.html

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

DATE: _____

INSTITUTION: _____

DEPARTMENT: _____

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

APPLICATION PREPARED BY (Required): _____

NAME: _____ **TITLE:** _____

PHONE: _____ **FAX:** _____

EMAIL: _____

Please list information on the speakers below. Please 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:

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

Women Speakers List (WSL)
Enrollment/Modification Form 2003-2004

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

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

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

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

Institution _____ **Telephone** _____

Address _____ **Fax** _____

_____ **Email** _____

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

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

❒ **New Entry** ❒ **Modification**

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

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

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

Roster of Women and Minorities in Physics Enrollment Form

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

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

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

Please indicate whether you are interested in receiving:

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

❒ **Employment Announcements *(women and/or minorities only)***

Is this a modification of an existing entry?:

❒ **yes** ❒ **no** ❒ **not sure**

NAME: _____
(last) (first) (middle)

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

GENDER:
❒ Female
❒ Male

Ethnic Identification

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

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

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

NAME AND TITLE

ADDRESS Line 1:

ADDRESS Line 2:

ADDRESS Line 3:

CITY/STATE/ZIP

Daytime Phone _ _ _ – _ _ _ – _ _ _ _ Fax: _ _ _ – _ _ _ – _ _ _ _

E-mail Number: _____

Educational Background

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

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

_____

PLEASE REMEMBER TO COMPLETE SIDE II OF THIS FORM

Current Employment Information (28 Characters per line)

Employer: _____

Department/Division: _____

Position/Title: _____

Professional Activity Information

CURRENT WORK STATUS (Check One)

1 ____ Faculty, Non-Tenured
2 ____ Faculty, Tenured
3 ____ Inactive/Unemployed
4 ____ Long-term/Permanent Employee
5 ____ Post Doc./Research Assoc.
6 ____ Retired
7 ____ Self-Employed
8 ____ Student Full Time
9 ____ Student Part Time
10 ___ Teaching/Precollege
11 ___ Other (please explain)
_____
_____

TYPE OF WORKPLACE FOR CURRENT OR LAST WORK

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

TYPE OF WORK ACTIVITY

Please check up to four of the activities in which you engage most frequently.

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

DEGREE TYPE (Highest)

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

FIELD OF PHYSICS

Current Interest	Highest Degree	
(check up to 4 in each column)		
1 ____	1 ____	Accelerator Physics
2 ____	2 ____	Acoustics
3 ____	3 ____	Astronomy & Astrophysics
4 ____	4 ____	Atomic & Molecular Physics
5 ____	5 ____	Biophysics
6 ____	6 ____	Chemical Physics
7 ____	7 ____	Computational Physics
8 ____	8 ____	Computer Science
9 ____	9 ____	Condensed Matter Physics
10 ___	10 ___	Education
11 ___	11 ___	Electromagnetism
12 ___	12 ___	Electronics
13 ___	13 ___	Elementary Particles & Fields
14 ___	14 ___	General Physics
15 ___	15 ___	Geology
16 ___	16 ___	Geophysics
17 ___	17 ___	High Polymer Physics
18 ___	18 ___	Low Temperature Physics
19 ___	19 ___	Materials Science
20 ___	20 ___	Mathematical
21 ___	21 ___	Mechanics
22 ___	22 ___	Medical Physics
23 ___	23 ___	Non-Physics
24 ___	24 ___	Nuclear Physics
25 ___	25 ___	Optics
26 ___	26 ___	Physics of Fluids
27 ___	27 ___	Plasma Physics
28 ___	28 ___	Quantum Electronics
29 ___	29 ___	Solid State Physics
30 ___	30 ___	Space Physics
31 ___	31 ___	Superconductivity
32 ___	32 ___	Surface Science
33 ___	33 ___	Thermal Physics
99 ___	99 ___	Other (please specify)
		_____

APS Membership Information

Are you an APS member?:

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

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

___ ___ ___ — ___ ___ ___ ___ ___ ___

Office Use Only

Date of entry: _____

Roster#: _____

Initials _____

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

AMERICAN PHYSICAL SOCIETY
Committee on the Status of Women in Physics
One Physics Ellipse
College Park, MD 20740-3844

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