GENDER EQUITY: STRENGTHENING THE PHYSICS ENTERPRISE IN UNIVERSITIES AND NATIONAL LABORATORIES

SUMMARY OF THE WORKSHOP RECOMMENDATIONS*

Consider the following three questions:

1. *Have you deliberately met in the past year with your cohort of female students to get their impression of the environment in your department/national laboratory unit?*
2. *In the past five years the fraction of women graduating with Ph.D.'s in physics was 13-18%. Did your hires during this period reflect this fraction?*
3. *Do you specifically and proactively accommodate family needs in your early-career faculty/scientists, postdoctoral associates, and graduate students?*

If you can answer yes to these questions, your department/national laboratory unit is probably taking pro-active strides to ensure that women will be afforded the opportunity to study and work within the field. Unfortunately, that is not the case everywhere as in 2006 only 10% of the faculty at doctoral degree-granting institutions were women (13% over all institutions)[1].

How can you address this issue? What are some concrete steps to take today? What has worked at other places that you can adapt to your institution?

To try and answer some of these questions, and to advocate for women in the field in general, the APS Committee on the Status of Women in physics (led by Nora Berrah (WMU) and Arthur Bienenstock (SU)) held a workshop[2] with the chairs of 50 of the largest research universities and 14 managers of national laboratories to share best practice ideas and to remind us all that although we have made progress on this, there is still considerable effort ahead.

The suggestions for physics departments/national laboratories unit from this workshop fall under four basic categories:

- Recruiting Students
- Building a Respectful Environment
- Faculty Hiring
- Faculty Retention

Although this conference focused on women, some of the lessons and recommendations may apply in some cases to building supportive environments to attract and retain minority students and faculty/scientists. Hispanic and African-Americans represent over a quarter of the US population, but only 5% of the PhDs granted in 2005[3].

RECRUITING STUDENTS

* Detailed recommendations are available at: www.aps.org/programs/women/workshops/gender-equity.cfm.
[1] "*Academic Workforce Survey, 2006*," AIP Pub. (in press).
[2] www.aps.org/programs/women/workshops/gender-equity.cfm.
[3] P. Mulvey, S. Nicholson, "*Enrollments and Degrees Report, 2005*," AIP Pub. **R-151.42** (2007).

Chairs in high school physics classrooms are now almost equally likely to be occupied by a girl or boy, and yet only one in four bachelor degrees in physics is earned by a woman. If we want to increase the participation of women in physics, we need to bring more in at the ground level. We must actively recruit women into the degree program and to serve as role models in high school classrooms. Direct actions you can take include:

- Actively recruit majors and inform them of the diverse career paths open to them with a bachelors degree in physics (only 1 in 7 bachelor degrees in physics will go on to receive a PhD[4]).
- Create flexible tracks for physics majors to allow interdisciplinary studies.
- The chair/managers should schedule regular meetings (at least once a year) with female students in their unit to get their opinion of the environment for women in that unit. This can also be useful with postdoctoral associates, or early career faculty/scientists.
- Design a physics major that can be completed by starting in the sophomore year to allow for late starters or those with lower initial preparation in mathematics.
- Encourage students to work in research laboratories or to consider a career in high school teaching. Design a major track that allows physics education courses to count towards the major so that students can complete this degree within four years.
- Form a mentoring committee of women faculty/scientists and students

The Strategic Programs in Undergraduate Physics (SPIN-UP) report[5] documents many such cases where actions like these have not only increased the number of women, but also the number of physics majors in general. Results from the Physics Teacher Education Coalition (PhysTEC) project[6] provide evidence that increasing the number of majors also significantly increases the production of high school physics teachers as well.

BUILDING A RESPECTFUL ENVIRONMENT

Overcoming inherent biases[7] and barriers to women in physics begins with a supportive environment that acknowledges the challenges faced by many women in balancing work and family life. These recommendations are common sense and benefit everyone. Ensuring that they are applied uniformly, and consistently is the responsibility of every faculty/scientist member, but the department/unit chair/manager must set the tone. These recommendations from the workshop are among those that should be in place in every department/national laboratory unit:

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[4] P. Mulvey, S. Nicholson, "*Enrollments and Degrees Report, 2005*," AIP Pub. **R-151.42** (2007).
[5] www.aapt.org/Projects/upload/SPIN-UP-Final-Report.pdf
[6] www.PhysTEC.org
[7] See for example: C. Colbeck and R. Drago, *"Accept, Avoid, Resist: Faculty Members' Responses to Bias Against Caregiving... and How Departments Can Help*," Change: The Magazine of Higher Learning (Nov-Dec 2005); R. Drago, C. Colbeck, D. Stauffer, A. Varner, K. Burkum, J. Fazioli, G. Guzman and T. Habasevich, "*The Avoidance of Bias Against Caregiving Among Faculty*," Academe (Sept-Oct 2005) and references therein; Virginia Valian, "*Why So Slow?*" The advancement of women", MIT Press, 1998; M. A. Mason and M. Goulden, "*Do Babies Matter (Part II)? Closing the Baby Gap*", Academe **90**, (Nov-Dec 2004); M.A. Mason and M. Goulden, "*Marriage and Baby Blues: Redefining Gender Equity in the Academy*," The Annals of the American Academy of Political and Social Science **596**, 86-103 (2004); M.A. Mason and M. Goulden, "*Do Babies Matter: The Effect of Family Formation on the Lifelong Careers of Academic Men and Women*," Academe **88**, (Nov-Dec 2002).

- Departments and National Laboratory units must have a zero-tolerance policy for offensive or belittling comments. Chairs and managers must set the example by publicly challenging offenders and making it known that comments of this nature are inappropriate and will not be tolerated.
- Diversity awareness must be on the minds of every faculty/scientist involved in unit functions such as hiring, forming committees, and setting policy. Faculty/scientists should be reminded, frequently, of the importance of equity and challenged to defend their choices and actions in these matters. All policies (e.g., hiring, tenure, promotion, harassment, discrimination, space allocation, teaching assignments, etc.) should be transparent and easily available to all. It is suggested that these be posted electronically for easy and anonymous access.
- Harassment policies must be clear, equitable, and applied.
- Develop policies that support a work/life balance for all. Examples include allowing personal leave for dependent care, or setting meeting times that do not interfere with parental responsibilities.
- Publicly recognize awards and achievements for all in an equitable manner.
- Ensure meetings are run fairly for all by providing training for faculty/scientists members on meeting facilitation.

FACULTY HIRING

Hiring new faculty/scientists is one of the most important jobs for any chair. These individuals represent and build the integrity and reputation of the department and institution. They also act as mentors and role models for the next generation of students and faculty. Hiring women into these positions is challenging because of the smaller fraction of candidates, but it is also a great opportunity to broaden the diversity of the department/national laboratory unit and provide role models that can attract women into the field. Recommendations from the workshop ranged from hiring practices to developing innovative ways to hire pairs of people:

- Actively recruit women. Keep apprised of women in the pipeline and let them know you would like them to apply for positions at your institution. Have faculty/scientists help keep a current list of up and coming women.
- Advertise broadly for positions to attract more women candidates with different backgrounds.
- Those interviewing candidates should be advised of the types of questions allowable in an interview and guidelines for equitable treatment. Questions should focus on job-related issues, and avoid questions of a personal nature such as marital or family status.
- Have candidates meet with a diverse group of individuals including graduate students, women inside and outside the department/national laboratory unit, and post-docs to get a sense of the environment at the institution.
- Invite more women to interview. It is documented that women often under-sell themselves when compared to men. Digging deeper into the candidate pool might identify an excellent fit that is not immediately apparent.
- Mentor postdoctoral associates (and graduate students where appropriate) into faculty/scientists positions. Advice on how to succeed in the academic and national

laboratory arena will help them prepare themselves better for hiring and cope with the difficulties inherent to the field.

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- Women physicists are much more likely[8] than men to marry other scientists. Many universities have creative solutions for hiring a pair of individuals such as upper-administration assistance in offering an additional position, or partial payment of the spouse's salary to another department or institution during some fraction of the pre-tenure period. Investigate these arrangements well in advance of hiring so that your job opening will be more attractive to woman candidates[9].

FACULTY RETENTION

Retaining women faculty/scientists who have many options can be difficult, but it is good to keep in mind an adage from business: 'People don't leave jobs, they leave managers.' For academia/national laboratory units, the lesson is how to provide a working environment that is supportive and invigorating. Workshop recommendations included:

- Provide new faculty/scientists with more than one mentor and encourage faculty/scientists to seek out additional mentors and support networks. Provide mentors with training that includes issues relevant to gender and cultural issues.
- As a chair/manager, follow the careers of new faculty/scientists, and check in frequently on the status of their activities. Corporate managers often use a technique called 'coaching by walking about' to gain insight into employee activities and provide support. Chairs/managers can provide an open atmosphere of support and encouragement through informal visits and an open-door policy.
- Form an early-career faculty/scientist committee to encourage networking and enable anonymous feedback of the department's/unit's environment to the chair/managers.
- 'Stopping the tenure clock' for family leave should be available at all institutions. Although in some institutions this has been viewed as a stigma, policies should be developed and chairs/managers should make public comments to encourage all faculty/scientist to take advantage of this option.
- Nominate women for both small and large awards. This will help build their reputation and enhance their chances for winning larger awards.

These recommendations, while directed explicitly at improving equity within physics departments/national laboratory units, also directly benefit men. Suggestions like working to improve the work/life balance, or making arrangements to hire academic/staff scientist couples helps to keep faculty productive and enthusiastically committed to your institution. Many of the suggestions are common sense, but many have approached the problem from a unique perspective. If you have such an idea or action that helps in this regard, please contact the APS Director of Education and Diversity, Ted Hodapp (hodapp@aps.org), and we will work to help disseminate your ideas to help others. The American Physical Society also publishes a list of best practice strategies that cover many areas from recruiting and retaining female faculty/scientists to advice for undergraduate, and graduate students[10].

[8] "*Education in Nuclear Science*," A report to the DOE/NSF Nuclear Science Advisory Committee, p4-15 (November 2004), www.sc.doe.gov/henp/np/nsac/docs/NSAC_CR_education_report_final.pdf

[9]L. McNeil and M. Sher, "*The Dual-Career-Couple Problem*," Physics Today **52**, 32-39 (1999). M. Sher, "*Dual Career Couples – Problem of Opportunity?*" CSWP Gazette **25**, 1-2, 9 (2006), L. Mayberry, "*Dual Career Couples: What One University Does to Help*," CSWP Gazette **25**, 3 (2006) (www.aps.org/programs/women/reports/gazette/upload/fall06.pdf)
[10] www.aps.org/programs/women/reports/bestpractices

ADDITIONAL RESOURCES

- The University of Michigan ADVANCE site, sitemaker.umich.edu/advance has many creative ideas. Useful links including those to all ADVANCE Institutional Award Sites can be found at wiseli.engr.wisc.edu/links.html.
- National Science Foundation, Division of Science Resources Statistics, Women, Minorities, and Persons with Disabilities in Science and Engineering: 2004, NSF 04-317, Arlington, VA, 2004.
- "*Women in Physics*", 2nd IUPAP international conference on women in physics, Rio de Janeiro, Brazil, May 23-25, 2005, AIP conference proceedings, **795**, Editors Beverly Karplus Hartline and Ariel Michelman-Ribeiro and references therein.
- Workshop report by the chemistry community on "*Workshop on Building Strong Academic Chemistry Departments through Gender Equity*" (prepublication 2006) references therein.
- *Committee on the Status of Women in Physics* – Links and Resources, www.aps.org/programs/women/resources/. Links to reports, articles, associations
- *Recruitment and Retention of Female Graduate Students: What Have We Learned from the APS Climate for Women Site Visit Program?* Laurie E. McNeil, Dept. of Physics and Astronomy, Univ. of North Carolina at Chapel Hill, www.physics.unc.edu/~mcneil/MM04_files/frame.htm (must use Internet Explorer to view).
- *References on Chilly Climate for Women Faculty in Academe*, dynamic.uoregon.edu/~jjf/chillyclimate.html.
- *Dual Science Career Couples***,** by Marc Sher and Laurie McNeil, www.physics.wm.edu/dualcareer.html.
- Meg Urry, "*Speeding up the long slow path to change*", APS News **12**, 12 (February 2003).
- *Improving the Postdoc*, by Celia M. Henry, Chemical & Engineering News **82**, 47-48 (26 January 2004) pubs.acs.org/email/cen/html/021904101943.html.
- *Resources from AIP's Website with advice and data on graduate schools*, www.gradschoolshopper.com/resources.jsp#gradadvice.
- *Mentoring New Faculty: Advice to Department Chairs***.** Marjorie Olmstead, University of Washington, faculty.washington.edu/olmstd/research/Mentoring.html.
- E. Culotta, *Male Scientist Publish More, Women Cited More* - The Scientist **7**(15):14, (26 July 1993) www.the-scientist.com/article/display/16183/.