

## Waterloo Charter for Women in Physics

We hold as our guiding principles that:

- Women and men are equally good in doing excellent science and deserve equal opportunity.
- Diversity contributes to excellence in science so that the full participation of women and men will maximize excellence in the field of physics.
- Current recruitment, training, evaluation and award systems often prevent the equal participation of women.
- Formal and informal mechanisms that are effectively discriminatory are unlikely to change without intervention. Both thought and action are necessary to ensure equal participation for all.
- The measure of equal opportunity is outcome, namely gender equity is attained when the percentage of women in the next level of advancement equals the percentage in the pool.
- Increasing the number of women in physics will improve the professional environment and improving the environment will increase the number of women.
- Long-term change requires periodic evaluation of progress and consequent action to address areas where improvement is necessary.

### Context

The IUPAP established the working group on Women in Physics (WIP) in 1999 as a resolution of the Atlanta General Assembly as Working Group 5. The working group is charged with the following responsibilities:

- To survey the situation for women in physics in IUPAP member countries;
- To analyze and report the data collected along with suggestions on how to improve the situation;
- To suggest ways that women can become more involved in IUPAP, including the Liaison Committees, the Commissions, the Council, and the General Assemblies.

This Charter was formulated at the fifth IUPAP International Conference for Women in Physics organized by the working group in WIP in Waterloo, Canada from August 5-8, 2014. The Charter is based on the rubrics of the Baltimore Charter and the Pasadena Recommendations formulated by the American Astronomical Society in 1993 and 2003 respectively. The document is also shaped and guided by the principles dictated by the JUNO project initiated by the Institute of Physics (UK).

### Rationale

Physics has a long and honorable tradition of participation by women, who have made many significant and highly creative contributions to the field. However, the percentage of female physicists remains low. It is increasingly clear that scientific careers are strongly affected by social and cultural factors, and are not determined solely by ability.

The search for excellence that unites all scientists can be maintained and enhanced by increasing the diversity of its practitioners. Great discoveries have always strived

on cross-cultural diversity. The attainment of such diversity needs revised criteria for judging excellence, free of cultural perceptions of talent and promise.

Current available data on the relative numbers and career histories of women and men in science reveals widespread discrimination: access to the profession, like graduate education, hiring, promotion, and funding, is not always independent of gender. There are cases where unequal treatment of women occurs in the laboratory, the lecture hall and the observatory. Some of these discriminations could be subtle, rather than overt discrimination, creating a non-conducive atmosphere that not only discourages and distresses women but also alienates them from the field. Ultimately, such discrimination can only damage the profession.

The working group believes that IUPAP should assume responsibility for implementing strategies that will enable women to succeed within the existing structures of physics and allow the desired acceptance of diversity to develop fully.

## Recommendations

1. Significant advances for women have been made possible by affirmative action. Affirmative action involves the establishment of serious goals, not rigid quotas, for achieving diversity in all aspects of the profession, including hiring, invited talks, committees, and awards.
  - (a) Standards for candidates should be established and publicized in advance. Criteria that are culturally based or otherwise extraneous to performance or the pursuit of scientific excellence should not be applied.
  - (b) Women should participate in the selection process. If insufficient numbers of women are available at particular institutions, outside scientists can be invited to assist. Men must share fully the responsibility for implementing affirmative action, as they hold the majority of leadership positions.
  - (c) The selection of women should reflect on average their numbers in the appropriate pool of candidates and normally at least one woman should be on the short list for any position, paid or honorific. When women are underrepresented in the pool, their numbers should be increased by active and energetic recruitment.
  - (d) Data concerning equal opportunity for women should be widely publicized. If the goals for affirmative action are not achieved, the reasons must be determined.
2. The criteria used in hiring, assignment, promotion and awards should be broadened to include different pacing of careers, care of older and younger family members, and demands of dual-career households. Provision for day care facilities, family leave, time off and re-entry will instantly improve women's access to a career and in physics is of equal benefit to men.

### A. Tenure-Track Hiring

Traditional hiring practices may work against women as candidates for tenure-track positions in research universities, large national observatories, and science institutes. Statistics show that the fraction of women in the tenure-track pool has increased over the last two decades, but the fraction of women in tenure-track positions has not grown commensurately. It is the clear responsibility of research organizations to take affirmative steps to ensure that all viable candidates for tenure-track positions are identified and

given equal opportunity both for hiring and success. While specifically calling out tenure-track hiring as an area of immediate concern, we recognize that the same practices should be applied to hiring for all positions. In this spirit, we make the following recommendations to be adopted.

Recommendations:

- a. Ensure that all search committees for tenure-track positions contain two or more members whose specific task is to advocate for consideration of candidates from groups that are underrepresented in physics.
- b. Require that search committees be informed about what constitutes legal and ethical hiring practices.
- c. Actively recruit women to apply for tenure-track positions.
- d. Develop policies encouraging flexible means of accommodating dual-career couples.
- e. Require accountability in the hiring process, using appropriate institutional channels, so that results are commensurate with the possible candidate pool.
- f. If two candidates for the same position have equal qualifications within the uncertainties, the candidate from the underrepresented group should be hired.

## B. Career Advancement and Recognition

The "classic" career path for physicists in academia has been a progression through undergraduate and graduate school, a postdoc or two, and then a research faculty job at a major university. Statistics indicate that women are lost from this "progression" in proportion greater than for men, for a variety of reasons such as unsupportive work environments, lack of role models, and insufficient opportunity for recognition of their performance. Recognition often comes in the form of professional awards and invited presentations, where women frequently have been underrepresented relative to their achievements. Informal mentoring is easy and widespread for young people who resemble those already in the field but often is nearly inaccessible to those from underrepresented groups. We offer several recommendations to ameliorate this situation:

Recommendations:

- a. Academic institutions should provide regular evaluation, mentoring and career counseling to young faculty members.
- b. Universities and individual departments should set up formal programs to train mentors for younger students and professionals, with attention paid to both career and family issues. In addition, IUPAP should sponsor periodic special sessions or short training programs at the semi-annual general meetings. The individual astronomy and physics departments then should take the responsibility of implementing a mentoring program, so that their more junior members have a mechanism to acquire support and advice. Specific areas of interest for training and mentoring would include information about rules (both written and unwritten), expectations, networking, and the general decision-making process of a particular institution.
- c. Ph.D.-granting universities should recognize the potential of graduate-student applicants from institutions that traditionally serve underrepresented groups. Departments should develop working relationships with faculty at these institutions, and establish specific

mentoring programs for graduate students who may undergo "culture shock" upon arrival at a major research university.

- d. Decisions on advancement should result from an open process, based on specific criteria that are spelled out in advance. Senior faculty and other senior personnel must provide an environment that enables all junior faculty to have an equal opportunity to succeed and advance in this process.
- e. Organizations and academic institutions should offer women equal opportunity for scientific recognition in the form of awards (IUPAP awards and others) and invitations to present invited talks in a variety of circumstances, including all IUPAP and physical societies meetings, topical professional meetings, and traditional colloquia/seminars. Prize nominee pools and invited speaker lists should adequately reflect the diversity of the profession. The institutions responsible for selecting awardees and invitees should review periodically their policies and progress in this area, in order to ensure that the achievements of women are being represented fairly.
- f. Along with direct contributions to science, criteria for success should include teaching and other functional terms of employment. Specifically, outreach and education activities are important both for the future of physics and in relation to possible career paths; involvement in such activities should be supported and rewarded at all levels, including hiring decisions and performance evaluations. Paradoxically, individual women sometimes are heavily burdened with committee service in an effort to achieve greater diversity; this additional service also should be recognized in advancement decisions.
- g. The responsibility to create institutional changes that promote equity in physics lies first and foremost with the senior and more established members of an institution. However, individuals at a more junior level have a strong interest in such change and should participate as is feasible. In addition, these younger physicists should not be thwarted by apparent barriers, but should enthusiastically pursue their own goals and dreams for scientific achievement and career advancement.

### C. Institutional Policies

Institutions have a responsibility to change the face of our profession, by developing and implementing policies that are friendly to women and that ensure equal access to all benefits and opportunities that will help them advance in their careers. Many institutions have policies that are limited in scope or outdated. Consistent policies that are supportive of diversity, among institutions that grant degrees in physics or employ physicists, play a critical role in "leveling the playing field" for women physicists.

#### Recommendations:

- a. All institutions should establish and promote strong policies and training in the areas of sexual harassment and general ethics, including clear complaint paths and accountability, taking care that these policies apply both to permanent employees and to short-term visitors (e.g., students and visiting observers).
- b. Institutions should endorse and implement the Waterloo Charter as far as possible. The IUPAP should maintain a public list of institutions and

organizations that endorse this Statement.

- c. Members of the departments granting degrees in physics or employing physicists should work proactively with their institutions to establish policies that allow all department members access to affordable health and childcare. This access should not be reserved only for faculty, but be extended to graduate students, post docs, research and administrative staff as well.
- d. All job applicants should be made aware of institutional policies and benefits e.g., health care, childcare, leave policies, spousal/partner hire policies, spousal/partner job search assistance, and retirement) provided at all levels.
- e. IOP maintains an assessment scheme to recognize and reward physics department that can demonstrate that they have taken action to address the under-representation of women in university physics and to encourage better practice for both women and men. IUPAP should encourage member countries to adopt such self-assessment schemes.

#### D. Varied Career Paths

Many, if not most, professional physicists worldwide are employed in positions other than tenure-track positions at major research universities. Examples are employment at national or private laboratories, colleges that do not grant Ph.D.s, science centers, industry, or various roles in science or university management. The paths to these roles typically are not well understood, nor are the opportunities available to develop skills that are useful in these various types of positions.

#### Recommendations:

- a. Academic departments should encourage outside training in non-research fields, such as program/project management or science policy, in order to prepare their students for the possibility of future careers in managing a variety of scientific endeavors. This may include, for example, courses outside the academic department or department seminars given by people in various related careers.
  - b. Educational institutions that are co-located with related industrial employers, research institutions, or observatories should establish specific programs that enable students to "cross-train" between the university and the other organizations. Likewise, informal and formal science discussions, mentoring groups, seminars and colloquia, etc. at these professional institutions should have an open door policy and encourage student participation.
  - c. Mentoring programs such as that recommended in the section on "Career Advancement and Recognition" should include discussions and explorations of options outside the traditional faculty progression; physics departments should work with their university's career development centers, and with their own graduates, to provide information about these options to their undergraduate and graduate students.
3. Strong action must be taken to end sexual harassment. Education and awareness programs are standard in many governments and in the industry and should be adopted by the physics community. Each institution should appoint one or more women to receive complaints about sexual harassment

and to participate in the formal review process. Action against those who perpetrate sexual harassment should be swift and substantial.

#### A. Cultural Issues

Some of the strongest, but most difficult to quantify, reasons that individuals from underrepresented groups can feel disadvantaged arise from a mismatch with the majority "culture" –i.e., implicit norms and expectations of behavior. Specific recommendations that are made above would go far toward dealing with some of these issues in terms of policies and practices, but there remains a large gray area of subtle cultural issues that contribute to the underrepresentation of women in tenured and other leadership roles. In the words of Jocelyn Bell Burnell (*Science* 304, p. 489, 2004): "Women and minorities should not do all the adapting. It is time for society to move toward women, not women toward society."

Recommendations:

- a. Institutions should encourage gender-equity training and make it available at all levels. This should include discussions of the well-studied effects of subtle discrimination, unconscious bias, and the accumulation of disadvantage.
- b. In an era in which the ability to work within a large team is becoming increasingly important for scientific success, departments should foster a collaborative and team-oriented approach rather than just the more traditional, competitive scientific culture. Responsibilities and rewards should be shared equitably in the team environment. It is also expected that such a team should be composed of diverse members of the department, where appropriate (for example, men and women, junior and senior faculty, students, etc.).
- c. Good communication channels should be maintained and encouraged throughout academic departments and laboratories, both within peer groups and spanning traditional hierarchical levels. Department chairs should organize regular opportunities for two-way communication throughout the hierarchy.
- d. Institutions should ensure that a career in research is compatible with having a family; professional activities (e.g., class and meeting schedules) as well as employment benefits (e.g., childcare, family leave, etc.) should be developed with this specific goal in mind.

#### B. Statistical Information

Evidence of the underrepresentation of women in the physics community relies on insufficient long-term statistical data. Better longitudinal data, specific to physics, are needed to assess women's representation and to assess the effectiveness of remedies. The issue of statistics must be recognized for its central importance to understanding the social and cultural forces that shape the characteristics of our field.

Recommendations:

- a. The IUPAP should commission a longitudinal study of young women in physics, beginning with those aged 18-23 in 2003. A similar group of men should be used as a comparison sample. Both subjects that remain in the field and those that leave the field should continue to be

tracked for the duration of the study. The IUPAP should commit to continue this study for at least 10 years, in order to establish statistics on retention and career paths for this cohort. Professional sociologists, using accepted statistical techniques, should carry out this study. One goal of this study would be to measure whether there is differential attrition of women from the pipeline and if so, to learn the reasons for it.

- b. The working group (WG5) has been engaged in a Global survey. There is a need to continue to conduct regular Global Survey of Physicists. Questions pertaining to cultural perception and bias should be crafted into the survey. We recommend that physical societies adopt all the questions in this Global Survey of Physicists for their own use within their countries.

The IUPAP should build the Global survey and form a "Committee on Statistics"; whose main objective would be collecting, analyzing and reporting data on the demographics of our field. This committee could work closely with other relevant IUPAP committees (as well as organizations such as the National Science Foundation and American Institute of Physics (AIP) that conduct their own surveys). This committee should provide complete and regular access to statistics on items such as gender balance, the fraction of beginning students who earn their Ph.D., and the mean time to completion.

- c. The above mentioned committee's prime focus should be to examine the demographic status of the IUPAP membership and the physics community in a three-fold approach: (a) mining standardized yearly departmental reports (using those currently administered by the AIP) for statistical information, (b) administering and analyzing in depth periodic surveys and (c) giving input to and reporting results from longitudinal studies.
4. Gender-neutral language and illustrations are important in the formation of expectations, both by those in power and those seeking entrance to the profession. Documents and discussions should be sensitive to bias that favors any one gender, race, sexual orientation, life style, or work style. Those who represent physicists to the public should be particularly aware of the power of language and images that, intentionally or unintentionally, reflect on Physics as a profession.
  5. Physical safety is of concern to all physicists and of particular significance to women, who often feel more vulnerable when working alone on campus or in observatories. This issue must be addressed by those in a position to affect security, making it possible for everyone to work at any hour, in any place, as necessary.