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.
- 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.
- 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 initiated 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 and finalized during its sixth edition that took place in Birmingham, UK in July 2017. 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 thrive 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 or unintentional, rather than overt, 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. 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.

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. In the Appendix, we spell out recommendations pertaining to affirmative action, career paths and institutional policies.

Appendices

1. Recommendations for Affirmative Actions

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. Recommendations for Career Paths

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, career breaks, 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 in physics and is of equal benefit to men.

A. Academic Hiring

Traditional hiring practices may work against women as candidates for positions in research universities, laboratories, and scientific institutes, whether these are permanent, tenure-track, or contract. 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[1]. It is the clear responsibility of research organizations to take affirmative steps to ensure that all viable candidates for positions are actively identified and given equal opportunity both for hiring and success. While specifically calling out tenure-track and similar 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:

[1] see for instance: https://www.tiaainstitute.org/publication/taking-measure-faculty-diversity or https://arxiv.org/pdf/1503.01333.pdf

a. Ensure that all search committees for 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. In particular, it would be good to provide training sessions on what constitutes good practice including unconscious bias training.
c. Actively recruit women to apply for 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 and institutes 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 physics and physics-related 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 physics 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. Open nominations, self-nomination for awards, memberships or fellowships should be allowed.

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. Consider "career level" to allocate these tasks fairly. Mid career women should not be forced to mentor younger students at the expense of themselves being mentored. Fair allocation task with equality of career value.

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.

h. There should be sufficient support and flexibility to allow a woman to work part time and be accord the same benefits and privileges as a full time staff.

C. Varied Career Paths

Many, if not most, professional physicists worldwide are employed in positions other than academic positions at universities. Examples are employment at national or private laboratories, colleges that do not grant Ph.D.s, science centers, industry, various roles in science or university management, and in government. 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 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. Recommendation for Institutional Policies

A. Professional misconduct

Recommendations:

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 implement an enforceable policy 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.

B. 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 diversity 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.

C. 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.

Working Group 5 has been involved in a Global Survey to collect data on the conditions for women in physics across the world. The baseline Global Survey of Physicists (2011) was remarkable for having 14932 respondents in 8 languages

Led by IUPAP Working Group 5, a proposal was developed by IUPAP, IMU[2] and IUPAC[3], and successfully submitted to ICSU[4]. The collaborative ICSU project is led by Prof Marie-Francoise Roy, of IMU, and is called "*A Global Approach to the Gender Gap in Mathematical and Natural Sciences: How to Measure It, How to Reduce It?*"[5]. The project covers a Joint Global Survey, a bibliometric study of publication profiles, public awareness, particularly in developing countries, and the implementation of good practice.

The project now includes ten partners: IMU, IUPAC, IUPAP, IAU[6], IUBS[7], ICIAM[8], IUHPST[9], UNESCO[10], GenderInSITE[11], and OWSD[12]. The ICSU Budget is €100 000 each year for 3 years and the contributing Unions, including IUPAP, provide an additional €5 000 each per year. The funding for Task 1, the Joint Global Survey, is allocated and used for the Workshops

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2 International Mathematical Union
3 International Union of Pure and Applied Chemistry
4 The International Council for Science
5 More can be found at https://icsugendergapinscience.org/
6 International Astronomical Union
7 International Union of Biological Sciences
8 International Council for Industrial and Applied Mathematics
9 International Union of History and Philosophy of Science and Technology
10 United Nations Educational, Scientific and Cultural Organization
11 Gender in Science, Innovation, Technology and Engineering
12 Organization of Women in Science for the Developing World

listed below and preparation through AIP for the survey.

Recommendations:

a. The working group (WG5) should continue to be involved actively in surveying the situation of physicists worldwide. Questions pertaining to cultural perception and bias should be crafted into the survey. Regional and national analyses are needed. We recommend that physical societies adopt all the questions in the Global Survey of Physicists for their own use within their countries.

b. IUPAP should build on 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.

D. Safety and environment

Recommendations:

a. Gender-neutral language 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 physics to the public should be particularly aware of the power of language and images that, intentionally or unintentionally, reflect on Physics as a profession.

b. Physical safety is of concern to all physicists and of particular significance to women, who often feel more vulnerable. This issue must be addressed by those in a position to affect security, making it possible for everyone to work in a safe environment.