

Report on IUPAP's International Conference on Women in Physics

Paris, France
7-9 March 2002



Beverly Karplus Hartline
Argonne National Laboratory
Member of IUPAP Working Group on
Women in Physics

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International Conference on Women in Physics
<http://www.if.ufrgs.br/~barbosa/conference.html>

Women in Physics

Purpose

- **To understand the severe underrepresentation of women in physics and to develop strategies to increase their participation**
- **Why increase female participation in physics?**
 - Good for physics: expands talent pool & ideas
 - Equity: fair for women to have opportunities
 - Public scientific literacy: enfranchise women (& children) in increasingly technological society
- **Organized by IUPAP working group on Women in Physics (Chair: Marcia Barbosa, Brazil)**

Thanks to Many Generous Sponsors

- **IUPAP: International Union of Pure & Applied Physics**
- **CLAF: Centro Latino-Americano de Fisica**
- **Europe: European Commission, EPS, ESF**
- **France: Ministere de la Recherche, CNRS**
- **Italy: International Center for Theoretical Physics**
- **UK: Institute of Physics, EPSRC, OST, PPARC**
- **Japan: Physical Society, Society of Applied Physics**
- **USA: NSF, DOE, NASA, NIST, APS, AIP, NAS, LLNL, KLA-Tencore, ONRIFO**
- **International Council of Scientific Unions (ICSU)**
- **ROSTE UNESCO: Regional Office for S&T for Europe**
- **Employers and sponsors of organizers & participants**

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Conference Overview

- **>300 physicists, ~15% men, ~65 countries**
- **Plenary talks from all world regions**
- **Posters from all countries**
- **Ideas shared & created in small groups**
 - Attracting girls to physics
 - Launching a successful career
 - Achieving leadership roles
 - Improving the institutional climate
 - Balancing family and career
 - Understanding regional differences



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Plenary Talks

- Roman Czujko, (USA): *Resources, Opportunities and Encouragement: Findings from the International Study of Women in Physics*
- Teresa Rees, (UK): *Women and Science in Europe: A Review of National Policies*
- Claudine Hermann, (France): *'The European Union Report on Women and Science' and a French Experience*
- Chen Zhili, (China): *Women in Physics: The View from China*
- Karimat Mahmoud El-Sayed, (Egypt): *Women in Physics: The Situation in Egypt*
- Elisa Baggio Saitovitch, (Brazil): *Personal Experience as a Latin American Physicist*
- Masako Bando, (Japan): *Status of Women in Physics of Japan and Future Aspects: Findings from Questionnaire of JPS and JAPS*
- Iya P. Ipatova, (Russia): *Russian Women in Physics: Line of Life*
- Catherine Cesarsky, (Europe): *Women in Science: Personal Impressions*
- Nancy Hopkins, (USA): *Women Faculty in Science at MIT*
- Rohini Godbole, (India): *Being a Woman Physicist: An Indian Perspective*

Eight Resolutions Approved Unanimously

- **For schools and their government sponsors**
- **For universities**
 - Students
 - Faculty and researchers
- **For research institutions**
- **For industrial laboratories**
- **For scientific societies**
- **For national governments**
- **For granting agencies**
- **For IUPAP**

Attracting Girls into Physics

- **Organizing Committee:** Sumathi Rao (India, Chair), Beverly Hartline (USA), Barbara Sandow (Germany)
- **Discussion Leaders:** S. Rao, Neelima Gupte (India), Jyoti Gyanchaudari (India), Christa Hooijer (Netherlands)
- **Recorders:** Jenni Adams (New Zealand), Ashild Fredriksen (Norway), Peter Saeta (USA), John O'Brien (Ireland)

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Issues for Attracting Girls

- **Image of physicists: dull, nerdy, male**
- **Value of physics not recognized**
- **Physics teaching & textbooks not well matched to girls' interests**
- **Competitive vs collaborative learning approaches**
- **Social/cultural problems that place low value on the education of girls**
- **Publicizing and adapting successful approaches practiced in some schools and countries**

Recommendations for Attracting Girls

- **Revise curriculum & textbooks to relate physics to society technology, medicine, daily life, etc.**
- **Improve physics teaching: teacher training, interactions with working scientists, girl-friendly atmosphere**
- **Use role models to glamorize physics and improve image**
 - Emphasize the many, varied jobs physicists can do
- **Encourage universities, institutes, and industry to partner with schools**
- **Reward physicists who work to attract girls**
- **Help smart girls network; create science clubs; have mentoring programs**
- **Involve more girls in international physics competitions**
- **Counsel parents, teachers, and career advisors to encourage girls**
- **Make undergraduate curricula flexible: allow different preparation and paths**

Launching a Successful Physics Career

- **Topic organizing committee:** Beverly Hartline (USA, Chair), Elisa Molinari (Italy), Herwig Schopper (Switzerland), Yosr Gamal (Egypt)
- **Discussion leaders:** B. Hartline, Marilia Caldas (Brazil), Gillian Gehring (UK), Engin Arik (Turkey)
- **Recorders:** Dimitra Darambara (UK), Annalisa Fasolino (Netherlands), Liv Hornekaer (Denmark), Peter Melville (UK)

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Three Dimensions to Success

- **Recognition**: advancement, peer respect, publications, citations, job offers, invitations, funding success...
 - **Impact on Society**: improvement to world, country, society, science, physics,...
 - **Individual/self**: fulfilled passion, independence, life balance, balance between effort & rewards
- Importance of different dimensions depends on age, experience, & success

Career Phases and Issues

- **Launching a physics career**
 - Choosing physics, a specialty, and career path
 - Setting near-term and long-range goals
 - Obtaining position/funding; surviving peer review process
 - Handling family responsibilities (see “Balancing Family and Career”)
- **Gaining reputation and visibility**
 - Finding/making the best mentors and opportunities
 - Getting and succeeding in important assignments
 - Assessing progress and adjusting goals
- **Winning the success and recognition you deserve**
 - Knowing/changing ‘the game;’ rewards and promotions
 - Joining the power structure

Alternative Physics Career Paths

- **Academia:** university level, school level; teaching, research, administration
- **Industry:** research, manufacturing, sales, management
- **Government:** research, policy, regulations, politics, management
- **Others:** writing, finance, medicine, law, movies...
- **Education:** Doctorate, lesser degrees

Recommendations for Career Success

- **Decide your career goals & strategy**
 - Be flexible to exploit best opportunities
- **Have confidence in yourself!**
- **Find/make good supervisor(s)/mentor(s)**
 - Change if not good: you deserve the best!
- **Seek the best physicists & learn from them**
- **Network with other women to help each other**
- **Volunteer for important assignments**
- **Promise a lot and deliver more**
- **Ask for what you need**
- **Get famous—write a book or chapter, get on TV....**
- **Invite women to give talk(s), serve on important committees, and take important assignments**

Getting Women into Physics Leadership Nationally and Internationally

- **Organizing Committee: Katharine Gebbie (USA, Chair), Hidetoshi Fukuyama (Japan), Yosr Gamal (Egypt), Beverly Hartline (USA)**
 - **Discussion Leaders: K. Gebbie, Azam Irajizad (Iran), Helene van Pinxteren (Netherlands)**
 - **Recorders: Laurie McNeil (USA), Kim Budil (USA), JoAnn Joselyn (USA)**
- ❖ **What is leadership? A formal position with control over allocation of human and financial resources and over the research agenda**

Issues related to Women in Leadership

- **Social/cultural expectations that men are leaders and women are helpers or homemakers**
- **The many qualifications and skills needed for leading**
- **Criteria & processes for hiring, promotion, & funding**
- **The current status: very few women in physics leadership**

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Leadership Recommendations

- **Current leaders (mostly men) should create a climate in which people are treated equitably**
- **Women leaders should help change prejudices, mentor, and be visible role models**
- **Criteria and processes must be transparent and involve women**
- **Employers should provide formal leadership training and choose women for assignments where they will gain leadership skills**
- **Physics societies and IUPAP should involve more women in their leadership**

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Improving the Institutional Structure & Climate

- **Organizing Committee:** Ling-An Wu (China, Chair), Marcia Barbosa (Brazil), Herwig Schopper (Switzerland)
- **Discussion Leaders:** L.-A. Wu, Manjula Sharma (Australia), Larissa Svirina (Belarus)
- **Recorders:** Joann Baker (UK), Anne Borg (Norway), Peggy Frederickx (Belgium)

Institutional Climate Issues

- **Facilities: office & lab space, restrooms,...**
- **Gender-based differences in pay, recognition, and opportunities**
- **Convenient, available child care**
- **Perceptions and expectations different than for men**
- **Women often isolated and marginalized**
- **Sexual harassment**
- **Safety**



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Recommendations to Improve Institutional Climate

- **Written, enforced equity policies**
- **Transparent decision-making processes**
- **Women in leadership and on important committees**
- **Strengthened networking: horizontally & vertically**
- **Visiting teams to assess and advise on climate for women**
- **Training for men on how to treat women as colleagues and improve the climate**
- **Training for women on how to succeed**
- **Leading men engaged as change agents**
- **Innovative structures, such as shared leadership**

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Balancing Family and Career

- **Organizing Committee:** Barbara Sandow (Germany, Chair) Kwang-Hwa Chung (Korea), Janis McKenna (Canada), Yosr Gamal (Egypt)
- **Discussion Leaders:** B. Sandow, Corinna Kausch (Germany), Monika Bessenrodt-weberpals (Germany), J. McKenna
- **Recorders:** Helen Heath (UK), Yasmin Andrews (UK), Joanna Hamilton (UK), Nathalie Balcaen (Belgium)

Family/Career Issues

- **Career interruption for childbearing and infant care**
- **High-quality, convenient, affordable child care**
- **Other responsibilities to family and home (cleaning, cooking, parent-care)**
- **Dual-career families: the two-body problem**
- **Importance of travel and foreign work experience to career progress**
- **Social/cultural expectations of women/men**



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Family/Career Recommendations

- **Pause “career clock” and value family service (like military service)**
- **Implement family-friendly work conditions – flexible leaves, and working hours, part-time jobs, shared jobs**
- **Make high-quality child care available near workplace and at physics conferences**
- **Help dual career couples find two nearby positions**
- **Use role models to show students that one can have a successful physics career and wonderful family.**
- **Have men and women share family duties and pleasures.**

Learning from Regional Differences

- **Organizing committee & discussion leaders:**
Elisa Molinari (Italy, Co-Chair), Pia Thörngren-Engblom (Sweden, Co-Chair), Ulla Tengblad (Sweden), Karoline Wiesner (Sweden)
- **Recorders:**
**Karen Janssens (Belgium),
Ann Marks (UK),
Sue McGrath (Ireland),
Sharon Stephenson (USA)**



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Important International Similarities

- **Passion for physics**
- **Scarcity and isolation of women in physics, especially at higher levels**
- **Childbearing and family responsibilities**
- **Dual-career couples: the ‘two-body’ problem**
- **Value of internet for communication and information access**

Important International Differences

- **Social-cultural expectations**
- **Size of country and its physics enterprise**
- **Wealth of country: equipment for physics**
- **Representation of women in physics (10% to 50% undergraduate; 1% to 20% faculty)**
- **Amount of data and concern about women in physics**
- **Developed vs developing nations**
 - Existence and reputation of universities
 - Quality of schools and girls' education
 - Industries employing researchers
 - Employment opportunities using physics
 - Availability of computers, even electricity

Lessons from Different Regions

- **Regularly collect physics demographic data, including gender, in each country to track trends**
- **Understand reasons women leave physics; then develop effective interventions**
- **Share successful math and physics curricula, textbooks, and teaching approaches internationally**
- **Ensure funding and R&D opportunities exist for physicists in developing countries and provide web access**
- **Establish international women's speaker program**
 - Web list of speakers/topics; travel support (USA/APS model)
- **Sponsor prestigious topical international physics summer schools, including women**

Controversial Issues

- **Affirmative action**
 - Hiring rules and quotas
 - Prizes specially for women and girls
 - Potential to undermine progress
- **Multiple post-doctoral positions**
- **“Volunteering” in research laboratory if unable to obtain a paid position**

IUPAP Working Group on Women in Physics Conference & Program Committee

- **Dr. Marcia C. Barbosa, Brazil, Chair**
- **Dr. Kwang-Hwa Chung, Korea**
- **Prof. Hidetoshi Fukuyama, Japan**
- **Prof. Yosr E. E-D Gamal, Egypt**
- **Dr. Katharine Gebbie, USA**
- **Dr. Beverly Hartline, USA**
- **Prof. Elisa Molinari, Italy**
- **Dr. Barbara Sandow, Germany**
- **Prof. Herwig F. Schopper, Switzerland**
- **Prof. Sumathi Rao, India**
- **Prof. Ling-An Wu, China**
- **Dr. Judy R. Franz, USA IUPAP Liaison**

Follow Up and Next Steps

- **Participants**

- Spread the word
- Translate resolutions
- Drive change in their countries
- Post country posters on conference website
- Establish or strengthen networking

- **Working Group**

- Maintain & expand website
- Present resolutions for approval at IUPAP General Assembly in October 2002
- Publish proceedings by September

- **You**

- Network locally, regionally, nationally, internationally
- Send your name, contact information, and physics specialty to barbosa@if.ufrgs.br
- Invite a US participant to talk in your neighborhood

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Women in Physics

Introduction to Resolutions

Physics plays a key role in understanding the world we live in, and physicists contribute strongly to the welfare and economic development of nations. The knowledge and problem-solving skills of physicists are essential in many professions and industries and to society at large. To thrive in today's fast-changing, technological world, every country must achieve a highly educated population of women and men, fully engaged in making decisions important to their well being.

Thus a knowledge of physics is an important part of general literacy for every citizen. In addition, advancing physics understanding is an exciting intellectual challenge that benefits from the diverse and complementary approaches taken by both women and men from many cultures. Currently women can and do contribute to this quest and, through physics, to the welfare of humankind, but only in small numbers: women are an underutilized "intellectual reserve." Only when women participate fully as researchers in the laboratory, as scientific leaders and teachers, and as policy makers will they feel equal partners in a technological society.

The ideas in these resolutions are aimed at bringing more women into the mainstream and leadership of physics. They were unanimously approved by over 300 physicists from 65 countries attending the first International Conference on Women in Physics, held in Paris, France, 7-9 March 2002.

Each country is different. Thus the conference participants are translating these resolutions into their own languages. In the translation, the ideas in the resolutions will be appropriately phrased and directed to the responsible entities in each country.

Resolution Directed at Schools and Their Government Sponsors

Girls should be given the same opportunities and encouragement as boys to learn physics in schools. When parents and teachers encourage girls, it strengthens their self-confidence and helps them advance. Methods and textbooks used in teaching physics should include those that have been shown to interest girls in physics and foster their success. Studies show that young girls have a strong desire to help improve people's lives, and therefore it is important that they have the opportunity to see ways that physics has a positive impact on society.

Resolutions Directed at Universities: Students

Universities should examine their policies and procedures to ensure that female students are given an opportunity for success that equals that of male students. All policies that perpetuate discrimination should be abolished, and policies that promote inclusion should be adopted. This may involve adopting such practices as: using a broad interdisciplinary approach to physics; providing flexible entry criteria to the physics major; allowing early participation in research; providing mentoring; and exposing students to the important contributions physics makes to other sciences, medicine, industry and the quality of daily life. Adopting these practices will have an especially positive effect on young women, who often feel isolated and unwelcome in physics.

Resolutions Directed at Universities: Faculty and Researchers

Recent studies have shown that, even at top research institutions, women scientists have not been treated fairly with respect to their male colleagues. This is not only very harmful to women in science but in the long run will be harmful to science as well. Universities must examine and communicate their policies and practices to make sure that they promote equity; it is of key importance that universities guarantee transparent and fair mechanisms of recruitment and promotion. Additional important elements for success are access to research funding and facilities and sufficient time for research.

Having a family should not be allowed to impede women's participation in scientific careers. A family-friendly environment that provides such things as child-care facilities, flexible working schedules and employment opportunities for dual career families will enable career success.

University governance has been found to be dominated by men. Women need to be included in university and physics department governance, particularly on key policy committees. Women must have input into those policies that control their own destinies. It is important for the development of young women physicists to see successful women active in research, teaching and leadership.

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Resolution Directed at Research Institutes

Research institutes will benefit from policies that allow women scientists to be successful. Institute directors should make sure that policies that promote gender equity in recruitment and promotion are adopted and enforced. Too often what has been termed a “glass ceiling” is allowed to stop the advance of women’s careers.

Institute directors should take an active part in ensuring that family-friendly practices such as child-care facilities and flexible working schedules are available to all. Surveys repeatedly show that a leading concern of women is balancing career and family life; having a family should not be allowed to impede successful participation in scientific research.

Resolution Directed at Industrial Laboratories

Industrial laboratories will benefit from policies that allow women scientists to be successful. Industrial managers and research directors should make sure that policies that promote gender equity in recruitment and promotion are adopted and enforced. Too often what has been termed a “glass ceiling” is allowed to stop the advance of women’s careers.

Industrial managers should take an active part in ensuring that family-friendly practices such as child-care facilities and flexible working schedules are available to all. Surveys repeatedly show that a leading concern for women is balancing career and family life; having a family should not be allowed to impede successful participation in scientific research.

Resolution Directed at Scientific Societies

Scientific and professional societies can and should play a major role in increasing the number and success of women in physics. Each society should have a committee or working group that is responsible for such issues and that makes recommendations to the society as a whole. At a minimum societies should do the following things: work with other organizations to collect and make available statistical data on the participation of women in physics at all levels; identify women physicists and publicize them as role models; include women on program committees and as invited speakers for society-sponsored meetings and conferences; and include women on editorial boards of society journals.

Resolution Directed at National Governments

Physics plays a key role in understanding the world we live in, and physicists contribute strongly to the economic and cultural development and welfare of nations. It is therefore in every nation's self-interest to provide strong physics education for all its citizens and to support advanced education and research. Governments must ensure that women have the same access and chance for success in research and education as men. National planning and review committees should include women, and awards of government funds should only be made to organizations and institutions that make gender equity a part of their policies.

Resolution Directed at Granting Agencies

Agencies that make funding available for scientific research play a key role in promoting the success of individual scientists as well as science as a whole. Past studies have shown evidence for gender bias in the review process. Therefore, to ensure that women have the same access to research funding as men, all competitions for funding should be transparent and widely publicized; the criteria for obtaining funds should be clear; and women should be included on all review and decision making committees. Limits on age of eligibility or grant structure and duration that seriously disadvantage applicants taking family leave should be reconsidered. Granting agencies should maintain and make available statistical data by gender, including such information as the proportion and qualifications of women and men who apply for funding and who obtain funding.

Resolution Directed at IUPAP

IUPAP is the international organization of physicists and as such exerts considerable influence on the physics community through its statements and activities. IUPAP should both endorse the above resolutions aimed at other groups and also examine its own actions to make sure that they contribute to increasing the number and success of women in physics. It will also be valuable for IUPAP to communicate the results of this conference to international scientific organizations in other fields. In the election of IUPAP's Executive Council and Commission members, procedures should be instituted to ensure the full inclusion of women. IUPAP sponsors major international conferences; a criterion for such sponsorship should be the demonstration that women are included on the International Advisory Committees and Program Committees. IUPAP should require conference organizers to report gender distribution of invited speakers. IUPAP should encourage all of its national Liaison committees to include women among their members. Liaison committees should also advocate these resolutions in their countries. IUPAP should continue its Working Group on Women Physics and empower it to establish an international advisory committee with a member in as many countries as possible. Finally, this group will form the basis of a network that can continue the work of increasing the number and success of women in physics.