

The International Conferences for Women in Physics

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The International Conference for Women in Physics (ICWIP) meets every three years in locations around the globe. Under the auspices of the International Union of Pure and Applied Physics (IUPAP),¹ ICWIP draws female physicists (and a few males) from over two dozen countries to meet for three days and share stories and research, in order to promote a more equitable physics community. The first ICWIP was created to get a sense of the status of women in physics globally.² This goal has been upheld with the following conferences. But the value of a meeting is not just for those who attend; sharing what is learned is in many cases even more valuable. In this paper, we share an overview of the ICWIP, focus on what will be useful for readers of *The Physics Teacher*, and highlight the fact that the proceedings of the ICWIP are all available for free through AIP Publishing,³ as part of the goal of sharing work that will help make physics a more diverse and equitable field.

The program

For each conference, countries send a delegation of three people. The United States is allowed a larger delegation and provides financial support for developing nation delegations. The authors were both delegates to the 6th ICWIP in 2017, held in Birmingham, U.K. As with most conferences, there are great plenary speakers each day, some speaking on their experiences as a woman in physics, some speaking on their research. The international component of ICWIP is extremely important and particularly valuable, both for developed and developing country delegations. Hearing about the experience of Francisca Nneka Okeke, a female magnetospheric physicist in Nigeria,⁴ for example, gives one needed perspective about the problems in the United States.

One of the fascinating parts of ICWIP is that every nation represented produces a poster and a paper related to women and physics in their country. Some papers report statistics, some report climate issues, others tell of successful tactics to improve the recruitment and retention of women in the field. The delegates from the United States have produced papers focusing on programs that work, statistics on numbers of women in the field, and issues facing women in physics. The delegates from the United States also work on a special project for that year. Past projects have included the HERStories videos⁵ and the International Forum on Gender Bias in Physics.⁶ Both these projects are of interest to the readers of *The Physics Teacher* as they can be used as tools to encourage, highlight, and promote gender equity in the classroom.

Another valuable outcome of ICWIP was the coalescing of many international surveys focusing on the experiences of physicists around the globe. Here, we will highlight surveys that have useful information for physics teachers interested in gender equity. In 2001, a survey of 1000 female physicists

reported that three-quarters of them developed an interest in physics before graduating high school.⁷ Almost one-third of respondents noted special encouragement by teachers. Early physics education is a key time to keep girls and young women interested. During undergraduate physics years, women from smaller cohorts of physics majors reported more positive attention from professors: an interesting bit of data for programs with small numbers!

Another survey in 2006 reports similar findings: three-quarters of women developed an interest in physics before or during high school, and half reported positive encouragement from teachers.⁸ The authors of these reports are careful to note that these are surveys of women who have persevered in physics: we cannot generalize to all women. But we can still learn from them.

The global survey was expanded to include all physicists in 2009-2010. This survey was completed by 15,000 male and female physicists from 130 countries⁹ and focused on career-level issues, such as funding, space, and other resources.

Workshops

Parallel workshop sessions are offered daily on several topics. The workshops for ICWIP 2017 were:

- Intersecting identities—Gender and intersectionality in physics
- Improving workplace/science practice and ethics
- Professional development and leadership
- Cultural bias and perception
- Physics education—Strategies for engaging female students in physics

We highlight the physics education and intersection identities workshops in this paper, but encourage readers of *The Physics Teacher* to read the conference proceedings for more information on the other workshops.

Education workshops

The last two ICWIPs have included workshops on education.¹⁰ The 2017 session on education included a workshop for primary school girls where girls learned about friction then built a hovercraft with a compact disc. Other sessions included sharing good practices in the classroom with respect to gender, and using art and beauty in physics to engage girls.

At the conference in 2014, the workshop on physics education¹¹ included discussion of gender differences in students' ideas of magnetism, a U.K. program to support inquiry-based approaches in the secondary science classroom, European programs to support teachers in useful assessment strategies, and helping teacher-candidates develop effective questioning skills.

Each workshop closes with development of a summary and resolutions to share with the larger conference group.¹² Examples of these resolutions are:

- Translation of educational resources/posters to local languages
- Encourage links between individuals, societies across countries for exchange of resources
- IUPAP Working Group 5 to investigate the possibility of creating a repository of educational resources in collaboration with the Education Commission
- Require that IUPAP-funded conferences include a session on diversity and inclusion in the physics profession. Organizers are encouraged to include expertise from the social sciences for these sessions and, in particular, consider intersectionality.

Intersectionality workshop

Of particular note for those who teach, a special workshop topic in 2017 was Gender Studies and Intersectionality, which focused on the intersections of marginalized identities (e.g. gender, race, sexuality, etc.).¹³ The term intersectionality was coined by Kimberle Crenshaw in 1989¹⁴ and it describes the idea that if people have more than one marginalized identity, they are more likely to encounter higher barriers to their advancement.

The issue of simultaneously occupying marginalized identities was touched upon when discussing the stereotype concept model.¹⁵ The stereotype concept model highlights how societal perceptions of women can further affect the number of women pursuing physics. According to the stereotype concept model, professionals and scientists are highly competent with little warmth. This dichotomy is partly responsible for why the idea of a female scientist is difficult for people to grasp, in part due to the fact that according to the same model, women should be warm and not competent. Including the intersection of race makes the conflict between societal perceptions of who does science and who is doing science even more complex. Black professionals are viewed as highly competent and not very warm. What happens then to Black women professionals or Black women scientists?

The issue of simultaneously occupying marginalized identities was fleshed out in more depth when discussing the framework of “the double bind,” which was first discussed by Malcolm, Hall, and Brown in 1976,¹⁶ and later elaborated upon by Traweek in 1988,¹⁷ Crenshaw in 1993,¹⁸ and Ong in 2005.¹⁹ The double bind is an emotionally distressing dilemma in which an individual (or group) receives two or more conflicting messages and one message negates the other. This dilemma then creates a situation in which if people were to successfully respond to one message, they would fail to respond to the other, therefore leaving that person to always be inadequate. Ong went beyond the double bind in 2011 with an NSF-funded project, which drew conclusions from data and interviews/publications.²⁰ The findings were that there were unfriendly STEM environments for people occupying dual (or multiple) marginalized identities.

The U.S. delegation highlighted the importance of inter-

sectionality when discussing ways to increase the representation of women in physics, in the country paper,²¹ and the country poster by discussing the intersection of gender and race and gender and sexuality. Black women and Latinas have the lowest percentages (roughly 30%) of any group for identifying strongly as “physics people.”²² When it comes to the intersection of gender and sexuality, LGBT women were more likely to report having experienced exclusionary behavior in 2015 than LGBT men (around 30% for women compared to 10% for men).²³

Both the Gender and Intersectionality workshop and the research done by the U.S. delegation focus on the importance of intersectionality, the heightened challenges women in physics face created by race, ethnicity, sexuality, etc., and the need to improve access for all women.

For those who teach physics, intersectionality is an important concept to understand. It is not enough to recognize that we have girls and women in our classrooms and address their needs; for a young Black woman or a Latina, the racial and ethnic effects are added on to the gendered barriers.

Spreading the word

The experience of attending a conference with and for women in physics has long-reaching consequences. Besides the development of a cadre of fellow female physicists, when participants return, they often share their stories with colleagues and friends. One participant said, “Since it was all women I felt that I was able to speak more and felt more comfortable, more safe, to talk. That continued when I traveled home.”²⁴ These stories help spread the awareness that there are serious issues in physics for those who aren’t men. This awareness is spreading to the classroom as well: another participant stated, “It influences my teaching approach and what I can do in that area.”²⁵ One of the ICWIP participants is now working with the STEP UP program,²⁶ bringing curriculum about gender diversity in physics to the high school classroom.

There are many ways that teachers and researchers can help. Readers of *The Physics Teacher* can use the conference proceedings and results of the global surveys to continue the work of making physics more welcoming and equitable. Other suggestions include:

- Share the stories of plenary speakers with students to expand the picture of who does physics.
- Send data from the global survey to colleagues.
- Invite a delegate or plenary speaker to give a seminar.
- Print a photograph from the conference²⁷ and hang it on a wall.
- Share the recommendations and resolutions with leaders in your area.

Conclusion

The International Conferences on Women in Physics have been working to increase gender equity in physics since 2002. With a focus on sharing good practices, and developing net-

works for female physicists, these conferences have been active in creating positive change for women doing physics, and for the field of physics. The value of ICWIP is well stated by one participant: “Just being in a conference full of women who also do physics who are also excited to learn about these issues sounded too good to be true. It was awesome and completely new.”²⁸

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