

# Women in Physical Oceanography: Why the leaky pipeline?

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"Can I really do this?!" As in other science and engineering fields, real and perceived challenges prevent many women from continuing careers in physical oceanography after graduate school. Which are the real challenges faced by junior women? In this article, we--junior scientists in physical oceanography--describe a few challenges faced by ourselves and our fellow junior women scientists.

Over the past 50 years, the number of women obtaining PhDs in physical oceanography has dramatically increased. However, as in other science and engineering fields, the balance of female principal investigators does not reflect this increase. The problem does not seem to lie in recruiting women in to the field, rather in retaining those trained in physical oceanography. As junior women, we see many barriers to success in oceanography: the demands of combining a family and career, real and perceived sexism, the current job market and future funding climate. How these barriers actually affect women is hard to quantify, however it is a problem when the majority of women leave the field after obtaining their Ph.D.

Does academia suggest to many women that the costs outweigh the benefits of a scientific career, and it is not worth it for them to succeed? As graduate students we have little or no paid maternity leave, and student stipends barely stretch to cover daycare expenses. The intrinsic message is that women must wait to have a family. For those not willing to put off family in the name of science, creative work-life arrangements with their families are required to make it through financially, emotionally and physically. On top of initial prospects of low pay, uncertain job security and long hours, it is no wonder that some opt out of the academic career track more than do men.

Conscious or unconscious sexism creates an environment of exclusion. Already in our relatively short scientific careers, we have heard our ideas attributed to another, been left out of social engagements, or felt singled out by the offhand demeaning comment. Certainly, anyone can mistake where they heard an idea, and men should not feel required to invite women or censor their speech, however these patterns inhibit the organic development of scientific collaboration.

Sustaining confidence in this environment can be a challenge. Internalized or portrayed confidence exposes your science to a broader audience, while questioning your self can limit it. This sort of lack of confidence is referred to as the imposter or fraud syndrome: that regardless of the research accomplished, we retain the feeling that others know more and will "find out" that we are faking. On occasion, we have avoided high-pressure situations ourselves, whether they be talks at large conferences, or inviting another scientist to take a close look at our work. The truth is, even senior scientists may still feel the imposter syndrome. Recognizing that these feelings of inadequacy are shared can reduce their impact. In the end, you need to believe in yourself and your science.

Knowing that our science is good does not come out of thin air, but is developed through experience and feedback from a trusted advisor or mentor. One indicator of an individual's success in science is whether or not the individual has a mentor or mentors. [Women Scientists in Industry – A Winning Formula for Companies (1999)] All graduate students have an advisor, but that individual may not fulfill all the mentoring roles needed to nurture scientific development. A mentor may be a scientific guide, advisor, advocate, career consultant or any number of other roles. It is unlikely that one person will fill all these roles. Rather, multiple mentors are needed to fill various roles and at different stages in our careers [Olmstead, 1993; Nelson, 2003]. As junior scientists, it is our responsibility to continually seek out, recognize and nurture many potential mentoring relationships.

The MPOWIR organization (Mentoring Physical Oceanography Women to Increase Retention) was formed to increase the retention of women in physical oceanography, and in one of their initial surveys, found that junior women tended to have fewer mentors in physical oceanography than did junior men. They also noted that women lacked sufficient role models--people whose scientific and personal life reflect what a junior woman is striving for. The presence of one woman in an academic department

does not guarantee that she will be an appropriate role model for all the women at the institution [Handelsman et al., 2005]. The recent Pattullo conference brought several junior women scientists together with senior scientists to share experiences, advice and concerns and to build community networks. In doing so, we were able to make personal connections with a variety of senior scientists, and could potentially find role models within that larger group.

Is this "science for the sexes?" Wouldn't it be simpler to just ignore the women issue, but welcome the few who survive to the highest ranks? It's only half the talent pool, but the convenience of not bothering with different ways that men and women communicate, or react to critique, or express self-confidence could simplify the interpersonal bit and leave more energy for the science. We argue that keeping women in the physical oceanography community benefits everyone. Diversity breeds creativity. A diverse work force--different styles of thinking, learning, or teaching, which may or may not split along gender lines--results in more creative solutions [Milem, 2003]. Retaining women ultimately strengthens the field of oceanography and all STEM fields.

In spite of the possible and perceived barriers, we remain confident in our career choice. Why? The rationale for each of us is slightly different, but the love of science and academic freedom, and the desire to teach or mentor and pass along our enthusiasm to many more young people are among the reasons.

Inspiration for the article was derived from conversations and sessions at the recent MPOWIR Pattullo conference, May 2008.

MPOWIR is supported by the physical oceanography programs at ONR, NSF, DOE and NASA. To learn more about MPOWIR please visit, <http://www.mpowir.org>.

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