

**CSWP/DPF Networking Luncheon for Women in Physics**  
**April 13, 2008, St. Louis, Missouri**  
**Remarks from speaker, Patricia Rankin, University of Colorado**

A common response people make after learning I am a physicist is to tell me that I don't look like one, and for years I was flattered by that response because I assumed that they thought that I was much better dressed than many of my colleagues and wore fashionable clothes. It was long time before I realized that they were surprised to meet a woman physicist. I mention this because I sometimes think that one of the things that helped me stay in physics was a certain level of cluelessness about the fact that some people thought that women should not be physicists coupled with an ability to respond well to praise but pay less attention to criticism.

I went to university in the late seventies/early eighties when many people were worried that women were not pursuing careers in science, and many of my professors went out of their way to encourage me to stay in physics. They wanted me to be a role model and encourage others to follow me. Even better – all that was asked of me was for me to concentrate on my career and be successful. So I was not really prepared for discovering when I became a faculty member that not all women were having such great experiences, nor was I prepared for the different demands that were placed on me in terms of committee assignments and service obligations compared to those asked of my male colleagues. I didn't expect students to assume I was an admin assistant when I turned up to cover a lecture – nor to be asked to bring a dessert to the physics Christmas party – since that was “expected” of the other women coming to the party – all of whom were faculty spouses. I look back on this period and am grateful to the woman history professor who advised me that I had to get tenure to change the system from within, and for a period of time I spent at the National Science Foundation as a program officer which significantly built my skill set as a change agent (and taught me the importance of control over resources).

So, newly tenured, and ready to use my new skills I really didn't expect to be the chair of a search committee for a high energy experimentalist and then not be able to find any women who would apply (and I am persuasive – maybe not as much then as now but still!).

Just at the point when I realized I wanted to better understand what was going on – the NSF ADVANCE Institutional Transformation Program came along to provide significant funding to allow me to do just that and I am grateful to the NSF for the opportunity they provided me with – and I want to share with you what we know and get you thinking about we need to be doing.

Let me be clear – giving everyone the same opportunities is the right thing to do.

Let me be equally clear that it is the smart thing to do. The data on the top performing companies on Wall Street shows that firms that have gone out of their way to promote women are doing better than firms that lack diversity at the upper levels. Studies of teams show that those where there is some conflict between the team members due to differing viewpoints outperform teams where everyone thinks the same way.

Finally, it's a necessary thing to do. We have to expand the talent base in science, technology, engineering and math (STEM). Right now – only 1/5 teachers of high school physics in Colorado has at least a minor in the subject! We need many more scientists and engineers – and to get them we need to draw upon new demographic pools.

Research shows, though, that despite the advantages they bring to the table, women and minorities are still disadvantaged in their careers. Women no longer face a glass ceiling – what they face instead is a series of obstacles at each career stage that are negotiable but which take more effort for women to make their way through than men. Making it to the top requires overcoming accumulated disadvantage (to use a phrase of Virginia Valian – her book “Why So Slow?” is a “must read” on this research) - again it is possible but it requires more effort and takes more of a toll than making it to the top does for members of the majority group. A recent book (“Through the Labyrinth” by Eagly and Carli) likened the path that women have to take to a labyrinth that can be navigated but leaves many wondering if it is worth the time and effort. So we are replacing the (perhaps appealing) model that suggests the lack of women can be fixed by removing a final barrier with one that argues that we need to intervene at many more career stages and make much more widespread changes.

Many of these barriers originate in the tendency for us all, both men and women, to draw conclusions about an individual; based on implicit assumptions we hold about the groups they belong to. Let's take a basic fact – women are as a group shorter on average than men as a group. Then, let's give a group of college students two sets of photographs of men and women and ask them to estimate the height of the people in the pictures – without telling them we biased the sample to include taller than average women and shorter than average men so that the average heights of people in the two sets is the same? What happens? The heights of the women are under-estimated – those of the men over-estimated. And what happens when people are asked to assess leadership ability?

Many of the studies made of women in leadership roles date back to the fifties when what they measured may not have been what they planned to measure. Studies of the leadership tendencies of male managers and women administrative assistants could have shown differences that were positional rather than gendered and indeed, recent studies that work harder to draw samples of men and women who are in comparable roles show little if any

difference in their goals and aspirations. Perhaps the most interesting studies though come from the Catalyst organization and from the work of Madeline Heilman on gender impacts on work roles. First, women who behave exactly like men pay a penalty – they are expected to put more time into nurturing relationships. Second, if they put more time into relationship building they are seen as less assertive leaders. The Catalyst report calls this the “Dammed if you do – Doomed if you don’t” phenomena. Similarly the Heilman research shows that when presented with identical CV’s differing only in having a male or female name attached to them people would rather work for the man – since the woman is seen as cold and indifferent, effects that are strongest in fields where women are most under-represented. Heilman’s work then goes on to show that if the CV of the woman is altered to stress her collaborative style and mentoring skills the probability that she is hired will increase. But again – its at an additional cost of more effort.

It is hard to sort out the effects of gender from the effects of societal norms. I will comment though that gender differences in math scores are much less significant than the differences in national scores suggesting societal influences not gender account for much of the variation. This conclusion is supported by the research on “Stereotype Threat” that shows that the scores of a group on a math test can be changed significantly if gender identifying information is asked for at the start rather than the end of a test.

There is a lot of interesting research here but rather than spend all my time on the problems I’d like to also talk about we have also been learning about the solutions.

First, in many cases what women are facing here is unconscious bias – and both men and women turn out to be similarly biased. The good news is that a little bit of education on how unconscious bias can enter in to decision making can be effective in countering it – people want to do the right thing. Second – attention to process makes a difference – if people are asked to define the qualities they are looking for in a hire in advance of looking at the applicant pool the probability of hiring a woman increases – perhaps because the focus on process makes people look more at the actual qualifications that matter. Third, networking benefits women – the more you know the better you can negotiate and plan.

But my guess is that making hiring practices more equitable is not going to dramatically change the demographics of the field. Part of this is demographic inertia – it takes time for change to propagate through a population but part of it is the 800lb gorilla in the room that we tend to avoid discussing – the fact that for the majority, physics may be seen as a fascinating career but not one that encourages work/life balance.

The pipeline analogy describes the flow of women into a career in physics as if we pass through a leaky pipe with lots of joins and opportunities for women to

drip out. This is a classical model – it suggests that there is only one path from A to B and it implies that a career is a series of well defined decision points which lead to pre-determined outcomes. If you take the right courses in high school, go to a good college, get into a great grad program, post doc with a leader in the field – you too will become a faculty member (which is not the only valid option!). It encourages us to think linearly (and allows us to conveniently excuse the lack of women and minorities as a “pipeline” problem, and lay the blame at K-12 since that is where the bulk of the losses occur).

Modern careers are not like that and are becoming increasingly unlike the classical model. The time has come for us to admit the failings of the classical system and start thinking like modern physicists. We need to acknowledge that multiple paths may be followed (some more probable than others) and take a quantum mechanical approach that allows people to tunnel into or back into physics careers through classically forbidden regions – like taking time an extended time off for parental leave.

The classical, pipeline approach has failed as a way to approach solving the problem – so we need a paradigm shift and that means that we are going to have to challenge current assumptions and give some of them up if we are going to achieve the goal of keeping more, talented people in the field.

Does science have to be 24/7? Have we have traded quality for quantity? Do people have to be full-time researchers? Do we want to give up on people that need to work at a reduced level for any reason? Can people come into the field after a bachelor’s degree in history? Could we develop an accelerated curriculum to help people who decide on physics later in life or people who want to come back in? Can we give graduate students funded parental leave? To use another analogy from Hewlett – if we think of a physics career as a highway – can we add on ramps instead of only having off ramps?

Paradigm shifts in physics always lead to periods of tremendous growth and creativity – changing how we determine the demographics of the field would be no exception.