



## **Women in Science and Engineering: What the Research *Really* Says**

A panel discussion co-sponsored by WISELI and the Science Alliance.

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“How Do Unconscious Biases and Assumptions Affect the Careers of Women in Science and Engineering Fields?”

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So, I'm going to talk a little bit about a few studies that are emblematic of really a mountain of research in the social sciences that fairly consistently shows that due to unconscious assumptions that we all have, women and the work performed by women consistently received lower evaluations than men and the work performed by men. And this is true no matter whether the evaluators are men or women. And it's true even if the work is identical, if you just shift the person of the name doing it. So I'm going to go through just a couple of studies but we have a much longer and more thorough review of this literature on our website, on WISELI's website. And if you want to write it down this is it [slide depicts WISELI website address, <http://wiseli.engr.wisc.edu>] or it's on the pens or you can search it. And if you go the website click library and there's an annotated bibliography largely done by Eve Fine, the researcher for WISELI.

The first study I want to talk about is a study done by two Swedish scientists, Wenneras and Wold. They noted that, just like in this country, even though many PhDs were being awarded to women in the sciences – so here now in this country forty-six percent of PhDs in Biology, for example, awarded to women – and it was similar in Sweden. But they noticed [that] despite the fact that many women were getting PhDs, very few of the prestigious research fellowships awarded by the Medical Research Council of Sweden were going to women. So after some difficulty they were eventually able to get from the Swedish government 114 of the applications in one of the review rounds as well as the evaluations of the reviewers. And they generated for the applicants a standardized metric based on their publication records. So it included the number of publications, who was the lead author, the prestige of the journal in which the publication occurred and from this they generated what they called impact points. And particularly in the area of competence, women were consistently evaluated lower than men. And overall, to receive the same competence rating, women had to be two-and-a-half times as productive. They had to have two-and-a-half times as many publications to get the same rating of competence from the reviewers. So the authors said this was the equivalent of three additional papers in a prestigious journal like *Science* or *Nature* or twenty additional publications in a less prestigious scientific journal.

Well, there's another interesting thing about their research, I don't know if you can see the lines connecting these dots [slide depicts graph of data]. So if you graph out what they found, so here on the y-axis you have the competence scores from the reviewers and on the x-axis you have the impact points based on the publication records. As you can see

for men, as you would expect the more publications people have the more competent one assumes that they are. That's a very clear linear relationship. But for women the slope is flat. So this is not biology. These women are swimming up stream. This is environment. A woman with ninety-nine impact points, very productive in terms of a publication record, would be given the same level of competence as a man with twenty impact points. And there's only a slight inflection when a woman has over ninety-nine impact points and still, her competency level is rated lower than a man with twenty impact points.

We can understand a little bit of this if we look at some of the research from social and cognitive psychology. Our assumptions about the way men and women behave are widely pervasive and deeply imbedded in our culture. And the social and cognitive psychologists talk about the existence of descriptive behaviors for men and women and prescriptive behaviors. So descriptive behaviors refer to descriptions of the way men and women actually behave. So women are more likely to occupy staff positions in most organizations, secretarial type positions, clerk, assistants to administrators where as men are more likely, in most organizations, to occupy the top leadership positions. That's descriptive. Women are more likely to wear dresses and lipstick [and] men are less likely, that's descriptive. And we all know we have these because if you even think about a man wearing high-heels it makes you laugh, right? That actually gets at a prescriptive behavior because based on descriptive behaviors there are also prescriptive behaviors and these are the subconscious assumptions we all have about the world, the way we think men and women ought to behave sort of in the abstract. So for women these tend to be things like being nurturing, communal, nice, supportive, helpful, [and] sympathetic. For

men they tend to be decisive, inventive, strong, forceful, [and] independent. Even though we all know men and women who don't necessarily have these traits, in our unconscious assumptions about men and women in the generic form these are the traits we tend to associate with them.

So there's two relevant points to this. One is that the prescriptive behaviors, the unconscious assumptions about the way scientists, professors, and leaders ought to behave overlaps much more with the unconscious assumptions about the way men ought to behave – decisive, inventive, strong, independent. And this gives men an unconscious advantage when they act in any of these roles. And the other important thing to know is that are social penalties for violating prescriptive gender assumptions. So at the extreme, if some of your male colleagues began to wear high-heels and lipstick to work it would probably work against them. Less extreme, we know this exists because we have pejorative adjectives in our language to describe men and women who behave outside the prescriptive norms of behavior. Right? For men we have wimpy, we have effeminate. For women we have boyish, we have domineering. These are not usually considered flattering adjectives.

Madeline Heilman has done a lot of work in this area. One study, which I'll go over because I think it shows how the social penalties can occur when women violate prescriptive gender norms. She had forty-eight subjects and gave them a job description for an assistant vice president. And she made it a male-assumed job by making the company that this person was an assistant vice president for a company that made engine

parts, fuel tanks. And she gave the evaluators a list of names of assistant vice presidents who had previously held the job and they were male gendered names mostly. And then the assistant vice president was either Alice or Andrew or some other gendered names, but was otherwise exactly the same. And the evaluators had to rate Alice or Andrew on a number of different traits. They had nine-point scales for different personality traits and forced adjectives to look at their competence, and whether they were hostile and whether they'd want to work with them. And they had to evaluate Alice or Andrew in two different conditions. One where their performance was clear – so the evaluators were given a paragraph that said Alice or Andrew has just undergone their annual performance evaluation and they were felt to be stellar. They were in the top five percent of all assistant vice presidents. Or they evaluated Alice and Andrew in a performance ambiguous situation where the paragraph said Alice or Andrew are coming up next week for their performance evaluation and they'll be evaluated in the following criteria – how much money they made, how many markets they opened, how many people work under them. And the results were that when the performance was clear and they'd been evaluated Alice and Andrew were comparable in terms of competence. And they were comparable in terms of the achievement related characteristics that they possessed. But the evaluators consistently found that when the women were clearly competent they were almost always assumed to be less likable and to be more hostile than were the men. On the other hand when the performance was ambiguous, likeability and hostility were comparable between Alice and Andrew but men were consistently assumed to be more competent at the job and to have more achievement related characteristics.

So Heilman said, is it just when women are competent at male-assumed jobs that its assumed they won't be likable and they'll be more hostile or is it any job? So she redid the study and made the assistant vice president more of a gender neutral or female-assumed position. She made the assistant vice president in charge of childcare [or] tasked with developing a women-mentoring program. And then it didn't matter. It was okay. Women were not less liked if they were competent, they were not assumed to be more hostile, everything was gender equal then.

Then she asked, what about likeability itself, does it matter? Maybe it doesn't matter if Alice isn't liked. So in this study she found indeed likeability and competence are independently linked to recommendation for pay and organization rewards. So the bottom line is if you're incompetent it will work against you. But if you're incompetent it's really good to be likeable because even if you were incompetent if you were likable you were more likely to be recommended for a higher pay and institutional perks. But for only women [is it true that they are] not liked for being competent at their job if it's a male-assumed job. And of course Summers was talking about top academic positions in Research I universities in science and engineering. These are male-assumed jobs.

Do I have time for this one or are we done? One more, just to show you [that] subtle things can definitely impede women's progress toward advancement in science and engineering. And this is a study done by two academic linguists looking at letters of recommendation for faculty who had been hired at an academic medical center in the

Midwest. And they looked to see if there was any systematic difference between the letters written for men and women and they found several differences.

The letters written for women were significantly shorter; the letters written for women were more than twice as likely to have statements of what they referred to as “minimal assurance.” So these would be statements like, “I don’t see any reason why she wouldn’t do a good job.” Women’s letters were twice as likely to have gendered terms. So “intelligent young lady,” “insightful woman” – you didn’t see “insightful man” or “intelligent young man.” Women’s letters were twice as likely to have what the authors call “doubt raisers.” So this would be, “She did a good job at the things she was asked to do.” So what did she do with the things she wasn’t asked to do? And stereotype[d] adjectives, which kind of reflect the prescriptive behaviors. So women were more likely to be described as compassionate [and] relating well. Men were more successful [and] accomplished. And women’s letters had fewer standout adjectives like outstanding and excellent. And finally even though women’s letters were significantly shorter they were far more likely to follow the possessive – his or her. Women’s letters were far more likely to follow the possessive with references to her personal life. So her family, her husband, her parents. And men were more likely to have things like publications, CV, patents and colleagues. And that’s all I’m going to say.