Making Research Breakthroughs and Breaking Glass Ceilings:

Communication Challenges for Women in Higher Education *

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In the spirit of our location, “muchos gracias” to Bozenna for honoring me with an invitation to talk with you today. Bozenna is definitely a woman who is a celebrated scholar and who has broken glass ceilings in professional organizations. She is an outstanding teacher who has been honored on our campus by students with one of the highest awards for classroom teaching, the Hope Award. It’s difficult to say “no” to her, so here I am. It’s also difficult as a university administrator to resist speaking to a group named “Women in Control.” I spend most of my life hoping to control some element of my day, and to be around women who are “in control” is definitely inspirational. In fact, I’ll get back to that notion of control later in my speech and you may realize that your organization’s name has another dimension.

Bozenna, her husband Tyrone and daughter Dominique and I had lunch yesterday and were talking about my speech. Bozenna noted that she thinks the glass ceiling issue is a bigger one in the United States than it is in most European countries insofar as women in the academy are concerned. Regardless of whether that is a universal perception among those of you in the audience or not, I am sure that there are issues and experiences you share as women or this group would not exist. Simply being a minority in a field creates a certain set of dynamics that are undoubtedly universal.

Today I am going to talk about the glass ceilings that still exist for women. The common definition of the glass ceiling is “an invisible barrier that limits advancement of women and minorities.” What I want us to consider today is if it is really invisible, does it actually exist, and can it be cracked or broken?

Before answering those questions, however, I want to present several scenarios that provide the basis for much of what I am going to discuss. So visualize the following:

First, I’m seated on a plane next to a woman who is a grant writer for a Native American tribe in Oklahoma. She looks for grants to advance educational opportunities for young people. Without knowing my interest in gender issues, she commented that she “has a tough time getting the young women to think about taking more math and science courses because they just don’t think they’ll be any good at it.”

Scenario two: A friend is showing me photos of her three-year old daughter. Among the Halloween costume, dance recital, and family photos is one of Kaila with a stethoscope around her neck and a shower cap on her head checking her doll’s heartbeat. I said, “Oh, here’s Dr. Kaila!” Kathryn, the proud mother replied, “Well, another example of generational differences. Everyone our age and younger sees her as a doctor and most of the older generation thinks she is a nurse.”

Third: I am glancing through the Lawrence Journal-World on December 4—10 days ago and come upon the following:

40 years ago in 1965 Kansas University engineering dean William Smith was pictured while meeting with seven women who were majoring in engineering, an unusual event in a field where men so long had dominated.

Fourth: I am doing research for this lecture and decide that I may want to pull an example I've used in other speeches: Rosalind Franklin's photograph 51 of the B form of DNA from her x-ray crystallography research that led to Watson and Crick's double-helix model of the structure of DNA. I used the example to show that each researcher had a partial view of DNA that wasn't complete until they were joined—without Franklin's knowledge initially—and that history isn't complete unless we look at contributions of both men and women. Franklin wasn't alive when Watson and Crick won their Nobel but the thought of the Nobel led me to the Prize's Web site where I decided I wanted to find out how many women had won Nobel Prizes in chemistry, physics, medicine and economics. Here are the numbers: Medicine-7, chemistry-3, physics-2, and economics 0. When you factor in that Marie Currie won in two categories, that means in the 104 year history of the Nobel, only 11 women have won an award in those categories compared to 513 men.

Finally, my husband wanted to know about my speech and as I told him the general outline, he said, "Don't forget the Harvard president." Of course, there is Lawrence Summers' famous analysis from last January,

> "There are three broad hypotheses about the sources of very substantial disparities [in women's representation in tenured positions in science and engineering]. . .the second is what I would call availability of aptitude at the high end."

Each of these scenarios presents a different communication challenge for women, especially those in male-dominated professions. First, the conversation with the woman on the plane suggests that women aren't capable. Second, Dr. Kaila, points to the need to overcome stereotypes. Third, the 40-years ago today column, reminds us of the problems of being the minority in fields such as yours. Fourth, Rosalind Franklin, reminds us that we don't always get credit for accomplishments. And, finally, Larry Summers underscores the need to address the structural problems in institutions that grow out of the social and cultural stereotypes and misperceptions.

Each of the challenges is created through communication, and conversely communication strategies provide a means of addressing them. While it is impossible in 30 minutes or less to analyze everything about communication that leads to the challenges, I want to center on two key points related to communication and gender. First, how does communication hold women back or limit their choices and, second, how can women develop effective communication strategies to both present research breakthroughs so they get noticed and break glass ceilings in terms of advancement in a position or in a professional association. So let's take each of the five problems one at a time and then some possible ways of addressing them. I will give Bozenna an extended paper with citations to distribute to all of you and to post as part of the conference proceedings on your Web site.

First, overcoming messages that suggest women aren't capable. A few years ago Mattel Corporation introduced a talking Barbie doll. If you aren't familiar with American culture you may not know of the voluptuous 12-inch high doll that has introduced at least three generations of American women to the model of "ideal" womanhood. One of talking Barbie's statements was "Math class is tough." Needless to say there was a cry of outrage and Mattel had to eliminate that statement. While Mattel could delete a statement from a computer chip, what is more difficult is to delete the feelings of inadequacy that many young women possess in terms of their ability to do math and science. Research tells us that women underestimate their abilities in these fields and men overestimate.

Gender scholars Diana Ivy and Phil Backlund in their book, *GenderSpeak: Personal Effectiveness in Gender Communication* (p. 406) noted that:

> A study at the turn of the new century found that girls still feel alienated from traditionally male subjects such as math and science), career aspirations are still highly gendered, boys still dominate the classroom environment, boys' behavior can have a negative effect on girls' learning, and some teachers have lower expectations for girls and find boys more stimulating to teach (Warrington & Younger, 2000).

Their analysis of messages that create achievement gaps in the math and sciences continues by noting that

> (1) Boys receive more encouragement from adults to take math and science, plus they have more out-of-school experiences related to these topics than girls; (2) In labs, boys tend to do the experiments while girls fall into the role of recorder; girls have few role models in math and science classes or texts; and 93) Girls lack self-confidence in math and science, often perceiving it as too difficult, unfeminine, and irrelevant (p. 407).

Women who overcome the sense of inadequacy usually do so because they have had mentors or role models who help them see their potential. Without that, even in the 21st century messages are still prevalent that discourage women from following your examples.

The second problem is overcoming stereotypes. Gender stereotypes exist largely because we confuse gender with sex. Contrary to popular usage, the two words are not synonymous. The former is a biological trait. The latter is a complex, socially constructed trait that is not static. It relates to femininity and masculinity as they are culturally defined. For example, common feminine traits are caring, deference, emotionality, nurturing, and attractiveness. Masculine traits include strength, ambition, aggressiveness, competitiveness, emotional control, and competitiveness. Stereotypes of masculine and feminine traits, unfortunately, suggest how we are to behave if we are one sex or the other. This helps explain the problems of self-perceptions of women about their skills in math and science.

I am sure that as you listened to this list, you thought, "Wait a minute, I know plenty of women who are strong, competitive, and cool as cucumbers and men who are nurturing and emotional." That's the point. Gender traits are stereotypical, and no one fits the stereotype

completely. Women and men are more likely, as a result of cultural conditioning to exhibit more traits consistent with their sex than are members of the opposite sex. This is referred to as "gender congruency." However, we all exhibit combinations of both sets of traits as well as gender neutral traits such as being moral or dedicated. Gender is learned, and as a result, one's gender can change over time and through experiences. Psychologist Sandra Bem refers to this blending of traditional masculine and feminine traits as "androgyny." Androgynous individuals have a greater repertoire of communication skills and can adjust to a variety of situations. Women who are successful often score high on scales of androgyny. They know when feminine traits are best used and when it is important to act more like a male.

Culture, as with Barbie, can promote the stereotypes. For example, when Elizabeth Dole was running for President of the U.S. in 2000 she did surprisingly well in an early poll in one of the first primary states. When the political pundits were discussing her surprising finish the next morning on a radio show I was listening to while driving to campus, I nearly wrecked my car reacting to what I was hearing. The male pundits were explaining that she wouldn't finish strong however because as a woman she had no military experience and no one would be able to see her as Commander-in-Chief. Now this was at a time when Bill Clinton, who did not serve in the military, was President. Hollywood is trying to overcome this stereotype with a new television show about the first woman president, "Commander-in-Chief," but whether it succeeds or not remains to be seen.

The Nobel Web site I referred to earlier, doesn't help with the stereotyping problem either. True, few women have won the prize and the second page for each of the various prizes that lists each winner with a link to their biographies and lectures does have images of women. But the first page with a list of the categories of awards and icons for each has only men.

One of my former graduate students did her masters thesis on women engineers who succeeded in moving up the corporate ladder. In reviewing research on the problems women fact, Patricia Magerkurth concluded that "expectations about how women should behave and preconceptions about how managers should behave remain as barriers to women's success" (p. 14). She went further to state that "women working in traditionally male-dominated fields face inner struggles, because they may feel the need to split their identities and become two separate people: thus denying their authentic selves in their roles at work" (p. 16).

When communication patterns are considered, researchers find very few differences in the words women and men use or in general communication patterns. The major difference is in the view of communication. Women tend to view communication as necessary for relationship building; whereas, men see it as more instrumental or task oriented. While women are concerned about accomplishing tasks, they are more likely to associate relational development as fundamental to task completion. It is this emphasis on the relational that creates perceptions of weakness or unsuitability for professions that are highly task oriented. The reality, however, is that tasks require a combination of technical expertise and interpersonal skills, and women can balance those scales. Management strategies such as Total Quality Management and collaborative decision making have also required a more feminine approach to communication and leadership.

While it is difficult to accept the existence of stereotypes in the 21st century, the reality is that they do exist and women need to be aware of their existence, their causes, and how they can adapt and eventually erase them.

The third problem I noted was that of overcoming the challenges of being in the minority. You can feel incredibly alone and without a lack of role models, you may not know how to behave. Without mentorship that empathizes with the problem, it can be difficult to adapt and excel. Dianne O'Leary at the University of Maryland has prepared a tutorial on "Accessibility of Computer Science: A Reflection for Faculty" (http://www/cs/umd.edu/~oleary/faculty/node1.html) .One page of the tutorial contains the following:

Picture Yourself:

You are male, almost 20 years old, naïve but bright. You choose to major in Computer Science, and on your first day at the university you walk into your first class and find a large room full of excited newcomers—and all but a handful of them are female.

You might begin to wonder

- Why aren't more males interested in this subject?
- Aren't males good at Computer Science?
- Should you change majors?

You persevere, though, but at midsemester you still have doubts.

- "Everyone" else seems to have a lot more experience than you do; at least it seems that they understand the subject better.
- The one time you got the courage to answer a question that the assistant asked, some of the females in the course seemed to resent it.
- None of the projects have been very motivating, although many of the females seem to really enjoy them.
- Many of the females have formed study groups, but you aren't invited to join. The other males seem equally isolated but afraid to be seen as banding together.
- You haven't seen any male faculty members or assistants in the department, so you wonder if you have any future in the subject.

After the end of the semester, you take the exam, but don't do very well. This magnifies your earlier doubts. **Will you continue to study computer science?**

Is O'Leary's scenario familiar to you. If it is, then you know about the extra pressures you may feel as a woman in a male-dominated profession. When you couple the feelings of being a minority with the fact that women are less likely to take risks, the environment for success for women in your disciplines is further complicated.

The fourth scenario, Rosalind Franklin, addresses the problem of getting credit for accomplishments. In Franklin's case, her sex caused others to readily accept the fact that she was in an inferior position at the lab. A little closer to home, two women I know were incensed about two years ago when a news release gave credit to a male for an accomplishment for which he had nothing to do—it was their hard work that had brought the honor to the university. The news release was about the promotion of an associate director of a research institute to director. It indicated that during his tenure in his previous post the university had led the country in the number of faculty Fulbright awards received the past year. The person in question and the research institute had nothing to do with the awards. The only relationship between the awards and the research institute is that faculty awards such as Fulbrights are one metric in determining rankings of U.S. universities. The news release was touting gains in research dollars and grant awards—for which the individual did deserve credit--but the Fulbright mention should not have been listed since the work was done in two other offices with no direct relationship to the research institute. The women were stunned that the man would have let such a statement go to press when he knew he wasn't deserving of the credit. The dean for whom one of the women worked sent an e-mail to the provost noting that the two women were very upset. There was no response.

There is considerable research on women in organizations that is discussed in books such as the one by Ivy and Backlund and another by Julia Wood that indicate that women often fail to get the praise they deserve. O'Leary's Web site provides additional support.

However, all of the fault cannot be laid at the feet of men. Women—especially when engaging in traditional feminine communication patterns—make it easier to overlook their accomplishments. The organizational literature indicates that women have trouble accepting praise. They often downplay the importance of what they have done or they make sure that they share the credit. They find it difficult to say, "Thank you. Yes, I am proud of what I've done and a lot of hard work went into it" rather than saying, "It's all part of the job and I couldn't have done it without the help of a really good staff." Men do share praise, but when they do so, they don't tend to undervalue or under-represent their own role and importance in success. Women need to realize that if they don't blow their own horns, no one else is likely to do it for them.

And, finally, there is the issue of addressing the structural problems in institutions that grow out of the social and cultural stereotypes and misperceptions already discussed. *Inside Higher Education* reported an NSF study on work habits of academic, industry, and government professionals in science, engineering, and technology. They found that academics work longer hours than those in the other two areas, that non-tenured faculty work longer hours than tenured, women with children work shorter hours, and that "it helps if you're single" in these professions. They also found consistent with an American Time Use Survey that women spent more time on child care than men in similar positions who had children. Does this begin to explain why women submit fewer grants than men?

When you couple these findings with the fact that committee work at universities usually seeks to have balance across disciplines and both men and women represented, you will find another possible explanation for why the few women in the STEM disciplines may have less time in the lab. One of the biggest barriers to solving the problem of greater grant activity among women is

that institutions don't think that women are disadvantaged. In 1999 MIT was convinced that women and men were treated equally. O'Leary cited the MIT study that concluded that "data on office space and other resources proved them wrong." The report specifically noted that:

> Given the tiny number of women faculty and the fact that they are essentially irreplaceable, one would have assumed that all tenured women would be treated exceptionally well—pampered, overpaid, indulged. Instead, they proved to be underpaid, to have unequal access to the resources of MIT, to be excluded from any substantive power within the University.

Besides the self-perceptions by universities that don't necessarily reflect reality, there are definite structural barriers such as maternity leave policy. Some universities are looking at stopping the tenure clock for both men and women when they have a new baby or adopt. But, once again, women have to look at their own cultural tendencies that may contribute to some of the problem. Research on women entering the job market in a variety of fields tells us that women often ask for less when they are hired. They don't push as hard for a salary package that is above what was advertised as men do and they often don't ask for as much in a start-up package. Because women are in the minority, they may not want to jeopardize their standing by appearing "pushy" or too demanding.

To get back to the questions I posed at the outset about the existence of a glass ceiling, we can conclude that the glass ceiling does exist. It is not necessarily invisible because there is sufficient research to explain the complex set of variables that contribute to it. And your presence in this room as well as notable successes by women in science, engineering, technology, and math as well as other disciplines proves that the glass ceiling can be broken. While some of my analysis has alluded to the tools that are needed to crack and break the ceiling, I want to provide some additional specific suggestions before concluding.

Patrician Magerkurth's research provides some important insights. She identified the success strategies of women in male-dominated engineering and technical fields, including the president of the European division of a major oil company who began her career as a petroleum engineer. From interviews with 23 women, five themes emerged to explain their ability to break glass ceilings: the presence of a mentor, self-efficacy, persistence, collaboration, and assisting others.

Magerkurth explained in her analysis that one of the first things these women needed to do was to understand the "community of practice" in which they operated. Communities of practice exist when a group of professionals work alongside and rely on one another as they work through a common set of problems and seek their solutions. They have profession specific knowledge that those outside a profession do not share, and members of the community engage in ongoing learning and pass along the knowledge of technical, practical, and culture matters to new members.

In order to survive and succeed, mentoring is a necessity. Many successful women had male mentors because there were no women. Women have to seek out mentors—either male or

female—to help them learn the system. Equally important, having a mentor sends a signal throughout the organization that the person being mentored is of value.

The second theme Magerkurth discovered was the need for self-efficacy. Women have to believe that they can do it. Think about the young women the woman from Oklahoma sitting next to me on the plane was counseling. They obviously were receiving messages that women can't succeed in certain fields. Successful women trust themselves and their talents. They know that Lawrence Summers wasn't right. Magerkurth wrote that "Perceiving self-efficacy is also linked to a person's ability to adapt to change, the strength of their commitment to their goals and aspirations, their perseverance in the fact of difficulties, the strength of their commitment to their beliefs, their level of motivation, and resilience in adversity" (pp. 44-45).

Persistence is the next commodity for success. Successful women and men simply will not give up. All successful people have examples of failure and disappointments and they learned from them. The women Magerkurth interviewed had experienced stereotyping and even outright discrimination, but she found that "they overcame these obstacles using various strategies. They rarely confronted the discrimination, unless it was blatant harassment, and, for the most part, they used humor, denial, and collaboration to address them" (p. 55).

Collaboration was a frequent theme. The women in the study learned how to work with both men and women. The found new ways to merge feminine and masculine cultures within the community of practice and to eventually change the community's culture to accommodate women better.

Finally, successful women who were in the minority learned that they had to assist others. They helped other women. They helped others adjust and adapt and taught the lessons they had learned, often from their male mentors. Magerkurth concluded that the women she interviewed adapted to the culture but also integrated other ways of thinking and doing into the culture. Relationships were the key to their success—both through being helped by others—often men—and by helping others in turn. In other words, these women took control of the situation. They asked for help, they learned the culture and how to operate in it, they believed in themselves, and they added value to the organization by contributing through their differences as well as through the adaptations.

It is important for all of us to mentor young women. Many universities offer summer camps or research experiences for undergraduates. Our university has an engineering camp for middle and high school women. Our local American Association of University Women's branch provides scholarships for several women to attend each summer. AAUW at the national level has conducted considerable research on the technology divide in schools. Their Tech Check for Schools is an important document that helps schools identify things they might be doing to discourage women from learning how to use technology. Bozenna is well known in Lawrence, Kansas for her work with elementary and middle school girls to make them confident of their abilities in math. Development of mentoring groups on campus—including across disciplines—is an easy an important step everyone can take. There are numerous organizations that are seeking

to turn the tide and change attitudes among young women about their capabilities. WISE, the Glass Ceiling Foundation, and MentorNet are a few of the many.

The other important thing that we can do is to work to change structures such as MIT, Harvard—which is going to put $50 million into hiring more women and breaking down institutional barriers—and others are doing. One of the most interesting examples I found of a university that is making a concerted effort to change structure is the University of Maryland-Baltimore County. An excellent article about their process appeared in *Inside Higher Education* (http://insidehighered.com/workplace/2005/05/24/umbc). I highly recommend the article to you which explains six strategies:

- **Examining the search process.**
- **Mentoring starts before hiring has even taken place.**
- **Educating women about their faculty careers.**.
- **Enhancing good family leave policies.**
- **Winning grants.**
- **Involving the president.**

None of them is especially difficult or expensive to put into place, but they provide a support system and a systematic approach that is necessary for long-term change.

The final area that I want to discuss as a way of enhancing women's role in the STEM disciplines is through self-monitoring of communication. As I indicated before, women and men don't communicate differently, but use of similar language is often perceived differently or strategies that encourage collaboration and inclusiveness may actually be perceived as weaknesses in some circumstances. Make sure that your language reflects your self-confidence about your work and that in your efforts to be collaborative and to be a team player you are not selling yourself short.

I am a very visual person and I have always found cartoons to be an excellent way of making a point. While I don't have a projector to show a cartoon that summarizes some women's attitudes about the glass ceiling. The cartoon shows a woman sitting across a desk from a man who is obviously "in charge." The woman has a large lump on her head. The title of the cartoon is "Adding Insult to Injury" and the caption that quotes the man reads: "Oh, and the cost to repair the crack in the ceiling will be deducted from your paycheck."

There may be times when we as women feel as though this is what happens when we attempt to change long-standing beliefs, attitudes and practices within our communities of practice. However, I am the eternal optimist and I believe all of you are also or you wouldn't be here in the positions you are in having accomplished what you have. The glass ceiling may still exist in the 21st century and it can be seen in practices that may frustrate us. Often the factors that keep it in place are more social than inherent within who we are as women and the institutional barriers may be more perceived than real—or at least structured in such ways that they can be overcome. The National Science Foundation's 2003 report on graduate enrollment in science and engineering found that enrollments among women were at 42% compared to 36% a decade

earlier. The glass ceiling has been and will continue to be cracked—and without deductions to our paychecks because women such as all of you have been persistent and care about the women who will come after you.

Resources cited in the speech and additional sources of information:

Books

Diana Ivy & Phil Backlund, *Exploring GenderSpeak: Personal Effectiveness in Gender Communication*, 3rd edition. New York: McGraw-Hill, 2004.

Julia T. Wood, *Gendered Lives: Communication, Gender, and Culture,* 6th edition. Belmont, CA: Wadsworth, 2005.

Thesis

Patricia C. Magerkurth, Strategies for Success: A study of Women in Engineering and Technical Work Environments. Unpublished master's thesis, University of Kansas, 2004.

Web sites proving resources for the speech

http://insidehighered.com/news/2005/05/10/umbc Critical Mass, Scott Jaschik

http://insidehighered.com/workplace/2005/05/24/umbc Helping Female Scientists Thrive, Scott Jaschik

http://insidehighered.com/news/2005/05/17/harvard Turnaround for Women at Harvard, Inside Higher Ed News, Scott Jaschik

http://insidehighered.com/news/2005/08/12/grad Scott Jaschik

http://www.president.harvard.edu/speeches/2005/nber.html Lawrence H. Summers, January 14, 2005

http://www.findarticles.com/p/articles/mi_m2294/is_2002_August/ai_95514607

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Organizational Web sites

http://www.aauw.org/

http://www.awise.org/

http://www.breaktheglassceiling.com/

http://www.mentornet.net/

http://www7.nationalacademies.org/cwse/

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