

WEPAN National Conference

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Thank you, Marilyn, and good morning to all of you. It is a great pleasure to be here, and I am very grateful to the Women in Engineering Program Advocates Network for inviting me to this important conference.

It is a special privilege to be on the program today because my colleagues and I at the University are so pleased and honored that The Women in Engineering Program at the University of Maryland's Clark School of Engineering has just been selected the best in the nation by WEPAN. I want you to know that on Friday night we had our annual engineering alumni banquet and the dean, Bill Destler, featured this award in his remarks on the year's achievements.

A great deal of talent, energy and dedication has gone toward building this program into the exemplary one that it is today, and I am sure many brilliant young women will be enriching the engineering profession because of this program's initiatives.

Of course, the person who deserves the lion's share of credit for the quality of the program and for this award is Marilyn Berman. As I'm sure all of you know, Marilyn is the program's founder and, since its inception, its primary nurturer, advocate, and leader.

Regrettably for the University, Marilyn is retiring in a few weeks. Marilyn has been such a valuable asset to our College of Engineering and to the University for so many years and in so many ways. I wish I had the authority to issue an Executive Order and prevent this loss from occurring. Fortunately, she has agreed to stay involved with the University. Knowing Marilyn, this means she will reduce her effort to something like 40 hours a week rather than her current 80.

In preparation for attending this conference, I had the occasion to review the mission and goals of WEPAN and was very impressed. I can hardly think of a more important national goal than the development of a multi-cultural workforce in engineering and related professions.

We all know how the demographics of our nation and its workforce are changing. And the pace of that change is accelerating. In the next decade, 85 percent of the net new entrants into the nation's workforce will be made up of what we now call minority groups -- which of course, includes women.

Since slightly more than half of the American population is made up of women, one might think the "minority" status we accord them is hardly appropriate. In fact, however, women are so grossly underrepresented in some of the key professions, like science and engineering, that they are still very much a "minority," subject to the same inequities that many ethnic minorities face. If America is to continue to lead the world in providing solutions to engineering problems and in creating new technology for industry, we need all the talent we can recruit to the engineering profession -- and that means we must draw upon our entire workforce, not just the male half.

There is, of course, a moral reason why we as a nation should be concerned about equity of opportunity in the professions. Regrettably, moral arguments do not often lead to change in our society. Fortunately, there is a very practical argument as to why it is in the nation's interest to see the kind of changes WEPAN advocates. When I entered the workforce three decades ago, there were five people working for every retired person, five people whose productivity helped support each retiree through Social Security, Medicare, and related programs. My parents were the beneficiaries of this system. I don't know who those five workers were in their case but they most likely had names like: Andy, Charlie, John, Mike, and Bill. When I retire a few years from now, there will be three people working for each retiree. Their names are more likely to be something like Ann, Juanita, and Koume. It is certainly in all our interests to insure that Ann, Juanita, and Koume have the best possible education and the opportunity to utilize their talents to the fullest, especially in fields like engineering and technology that are so vital for our nation's economic well being.

Although there have been women engineers since our professional and technical societies were founded in the 19th century, it is only in the past few decades that women have begun to make up more than a tiny fraction of the profession. As recently as the early 1970's, less than one percent of the engineering graduates in the United States each year were women. Even through the decade of the 1980's, the rate of progress was slow. According to figures from the American Council on Education, the percentage of degrees awarded to women in Engineering and related fields grew from 11 percent in 1984-85 to only 13 percent at the end of the decade. Fortunately, because of the efforts of WEPAN and others, the pace of progress is picking up. In 1993, women accounted for almost 20 percent of the nation's first year undergraduate engineering students.

It is interesting to note that since the mid 1980's, about 25% of the graduates in chemical and industrial engineering have been women. And although the proportion of women in other engineering specialties is lower (as in civil engineering or electrical engineering where the women's share of new B.S. degrees is currently around 15 percent), the absolute number of people represented by these percentages is quite large, reflecting the movement of thousands of women into the profession.

Because the entry of a significant percentage of women into the profession of engineering is a relatively recent sociological development, most women working in engineering today are fairly young, and women are still rare at the most senior levels of management. This is clearly a problem for the profession and something that must change if we are going to achieve real equity of opportunity. To reinforce this point, I cite a 1993 study by the Society of Women Engineers that contains some very troubling data. In survey questions for the study about job satisfaction and equity of treatment, men and women engineers under the age of 40 responded in an almost identical fashion and with high rates of satisfaction. For engineers over 40, however, men reported satisfaction rates of around 60%, whereas, women's satisfaction rates dipped into the 30% range. Not surprising, given these data, the survey also showed that it was about age 40 where salary discrepancies began to creep in, rising to a differential of \$10,000 by age 50. I raise this issue not because I have solutions to propose but because I think it is a vitally important matter that I hope WEPAN and the other professional societies will press.

In my remarks today, I will stick to a more immediate problem, one that I and other university administrators have much greater responsibility for addressing: the increase in the number of women with bachelors, Masters and PhD degrees in engineering. For, as long as the university remains the main gatekeeper to careers in engineering and science, we in higher education have a special obligation to ensure that the intellectual resources we have in our female and minority populations are better represented in these critical disciplines.

I will not presume to know more about the issues facing women in engineering today than the members of this audience, but I can tell you about some of the things we at the University of Maryland are doing to encourage more women to take up engineering as a profession.

First let me give you a little context for my comments. The University of Maryland is the so-called flagship campus of the University of Maryland System. It is the state's officially designated center for graduate education and research, and the institution mandated to educate the best prepared students coming out of Maryland's high schools.

The University has 24,000 undergraduate students and 8,000 graduate students. We have roughly 120 bachelors degree programs, 100 Masters programs and about 80 PhD programs.

The University has a long tradition of support for women in higher education. It was one of the nation's first institutions to establish a Women's Studies program and as early as the late 1970's, the University was conducting salary equity studies for male and female faculty. To this day, we have one of the lowest salary differentials between men and women faculty among all AAU institutions.

In the mid 1980's, the University created a task force, chaired by Sandra Greer, a chemistry professor, to study the role of women and the status of their opportunities at the University. The report of this task force, the Greer Report as we call it, has led to a set of ongoing initiatives in support of enhanced opportunities for women. Included among these initiatives are a curriculum transformation project and programs aimed at attracting more women to fields in which they are underrepresented.

Fortunately for us, Marilyn Berman was ahead of the curve. She had already begun her Women in Engineering Program long before the Greer Report was issued. But I think Marilyn would be the first to say that her efforts have benefitted from the campuswide initiatives and climate of support for women.

With this background, let me describe some of the programs in engineering that have contributed to the WEPAN award. First, let me say that, as many of you already know, College Park's A. James Clark School of Engineering is ranked as one of the top schools in the nation. We are convinced that our record in recruiting women and other underrepresented minorities to engineering disciplines is a contributing factor in our high ranking. Thus, we see our success now, and in the future, as directly linked to our ability to include ever greater numbers of minorities and women as students, faculty members, and administrators. Consequently, our efforts in this regard are "mainstream" efforts involving the department chairs and core faculty.

One of the primary reasons for the success of our Women in Engineering Program was the recognition by Marilyn and her colleagues that career choices and prejudices against certain professions are usually formed well before the student reaches college. Many

capable young women with the requisite aptitude and interest for a successful engineering career are dissuaded from considering it early in life. They are conditioned by society and often by their own families to think that engineering is an unseemly or unattainable goal for a woman, that "girls are not good at math" and other specious arguments for not majoring in engineering. This is why our Women in Engineering Program focussed on recruiting women early in their educational career.

For example, since 1975 the College of Engineering has offered a six-week summer program for women students who have completed their junior year of high school. The summer program provides tuition and housing for up to 30 promising, highly motivated high school students who take two engineering courses for a total of 6 college level credits. Once they are on our campus, our faculty and administrators go all out to make them feel they can succeed, and we are very proud to say that an overwhelming percentage of them do.

Statistics from our own experience show that inducements and incentives to recruit women into engineering disciplines can really pay off. The percentage of women students enrolled in engineering at the undergraduate level rose from 7 percent in 1976 to 19 percent in 1996. In 1976, only 3 percent of our engineering graduates were women. This year, women make up 21 percent of our engineering graduates.

One of the most effective ways of encouraging women to go into non-traditional professions like engineering is to make sure there are adequate role models for them at the faculty level, and here again, our Engineering college has made substantial progress: there was only one woman on our entire engineering faculty of 150 in 1976. Today, the number is still way too low but we have 18 in a total faculty of 190, almost 10%. The problem, of course, is the relative scarcity of women with PhD's in engineering.

With help from the Sloan Foundation, our Women in Engineering program is doing something about this problem. Over 30 research fellowships in engineering have been awarded to women undergraduates, allowing them the valuable opportunity to work with faculty on research projects. Currently, there are over 25 women undergraduates at College Park who serve as Teaching Fellows, assisting faculty in teaching basic engineering courses. These expanded educational and practical training opportunities for aspiring women engineers have already started to show results: not only are more women majoring in engineering at the undergraduate level, but more women engineering graduates are considering going on for an advanced degree.

Beyond offering incentives for women in engineering education, and other types of programmatic intervention, we need the input of women already in the discipline to help us make engineering more inclusive, more reflective of the American workforce in general. Many of our women faculty are doing this, by example as well as by active participation in initiatives to recruit and encourage women applicants.

The Women in Engineering Program has launched a Professional Mentoring Program in which women engineering students are matched with alumnae who are professional engineers to help our students gain a better insight into the actual conditions and experiences of women who work as engineers. There are currently 70 women professional engineers involved in this mentoring program and already, our students are benefiting from the strong support system and networking opportunities that the program involves.

I realize, of course, that talking about the value of networking to this audience is like preaching to the choir, but it cannot be said too often that young women need all the support we can give them to succeed in an environment that is still very dominated by men.

Although there are more women engineers now than ever before, the engineering workplace can still turn out to be a pretty lonely place for a woman -- and sometimes downright hostile, as the Women Society of Engineers study that I cited documents. I am always impressed at how well women who dare to venture into the traditional male professions cope with the strongly entrenched biases against their gender.

I am reminded of a story reported recently in the newspaper about an automobile accident in which there was an injured man stretched out on the ground. A woman was bending over him, trying to help him. A crowd started to gather. A man elbowed his way through and pushed the woman aside, saying "I'll take over now, I've had first aid training." The woman looked up and said, "this man needs a doctor and that's why I'm staying right here." As a nation, we have a long way to go in eliminating the harmful stereotypes that hamper the progress of women in the professions.

The engineering profession, which has always been a tough choice for women, has in some ways become even more challenging now that engineers are having to ply their trade in a global economy. A global economy means that professionals from all over the world will be collaborating on projects to an extent we have never before experienced. So in addition to a solid background in traditional engineering subjects, the well-equipped engineer will need the skills and the experience to work very closely with her counterpart from overseas. In a climate like that, qualifications like foreign language proficiency and exposure to other cultures have very special significance for the engineer who wants to excel at her job. International projects and travel to other nations have always been a part of the engineer's job description, but as American industry expands its partnerships with companies from overseas, engineers are finding that they are required to explain, coordinate and negotiate with professionals and technicians of widely differing nationalities at every stage of the project and on a daily basis. That kind of close collaboration requires more than a superficial knowledge of one another's language and culture.

Like many other universities, we at the University of Maryland are encouraging our students to learn a second language and to immerse themselves in other cultures. We do this not only through course requirements but also through co-curricular activities. We have several residence halls that are reserved exclusively for students studying -- not necessarily majoring in -- foreign languages and cultures.

Let me mention just two of the unique programs we have developed to prepare our engineers for the global workplace.

The Japan Technological Affairs Program (JTAP as we call it) offers students in the College of Engineering intensive Japanese language instruction, workshops and activities related to Japanese culture and society in preparation for year-long internships in Japan, in a Japanese laboratory or company. Through this program, which is coordinated between the College of Engineering and the Department of East Asian Languages, students who are enrolled in an undergraduate program in engineering receive intensive Japanese instruction during the academic year and in special summer classes held in the Language House on the College Park campus. The future engineers are thus fully prepared to operate with ease in Japan's research community.

We also offer a Dual Degree in German and Engineering which allows students to develop expertise in German as well as engineering. Under this program, which is jointly administered by the Department of Germanic Languages and the A. James Clark School of Engineering, students go to Germany in their senior year for a two-month intensive German language program. After that, they work for 4-6 months either at a university in Berlin or in industry in Mannheim.

Initially, the globalization of engineering activities and firms poses an additional obstacle for women. As far as we need to travel in the U.S. on matters of gender equity, we are still light years ahead of many European countries and most Asian countries. However, since language skills and communicating with people of different interests and different cultures seem to come easier to women than men, I suspect the movement toward globalization will ultimately work to the advantage of women. Women engineers should make certain that these talents are developed and that they list them as important components of their international expertise in their resumes. Women, on the whole, have proven themselves to be inherently superior to men when it comes to people skills, for communicating effectively, and for their sensitivity in resolving conflict and accommodating other points of view. The global workplace is one in which these attributes are going to be very highly valued.

If I could offer one suggestion, one simple strategy for women in engineering to exploit in their fiercely competitive workplace, it would be to capitalize on their facility for languages and to take advantage of every opportunity to acquire expertise in another language or another culture. All of us are familiar with the stereotype of the one dimensional engineer, too steeped in the technical complexities of his discipline to be at home with other disciplines, other cultures. I think nothing will shatter that stereotype more completely than the entry into the engineering profession of large numbers of women with their natural flair for languages and their aptitude for managing and reconciling multiple interests.

Despite all the disparagement and disadvantages that women still have to endure in some engineering workplaces, we know from the amazing progress of women in the life sciences and other scientific disciplines that the day will come when the profession of engineering is no longer an unusual choice for a female undergraduate, and when the engineering firm with a woman CEO is the norm rather than the exception. Given the competence and the commitment of women already in the field of engineering who are working on that agenda, who knows, one day Americans may even be calculating their productivity in terms of "woman" hours and "woman" power.

Thank you again for inviting me, and best wishes for the continued success of WEPAN.

