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TITLE IX AND SCIENCE

HEARING

BEFORE THE

SUBCOMMITTEE ON SCIENCE, TECHNOLOGY, AND SPACE

OF THE

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION
UNITED STATES SENATE

ONE HUNDRED SEVENTH CONGRESS

SECOND SESSION

OCTOBER 3, 2002

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ONE HUNDRED SEVENTH CONGRESS

SECOND SESSION

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TITLE IX AND SCIENCE

THURSDAY, OCTOBER 3, 2002

U.S. SENATE,
SUBCOMMITTEE ON SCIENCE, TECHNOLOGY, AND SPACE,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
Washington, DC.

The Subcommittee met, pursuant to notice, at 2:35 p.m. in room SR–253, Russell Senate Office Building, Hon. Ron Wyden, Chairman of the Subcommittee, presiding.

OPENING STATEMENT OF HON. RON WYDEN, U.S. SENATOR FROM OREGON

Senator WYDEN. The Subcommittee will come to order. Today, the Subcommittee on Science, Technology, and Space convenes the third in a series of hearings on the subject of women studying and working in math, technology, engineering, and the so-called hard sciences such as physics and chemistry. Congress may not be able to legislate away the entrenched attitudes of the math and science establishment that women are somehow second-class scholars in these fields, but as Chair of this Subcommittee I am determined to see the Title IX statute fully enforced to give women equal opportunity in the critical fields of science, engineering, and math education.

As one of our witnesses today knows, the enforcement of that common sense rule has brought women much closer to parity, if not all the way, in high school and college sports. In my view, if Title IX can do that on the playing fields of this country, it ought to be able to do it in the classroom, where its help was originally directed, and making sure that Title IX protects women in and out of the sports arena is more important than ever before as the administration opens up a commission to review and possibly revise the Title IX rules.

In June of this year, I laid down a new challenge before this Subcommittee. In this hearing room, I called on the Administrator of NASA, Sean O'Keefe, to determine how his agency could help triple the number of women graduating and working in math, science, and technology. At a hearing in July, Dean Kristina Johnson of Duke University Pratt School of Engineering encouraged the Subcommittee to pursue the enforcement of Title IX as a tool to ensure equal opportunity for women in math, science, and engineering education.

Title IX is all about a simple principle. The entire statute reads, no person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be sub-

jected to discrimination under any education program or activity receiving Federal financial aid. The evidence of discrimination against women in math, science, and engineering is both empirical and it is anecdotal. The numbers raise your eyebrows, but the stories ought to raise your hackles.

According to the National Research Council, young women studying science and math are pushed into traditional female roles such as teaching, while their male counterparts receive almost all the research fellowships that pay more completely for graduate school. Without a research background, women are less likely to obtain tenured track faculty positions. They earn less money and they lose the chance to encourage still more young women. And the discrimination does not stop with students; full professors who happen to be women tell stories of losing their lab space to associate professors who are male.

The consequence of systematic discrimination is immediately visible to women across this country, and it is more subtly damaging to the country as a whole. The Hart-Rudman Commission on National Security warned that America's failure to invest in science and reform math and science education is the second biggest threat to our national security. Only the threat of a weapon of mass destruction in an American city is a greater danger. Yet in essence, 51 percent of the population is being actively discouraged from entering these fields that desperately need new experts and practitioners.

Last week the Commerce Committee approved an amendment that I wrote with Senator Cleland. The amendment calls for a 10-year retrospective report on NSF program to promote participation of women, minorities, and persons with disabilities in science and engineering.

This week, I intend to offer another amendment to the National Science Foundation authorization bill. I want the National Academy of Sciences to report on how universities support their math, science, and engineering faculties with respect to Title IX. This can cover hiring, promotion, tenure, even allocation of lab space.

The Federal Government should share some of the spotlight on this issue as well. I intend to request the academy's report also detail how many Federal grants for scientific research are given to men and women, and why. It is time the Congress quantified and qualified the realities facing women in the sciences. Only then is it possible to come up with truly effective solutions.

I also think it would be remiss today to not mention our late colleague, Congresswoman Patsy Mink. She made extraordinary contributions in this field, and was absolutely instrumental, as I know Senator Bayh recalls, in getting Title IX through the House. Sadly, Patsy Mink died this past weekend in Hawaii, and her obituary recalled that Title IX was one of the accomplishments she felt most strongly about.

We have a terrific panel of witnesses from the administration. We welcome Mr. C. Todd Jones, Deputy Assistant Secretary for Civil Rights at the Department of Education, former Senator Birch Bayh, who I have long considered a friend and admired for all of his great work is here today, the author of the Title IX statute, Marcia Greenberger of the National Women's Law Center, who has

testified before me in both the House and the Senate, and we acknowledge her outstanding work. Dr. Geraldine Richmond of the University of Oregon, we are pleased that you could be with us Dr. Richmond, Dr. April Brown, chair of the Duke University Department of Electrical and Computer Engineering, Coach Margaret "Digit" Murphy of the Brown University Women's Hockey Team, and Senator Reed in particular was so pleased that you could come, and while he is not a witness, special recognition goes to Brian Kevin, who turns 11 tomorrow, and where is Brian? Is he out in the audience? Why don't you stand up, and we are glad that you are in the cheering chorus for your mom. I am certain he is a strong supporter of Title IX.

We thank all of you. This has been a busy session for this Subcommittee. We have been able to make contributions in the homeland security legislation with respect to creating a testbed to evaluate products to fight terrorism and the National Emergency Technology Guard.

We began this session with a big success in terms of extending the Internet tax freedom legislation. Several weeks ago when we moved forward with an important bipartisan bill to promote nanotechnology, essentially, what we call the small sciences. In all of these areas Senator Allen, who could not be with us this afternoon, has been instrumental. This is potentially, and I use that word advisedly, the last hearing of this Subcommittee for this session, but in my view you cannot get any more important than this issue.

I do not think that statute has been utilized as fully and as aggressively as it could be to deal with an issue that I think is of enormous importance to the country. It is an issue of basic fairness, and our country cannot afford to duck vigorous enforcement of Title IX as it relates to creating opportunities for women in the hard sciences. This may be late in the session, but those who have worked with me in the past know that when I feel strongly about something we do not tend to let it slide quietly by, and that is my plan here, so I very much appreciate all of you in coming.

We will make your prepared remarks a part of the hearing record in their entirety, and we are very pleased that Senator Bayh could be here. If you really look in the last half-century at the names of those who have been there on the important civil rights issues and the important statutes that really made progress for this country in terms of creating opportunity, Birch Bayh's name shows up again and again and again.

Senator Bayh, we thank you for all of your efforts on behalf of these important causes, we are very honored to have you here today, you may proceed with your statement.

STATEMENT OF HON. BIRCH BAYH, VENABLE, BAETJER, AND HOWARD, LLP

Senator BAYH. Thank you very much, Mr. Chairman, and fellow panel members. It is a privilege to be here. I appreciate more than I can say all the compliments that you gave me. I wish my wife had been here to hear them all, and you could have left out a few of those again and again's. My back reminds me how old I am.

[Laughter.]

Mr. Chairman, I for one have marveled at your perseverance against great odds. It is a tribute to you and to the Committee that you would take your time in a very crowded Senate schedule to have these hearings on discrimination against women, particularly in the critical areas of mathematics, engineering, and hard sciences, which are probably one of the last vestiges where we have not really opened up the door and let the sunshine in. I hope this hearing will help us to do that.

It is obvious that in the high tech world in which we are living today we cannot ignore the need to fully develop the talent of all of our citizens in these critical areas. I am a baseball fan. My dream in life was to be a professional baseball player, and somehow or another they discovered I could not hit—they discriminated against males who could not hit curve balls, so I am here just as a plain baseball fanatic. I think that to deny the society the benefit of women in these particular areas is somewhat like saying to the Arizona Diamondbacks that Randy Johnson, and to the New York Yankees that Roger Clemens would not be permitted to participate in these playoff games as we go down the road to the World Series.

This is a special degree of talent that women will possess when fully trained, and that are sorely needed. Mr. Chairman, as much as you are a real student of discrimination across the board, permit me to suggest that for a complete and most alarming view of discrimination and its effect on our families and standard of living, and on our relationships between husbands and wives and the constant drain on our society as well, I highly recommend Ann Crittendon's book entitled, *The Price of Motherhood*.

I used to read that at night before going to sleep, but I have to confess that in reading it I became so angry I could not go to sleep, so I stopped reading it, at least at that time. It will show the degree, the insidious nature in which this permeates our society and why we need to lay it to rest.

The other witnesses on the panel here are extremely well-versed. It is good to have the Department of Education so ably represented. I want to particularly say that it is a marvelous, fortuitous circumstance that Dr. Richmond would travel all the way across the country to be here today. She will contribute greatly, and she will have the chance to see her Senator in action, which she probably already has done before, and can be proud of him.

I also suggest to my friends on the Committee that you read carefully the testimony and the statistical analysis provided by Marcia Greenberger's statement, take it home and put it under your bed and pillows at night—under your pillow, not your bed. Ms. Greenberger and the National Women's Law Center have over the years, about 30 years now, provided a service like a modern day Paul Revere, or should I say Abigail Revere, as far as a wake-up call for America in the area of discrimination against women. It is a privilege to have a chance to serve with Marcia, as well as the other members of this panel.

It is appropriate and typical of the Senator from Oregon to point out the passing of Patsy Mink. I became involved in the legislative efforts to root out discrimination against women really back before Title IX, when we had a rather tortuous, lengthy effort to try to get the equal rights for women constitutional amendment passed.

I would be remiss if I did not point out that Congresswoman Mink and many of her peers, such as Edith Green, Shirley Chisholm, Bella Abzug, Barbara Mikulski, Pat Schroeder, and others both within and outside the Congress, were responsible for moving forward to get the Equal Rights Amendment passed. Unfortunately it fell three legislatures short of becoming part of our Constitution, but also to move forward in Title IX, which could become law without the passage of a constitutional amendment.

Most of the publicity with Title IX, Mr. Chairman, as you are aware, has been devoted to the accomplishments of women in the area of athletics, Olympic champions, World Cup soccer, championships, the annual trip to the final four of women's basketball, and in ice hockey I should say, out of respect to Coach Murphy. All of those athletic accomplishments are there for us to see. And I must confess, as one who wonders if you ever make a difference in this meat grinder up here where we work in Congress, I have to tell you that I have been told by countless numbers of these women who are presently participating that this would not have been possible for them to do personally were it not for the opportunity given to them by Title IX.

Now, I must confess that athletics were in my heart. As you may know, Mr. Chairman, my father coached four sports at Indiana State, and I inherited all of his enthusiasm for athletics but not a lot of his talent. But with all of that love for athletics, I thought when we were moving forward with equal rights, I thought the greatest benefit to society generally would become an opening up of economic opportunities and academic opportunities that would be the basis for any economic opportunities.

We looked at some of the discrimination going on. Women were not getting equal pay for equal work. Women were not treated equally in our court system. They were given more serious penalties, because women were not supposed to do that kind of thing, and so it was. But again, the one place that just leaped out at me was what was happening in the area of education, where twice as many scholarships would go to boys as girls, and the amount of those scholarships would be half as much, and on and on.

Enrollment of women in higher education was in the 40's some place, in the low 40's when we passed Title IX. Today, I think we can say with some degree of pride and hope, that women constitute approximately 53 percent of the student bodies on the campuses. A careful, analytical analysis of the disparities, which has again been provided by Ms. Greenberger and the Women's Law Center, can show you the degree to which that discrimination exists, particularly in the area in which you call us together here today.

We have faced a situation where traditionally, as you pointed out, at an early age boys and young men have been somewhat stereotyped to go down one path. They take vocational training in some of the more sophisticated science courses while women are basically trained to be homemakers and perhaps teachers in some of the liberal arts areas. But interestingly enough, it is really apparent that the wage difference between the stereotype for women's jobs as training through colleges and universities is significantly lower than that for men.

Permit me to zero in on the one area of the several that you are covering here today as special education, and that is engineering. At some of our institutions, such as MIT and Berkeley, the percentage of entry-level students in engineering gets as high as almost 30 percent.

If one looks at overall averages for the year 2001, students in the entering class for engineering, about 18 percent got bachelors' degrees, 20 percent got masters' degrees, and Ph.D.s went to about 16.7 percent, while the faculty as a whole, women's faculty in the area of engineering constitute about 8.9 percent. That is in our country today, not prior to Title IX, and the senior faculty, about 4.4 percent of all the administrators in our engineering schools throughout the country, only about 2 percent of that number is women.

Now, I am an optimist when I look at this rather depressing picture in the engineering area. I am an optimist because I think we can see what we have accomplished in some areas as a result of Title IX, and I do not see why we could not do the same thing in this particular area if we give it the kind of attention that I think your hearing is going to give it.

Unfortunately, at the risk of offending some of you and your colleagues on the Committee, I do not think this problem is going to be solved by congressional awareness, or by passage of legislation. Congress can send a clear message to those in the Department of Education, the institutions of higher learning throughout the land, and the mothers and fathers, that this type of second class standard is not going to be accepted for our girls and our women.

To solve this problem in the long run requires dealing with a more fundamental problem, it seems to me, that is really beyond our control immediately. In my judgment, this problem must be first addressed at the breakfast and the dinner tables, where mothers and fathers need to understand that equal opportunity should be expected for their daughters as well as for their sons.

Psychiatrists tell us that observations conclude that young women or girls tend to decide for themselves early on in their lifetime what path they are going to be following from what they hear at home and what their parents expect of them, or what their peers are prepared to do. Perhaps by the tenth grade, if we do not have some sort of an impact, it is going to be more difficult to make an impact.

The encouraging note, Mr. Chairman, as I jog around the American University soccer field, and see a public athletic field close by there, what used to be filled by little boys on Saturdays and Sundays now is occupied at least half of the time by little girls playing soccer, and so it is in the gymnasiums playing basketball, and on the softball field with the girls and young women playing softball. I think girls are participating in athletics basically because their parents urge them to do so. The father standing on the sidelines saying, "Annie, don't stand there, get that ball," is what fathers used to do for sons, and I think it is that kind of encouragement which has led women to excel as they have in the area of academics.

Now, we recognize the significant participation, not as much as we would like to see in athletics, but it is important for us to un-

derstand that we need to have similar participation in the academic field, and I would hope that the Department of Education, which has required rigid standards toward compliance—I say toward compliance, because we are not fully there yet, but the Department of Education is doing its best to enforce those regulations, and we are moving toward compliance. I would like to see similar regulations established for academia, and I think that we would see a great deal of progress.

I think we also need to look for role models for young women in the area of academia and in the private sector. We know about Chamique Holdsclaw, Cynthia Cooper, Mia Hamm and others, and so do our daughters, but it is important also for them to understand that there are also CEOs and members of corporate boards that are women.

We stereotyped earlier on, when we first started Title IX and Equal Rights Amendment discussions, that we had it in our mind that young women should not apply to law schools or medical schools. Only an infinitesimally small number were permitted. Now, if you are in a law firm and you are recruiting for young lawyers, you are going to find in the upper 10 percent at least half of them are women, and probably the number 1 student is a woman, and they make excellent lawyers. That is what we have learned, and we need to tell our daughters that that opportunity is available for them, and that it is also available for them in the other areas that you are studying here today.

I think it is important to understand, as I laid out the sad statistical record, how in the world can that happen. Well, I had a lengthy discussion with somebody who I think can be a role model for a woman in the area of engineering. I cannot tell you how proud I was to pick up the Purdue University alumni magazine and find out that a distinguished woman by the name of Linda Katahe had been appointed dean of engineering of the Purdue University Engineering School.

Now, 20 years ago that would have been unbelievable. That is the good news. The bad news is, she is only one of five deans of engineering out of 150 in the whole darn country.

Now, we need to use her as an example of what can be accomplished. In discussing her and in reading I ask myself, what is it that deters students who want to go into engineering from either not doing so, or not proceeding on to the profession of engineering. Unfortunately I think the record shows that young women before they go into engineering, that is high school seniors, or perhaps even in junior and freshman and sophomore years, when they are thinking about changing courses and have an opportunity, they are talking to the peers that just preceded them. They are being told that the environment that they face in the engineering curriculum, in the engineering laboratory, is often a hostile one for young women.

You find students that harass the women. You find some faculty members which are outright negative in their assessment of the women's capabilities right in an open classroom. Mr. Chairman, I think that students like that ought to be dismissed and faculty members ought to find some place else to work.

But also, as you look at the promotion path to be a dean, you find it is sort of a tortuous path. You have to get in 7 or 8 years before you can get tenure, and then before you get tenure in many, if not all of the institutions, you have to be approved by all of the faculty members in the engineering school. Most all of the faculty are men, and sometimes it is a secret vote. You wonder whether the male attitudes are uncomfortable with seeing women succeed. So it is when you go on up the ladder of promotion with the schools.

Well, Mr. Chairman, you have been very kind. I succumbed to my tradition of speaking more than I should, but thank you for your patience, and for this opportunity to be heard.

[The prepared statement of Senator Bayh follows:]

PREPARED STATEMENT OF HON. BIRCH BAYH, VENABLE, BAETJER, AND HOWARD, LLP

Mr. Chairman and Members of the Subcommittee, it is a privilege to have the opportunity to share some thoughts with you this afternoon on a subject which is near and dear to my heart. It is a tribute to the entire Committee that you recognize the subject of discrimination against women in those highly skilled areas of mathematics, engineering and the hard sciences as one of the most critical remaining vestiges of discrimination. In the high tech world in which we are living, we as a country cannot tolerate the underutilization of more than half of our population which happens to be women. To compete in today's world America must fully utilize all of its resources and we are far from meeting this goal in the education areas which are the subject of this hearing. To put it into today's terms, it is like telling the Arizona Diamondbacks that Randy Johnson and the New York Yankees that Roger Clemens will not be permitted to pitch in the early stages of the trip toward the World Series. Discrimination against women is to a great extent an unconscious, yet insidious fact of today's life. Most of our society does not realize that it exists. That makes the public awareness potential of your hearing extremely valuable.

When I became involved with discrimination against women in a very personal way, I was blessed to have an Oklahoma wheat farmer's daughter as my bride. Marvella was an outstanding human being, extremely intelligent, and recognized with many honors at the tender age of 18, whose dream was to become a student at the University of Virginia. Upon application she was informed that girls need not apply. She provided me with a masters degree in awareness of how discrimination affected the lives of our women for the next 26½ years. I am presently blessed by my wife, Kitty, who has been providing me with a Ph.D. degree in awareness of how American women are treated in business and corporate society. To get a complete and alarming view of discrimination and its effects on our families and their standard of living, on the relationship between husbands and wives, and the consequent drain on our society's well-being, I highly recommend Ann Crittenden's *The Price of Motherhood.* It presents a truly frightening picture as far as equality is concerned. This Committee is dealing with a critical and perhaps least-known element of this hurdle in our efforts to see that all American citizens are treated equally, and that America realizes its full potential.

The other witnesses on the panel are extremely well qualified to assist in your efforts. For a statistical analysis of this problem, I suggest that after reading my friend and colleague Marcia Greenberger's statement, you take it home and put it under your pillow at night. Ms. Greenberger and the National Women's Law Center have over the years served as modern-day Paul Reveres, or should I say Abigail Reveres, with a message of "Wake up, America." Permit me to give you some personal reflections of what these statistics mean, and share my thoughts about some of the factors which should be considered as the Committee fulfills its responsibilities.

From a policy perspective, I became involved in the legislative efforts to root out discrimination against women, as the principal Senate sponsor of the Equal Rights Amendment. Before proceeding further, I should point out that the death of Congresswoman Patsy Mink this week should remind us that she and many of her peers, Edith Green, Shirley Chisholm, Bella Abzug, Barbara Mikulski, Pat Schroeder and others both within and outside the Congress, worked tirelessly to achieve our common goal. I was shocked at the degree of discrimination that existed across the board. Women did not receive equal pay for equal work. Women were often treated more harshly by the nation's court system, because "women are not sup-

posed to commit such crimes." However, it was immediately apparent that the most egregious and damaging discrimination existed in the area of education. Tomes have been written about the fact that the future of our boys and girls and our country depends upon the quality of our education system. I need not repeat the impact of shortcomings in this area to the future well being of our country in today's high-tech environment to those of you who are well aware of this fact.

Most of the publicity about Title IX's existence has been from the accomplishment of our women athletes. Olympic champions, the World Cup in soccer, Olympic medals, the annual trip to the Final Four in women's basketball, and the extraordinary capabilities of the women who nightly perform in the WNBA, have been visual reminders of what women athletes can accomplish. I have been told by countless numbers of these women personally involved that their opportunity to participate would not have been possible were it not for Title IX.

I most confess that this athletic success warms my heart but it also reminds me that at the time we were considering the Equal Rights Amendment and Title IX, I thought that the greatest benefit would come from opening the doors of our education system so that girls, young women, faculty members and administrators could fully utilize their God-given talents in the academic area. As Marvella would remind me on occasion, "We cannot ignore the need to develop the thought processes and talents of 52 percent of the nation's population."

We have made significant progress in opening the doors of education to America's young women in the last 30 years. Before Title IX, womens' enrollment in higher education was in the 40s. Today, women constitute approximately 53 percent of the student bodies on our campuses, however a careful statistical analysis of the disparities which exist among the various degree programs causes one to be less enthusiastic and to realize that, despite this progress, unacceptable elements of discrimination continue to exist. Marcia Greenberger and her associates at the National Women's Law Center have provided a detailed study which permits us to focus on where the problem of discrimination is greatest. At the risk of over simplifying a complex problem, boys and young men have, from an early age, been prepared to follow one educational track. Girls and young women have been sensitized to follow another. It has been the age old stereotyping in which educators have assumed that girls and young women are better qualified to fulfill certain roles in society and boys and young men have been educated to fulfill another.

Prior to Title IX, our nation's education system provided boys with shop and vocational education and girls took home economics. The opportunity to train for jobs in the automotive, aviation, food and maritime trades was reserved almost entirely for boys. At the post-secondary level, young men traditionally received training for jobs in trade and industry and technical occupations. At the same time young women were traditionally educated to be homemakers, teachers or in the health occupations and cosmetology, all of which were lower paying jobs. It is readily apparent that wages received in male-oriented occupations provided a better standard of living for the worker and his or her family.

Permit me to zero in on one of the areas of education and that is engineering. Although at some institutions such as MIT and Berkeley the percentage of entry level students is 30 percent, if one looks at overall averages for the year 2001, students in the entering class averaged 18 percent, bachelor degrees 20 percent, and Ph.D. degrees 16.7 percent. For the faculty as a whole, women faculty constituted 8.9 percent and senior faculty 4.4 percent. Approximately 2 percent of executive positions were filled by women. This constitutes a dismal picture and it is easy to become depressed at the discrimination which exists in this area. Permit me to suggest that rather than dwell on failures, we recognize the successes which have been made in other areas of education. I am an optimist, I am confident that if our institutions of higher learning set the proper standards and follow the proper practices which are designed to accomplish the goal of equal education opportunities for women in the engineering field, we will reach this goal.

Unfortunately, the problem cannot be solved by Congressional awareness or by passage of legislation. Congress can send a clear message to those in the Department of Education and the institutions of higher education throughout the land that present standards will not be accepted. However, to solve this problem in the long run requires dealing with a more fundamental problem. In my judgment, this problem must be addressed first at the breakfast and dinner tables where mothers and fathers need to understand that equal opportunity should be expected for their daughters as well as their sons. Psychiatrists have observed that young girls/daughters begin developing expectations for themselves at a very early age. It is encouraging to note that soccer and baseball fields and basketball courts are filled with girls at an early age on into high school. Those girls are participating in athletics because their parents have encouraged them to do so and have been on the sidelines

encouraging them to participate and to be successful. Women would not now be participating at significant percentages in athletics at our colleges and universities and playing for the WNBA if it were not for encouragement at home or in the early ages of primary and secondary education. Also, it should be pointed out that the Department of Education had rigid requirements which were regularly enforced across the nation's athletic fields. Despite the notoriety and justifiable pride which has accompanied women's accomplishments in the athletic field, it is imperative to recognize that only a very small percent of the student body in our universities and colleges ever play varsity athletics.

Also, it is critical to note that young women need role models which help them focus and develop self-esteem. In the athletic area they have Chamique Holdsclaw, Cynthia Cooper and Mia Hamm, but who are the role models in the academic area? Before Title IX women were suspect if not outright prohibited from studying in the areas of law and medicine. Today, in the upper 10 percent of most graduating classes you will find at least half of them are women, often the number one graduate is a woman. We need to inform our daughters of the accomplishments of women in corporations and businesses where numerous women are CEOs and serving on corporate boards. But what about the fields of engineering and science? Who do they have for role models? We need to alert our daughters to accomplishments in these areas. Of course, we recognize the exploits and the sacrifices of women astronauts such as Christina McAuliffe and Sally Ride. Permit me to use an excellent example of a peer model in the area of engineering. Recently, my alma mater, Purdue University, appointed a woman, Linda P.B. Katehi, as the university's Dean of Engineering. This is all well and good, but Dean Katehi is one of only 5 women deans out of the top 150 engineering schools in the country. What happens to young women who determine to enter the engineering field? I have already cited the abysmal record in this area. Why do so few women choose engineering as a career? Here is only one snapshot. To advance as a faculty member, it is critical to be granted tenure. This status is not available until seven or eight years of faculty experience. Often the first stage to granting tenure is to receive the majority support of your peers on the faculty which is mostly constituted of men. Often the vote is held in secret and one cannot help but wonder whether male faculty members vote no because they are not comfortable to have female faculty members succeed. Permit me to suggest that the Subcommittee ask the Department of Education to allocate sufficient funds to establish specific criteria which must be met for institutions to comply with Title IX in the academic area. The Department should establish a system of careful examination and enforcement such as that which now exists in the field of athletics.

I am sure that Members of the Subcommittee can, from their own experiences, develop ideas which will help provide little girls, older girls and young women with examples and programs which will result in them developing the self esteem and incentive to make their mark in areas where now they are not comfortable.

Unbelievable as it may sound, often young women report that the reason for not pursuing an engineering education is that reports from women who have preceded them are to the effect that often male students have made life miserable for them and their professors have often exhibited outright hostility. If we mean business, I suggest that such students should be expelled and such professors should find new employment.

Thank you for providing me with the opportunity to express my thoughts.

Senator WYDEN. Thank you very much, Senator Bayh, for your passion, this is a fight that you were willing to take on quite some time ago, and we are going to pick up where you left off, and we just so appreciate your outstanding comments.

Mr. Jones.

STATEMENT OF C. TODD JONES, DEPUTY ASSISTANT SECRETARY, OFFICE FOR CIVIL RIGHTS, DEPARTMENT OF EDUCATION

Mr. JONES. Good afternoon. Thank you, Mr. Chairman. I thank you and the Subcommittee today for the opportunity to testify, because it gives me an opportunity to discuss one of the most important civil rights laws in our Nation's history, Title IX of the education amendments of 1972.

As you know, we just celebrated the 30th anniversary of this landmark legislation. Without a doubt, Title IX has opened the doors of opportunity for generations of women and girls to compete, to achieve, and to pursue their American dreams. I actually am too young to remember personally what schools were like prior to 1972, when Title IX first prohibited schools that received Federal funds from discriminating on the basis of sex. Back then, it was not uncommon for high school girls to be steered to courses that narrowed their future options. High schools routinely excluded girls from classes that stood to give them the skills to compete for higher paying jobs.

Mr. Chairman, you asked me to speak today about Title IX and the sciences, increasing the number of women pursuing degrees and careers in math, engineering, and hard sciences. Fortunately, I am here to deliver good news. Society and education have changed since Title IX was passed, and Title IX played an important part.

Title IX has contributed to the progress made by girls enrolled in high school math and science classes. Boys and young men previously dominated these fields to the extent that only an exceptionally gifted and talented female was thought able to take advanced math and science classes. Today, both male and female high school students are making strides in math and science. By 1999, nearly one half of the finalists in the Intel Corporation and Science Service, the competition that was formerly known as the Westinghouse Science Talent Search, were girls.

In 1999, 2000, and 2001, the winners of Intel's largest scholarship were high school girls. Today, the majority of college students are women, and many are entering professions that once eluded them in the sciences. In 1972, only 9 percent of medical degrees went to women as compared to nearly 43 percent today. Also in 1972, only 1 percent of dental degrees went to women as compared to 40 percent 2 years ago. The percentage of computer science graduates who are women doubled from 14 percent in 1972 to 27 percent in 1997. The percentage of engineering graduates who are women rose from 1 percent in 1971 to 17 percent in 1997. Among the physical sciences majors, the proportion of women graduates was 15 percent in 1972 and rose to 37 percent in 1997. Half of all zoology graduates were women in 1997, versus 22 percent in 1972.

OCR has supported this progress in part through conducting compliance reviews that focus on specific, systemic problems. For example, beginning in 1994, OCR conducted 15 broad-based compliance reviews that examined whether high schools and higher education institutions were discriminating against girls and women in math and science programs, but there are still areas for improvement. As a society, we must continue to avoid steering girls away from math and science, and continue to meet their developing interest in these areas. Title IX shares in the progress that they have made.

Senator thank you for inviting me to testify on behalf of the administration today, and I look forward to any questions.

[The prepared statement of Mr. Jones follows:]

PREPARED STATEMENT OF C. TODD JONES, DEPUTY ASSISTANT SECRETARY, OFFICE FOR CIVIL RIGHTS, DEPARTMENT OF EDUCATION

Good afternoon. Thank you Chairman Wyden for that introduction. I thank the Chairman and all Members of this Subcommittee for the opportunity to testify before you today because it gives me the opportunity to discuss one of the most important civil rights laws in our nation's history: Title IX of the Education Amendments of 1972.

As you know, we just celebrated the 30th anniversary of this landmark legislation. Without a doubt, Title IX has opened the doors of opportunity for generations of women and girls to compete, to achieve, and to pursue their American dreams. I am actually too young to remember personally what schools were like prior to 1972 when Title IX first prohibited schools that receive federal funds from discriminating on the basis of sex.

Back then, it was not uncommon for high school girls to be "steered" to courses that narrowed their future options. High schools routinely excluded girls from classes that stood to give them the skills to compete for higher paying jobs.

Mr. Chairman, you asked me to speak today about Title IX and the sciences—increasing the number of women pursuing degrees and careers in math, engineering, and the hard sciences. Fortunately, I am here to deliver good news.

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By 1999, nearly half of the finalists in the Intel Corporation and Science Service (the competition formerly known as the Westinghouse Science Talent Search) were girls. In 1999, 2000, and 2001, the winners of Intel's largest scholarship were high school girls.

Today, the majority of college students are women. And many are entering professions that once eluded them in the sciences:

- In 1972, only 9 percent of medical degrees went to women—as compared to nearly 43 percent in 2000.
- Also in 1972 only 1 percent of dental degrees went to women—as compared to 40 percent two years ago.
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- The percentage of engineering graduates who were women rose from 1 percent in 1971 to 17 percent in 1997.
- Among physical science majors, the proportion of women graduates was 15 percent in 1972 and rose to 37 percent in 1997.
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OCR has supported this progress in part through conducting compliance reviews that focus on specific systemic problems. For example, beginning in 1994, OCR conducted fifteen broad-based compliance reviews that examined whether high schools and higher education institutions were discriminating against girls and women in math and science programs. But, there are still areas for improvement. As a society, we must continue to avoid steering girls away from math and science and continue to meet their developing interest in these areas. But unquestionably, this country has changed, and Title IX deserves to share the credit.

Mr. Chairman, this month OCR will release a new document entitled "Title IX: Thirty Years Later." Many of these statistics are drawn from that publication, and while it has not returned from the printer yet, I have brought some bound versions of the page proofs for your review.

Thank You. I will be happy to take your questions.

Senator WYDEN. Mr. Jones, thank you, and we will have questions in a few moments.

Ms. Murphy, welcome.

STATEMENT OF MARGARET "DIGIT" MURPHY, HEAD COACH, WOMEN'S ICE HOCKEY, BROWN UNIVERSITY

Ms. MURPHY. It is a little different than being at the Frozen 4 press conference, but it is fun all the same. Thanks. It is certainly a pleasure to be here today. It is an honor. My name is Margaret "Digit" Murphy, and I am head coach of the Brown University Women's Hockey Team. I have been at Brown for 14 years.

You might be wondering what a college ice hockey coach has to say about educational opportunities for girls in math and technology. Let me begin by letting you know that a hockey puck travels 60 miles per hour because of the torque applied to the stick, which in turn creates a force on the puck and transfers momentum. I do not think I ever said those words in high school. Those are tough ones for a jock to get out.

But seriously, the world of sports used to look like the world of math and technology, all boys and no girls. Today, 42 percent of all high school and college athletes are female, and it is interesting to note that there has been 847 percent increase in girls participating in high school athletics since 1972, 847 percent, but participating on the field, in the pool, or on the ice is only part of the story. There are huge benefits associated with athletics that go well beyond the X's and O's. Research studies show that girls who play sports enjoy greater physical and emotional health and are less likely to engage in a host of risky behaviors, drug use, smoking, drinking, than nonparticipants do.

As a girls' ice hockey player growing up in Rhode Island I was an anomaly. Girls simply did not play ice hockey. Boys did. The only time it was acceptable for girls to be on the ice at that time was to be a figure skater and wearing a tutu. That was not something I wanted to do. It was difficult to grow up with that stigma that you did not engage in normal girls' sports like field hockey or softball, but the opportunity that ice hockey provided me to be recruited by an Ivy League school made it ultimately worthwhile.

As a collegiate athlete at Cornell University from 1979 to 1983, the team that I played on traveled in vans, stayed four players to a hotel room, had minimum per diem for meals, our equipment was self-provided, our ice time was what the men's team did not want, our head coach was paid little more than a volunteer, recruiting budgets were what our coach could pay out of his pocket, and administrative help was minimal. Strides have certainly been made in all areas of our sport. Unfortunately, we had to wait until 1995, after Cohen v. Brown, for Title IX to be enforced at my institution.

Presently, our student athletes are Brown enjoy vastly different conditions than I did in 1979. Today's budgets are adequately funded in regard to team transportation, lodging, per diem, equipment, scheduling, facilities, ice time, and recruiting. We have three full-time coaches, myself and two assistants. These conditions of equitable treatment for women's hockey players can be seen throughout all NCAA programs in the country.

The number of institutions sponsoring women's ice hockey has grown from nine collegiate teams in 1981 to 71 teams today. Collegiate participation in women's hockey has grown 392 percent. Grassroots development of girls playing hockey in both the U.S.

and Canada has grown as a result of Title IX and its trickle-down effect.

In the U.S., the number of girls playing hockey has grown from 6,336 in 1990 to 39,693 in 2001. The Olympic movement for women's hockey was equally a beneficiary of Title IX. With so many women playing in our sport, the pool of Olympians has grown substantially. I am sure you all remember the first ever gold medal won in women's hockey in 1998 by the U.S. Unfortunately, we did not do so well last time, but there might be some lessons to be learned from our experiences in fighting for gender equity in the previously all-male sports environment.

First, because the media is interested in sports, they produce report cards comparing men's and women's sports benefits and numbers. When these report cards made the educational institution look bad, change happened. Public embarrassment has a way of persuading schools that they had better get their acts together. Congress added the Equity in Athletics Disclosure Act in the late 1990's to be sure that report cards were issued in a public way, and now critical participation and expenditure data on college athletics is available on the web and used by the press to remind the schools of their obligations to comply, so my first recommendation is to require regular reporting of critical indicators on the status of girls and women in math and technology, hugely important.

The second reason why sports has advanced more so than other Title IX areas is because there are many lawsuits brought by parents. I lived through one at Brown. Let me tell you, it was not pretty. To be employed at an institution that is completely committed to the equitable treatment of our students on all fronts, and to have the ultimate test of equity in athletics challenged and interpreted, pitted the male population against the female population.

To this day, there are lasting implications of the lawsuit. Lawsuits are not good. They put parents, kids, and educational institutions at each other's throats, rather than looking for solutions. The Office of Civil Rights must do a better job enforcing the law. These types of situations should not continue to exist.

The third and most important reason why Title IX was a success—there needs to be more done, however—is because the newspapers, always preoccupied with controversy in sports, served as an effective mechanism for educating the American public. When parents understood their daughters' rights, they used the mechanisms of civic engagement for holding school boards accountable, to bring lawsuits, to make educational institutions responsive.

We must require our schools to educate students and their parents about Title IX. Unfortunately, math and technology are not sexy enough to get free press, but as the parent of a 7-year-old girl, I firmly believe that if parents were more informed of opportunities or lack thereof for their daughters in the math and sciences, they would be as vocal and as engaged as they are in their quest for equality in athletics.

In athletics, we have learned that it is really the intangibles that count. At Brown, our philosophy statement calls for the development of the total person. We focus on the process of being a team, and not the end result. Our athletes learn the values of teamwork, cooperative learning, discipline, personal responsibility, and com-

mitment. These are the life lessons we teach through athletics that help our athletes when they continue on to their careers.

Teachers encourage girls to play, showing up for the games and celebrating their victories. Teachers and administrators must inspire, encourage, and motivate young girls in the same way that they inspire, encourage, and motivate the young boys. We cannot allow educators to come to the stereotypical belief about boys being more interested in math and science than girls. Stereotyping has a way of becoming a self-fulfilling prophecy. We cannot allow this to happen to our children.

On a final note, I would like to convey the immediacy of this problem with the recent appointment of the Commission on Title IX by the Bush administration. If Title IX is weakened, it will not only have a profound impact on athletics, it will send a clear message that maintaining and progressing opportunities for our daughters in all program areas is not a priority.

I would like to close by conveying the message that girls hit hockey pucks, girls are great mathematicians, girls check, and girls love technology. If you create an environment that sends such a message to girls, they will come.

Thank you so much for having the opportunity to speak to you guys today.

[The prepared statement of Ms. Murphy follows:]

PREPARED STATEMENT OF MARGARET "DIGIT" MURPHY, HEAD COACH, WOMEN'S ICE HOCKEY, BROWN UNIVERSITY

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[1] Title IX at 30: Report Card on Gender Equity, Women's Sports Foundation June 2002

The number of institutions sponsoring women's hockey has grown from 9 collegiate teams in 1981 to 71 teams today. Collegiate participation in women's hockey has grown 392 percent[2] Grass roots development of girls playing hockey in both the U.S. and Canada has also grown as a result of Title IX and it's trickle down effect. In the U.S., the number of girls playing hockey has grown from 6,336 in 1990 to 39,693 in 2001[3]. The Olympic movement for women's hockey was equally a beneficiary of Title IX. With so many women playing our sport, the pool of Olympians has grown substantially. I'm sure that you all remember the first ever gold medal won in women's hockey in 1998 by the United States.

There might be lessons to be learned from our experiences in fighting for gender equality in a previously all-male sport environment:

1. Because the media is interested in sport, they produced "report cards" comparing men's and women's sports benefits and numbers. When these report cards made the educational institution look bad, change happened. Public embarrassment has a way of persuading schools they had better get their acts together. Congress added the Equity in Athletics Disclosure Act in the late '90s to make sure the report cards were issued in a public way and now critical participation and expenditure data on college athletics is available on the web and used by the press to remind schools of their obligations to comply. So, my first recommendation is to require regular reporting of critical indicators on the status of girls and women in math and technology.

2. The second reason why sport has advanced more so than other Title IX areas is because there were many lawsuits brought by parents. I lived through one at Brown. Let me tell you it was not pretty. To be employed at an institution that is so completely committed to the equitable treatment of our students on all fronts, and have the ultimate test of equity in athletics challenged and interpreted pitted the male population against the female population. To this day there are lasting implications of the lawsuit. Lawsuits are not good. They put parents, kids and educational institutions at each other's throats rather than looking for solutions. The Office of Civil Rights must do a better job enforcing the law. These types of situations should not continue to exist.

3. The third and most important reason why Title IX was a success (there is more to be done however) is because the newspapers, always preoccupied with controversy in sports, served as an effective mechanism for educating the American public. When parents understood their daughter's rights, they used the mechanisms of civic engagement—from holding school boards accountable to bring lawsuits—to make the educational institution responsive. We must require our schools to educate students and their parents about Title IX. Unfortunately, math and technology aren't sexy enough to get free press. But as the parent of a 7 year old girl, I firmly believe that if parents were more informed of the opportunities or lack thereof for their daughters in math and science, they would be as vocal and engaged as they are in their quest for equality in athletics.

4. In athletics we learned that it is really the intangibles that count. At Brown, our philosophy statement calls for the development of the total person. We focus on the process of being a team, and not the end result. Our athletes learn the values of teamwork, cooperative learning, discipline, personal responsibility, and commitment. These are the life lessons that we teach through athletics that help our athletes when they continue on to their careers. Teachers encourage girls to play, showing up for their games and celebrating their victories. Teachers and administrators must inspire, encourage and motivate young girls in the same way that they inspire, encourage and motivate young boys. We cannot allow educators to succumb to stereotypical beliefs about boys being more interested in math and science than girls. Stereotyping has a way of becoming a self-fulfilling prophecy. We cannot allow this to happen to our children.

On a final note, I would like to convey the immediacy of this topic with the recent appointment of the Commission on Title IX by the Bush administration. If Title IX is weakened, it will not only have a profound impact on athletics but will send a clear message that maintaining and progressing opportunities for our daughters in all program areas is not a priority.

I would like to close by conveying the message that, girls hit hockey pucks, girls are great mathematicians, girls check and girls love technology. If you create environments that send such messages to girls, they will come.

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[2] NCAA Year-By-Year Sports Participation 1982–2001

[3] USA Hockey Website 2002

Thank you for the opportunity to speak with you today. I welcome any questions.

Senator WYDEN. Thank you. It is an excellent statement, and on your point that girls hit hockey pucks and girls are capable of making big contributions in the hard sciences is an excellent one. Let me just add, when girls are doing all that hard work, Congress is going to make sure that Title IX is enforced, and I want to thank you again for an excellent statement.

Dr. Brown.

STATEMENT OF DR. APRIL S. BROWN, PROFESSOR AND CHAIR, DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING, DUKE UNIVERSITY

Dr. BROWN. Thank you. Mr. Chairman and congressional staff, thanks. I am honored to have this opportunity to talk to you about my perspective on how we can apply an existing law, Title IX, to increase the number of women engineers and scientists, and I know that you have been working, as you said, for a number of months on identifying the barriers that face women in science and engineering, so I am going to focus, from my experience, on a specific barrier, and then how Title IX can be used to eliminate that barrier.

I am a professor in the field of electrical and computer engineering. Like many other women engineers, I considered engineering as a career because I had an engineer, in my case my father, who was an engineer, in the family. We really must reach a point in this country where we do not have to rely on family members to interest girls in engineering, and where we are committed as a society to the participation of girls and women in engineering and the sciences. We must develop role models in order to do this, successful and visible women engineers and scientists in the academy, in industry, and in Government.

My specific focus is on the success of women engineers in sciences in the academy. They are the role models and shapers of education and research. Their experience starts in graduate school, as this is the initial training ground of our future professors. We must increase the number of women faculty members in science and engineering to increase the number of women and engineers in the work force.

Women students are drawn to women faculty, and they seek them out. Studies have shown that women faculty members are the primary research advisors to a larger number of female students than men. Many women are lost along the way if they cannot identify and relate to a teacher for guidance toward a successful career. My own experience certainly bears this out. When I was a graduate student at Cornell University, I joined a group led by Professor Lester Eastman, who actively sought out female graduate students, which was a rarity at that time. When I took my place on the faculty at Georgia Tech in 1994, female students sought me out in turn. My first two Ph.D. students were women.

Women graduate students and engineers in the professorate have different experiences than men. The MIT Study on the Status of Women in the Sciences made headlines in 1999, when the university unveiled its self-assessment showing that women received

a smaller share of important resources, including space, startup research funding, salary, et cetera, in comparison to men.

In 1998, I co-chaired the Task Force on Opportunities for Women in Engineering at Georgia Tech, and this showed that women were significantly concerned about the balance of work and family and achievement in their field in the university. Just last week, the University of Michigan unveiled its climate study, which showed similar outcomes.

Studies have shown that women have less access to important resources, fewer mentors, fewer graduate students, and they serve on more Committees than men, but they do not Chair Committees as often as men. Social and organizational practices are both important, and their interplay creates this inequitable situation, and Senator Bayh mentioned the example I am going to discuss for a minute, which is that of the tenure and promotion process. This faces all tenure-track faculty members.

Tenure decisions are made approximately 7 years after entry into the professorate at the assistant professor rank. The model for this evaluation assumes a trajectory for career success after attaining a Ph.D. or completing a post-doc that does not take into account that this is also the prime time for having children and starting families. Research by Dean Sue Rosser at Georgia Tech shows that balancing a career and family is, in fact, the most significant challenge facing women engineers and scientists today.

I was personally quite taken by this when I moved from industry to the university in 1994. I had my first child at Hughes Research Lab, and then a year later moved to Georgia Tech and found that many women felt they must forego childbirth and child rearing until after achieving tenure. Since tenure is often awarded in a person's early to mid-thirties, peak fertility is bypassed by doing this, and this is an incredible disincentive to women in the academy.

So how can we use Title IX to help women graduate students and faculty in the academy? During the past 30 years, Title IX, as we heard here, has created tremendous change in athletics. Now is the time we must use its power for science and engineering, with the hope that the results will be as dramatic. Universities must comply with Title IX to receive Federal funding. The Government can and should do more to ensure compliance in the specific areas of educational opportunities for women in science and engineering.

First, since graduate programs across the Nation are the primary training ground for our future faculty members, universities can be required under Title IX to create more institutional graduate support, such as scholarships for women graduate students. Successful recruiting and retention of women in graduate school creates the new faculty members we need.

Second, engineering programs can and should do more to ensure that their female faculty members and students have an equitable share of the resources provided by the institution. Title IX can be used to ensure that the financial aid and research support are equitably distributed among graduate students.

Third, university leaders must be accountable for the work environment they steward. They can be held accountable under Title IX provision for continuous improvement in the environment for

women, and there are many approaches for doing this that will address the student and faculty needs. For faculty, these include better work-family policies, including tenure clock extension, and for students these could include requiring mentoring programs such as women in engineering programs.

Federal funding is critical to science and engineering, and we must ensure that women principal investigators are well-represented in funding agencies, research, and education portfolios. The NSF has been proactive in its goal to support more women scientists and engineers through specific programs, and one such program, called Advance, supports not only individual women but activities that lead to institutional change. This type of program could prove to be a model.

In conclusion, I would just like to say from my experience dedicated leadership clearly does lead to positive change. When I moved from Georgia Tech to Duke University in July of this year, Dean Kristina Johnson at the Pratt School of Engineering had just completed a year of hiring new faculty in which she hired—over 50 percent of the entering new faculty were women, which was really an incredible thing to occur in an engineering program, so the growth of the women faculty members will profoundly affect the environment of the women faculty and students alike.

As my closing statement I would just say, as the mother of two boys that I actively encourage and hope some day may decide to be engineers, I fully believe these changes will benefit them as well as their female friends.

[The prepared statement of Dr. Brown follows:]

PREPARED STATEMENT OF DR. APRIL S. BROWN, PROFESSOR AND CHAIR, DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING, DUKE UNIVERSITY

Senator Wyden, Members of the Subcommittee on Science, Technology and Space, and congressional staff, I am pleased and honored to have the opportunity to share my perspective with you today on how we can take important steps to remove a formidable threat to our future: the declining number of engineers and scientists. Our opportunity today is to consider how we can apply an existing law, Title IX of the Education Amendments of 1972, to increase the number of women engineers and scientists.

This panel has already heard compelling testimony that describes how the shrinking pool of scientists threatens our national security, including a citation of the Hart-Rudman Commission on National Security to 2025, which warned that America's failure to invest in science and to reform math and science education was the second biggest threat to our national security; and NASA Administrator Sean O'Keefe's revelation that NASA's current over-60 workforce is three times larger than its under-30 workforce.

I know you are well aware of the barriers to success women and girls face in scientific and technological careers from your previous work on this Committee, so I will focus today on the opportunity provided by Title IX to eliminate them.

Though its most visible success has been in athletics, Title IX is an education law, not a sports law. Universities and governmental funding agencies can apply Title IX toward bringing more women into careers in science and engineering. The resulting pool of scientists and engineers will be larger and more diverse, which means we as a nation will be better prepared for the technological challenges our future will bring.

I am a professor in the field of electrical and computer engineering. Like many other women engineers, I considered engineering as a career because I had an engineer—my father—in the family. We must reach a point in this country where we do not have to rely on family members to interest girls in engineering, and where we are committed as a society to the participation of girls and women in engineering. We must develop role models—successful and visible women engineers in academia, industry, and the government. Role models show young women that they,

too, can do it! Role models are especially critical at educational transitions from high school to college and then on to graduate school. It is during these transitions that we lose many women on the journey to full and successful careers in engineering and science.

Reasons why we lose many would-be engineers include inadequate math and science preparation in K–12 education, the poor public understanding of engineering, and the traditional delivery of engineering education, but my specific focus is on the success of women engineers in the academy. They are the role models and shapers of education and research. Their experience starts in graduate school—the initial training ground of our future professoriate.

We must increase the number of women faculty members in science and engineering to increase the number of women engineers and scientists in the workforce. Less than 10 percent of engineering faculty members are women. My field, electrical and computer engineering, is the most rapidly growing engineering discipline. Yet in ECE, only 7 percent of the professoriate are women. Even the engineering programs with the highest percentages of female faculty in the country have less than 30 percent women.

Women science and engineering faculty members are necessary for an excellent engineering education. William Wulf, president of the National Academy of Engineering, identified diversity as a key imperative for an agenda for change in his article "A Makeover for Engineering Education," in the journal *Issues in Science and Technology*, Spring 2002. He states, "Our creative field is deprived of a broad spectrum of life experiences that bear directly on good engineering design." He's saying that engineering is about solving problems, and the more viewpoints that examine a problem, the better the chances of solving it. The undergraduate and graduate educational experience shapes our future engineers and scientists. A *diverse* faculty offers a much richer educational and research experience to these students.

Women students are drawn to women faculty and seek them out. Studies have shown that women faculty members are the primary research advisors to a larger number of female students than men (Mary Frank Fox, in *Equal Rites, Unequal Outcomes: Women in American Research Universities*, edited by L. Hornig. New York: Kluwer Academic/Plenum Publishers, 2002). Many women are lost along the way if they cannot identify and relate to a teacher for guidance toward a successful career. My own experience bears this out. I joined a graduate research group at Cornell University led by Professor Lester Eastman, who actively sought out female students—a rare occurrence at the time. I worked most closely with other women in my group. When I took my place on the faculty at the Georgia Institute of Technology in 1994, female students sought me out. My first two Ph.D. students were women: Dr. Carrie Carter-Comen and Dr. Georgiana Dagnall.

Understanding the Barriers to Women Scientists and Engineers in the Academy

Women graduate students and engineers in the professoriate have different experiences from men. The MIT Study on the Status of Women in Sciences made headlines in 1999 when the university unveiled its self-assessment showing that women received a smaller share of important resources: space, start-up research funding, etc. in comparison to men. In 1998, I co-chaired the Task Force on Opportunities for Women in Engineering at Georgia Tech that showed that women are significantly concerned about the balance of work and family. Just last week, the University of Michigan unveiled its climate study on women faculty in science and engineering.

Studies have shown that women have less access to important resources than men. Women report fewer mentors than men. Women have fewer graduate students than men. Women serve on more committees than men, yet they do not Chair Committees as often as men.

Research done by Mary Frank Fox, a sociologist at Georgia Tech, shows that engineers and scientists must be part of social networks for success in their fields. Developing collaborations, attracting the best graduate students to their laboratories, receiving guidance through mentors, and being asked to serve on important conference committees are critical to career success and happen through social interactions. The environment is created by the interplay of social processes and organizational policies and practices, such as ways in which people are evaluated and rewarded. They cannot be separated from each other.

Professor Virginia Valian, a psychologist at Hunter College, shows in her recent book *Why So Slow: the Advancement of Women* that despite general gains we have made in understanding the personal and social ills created by discrimination, day-to-day decisions that impact people are often unconsciously made on the basis of generalizations, or schemas. These schemas, still supported by media images, tell

us that engineering remains a "masculine" profession, and women are less likely than men to attain success in science and engineering. Women find themselves disadvantaged by the cumulative effects of a succession of decisions based on these schemas that place more resources in the hands of their male colleague down the hall.

Organizational practices and policies are just as critical. One example is the tenure and promotion process that faces all tenure-track faculty members. For most of us, tenure is more about continuing on in our positions, than about a lifetime job guarantee. Tenure is granted to the successful faculty member by an in-depth evaluation of his or her research and educational contributions by peer faculty committees. Gender schemas obviously come into play in this process. Tenure decisions are made approximately seven years after entry into the professoriate at the assistant professor rank. The model for evaluation assumes a trajectory for career success after attaining the Ph.D. that does not take into account that this is also the prime time for having children and starting families. Research by Dean Sue Rosser at Georgia Tech (*Journal of Women and Minorities in Science and Engineering*, vol. 8, pp. 163–191, 2002) shows that balancing a career and family is, in fact, the most significant challenge facing women engineers and scientists today.

I was personally quite taken by the real impact the timing of tenure and promotion has on people when I moved from industry to the academy. I had my first child after earning my Ph.D. and while working at Hughes Research Laboratories. When I joined Georgia Tech one year later as an associate professor, I learned that many women feel they must forgo childbirth and rearing until after tenure. Since tenure often is awarded in a person's early to mid-thirties, peak fertility is bypassed. This is an incredible disincentive to women in the academy.

How can we use Title IX to help

Title IX's regulations require institutions that receive federal funding to provide equitable athletic opportunities for all students, regardless of sex, in three separate areas: participation, treatment of athletes, and athletic scholarships. But Title IX does not just apply to athletics. The law states that "No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any educational program or activity receiving federal financial assistance."

During the past 30 years, Title IX has created tremendous changes in athletics. Now is the time to use its power for engineering and sciences, with the hope that the results will be as dramatic.

Universities must comply with Title IX to receive federal funding. The government can and should do more to ensure compliance in the specific area of educational opportunities for women in science and engineering.

First, since graduate programs across the nation are the primary training ground for the professoriate of the future, universities could be required under Title IX to create more institutional graduate support (scholarships) for women graduate students. Successful recruiting and retention of women in graduate school creates the new faculty members we need to attract more women undergraduates to science and engineering.

Second, engineering programs can and should do more to ensure that their female faculty members—and students—have an equitable share of the resources provided by the institution. Title IX can be used to ensure that both financial aid and research support are equitably distributed among graduate students.

Third, university leaders must be accountable for the work environment they steward. They can be held accountable under Title IX's provision of continuous improvement of the environment for women, and there are many approaches for doing that for both students and faculty members. For faculty, these include better work-family policies, including tenure clock extensions. For students, these include supporting mentoring opportunities, such as Women in Engineering programs.

Federal funding is critical to science and engineering, and we must ensure that women principal investigators are well represented in funding agencies' research and education portfolios. The NSF has been proactive in its goal to support more women scientists and engineers through specific programs. One such program, ADVANCE, supports not only individual women, but activities that lead to institutional change. This program may prove to be a model for the type of organizational change we need in the academy.

Conclusion

Dedicated leadership clearly leads to great positive change. One reason for my move from Georgia Tech to Duke University was the representation of women leaders in the highest positions at Duke: Dean Kristina Johnson at the Pratt School of

Engineering and President Nan Keohane. President Keohane has spearheaded a campus-wide initiative on the status of women at Duke. Through Dean Johnson's leadership, more than half of the faculty members hired in the Pratt School this past year are women. The growth of women faculty members in the Pratt School will profoundly affect the environment for women faculty members and students alike.

As the mother of two boys that I hope will someday consider becoming engineers, I fully believe that these changes will benefit them as well as their female friends.

Senator WYDEN. Thank you. Very helpful.

Ms. Greenberger, welcome.

STATEMENT OF MARCIA GREENBERGER, CO–PRESIDENT, NATIONAL WOMEN'S LAW CENTER

Ms. GREENBERGER. Thank you very much, Senator Wyden. Thank you for your leadership in this most important area, for holding these hearings, and for all of the other areas that you have been such an important force for advancing the interest of women and families both in the House of Representatives and now in the Senate. We are very grateful for all that you have accomplished, and look forward to your leadership in this area in the future.

With me are Jocelyn Samuels and Leslie Annexstein from the National Women's Law Center, who have been working tirelessly on the issue of Title IX across the board, and two new advocates beginning their careers with the National Women's Law Center working on this testimony, Melissa McKenna and Erin Fitzpatrick. It takes a lot of effort and time to chronicle the kinds of problems that this Committee has been studying and identifying in the area of women in science and engineering, and it takes sustained effort.

One of the important lessons that athletics has taught us, is that it has been a sustained effort with public attention, as has been pointed out, that has been required to get women as far as they have in the area of athletics, and we know with only 32 percent of athletics budgets, for example, going to women, even with the progress there is much more to be done in that area, let alone the areas we are discussing today.

It is also a great pleasure to be here with the other Members of this Committee, but I have to single out Senator Bayh for his extraordinary leadership not only in pushing Title IX forward—without his leadership we would not have a Title IX—but that leadership has continued over time through assaults on Title IX and up to this day. With those assaults, Senator Bayh speaking out and being a champion in our quarter is really a wonderful asset.

The Center, as Senator Bayh has said, was founded 30 years ago, just as Title IX was passed. We work in the areas of education, employment, health and reproductive rights, and economic security for women, and so it is no accident that Title IX has been a central part of our focus over those years.

One thing to point out about Title IX that is so important to focus on, especially for this Committee, is that of course it applies, as has been pointed out, to elementary and secondary schools and colleges and universities across the country, but it also applies to other education programs and activities, whether they are part of schools or not, that receive Federal funds. That means research labs, whether they are connected to universities or not. They can be in academic settings or they can be in commercial settings.

Title IX has an extraordinary reach and promise, and it is exactly right that it has not been given the kind of enforcement and attention that is necessary in this area. I will not repeat some of the statistics that have been discussed today about the serious under-representation of women in math and science and engineering and technology, and I appreciate our statement being introduced for the record that goes through those statistics.

I do want to say two quick things. First of all, we are not seeing a steady improvement across the board. These problems do not improve on their own. One very distressing fact is a downward trend, for example, in the number of women receiving bachelor's degrees in computer and information sciences, which reached a high of 37 percent in 1984, but dropped to 28 percent in 1999 to 2000. And while the Department of Education official rightly pointed to progress of 1 percent to 17 percent in engineering, for example, from the passage of Title IX to today, who could be satisfied with a 17 percent figure as a testament to what Title IX has accomplished.

Senator WYDEN. Ms. Greenberger, let me make sure I got that number. You said that the number of women graduating in computer science has dropped, 9 percent, did you say, from 37 to 28?

Ms. GREENBERGER. Yes, from 1984 to 1999–2000.

Senator WYDEN. Just out of curiosity, while we are on this point, do you disagree with that, Mr. Jones?

Mr. JONES. I am actually not aware of what the specific number is. I assume that is from the Digest of Educational Statistics from the Department of Ed.

Ms. GREENBERGER. I know it is footnoted in the written testimony.

Senator WYDEN. We will get into some of these issues in questions. Excuse me.

Ms. GREENBERGER. And I did want to point out one other important statistic that shows that we are not always making progress, even slow progress. The gap between the median annual salaries of men and women in science and education occupations has increased over time. In 1999, women earned an average of $14,000 less than their male counterparts, compared to $10,000 less in 1993.

Now, what is happening here, and what can we do about it? There are clearly areas of discrimination, discouragement, steering, harassment that have been documented that are violations of Title IX. There is a recent study that found that 71 percent of male teachers believe that male students are more interested in the mechanics of computer technology, and are more likely to attribute boys' success in technology to talent, while dismissing girls' success as due to luck or diligence.

There has been deficient career counseling in secondary schools. We have seen post secondary programs with female students transferring out of these areas more often than their male counterparts. We have seen the problem of low faculty expectations and gender bias. The National Women's Law Center released a study in June of this year looking at the area of vocational and technical high schools across the country, where we found shocking statistics showing virtually no progress over the last 30 years, with AP

courses in calculus, statistics, biology, chemistry, physics, or computer science far less likely to be even available to young girls that are in vocational and technical high schools in traditionally female programs than in traditionally male programs.

Those young girls often are tracked with choices they make in the eighth grade, and then they find themselves without the kinds of core math and science courses that allow their talents to shine through, so that by the time they get to college, or, let alone to post secondary programs of different sorts, many of these options are behind them. So, we would urge that while a focus certainly be kept on the college and post college level, the tracking that happens far below those levels for younger girls not be ignored.

I want to also quickly point for a minute to some of the studies and some of the disturbing arguments that I must say I hear more and more over the last couple of years that really resonate with what I remember hearing when Title IX was passed in 1972, and that is that women are either not as good in these areas because of biology, or that they are not interested in these areas and they like going into the kind of areas where there is less pay, less opportunity for promotion, and less career advancement. The argument is that these are the women's choices.

We hear that more and more, of course, in the area of athletics. The Title IX commission that has been established has been told that the fact that only 40 percent of athletes are women is a reflection of women's interests, that they are really not interested in having a 50–50 chance to play, and that women are unsuited to competitive athletics. These are like the arguments that women are not suited to the kinds of math or science careers that are the subject of this hearing.

Finally, I want to look at the issue of Title IX enforcement, and there has been a discussion about attitudes, for sure, that are needed to be changed, but attitudes often get changed when we have laws and enforcement of those laws that set out our principles of equal opportunity. We do not wait for attitudes to change, and fortunately we did not wait for attitudes to change when we passed the landmark civil rights laws, and whether people had racist attitudes or not the law went in, the enforcement went forward, and people learned because of the enforcement about the talents and the skills of all of our population.

I have to admit that I did grow up at a time pre Title IX. I did go through college and law school before Title IX was passed. I was sitting here trying to think about whether I would publicly say it, but I will. In any event, I do know from first-hand personal experience of a time when I was told that going to law school was not something that a woman would be interested in, that it was inconsistent with having a family, that it was not possible to be a good lawyer because women were not as aggressive and, as a matter of fact, that it would be something that I would not like doing anyway.

It was for a variety of reasons that I was able to overcome those stereotypes and, as Senator Bayh pointed out, there are many, many young women who have followed into law schools now, and nobody would suggest women do not make good lawyers today, but those attitudes die hard. The challenges and attacks on Title IX are

serious. They will affect all of Title IX, and I want to go through what I think are absolutely critical areas for this Committee.

Senator WYDEN. If you could just highlight your additional concerns, we will make them a part of the record in their entirety.

Ms. GREENBERGER. I would like to just talk about some of my concerns with the Office for Civil Rights' enforcement that is happening right now, and what I hope this Committee will do in addition to the very important things, Senator Wyden, that you had outlined in the beginning of the hearing. All of those actions I think are absolutely essential and are very, very important for this Committee to pursue.

I was concerned to hear the statistics from 1994 of compliance reviews being done in the area of math and science. I would like to know what statistics there are with respect to compliance reviews being done in 2002, not 1994. It is our understanding that there are very few of those compliance reviews being initiated by the Office for Civil Rights right now.

It is also my understanding from testimony from the head of the Office for Civil Rights that sexual harassment guidelines and policies that are in place may be under review, and that has been a very important barrier that has to be broken down in opening up nontraditional areas such as math and science for women. If it is true that those sexual harassment policies are under review, just as the Title IX athletics policies are, and other policies are, then we are really turning the clock back, and I think serious oversight with respect to that is essential.

When the Center issued its report with respect to vocational education, it filed 12 petitions for compliance reviews in each region of the country with the Office for Civil Rights. We do not know to this day whether even one compliance review in this area per region will be conducted or is planned.

Further, the National Science Foundation, NASA, the Department of Energy, and the National Institutes of Health, who give major grants and conduct their own programs as well as fund others, have Title IX responsibilities. One of the things that President Clinton did in acknowledgement of the 25th anniversary of Title IX was to ensure that all of the departments and agencies that have Title IX responsibility, actually issue regulations under Title IX.

Now that they have, or not every single one has, almost all have, we are very concerned that they take those regulations and actually enforce them, so we would want and hope that you would look at what the National Science Foundation, NASA, and other parts of Government agencies that are subject to this Committee's jurisdiction, are doing with respect to their own Title IX regulations.

What are they doing with respect to their own programs, not just doing the studies, but what kind of compliance reviews have they scheduled? Are they getting complaints? Have they informed anybody in the public that they could file complaints with them, that they do not have to look only at colleges and universities, but major research labs in private industry, nonprofit research labs are subject to Title IX as well, and also what kind of coordination with the Office for Civil Rights at the Department of Education is going on.

We would suggest as well some serious look at a number of bills proposed with respect to funding to help train teachers and im-

prove their skills with respect to math and science and technology, to include skills and teaching all of students, both male and female students, and also programs to encourage young girls to look more broadly with respect to their career horizons, and finally, GAO studies to look at what kind of compliance activities are happening in the Government, what kinds of strategies are useful. The kind of GAO research could be very, very instrumental.

And my final sentence comes from Representative Patsy Mink. I think she is on all of our minds. She was actually, during the brief period when she was not in public service, on the board of the National Women's Law Center, and so her loss is a personal one to us as well as, obviously, a great loss to women and men across the country.

She said in 1971, "discrimination against women in education is one of the most damaging forms of prejudice in our Nation, for it derives a high proportion of our people an opportunity for equal employment, and equal participation in national leadership." We know, you know how true those words are, and we are very grateful for your leadership in pursuing Title IX.

Thank you.

[The prepared statement of Ms. Greenberger follows:]

PREPARED STATEMENT OF MARCIA GREENBERGER, CO-PRESIDENT, NATIONAL WOMEN'S LAW CENTER

I am Marcia Greenberger, Co-President of the National Women's Law Center. Thank you for the invitation to appear before you today to discuss the applicability of Title IX of the Education Amendments of 1972 (Title IX) to opening up opportunities for women interested in pursuing degrees and careers in mathematics, engineering and the hard sciences. We are especially pleased to have this opportunity because this year is the law's 30th anniversary. While much progress has been made in the last three decades, much remains to be done to ensure that women have equal access and opportunities in all areas of education.

The Center is a non-profit organization that has worked since 1972 to advance and protect the legal rights of women and girls across the country. The Center focuses on major policy areas of importance to women and their families, including education, employment, health and reproductive rights, and economic security—with particular attention paid to the concerns of low-income women. Founded in the year that Title IX was passed, the Center has devoted much of its resources to ensuring that the promise of Title IX becomes a reality in all aspects of education.

Title IX was enacted in 1972 as a broad proscription against discrimination in any federally funded education program or activity. It states simply:

> No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of or be subjected to discrimination under any education program or activity receiving Federal financial assistance.[1]

Title IX applies to most elementary and secondary schools and colleges and universities. It also applies to programs and activities affiliated with schools that receive federal funds. It was intended to ensure equal opportunity for women and girls in all aspects of education—from access to higher education, to equal opportunities and fair treatment in elementary and secondary classrooms, to equal opportunities in athletics programs. In passing Title IX, Congress recognized that it is through education that women have the means to a better economic future for themselves and their families. Congress' vision has borne fruit: thirty years after enactment of the law, we have more women doctors and lawyers, as well as women athletes winning medals and trophies—all of whom help defy gender stereotypes about the interests and abilities of women and girls.

[1] Title IX of the Education Amendments of 1972, 20 U.S.C. § 1681 *et seq*.

I. Women and Girls are Underrepresented in Math, Science, Engineering and Technology.

Despite this progress, women remain underrepresented in the traditionally male fields of math, science and engineering. Gender disparities in math and science start small and grow as students advance in school, with boys outperforming girls on standardized tests and participating in math and science classes at higher rates in high schools, and men majoring in math and science at higher rates than women at the post-secondary level.[2] Similarly, at both the high school and post-secondary levels, female students are less likely than their male counterparts to receive training in computers and technology beyond the traditionally female areas of word processing or data entry.[3] This underrepresentation is particularly problematic at this time in our history, when proficiency in science, math and the information sciences is critical to jobs in a technological society.

While women have made remarkable progress in pursuing college degrees, they are still underrepresented in the areas of math, science and engineering—underrepresentation that grows larger at the master's and doctorate degree levels. In fact, the only science in which women receive bachelors' degrees in rough proportion to their presence in the student body is the biological /life sciences, where women receive 58 percent of bachelor's degrees and 55 percent of master's degrees. But even in this field, women lose their majority to men at the doctorate level, with women receiving only 44 percent of doctorate degrees.

And in other fields, the news about women's participation is worse. For example:

- In mathematics and physical sciences women are working towards parity with men at the bachelor level where women receive 47 percent of bachelor's degrees in mathematics and 40 percent of bachelor's degrees in physical sciences. However, women are awarded only 25 percent of doctorate degrees in each of these areas.
- In computer and information sciences, there is actually a downward trend. The number of women receiving bachelor's degrees in computer and information sciences reached a high of 37 percent in 1984, but dropped to 28 percent in 1999–2000.
- The most disturbing disparity lies in engineering, where women receive only 18 percent of bachelor's degrees, 21 percent of master's degrees, and 15 percent of doctorate degrees. (See attached charts.)

These disparities in the student body are mirrored by similar gender disparities in the employment of female professors in math, science and engineering. For example, in engineering, women are only 8.9 percent of tenured or tenure-track faculty, and only 4.4 percent of full professors.[4] They are only 25 percent of the full-time instructional faculty in natural sciences.[5] (See attached chart.)

As Representative Patsy Mink stated in 1971, "discrimination against women in higher education is one of the most damaging forms of prejudice in our Nation for it deprives a high proportion of our people of the opportunity for equal employment and equal participation in national leadership."[6]

Moreover, while girls the gender gap is narrowing in mathematics and science at the high school level, girls continue to lag behind their male counterparts in several key areas. For example:

- Girls score 35 points below boys on the math portion of the SAT.[7]
- Across all racial and ethnic groups, males are more likely than females to attain high scores on the AP biology examination and the AP calculus examination.[8]

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[2] National Coalition for Women and Girls in Education, *Title IX at 30: Report Card on Gender Equity*, 37 (June 2002).

[3] *Id.* at 52.

[4] Margaret Mannix, *Facing the Problem*, Prism Journal of Engineering, Vol. 12, No. 2 (October 2002).

[5] U.S. Department of Education, National Center for Education Statistics, Digest of Education Statistics (2001), at *http://nces.ed.gov/pubs2002/digest2001/tables/dt.235.asp.*

[6] 117 Cong. Rec. 2658 (1971).

[7] The College Board, *2001 Profile of College Bound Seniors*.

[8] Educational Testing Service, *Differences in the Gender Gap: Comparisons Across Racial/Ethnic Groups in Education and Work*, pp. 38–39 (2001).

- In 1997, girls comprised only 37 percent of students enrolled in Advanced Placement (AP) computer science classes across the nation, and in twelve states comprised less than 20 percent of the students.[9]
- Girls are less likely than boys to take math courses beyond algebra II, and boys far outnumber girls in physics and computer classes.[10]

II. This Underrepresentation has Significant Consequences for Women.

The gender disparities in math, science, engineering and technology have a deep impact on the earning power and career prospects of women. For example:

- Women employed in science are most likely to work in natural sciences, where they comprise 35 percent of the workforce. The annual mean income for natural sciences occupations is $47,790. This is significantly less than the annual mean income for computer and math occupations—$58,050—or for engineering (including architecture) occupations, $54,060. Women comprise only 30 percent of the computer and math workforce and a meager 11 percent of the engineering workforce.[11]
- Even where women and men have attained the same degree level, salary differentials persist. Women with a bachelor's degree in an area of science or engineering, earn 35 percent less than similarly situated men, and those with a doctorate degree earn 26 percent less than their male peers.[12]
- The gap between the median annual salaries of men and women in science and engineering occupations has increased over time; in 1999, women earned an average of $14,000 less than their male counterparts, compared to $10,000 less in 1993.[13] (See attached chart.)

Indeed, a 1997 report issued by the U.S. Department of Education noted several trends that inhibit educational and career opportunities for women, including women's lower number of degrees in computer science, engineering, physical science, and math compared with men, and the underrepresentation of women in jobs in scientific fields.[14]

III. Women and Girls in Math, Science, Engineering and Technology Face Persistent Barriers.

This pattern of underrepresentation at both the secondary and post-secondary levels of education is directly linked to the continuing barriers that female students face in these programs. For example, a recent study found that 71 percent of male teachers believed that male students were more interested in the mechanics of computer technology, and were more likely to attribute boys' success in technology to talent while dismissing girls' success as due to luck or diligence.[15] And deficient career counseling in secondary schools has been found to reduce women's entry into science and engineering at the university level.[16] Additionally, some research has demonstrated that in post-secondary programs, female students transfer out of science, engineering and technology-related majors more often than their male counterparts, in part due to experiences of gender bias and low faculty expectations.[17]

Further, many of our young women do not enjoy equal access to math, science or technology-related opportunities because of decisions made by their education systems about the placement of such opportunities. For example, an investigation conducted by the National Women's Law Center into educational opportunities for female students in New York City's vocational and technical high schools found that none of the four predominantly female vocational schools offer any AP courses in

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[9] U.S. Department of Education, Office for Civil Rights, *1997 Elementary and Secondary School Civil Rights Compliance Report, National and State Projections* (December 1999).

[10] American Association of University Women, *Gender Gaps: Where Schools Still Fail Our Children*, 13–14 (1998).

[11] U.S. Department of Labor, Bureau of Labor Statistics, at *http://stats.bls.gov/oes/2000/oes—15Co.htm.*

[12] Association of Women in Science, *Salary Differentials controlling for individual characteristics: 1999*, at *http://www.awis.org/statistics/statistics.html*

[13] American Women in Science, *Median Annual Salaries of Men and Women in Science and Engineering Occupations*, at *http://awis.org/statistics/statistics.html.*

[14] U.S. Department of Education, *Title* IX: 25 *Years of Progress*, 15–16 (June 1997).

[15] American Association of University Women Educational Foundation, *Tech-Savvy: Educating Girls in the New Computer Age*, *at* 24 (2000).

[16] Carolyn B. Ramsey, *Subtracting Sexism from the Classroom: Law and Policy in the Debate Over All-Female Math and Science Classes in Public Schools*, 8 Tes. J. Women and L.1 (1998).

[17] Congressional Commission on the Advancement of Women and Minorities in Science, Engineering and Technology Development, *Land of Plenty: Diversity as America's Competitive Edge in Science, Engineering and Technology*, at 31 (September 2000).

Calculus, Statistics, Biology, Chemistry, Physics, or Computer Science, although such courses are provided at the predominantly male vocational schools. According to our calculations, approximately 67 percent of male vocational students, but only 35 percent of female vocational students, attend a school that offers at least one math or science AP course. Similarly, the New York City Board of Education has implemented Cisco Networking Academies, which lead to industry certification in computer networking, at some of the vocational high schools, but has not placed this program in any of the predominantly female schools.[18]

Thus, a 2000 report of the United States Commission on Civil Rights found that "[t]hrough lack of counseling; stereotypical socialization; discouragement; less aggressive inclusion of parents in designing programs; gender-biased teaching styles, resources, and testing; and other barriers, girls are steered from math, science, engineering, and other technical fields."[19] Similarly, the Congressional Commission on the Advancement of Women and Minorities in Science, Engineering and Technology Development concluded that same year that "[a]ctive discouragement. . .contribute[s] to girls' lack of interest in [science, engineering and technology] careers."[20]

Women faculty members also face barriers at their institutions. A recent study on the status of female professors in science at Massachusetts Institute of Technology (MIT) drew national attention when the university publicly acknowledged discrimination against women faculty. In 1994, tenured women faculty in the School of Science at MIT formed a committee to investigate whether their individual experiences of veiled discrimination represented a broader framework of inequality.[21] The committee's report relied upon and analyzed data and interviews conducted with women faculty and department heads.[22]

The report found that tenured women faced "patterns of difference," evidenced by consistently lower salaries than their male peers, unequal access to resources and persistent exclusion from any substantive power at MIT.[23] The report also revealed a correlation between these "patterns of difference" and the tenured women's consistent reports of feeling excluded, disempowered, "invisible" and "marginalized" within their departments as their careers progressed.[24] According to the report, "as of 1999, there ha[d] never been a woman department head, associate head, or center director in the School of Science in the history of MIT."[25]

Unfortunately, despite evidence of the very real barriers that women and girls continue to face in these fields, gender stereotyped arguments about the abilities and interest of women and girls persist. Allegations continue to be made today, for example, that males outnumber females in doctoral degrees in fields such as physics and engineering because their spatial and mechanical aptitudes are superior to those of women, and that sex hormones are the cause of these differences between males and females.[26] These types of arguments have also been made repeatedly in an effort to deny women equal athletics opportunities, where critics of Title IX have asserted that women are less interested in sports than men. However, as Congress and the courts have consistently recognized, Title IX was enacted in order to remedy discrimination that results from stereotyped notions of women's interests and abilities and the law must be vigorously enforced to eradicate those discriminatory assumptions.

IV. Title IX Enforcement is Critical to Eliminating Barriers.

As this information demonstrates, vigorous enforcement of Title IX is necessary to ensure that discrimination on the basis of sex is stamped out. The Title IX regulations, promulgated in 1975, require federally funded education programs to take a variety of steps to prevent and address sex discrimination.[27] In particular, edu-

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[18] *See* National Women's Law Center, Letter to Chancellor Harold O. Levy, August 15, 2002, at *http://www.nwlc.org/pdf/LevyLetter.pdf.*

[19] United States Commission on Civil Rights, *Equal Educational Opportunities and Nondiscrimination for Girls in Advanced Mathematics, Science, and Technology Education: Federal Enforcement of Title IX*, 7 (July 2000).

[20] *Land of Plenty: Diversity as America's Competitive Edge in Science, Engineering and Technology* at 2.

[21] *A Study on the Status of Women Faculty in Science at MIT*, MIT Faculty Newsletter, Vol. XI, No. 4, March 1999, at *http://web.mit.edu/fnl/women/women.html.*

[22] *Id.* at 4.

[23] *Id.* at 7.

[24] *Id.* at 7–8.

[25] *Id.* at 12.

[26] Patricia Hausman, Independent Women's Forum, *Plenty of Nonsense, How the Land of Plenty Report Denies Female Scientific Achievement*, 14–15 (November 2000).

[27] 34 C.F.R. Part 106.

cation programs may not discriminate in recruiting, counseling, admissions or treatment of students. For example:

- Programs must ensure that counseling is not discriminatory and does not steer female students away from non-traditional areas, such as math and science.
- Programs must designate an employee to ensure Title IX compliance and to investigate complaints of sex discrimination.
- Programs must implement and disseminate a written policy prohibiting sex discrimination, with a process for filing grievances.

Importantly, the Title IX regulations require that if a program finds that a particular class is disproportionately male or female, that program must make sure that this is not the result of sex-biased counseling or the use of discriminatory counseling or appraisal materials.[28] Thus, math, science, engineering and technology-related programs have an affirmative obligation to review their own practices and remedy discriminatory practices that lead to underrepresentation of women in these areas.

The Department of Education's Office for Civil Rights (OCR) is recognized as the primary enforcement agency under Title IX. However, OCR has a mixed record on Title IX compliance and enforcement activities relating to women and girls in math and science education. For example, a recent review of OCR's activities indicated that few of OCR's Title IX cases have evaluated female students' access to and participation in science and math.[29] Moreover, it is unclear whether OCR is providing adequate technical assistance in this area. In April 1996, OCR released a "promising practices" document regarding access for women and minorities to math and science programs, to help school districts with an underrepresentation problem devise ways to ensure equal educational opportunity.[30] It is unclear whether OCR continues to make this document available to education programs today as it conducts technical assistance, or whether the underrepresentation of women and girls in math, science, engineering or technology programs is a priority issue for the office.

With its enforcement powers, OCR can effect great changes, but this requires resources and a greater commitment to enforce Title IX in all areas of education. Compliance reviews and other enforcement measures are needed to ensure that schools and programs are meeting their obligations under the law. In fact, OCR could be asked to undertake compliance reviews to determine the causes for women's lower participation in math and science, which decreases even more at the post-secondary level, and to take action to eliminate all forms of sex discrimination. Indeed, in a related area, in June 2002, the Center filed 12 Petitions for Compliance Review with each of the regional offices of OCR, requesting full investigations of the sex segregation in high school vocational and technical programs in specific states.[31] It is our hope that OCR will conduct full investigations and remedy any discrimination that has resulted in barriers to full educational opportunity for young women in these programs. Similar requests for compliance reviews of math, science, engineering and technology programs could generate beneficial results.

In addition to proactive compliance reviews conducted by OCR, any student or interested group may file a Title IX complaint with the federal government to challenge discrimination in math, science and engineering programs. Individuals whose rights under Title IX have been violated may also be able to bring a federal lawsuit against the education program or institution.

Conclusion

While there has been progress made over the last 30 years under Title IX, many battles still must be fought to eradicate sex discrimination in education and enable women and girls to realize their full potential. Women and girls continue to face unacceptable barriers in the non-traditional fields of math, science, engineering and technology. These barriers must be eliminated, and strong enforcement of Title IX is necessary to open up the door to equal educational opportunity. After 30 years of this important law, we still fall short of the educational landscape that the late Representative Edith Green and former Senator Birch Bayh envisioned when they

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[28] 34 C.F.R. 106.36 (c).

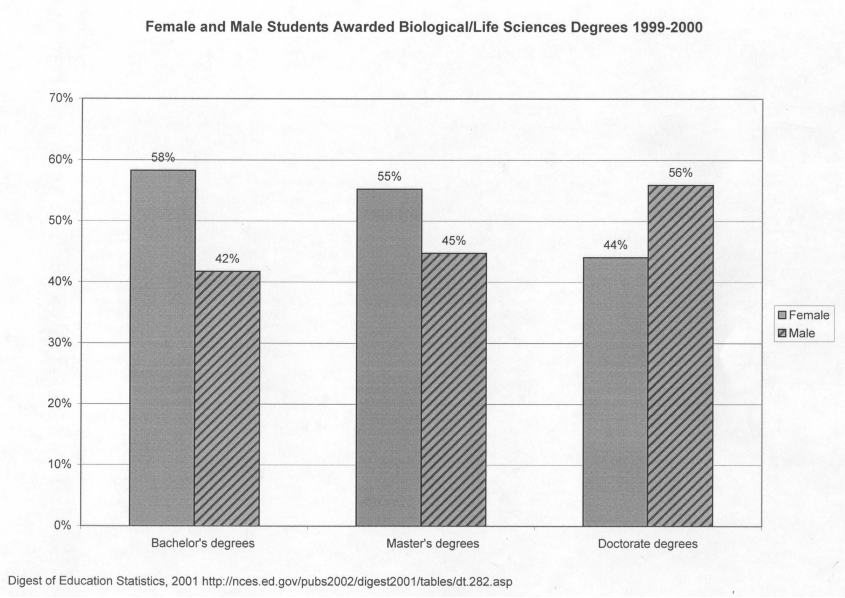
[29] *Equal Educational Opportunities and Nondiscrimination for Girls in Advanced Mathematics, Science, and Technology Education: Federal Enforcement of Title IX* , *at* 65.

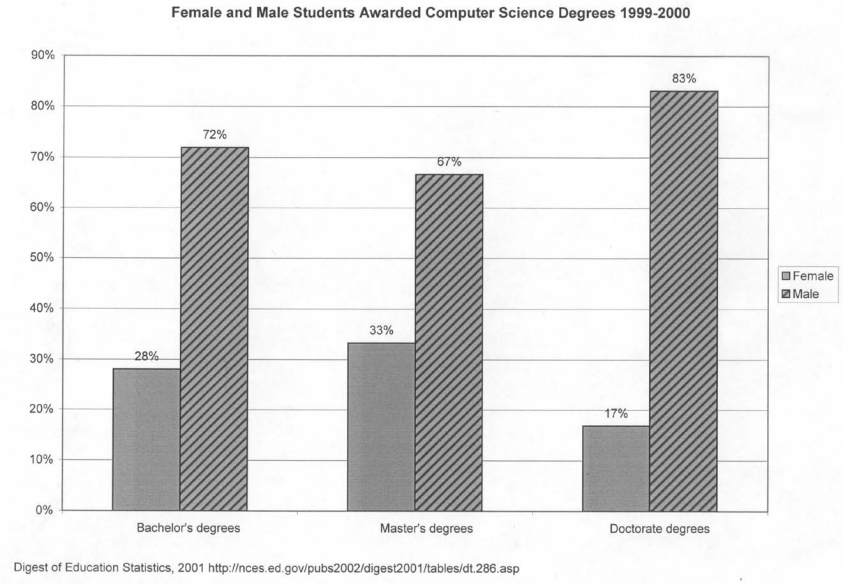
[30] U.S. Department of Education, Office for Civil Rights, *Promising Programs and Practices: Access for Women and Minorities to Mathematics and Science Programs and Gifted and Talented Education Programs*, April 1996.

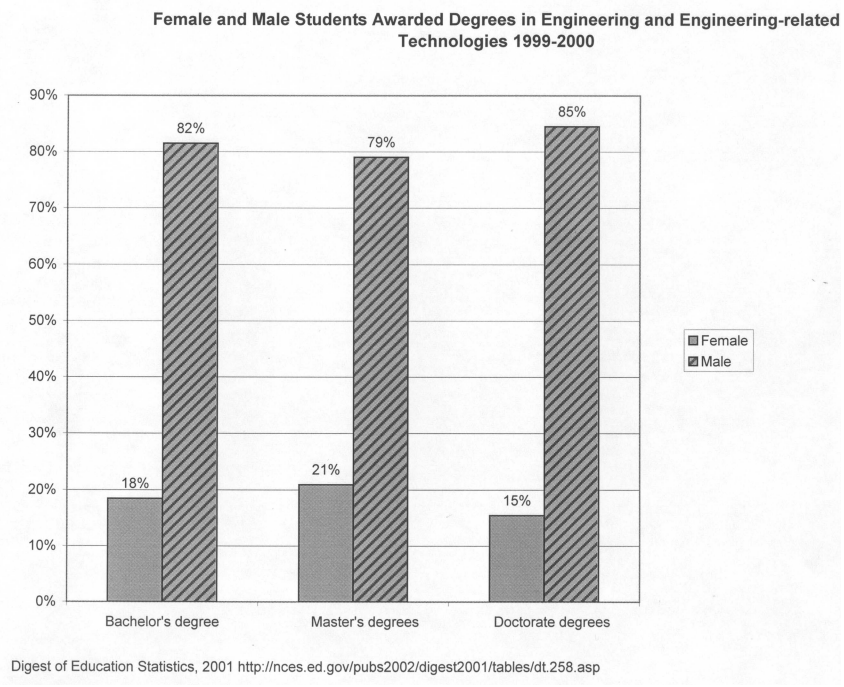
[31] *See* National Women's Law Center, Petitions for Compliance Reviews of High School Vocational and Technical Programs by the United States Department of Education, Office of Civil Rights, Regional Offices, at *http://www.nwlc.org/details.cfm?id=1138&section=education.*

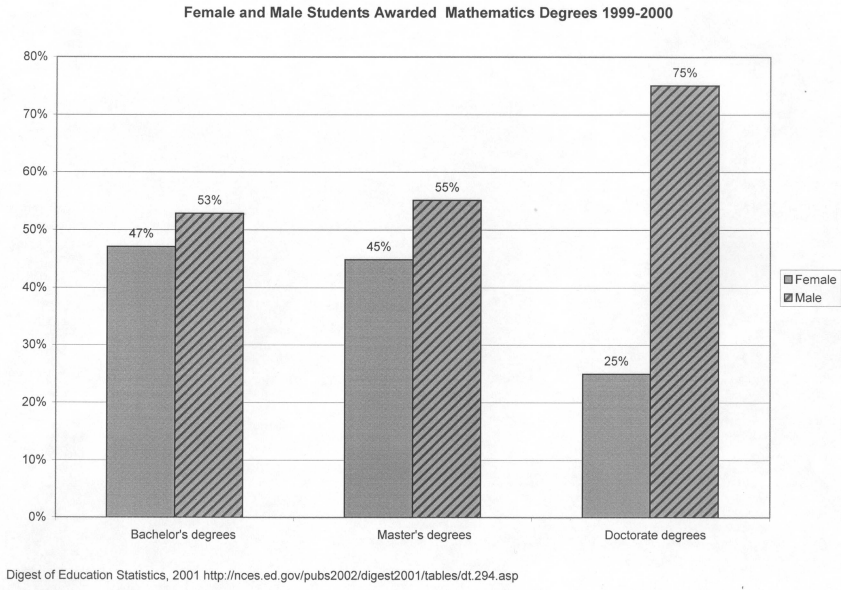
sponsored Title IX—namely, complete elimination of the "corrosive and unjustified discrimination against women" in education. As long as math, science, engineering and technology remain hostile fields for women, we will not have realized Title IX's promise. We must recommit ourselves today to making the letter and the spirit of the Title IX law a reality across all areas of education.

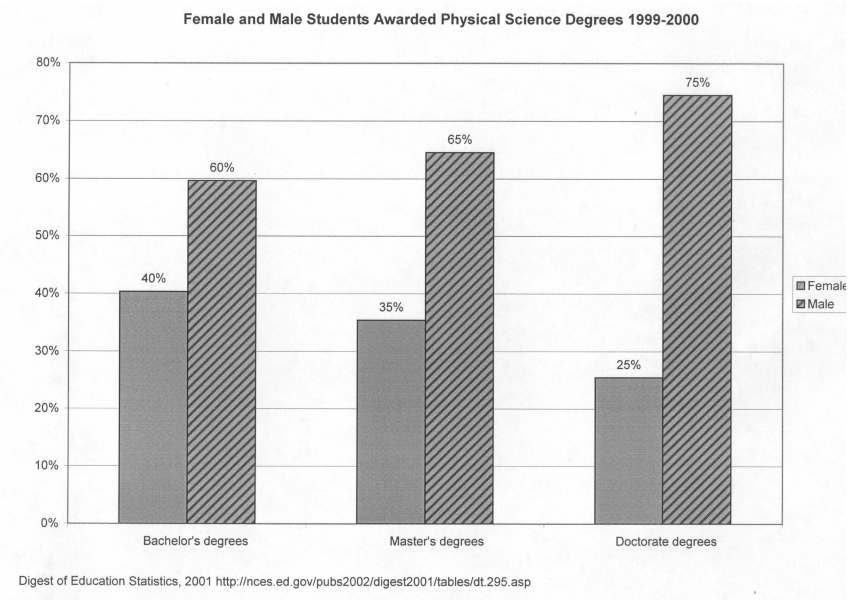
Thank you very much.


Female and Male Students Awarded Biological/Life Sciences Degrees 1999-2000
70%
60%
50%
40%
30%
20%
10%
0%
58%
42%
55%
45%
44%
56%
Bachelor's degrees
Master's degrees
Doctorate degrees
Female
Male
Digest of Education Statistics, 2001 http://nces.ed.gov/pubs2002/digest2001/tables/dt.282.asp


Female and Male Students Awarded Computer Science Degrees 1999-2000
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
28%
72%
33%
67%
17%
83%
Bachelor's degrees
Master's degrees
Doctorate degrees
Female
Male
Digest of Education Statistics, 2001 http://nces.ed.gov/pubs2002/digest2001/tables/dt.286.asp


Female and Male Students Awarded Degrees in Engineering and Engineering-related Technologies 1999-2000
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
82%
79%
85%
18%
21%
15%
Bachelor's degree
Master's degrees
Doctorate degrees
Female
Male
Digest of Education Statistics, 2001 http://nces.ed.gov/pubs2002/digest2001/tables/dt.258.asp


Female and Male Students Awarded Mathematics Degrees 1999-2000
80%
70%
60%
50%
40%
30%
20%
10%
0%
53%
47%
55%
45%
75%
25%
Bachelor's degrees
Master's degrees
Doctorate degrees
Female
Male
Digest of Education Statistics, 2001 http://nces.ed.gov/pubs2002/digest2001/tables/dt.294.asp



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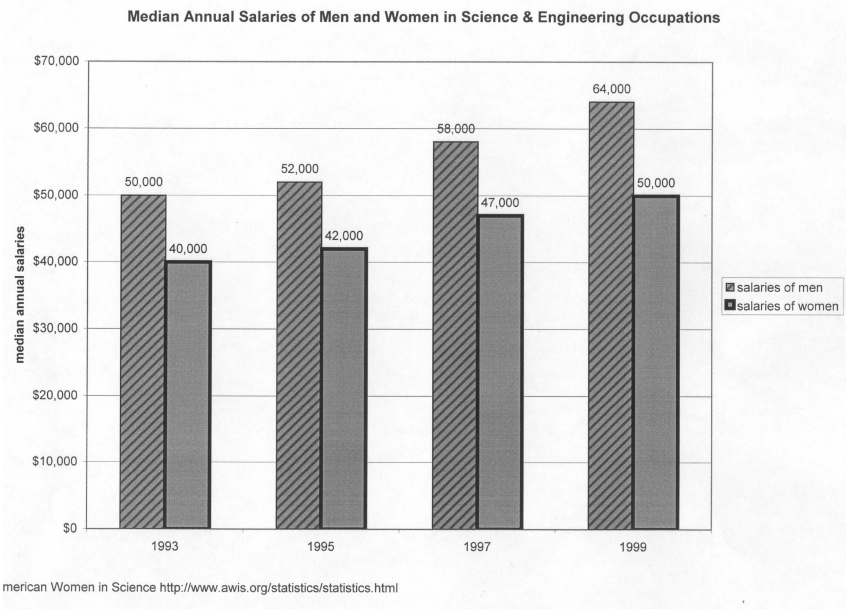
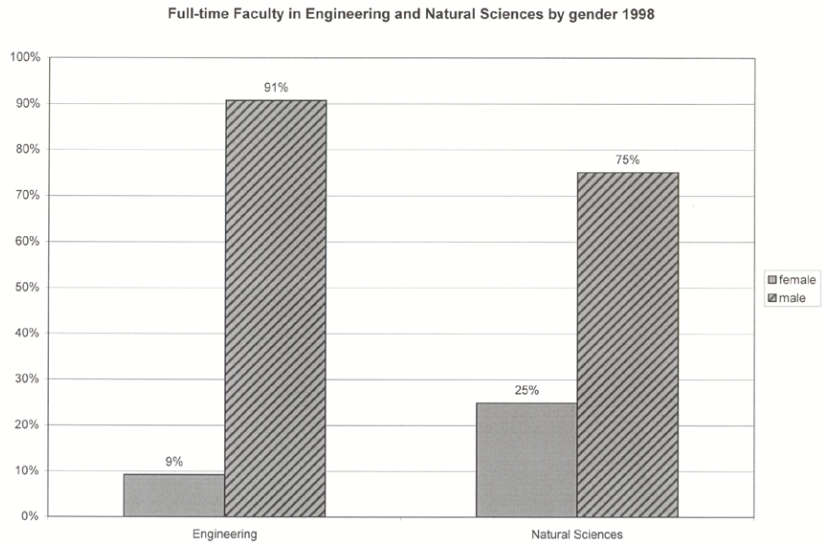


merican Women in Science http://www.awis.org/statistics/statistics.html



Digest of Education Statistics, 2001 http://nces.ed.gov/pubs2002/digest2001/tables/dt.235.asp

Senator WYDEN. Well said. We will have some questions in a moment.

Dr. Richmond, welcome.

STATEMENT OF DR. GERALDINE L. RICHMOND, RICHARD M. AND PATRICIA H. NOYES DISTINGUISHED PROFESSOR, DEPARTMENT OF CHEMISTRY, UNIVERSITY OF OREGON

Dr. RICHMOND. Thank you, Senator Wyden, and your staff members, for inviting me to attend this important hearing, and I am particularly proud, Senator Wyden, that my Senator has taken on this issue. It is a treat. I am a scientist, I am a researcher, and I am an educator at the University of Oregon. I have been doing chemical physics for the last 23 years as a faculty member. I have graduated numerous Ph.D. students who work in companies, Government labs, colleges and universities around this country, and I have taught introductory chemistry to several thousand undergraduates. Although you may think that is a little frightening, it is actually fun.

My research program involving laser spectroscopy and optics is supported by the National Science Foundation, the Department of Energy, and the Office of Naval Research. I have published volumes of research papers and served on more national and Statewide Committees than I care to count to oversee the health and vitality of the science enterprise in this country.

I am passionate about my science, my students, and my desire to see more women have the opportunity of a rewarding career that I have had. In 1997, I founded a group called COACh (Committee on the Advancement of Women Chemists)—how appropriate for this group—which is comprised of the most senior women academic chemists in this country. We are funded by the National Science Foundation, the Department of Energy, and the National Institutes of Health, and we seek solutions to the problems that are being addressed here.

As we seek a way to get more women into science careers, we must understand the scientific enterprise. Our country continues to be a world leader in science and technology because of the excellent training and exceptional accomplishments of our scientists. Those that scale the career ladder to obtain advanced degrees in science and engineering are the intellectual engines of this enterprise. The peer review process is a tool we use to measure scientific quality in this basic research and identify and reward the best science.

Unlike sports, where women's sports and men's sports are often separated, we do not separate our science by gender, nor do we want to. Our bodies are different, but our minds are comparable and strong, intellectually equal. The ladder one must climb to be a professor in a research university or laboratory is daunting to any incoming student. It takes 4 to 5 years to get a B.S. in science, 5 to 7 more to get a Ph.D., 2 to 4 additional years as a post-doctoral associate. All are usually done at different schools in different cities across the country.

The rigors of graduate school often demand a 60 to 70 hour work week, with an average stipend of 18 to 20 thousand dollars. This equates to $5 to $6 an hour. This low stipend makes it very difficult to pay off undergraduate student loans, buy a house, save

money, or have children. Those fortunate enough to be hired in a faculty position get to then spend the next 5 or 6 more years working even harder in order to get job security, or what we call tenure. For those counting, now you are in your mid to late thirties.

Further success in your endeavors leads you to promotion from associate professor to full professor, and if you are eventually elected to the National Academy of Sciences and Engineering, our hall of fame, you have reached the top rungs of the ladder.

The attrition of female scientists from this ladder is well-documented. As I travel the country, the concern I most frequently hear from female undergraduates and graduate students is the uncertainty about being able to handle a family and an academic science career, and how and when to fit children into this lengthy educational process, concerns of availability of good and flexible child care, financial stability, lack of maternity policies in most academic departments, particularly at the graduate student level. Others cite the lack of good role models, gender biases in the environment, and isolation, all of which contribute to our diminished ability to populate our academic institution with female faculty and consequently female students. It is no wonder so few women even think about applying for academic positions.

For those women who do choose to become professors, many factors slow their progress. These factors have a very damaging cumulative effect on their careers, outlined in Virginia Valian's book, *Why So Slow?* They arise from biases that originate in the culture of our scientific community and society. COACh has collected many stories of these factors in our workshops with women faculty from around the country. They make you cry, they make you mad, they make you wonder if it will ever get any better.

Gender bias in the peer review and teaching evaluation process, unfair tenure processes, heavy teaching and service loads, lower salary, less recognition for equal work, and resentment by colleagues for awards and recognition received that are only available for women, are all documented negative factors that accumulate over time, and lessen her ability to make it to the top rungs of the ladder and be an influential player in the education and research enterprise. Those familiar with accumulated interests know that even a small, 1 percent lower investment per year leads to an overall lower investment value of 25 percent over a 30-year period.

For women to flood the higher ranks of science as they have in sports, it is critical that we recognize the inherent differences in these two very different career paths as we seek to devise a solution. If Title IX is used as a tool, the key is in the implementation. Because of the flexibility that Title IX provides, there are good solutions and there are bad solutions, and we must seek only what is best for both the scientific enterprise and women.

My academic female colleagues in COACh believe that the approach must be targeted at three different levels, the individual researchers, the academic institutions, and the funding agencies.

First, every researcher and educator that receives Federal funding for scientific research that involves graduate students and research associates has the responsibility to assist in broadening the participation of women in the scientific enterprise. The National Science Foundation is on the forefront of trying to make this

change in the culture, with the October 1 mandate that all research proposals will now be judged on both scientific excellence and broader impact, what we call criteria 2, which includes the recruitment and retention of women in under-represented fields.

Second, all funding agencies that support research programs that involve training, such as research undergraduate students, graduate students, and post-doctoral associates, need to take appropriate action to assure that women are active players and leaders in the current and future scientific and technological workforce. This includes NSF, Department of Energy, NASA, NIH, and the DOD mission agencies. They all fund graduate students, and they need to be reminded that this is important. At a minimum, they should be following NSF's model of following criteria 2 in the evaluation process.

And third, educational institutions receiving Federal research funding need to demonstrate a commitment and sustained progress on increasing the number of female educators and participants in the scientific enterprise. The Advance program which was alluded to earlier at NSF has brought in lots and lots of ideas from institutions across the country. Seventy-two proposals were received this week from institutions across the country for changes that can happen in different universities. Only about eight or nine will be able to be funded. That is really unfortunate, but what we need to do is to make sure that those ideas get the kind of funding that they deserve in order to have these women see the lifeline coming to them.

It is vital for both the security of our Nation and the health of our global economy that this Nation's workforce be comprised of the brightest and the best minds in this country. I look forward to the day when more women can have the deeply rewarding career that I have had in my science, teaching, and friendships with other women scientists at the University of Oregon and sprinkled around the country.

Thank you very much for your attention to this issue, Senator Wyden.

[The prepared statement of Dr. Richmond follows:]

PREPARED STATEMENT OF DR. GERALDINE L. RICHMOND, RICHARD M. AND PATRICIA H. NOYES DISTINGUISHED PROFESSOR, DEPARTMENT OF CHEMISTRY, UNIVERSITY OF OREGON

I wish to express my sincere pleasure in being asked to speak at this important hearing on my two favorite topics, science and women in science. I come to you as a practicing scientist, researcher and educator. I have the best job in the world. Back home in my wonderful state of Oregon, and the University of Oregon, I have the privilege to spend my days working closely with my research students on experiments that employ lasers to understand chemical and biological processes at surfaces. In my 23 years as a professor in the field of chemical physics I have graduated numerous Ph.D. students who currently occupy positions in companies, government laboratories, colleges and universities around the country. In order to carry out this state-of-the-art research program, each year I spend endless hours raising at least a half million dollars from the Federal research agencies relevant to my work, from agencies such as NSF, DoE and DOD. I have published volumes of papers on our results and have served on numerous national and statewide committees that oversee the health and vitality of the scientific enterprise in this country. Through all of this, a passion of mine has been the recruitment and promotion of females in scientific careers, from my first faculty appointment at Bryn Mawr College to my current role as founder and chair of a national organization called

COACh, the Committee on the Advancement of Women Chemists that is based at the University of Oregon.

In my parallel role of mother, I have the opportunity to spend part of my days hanging around rainy soccer and baseball fields. One of the unexpected pleasures of this has been to watch hordes of young girls playing team sports, an experience that I never had as a young girl since I was pre-Title IX. As I watch these girls learning to be aggressive, competitive, goal oriented and team players, I wonder if these personality traits will translate later into them being more capable of dealing with workplace issues for which many of us were not prepared. For the girls who choose to go into male dominated fields of science and engineering, will these traits make the daily battles easier? Will they have the benefit of female science teachers in their college education and graduate school who can serve as role models, coaches, confidants and cheerleaders, a benefit that most of us in my peer group never had. For those young women entering college today, the likelihood is low, particularly if they attend one our top 50 research universities. In engineering, they will have to look beyond 12 male faculty members to find the female. Physics is worse, chemistry and computer science slightly better at around 1:10. Unfortunately, these numbers have shown minimal improvement in recent years relative to the increase in the number of female undergraduate students in these disciplines, Why? The factors are complex, just as the potential solutions. Given the challenges that lie ahead in national security, technology and the global economy, we can not afford to leave half of our population behind. We must recruit, educate and promote a higher percentage of our women in technical fields.

Our country continues to be the world leader in science and technology because of the excellent training and exceptional research accomplishments of scientists in this country. *Those that scale the career ladder to obtain advanced degrees in science and engineering are the engines of the enterprise.* Science breakthroughs generally depend upon years of accumulation of data from fundamental or basic research. This basic research is largely done at universities, decreasingly at government laboratories, with the assistance of graduate students and postdoctoral associates. The peer review process is the tool we use to measure scientific quality in this basic research, the backbone of our research enterprise that is essential to identifying and rewarding the best science. Unlike sports where women's sports and men's sports programs are often separated, we do not separate our science by gender, nor do we want to. *Our bodies are different, but our minds are comparable and strong, intellectually equal.*

The ladder that one must climb to make contributions to the research enterprise is daunting to anyone. The 4–5 years spent to obtain a bachelors of science or engineering degree is followed by 5–7 years of graduate research work leading to masters and Ph.D. degrees. Those interested in becoming a professor at a college or university, or research leader at a government laboratory require an additional 2–4 years of postdoctoral experience. All of these levels are usually done at different schools in different cities across the country. The ones who choose to go into academia enter as assistant professors with 5–6 more years to establish an independent national reputation that will ensure them a tenured position, i.e. secure employment. Receiving tenure in those 5–6 years is generally the biggest career challenge. It entails developing a research program that includes building a laboratory with state-of-the-art research instrumentation, obtaining research funds from peer reviewed proposals sent to numerous funding agencies, recruiting and training as many graduate students and postdoctoral associates as you can afford with the money you raise, conducting the experiments with the knowledge that only a fraction of your ideas will produce publishable results, publishing the results in peer reviewed journals, hoping that your discoveries will make a significant contribution to your field, giving talks all around the country to get your work known, and in the end, having your final research portfolio judged by experts from around the world who collectively believe that you deserve tenure. Your teaching accomplishments have a varying influence on the final decision depending on your university. Once you receive tenure the next 5–7 years are spent trying to advance from associate professor to full professor rank. Advances beyond this point make you increasingly eligible to win major awards or be elected to the prestigious National Academy of Sciences and Engineering—our Hall of Fame which is open to both men and women.

For an 18 to 22 year old, the climb up the ladder appears to be filled with uncertainty, professionally, financially and personally. The rigors of graduate school often demand a 60–70 hour work week. With an average stipend of $18–20K, this equates to roughly $5–6 per hour. This low stipend leaves little if any ability to pay off undergraduate student loans, buy a house, save money, afford children or associated childcare. For females, each rung that one climbs on the ladder brings additional,

gender-based, challenges. For many departments, there are few if any female faculty to serve as role models, advisors or mentors. One recurring concern that I hear from female undergraduate and graduate students around the country who are interested in an advanced degree or academic career path relates to the possibility to pursue this path and still have a family. Academic institutions in general do not send a positive message to women about having children. Unlike industry and government laboratories, most academic science and engineering departments have no policy for pregnancy or maternity leave for graduate students. Affordability, availability of good and flexible childcare, delaying children until after tenure, low income and long work hours, the lack of family friendly graduate policies all contribute to women jumping off the academic science ladder and leaving science, or choosing a career that does not assist our ability to populate our academic institutions with more female faculty members and consequently female students.

For those women who choose to move further up the academic ladder, many factors slow their progress relative to their male colleagues. These factors have a very damaging cumulative effect on a woman's career.[1] They arise from biases that originate in the culture of our scientific community and society. For example, research shows that for two identical papers, one version with a female first author and the other with a male first author, harsher reviews were obtained for the version with the female author.[2] A Swedish study shows that women have to have five times the accomplishments as their male colleagues in order to get similar recognition.[2] Women, for various reasons are often saddled with heavier service and teaching loads than their male colleagues, providing an additional impediment to their career advancement.[1] Both women and men react negatively to women who take a leadership role in a group[3].[4] Awards or programs that are given exclusively to women to assist in their progress up the ladder are largely ignored or often resented in the tenure, promotion and award process because these advances are perceived to not have been given the rigorous review process of nongender based advances. My women colleagues around the country often hear "she won that award or got elected to that position only because she was female". The message that she is not deserving of her accomplishments comes through unequivocally, and can be very damaging. This accumulation of disadvantage means that, as the years progress, the impact on her ability to make the top rungs of the ladder and be an influential player in the education and research scene can be substantial. Those familiar with accumulated interest know that even a small 1 percent lower investment per year leads to an overall lower investment value of 25 percent over a 30 year period.

The bottom line is, in order for women to "flood" the higher ranks of science as they have in sports it is critical that we recognize the inherent differences in these two very different career paths as we seek to devise a solution. If Title IX is used as a tool, the key is in the implementation. Because of the flexibility that Title IX provides, there are good solutions and bad solutions and we must seek only what is best for both the scientific enterprise and women. I and my academic women colleagues of COACh believe that the approach must be targeted at a number of identifiable levels:

(1) Every researcher and educator that receives federal funding for scientific research that involves graduate students and research associates has the responsibility to assist in broadening the participation of women in the scientific enterprise. The National Science Foundation is on the forefront of trying to make change in the culture with the October 1 mandate that all research proposals will now be judged on *both* scientific excellence *and* the broader impact (Criteria 2) which includes the recruitment and retention of women in underrepresented fields.

(2) All funding agencies that support research programs that involve trainees such as research undergraduate students, graduate students and postdoctoral associates need to take appropriate action to assure that women are active players and leaders in the current and future scientific and technological workforce. At a minimum, all need to follow the lead of NSF Criteria 2 in the evaluation process if the research grant involves training of graduate students and postdoctoral associates.

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[1] Valian, V. 1998. *Why So Slow?* Cambridge, MA: MIT Press.

[2] Wenneras, C. and Wold, A. 1997. Nepotism and sexism in peer-review. *Nature* 387:341–43.

[3] Brown, V. and Geis, F. L. 1984. Turning lead into gold: Leadership by men and women and the alchemy of social consensus. *Journal of Personality and Social Psychology* 46:811–24.

[4] Butler, D. and Geis, F.L. 1990. Nonverbal affect responses to males and female leaders: Implications for leadership evaluation. Journal of Personality and social Psychology, 58:48–59.

(3) Educational institutions receiving federal research funding need to demonstrate a commitment and sustained progress in increasing the number of female educators and participants in their scientific enterprise and eliminate barriers that impede the progress of these groups in their institutions. Those involved in hiring, tenure and promotion need to be aware of the documented factors that contribute to the slow rate of progress of women in their academic pursuit and act appropriately.

It is vital for both the security of our nation and the health of our global economy that this nation's workforce be comprised of the best and brightest minds that this country can supply. I look forward to the day when young women coming up the system enthusiastically embrace the joy and satisfaction that comes with a career in science. I deeply appreciate this opportunity to share with you some of the joys and concerns associated with being a woman in science. Thank you very much, Senator Wyden and Senator Allen.

Senator WYDEN. Dr. Richmond, thank you. All of you have been very good and very helpful.

If I might begin with you, Mr. Jones, you came and said you were here to deliver good news, to characterize your statement. It sure looks like everybody else on the panel does not think that the news is so great. Are they wrong, and how would you respond to the comments that have been made by the other panelists?

Mr. JONES. Well, I can only address the comments of the other panelists as it relates to the work of OCR. I can comment on their characterizations of how things have changed more broadly, but let me pick up on a few issues.

Senator WYDEN. But you do continue to believe that the news is good, in spite of what——

Mr. JONES. Indeed. The progress is significant and substantial. Let me give you another example. The gateway course to higher education in mathematics today would be AP calculus. Today, 7 percent of boys complete AP calculus. This is based on data 2 years ago. 6 percent of girls do, yet when we look back to when the earliest statistics were available, back in the early eighties, it was twice as many boys as girls completing AP calculus. That is progress.

Yes, 17 percent is not a substantial proportion. It would be a minority of women in engineering, but the difference between 1 percent and 17 percent, that is substantial progress, and frankly, with the exception of the statistic that Ms. Greenberger brought up, I did not hear any areas where there was what I might call backsliding. The progress may not be at the speed to which folks are looking for, but as I am looking at it there progress being made, and there continues to be.

Senator WYDEN. Let us talk about some of those specific areas, because I do not think your numbers and Ms. Greenberger's, if you really look at them in the right context, are in disagreement. For example, it looks to me, when you take your numbers and Ms. Greenberger's numbers, she is right with respect to the reduction in computer science graduates over the last several decades, and let me give you an example of why I think the numbers square.

I think that what you have in your testimony on page 4, which she has in her testimony on page 2, indicates that the number of computer science graduates who are women was about 14 percent in 1972, then increased very dramatically in the middle of the 1980's to about 37 percent, and then the two of you are in agreement that by the late 1990's that had fallen to 27 or 28 percent,

so it looks to me like your numbers, if they are taken in the right context, confirm the fact that there has actually been a reduction in the number of women getting the degrees in computer science. Do you find that at all troubling?

Mr. JONES. Well, again, I have not seen the source. I am going to assume, just for her benefit, that the source is the same, the Digest of Education Statistics, and it certainly indicates that there are fewer women since 1984 who have completed the degree. Given that, I would be interested in looking at the data more closely through the whole spectrum of years, but I will make the overarching comment there are two issues at play when we are looking at the number of degree completions.

There are issues that Senator Bayh talked about on the Senate floor when the law was being passed back in 1972, issues of discrimination, issues of denial of access, issues of exclusion from participation. These are issues for which the law was passed and the remedies were created.

There are also issues of self-selection. I do not know enough about the sociology of those in the computer science field, or the nature of broader industry discrimination, whether it exists or does not exist. What I can speak to are the areas I talked about, and frankly I wish I had the Diary of Ed Statistics with me.

But I look at statistics like algebra. In 2000 there were, I believe it was 64 percent of women completing Algebra II, and the figure for men is in the high fifties, and I may be off a little there, but it is actually more women than men completing that, the gateway to higher math. These, taken in the aggregate, I still see as outweighing, again, that being the sole statistic I have seen, and I would still see it as one, depending upon the timeframe, that represents progress since the passage of Title IX.

Senator WYDEN. Dr. Brown.

Dr. BROWN. If I could say something about computer science, because I think it is very good that this example came out, and I think it sheds light on some of the issues that we are talking about here today.

Computer science initially did attract the interest of numbers of girls, as this was a new field, very exciting new field, with the technology and development of computers, and something that interested girls and boys alike, so early on educational programs saw a good percentage of girls.

I believe what happened then, when you see the attrition of women from this field in larger numbers than men so that the percentage is lower, and this is a well-known fact that you can gather more statistics on, you see that there really is something wrong with the environment.

I mean, here is a situation where girls are attracted, they enter the programs, and programs that have addressed improving their educational methods in a way that engages male and female students better and creates a better environment for girls do see less attrition of girls out of those programs, so it is a very good example. These are very real statistics, and it shows fundamentally the problem with the environment in those fields.

Ms. GREENBERGER. I wonder if I could just pick up one quick point, too, because as an official with the Office of Civil Rights, the

whole point is to determine if there is discrimination going on. That is the job of the Office for Civil Rights, and when the statistics are as skewed as they are, let alone when we are actually looking and seeing some decreases in areas, but when we are still talking about 17 percent we can argue about 1 percent to 17 percent, is the glass three-quarters empty or not, or a quarter full, to round up a bit, but that still means that the Office for Civil Rights should be trying to figure out whether there are problems of discrimination, and not just looking at statistics and assuming because there has been some progress the news is good.

That is why it is so important to be doing compliance reviews. That is the job of the Office for Civil Rights, and that kind of discrimination means sexual harassment, and by sexual harassment we also mean the kind of harassment—this is what the Title IX law says—that girls do not belong in this class, girls are not as good in this class. Those kinds of statements are actual violations of Title IX. Biased counseling is a violation of Title IX.

That is the job of the Office for Civil Rights to answer the very question that was posed. When an official says, I do not know if there is discrimination or not, that is the job of this very official to find out.

Mr. JONES. Senator Wyden, would you like me to respond to that?

Senator WYDEN. Sure. At some point I will ask some questions, rather than everyone asking each other questions. No, feel free.

Mr. JONES. Senator, there are thousands of Federal funds recipients in this country. There are hundreds of thousands of students. I am not going to tell you today that sexual harassment does not go on, that there is not discrimination. Our office received, 6,000, over 6,000 complaints a year on all six of the statutes we enforce. We take action in many, many of those. I can tell you that is discrimination. I would not be in the position I am if I was not interested in enforcing those laws, but as to the issue of compliance reviews, that is something distinct, and the question is, how should the office go about it?

Telling are the cases we talked about. Under the Clinton administration in 1994, 15 compliance reviews were launched. The majority of those, there was a finding of no discrimination on the basis of sex in those math and science programs, the majority of them.

Now, I cannot comment on the following 6 years of the previous administration, and up until April of this year the Senate was conducting its advice and consent function for my boss, Assistant Secretary Reynolds, and since he came in in April—his team was completed in July—we started with the fiscal year practice of identifying where we are going to allocate resources for compliance reviews.

That process is occurring as we speak, and our career officials from each of the 12 offices are recommending where they believe in their regions compliance reviews are important. We are going to be pulling that together over the coming months, which is the very standard practice of the Office for Civil Rights.

Senator BAYH. Mr. Chairman, let me make just a couple of observations, and I consider the Office of Civil Rights an ally to rooting out this discrimination, but I think I would urge you to, as we talk

about, two or three of us, the goal of young women, that girls set for themselves, all the offices in our administrative bureaucracies, I would think that the Office of Civil Rights would be establishing high goals.

Now, it sounds pretty good to say the majority found no discrimination. I do not think you ought to rest on that. I would be very stern on those that found discrimination, and I am one who believes in persuasion rather than coercion, that honey gets more support than vinegar, but some people are not going to pay any attention unless there is a consequence.

That is what happened in athletics. You got results when people knew they were going to lose Federal funding, and I think as much as I hate to say that, I think that is what really needs to be addressed, and the people out in the school rooms, the universities, the deans' offices, the presidents' offices, the provosts' offices, they need to understand if they do not get their own house in order—they are the ones that can do it. You cannot do it for them, but you can sure tell whether it is done or not. Excuse me if I get a little excited here.

Ms. GREENBERGER. Senator Wyden, I know you want to ask a question, but I know we have talked about the majority of findings of no discrimination. Actually, the way the letters of findings work as a routine matter with the Office for Civil Rights, is that after an investigation, if a school agrees to enter into corrective action and has voluntarily changed practices, the resulting letter after a compliance review will find no discrimination, because of those voluntary agreements. So actually the fact that there was a finding of no discrimination does not mean even for those particular schools that there have not actually been Title IX problems that were surfaced during the investigation.

Mr. JONES. I would say in a majority of those cases no action on the basis of Title IX was required, or included, or directed for those institutions. They had to do nothing related to Title IX. Now, these were reviews more comprehensive. There were title VI issues in some of these cases, but the majority of them had those institutions taking no action on the basis of any Title IX issue.

Senator WYDEN. Well, we are going to crunch the numbers a little more here in the hearing, but here is what it comes down to. Mr. Jones, when the number of women participating in sports has increased more than 800 percent, I do not think it is good enough to say that we cannot do better than 17 percent in the engineering area, and the 27 or 28 percent that reflects an actual drop off in the number of women in computer sciences, and that is what I find so troubling, and let me go to some questions about how this process actually goes forward at your office.

My understanding from your answer with respect to compliance reviews is that it has been your watch here since January of 2001, but as of now there has not been a compliance review in the math or science area as of today, is that correct? You said you are talking about allocating dollars for your priorities. I would just like to know, on your watch, as of now, since President Bush took office in January of 2001, whether there have been any compliance reviews in math and science.

Mr. JONES. I can say both since January of 2001 and since April of 2002, when my boss, Gerry Reynolds, was appointed by the President to the position to lead this office, there have been no compliance reviews commenced under Title IX.

It would be my view, and I believe it is the Secretary's view, that while there is a candidate for the position nominated before the Senate it would be inappropriate to foreclose the leadership opportunities of that Assistant Secretary by determining compliance reviews that requires multiple years of work and starting them during a period. Compliance reviews can take 1, 2, 3, 4 years, and to begin a course of work of that length when the expectation is there will soon be an Assistant Secretary would be to diminish the leadership role of that Assistant Secretary.

Senator WYDEN. Well, no quarrel about the fact that appointees ought to be able to drive their own priorities, but at the same time, shutting down an operation, which is almost a conclusion you come to if there are no compliance actions at all, is a different story.

Tell me, if you would Mr. Jones, there are very focused criteria to judge compliance with respect to Title IX in athletics. What criteria are used now to judge Title IX compliance when it comes to academics?

Mr. JONES. Academics actually have the same criteria for compliance, broadly speaking, as all other areas of implementation of Title IX, with two exceptions, I would say, athletics and vocational education.

What is notable about both of those areas is the extensive legislative history, and in the case of vocational education the actual specific statute that was enacted in the late seventies relating to vocational education that require additional detail, in other words, academics, whether it be employment, whether it be scholarships, whether it be admissions are all governed by the same standard, the standard driven by those words on the blue chart to your left.

Senator WYDEN. Let me talk to you about the situation in my home State of Oregon, because I think it sort of reflects again why it is hard to see what you call an exercise in delivering good news. A report just came out—it was done by the Oregon university system—saying, of course, far fewer women than men are involved in the field. It said 20 percent of the students surveyed, these are the students heading for college in Oregon, said that they would major in science and technology, and they said only 14 percent of those students were women, and I want to read you a couple of comments by those who are involved in this work and get your reaction as to whether or not you think these are valid concerns.

I will just quote here. It is from an Associated Press article, August 1, 2002, and Mr. Recorder, if we might, let us put that into the record at this point.

[The information referred to follows:]

The Associated Press, August 1, 2002

NEW STUDY SAYS MORE OREGON STUDENTS PLAN TO MAJOR IN SCIENCES

By Julia Silverman

PORTLAND, Ore. (AP)—Increasing numbers of Oregon students plan to study the sciences in college, a new report from the Oregon University System says.

But far fewer women than men are interested in the field, according to the report, which surveyed 800 Oregon College-bound students.

Overall, 20 percent of the students surveyed said they might major in science and technology.

But only 14 percent of those students are women. The numbers remain low despite decades of outreach programs aimed at recruiting more women into the sciences.

Jan Cuny, a professor of computer and information sciences at the University of Oregon, said there are a range of reasons woman have not historically been drawn to her field.

"Exposure that kids have to computers is usually through games," said Cuny. "And there are not that many games that appeal to girls. Girls may take a little computer science in high school, but guys play games, start thinking that graphics are cool, and start programming. By the time they get to college, they often have much more experience."

There's also a lack of female role models in science fields, and a lingering stereotype around computer science students, Cuny said.

"The stereotype is the nerd who sits in a cubicle who works 24 a day," she said.

Kenneth Krane, a professor of physics at Oregon State University, said he thought the numbers were surprising, especially after teaching a 500-person Introduction to Physics class that he remembered as evenly split between the genders.

"The percentage of (science) bachelor's degrees given to women has been growing steadily over the past 20 years," he said.

The survey also showed that:

Seventy-three percent of students planning to major in engineering or related fields will attend either an in-state community college or four-year Oregon university. Of the students not interested in science or technology majors, 66 percent plan to attend an Oregon school.

Of students interested in science fields and planning to go to a four-year in-state school, 56 percent chose OSU, 15 percent picked Oregon Institute of Technology, 12 percent enrolled at Portland State University, 17 percent chose other four-year schools, and seven percent picked a private school in Oregon.

Senator WYDEN. In this article it quotes Jan Cuny, professor at the University of Oregon, saying there are a range of reasons women have not historically been drawn to our field. It quotes Professor Cuny, Mr. Jones, as saying exposure that kids have to computers is usually through games. There are not that many games that appeal to girls. Girls may take a little computer science in high school, but guys play games starting to think the graphics are cool and start programming. By the time they get to college, they often have much more experience.

The professor also says there are a lack of female role models in the science fields and a lingering stereotype around computer science. The stereotype, the professor says, is the nerd who sits at a computer in a cubicle who works 24 hours a day.

Do you think these are problems?

Mr. JONES. Do I think it is a problem that men are perceived as the only ones who should enter computer science, and that women are discouraged from entering it? I could certainly see that as a sociological problem if that is what is occurring.

Senator WYDEN. Do you dispute that it is occurring? That is what I am trying to find out. I am not talking about a legal case. I just read you some very damning statistics from a current analysis done by the University of Oregon, then I read you from a professor of computer sciences, not somebody with a political ax to grind, who said why, and then you said those would be problems if they were occurring. Do you dispute that these problems are occurring?

Mr. JONES. Senator, I am just unwilling to generalize from the specific to the general based upon one particular area. I am also

not willing to generalize that personal selection, that personal desires about what opportunities one wants to undertake are also a relevant issue.

The majority of people who run donut shops in California happen to be Cambodians, half of the dry cleaners in Los Angeles are Korean, the majority of the people who run tugboats in the New York harbors are of Scandinavian origin, but does this constitute a form of discrimination, or is it a form of self-selection? It is possibly both, but I do not have the information to say.

By the same token, the fact that 1 percent of women were in 1971 graduating from computer science programs clearly probably indicated there was some level of discrimination going on around this country. To what extent does 17 percent today constitute that, I cannot say, and it is that balance and blend upon which I have to have more information to make a generalized conclusion.

Senator WYDEN. I guess I find your analogy with donut shops a little troubling. They are not under Title IX criteria. There are Federal laws that say people have equal opportunity to enter those fields, and the question is whether the administration thinks that is what Title IX is all about when it applies to math and science, and that is what we are going to ascertain in the days ahead, I can assure you of that.

Let me just move on to one last point, if I might. Mr. Jones, Ms. Greenberger said that she was concerned that sexual harassment guidelines are under review in your office, and obviously this goes right to the heart of the environment that Dr. Brown is talking about that encourages people to have an opportunity for these disciplines. Is that correct? Are these sexual harassment guidelines under review in your office, and if so, what areas are you reviewing, and what are the issues under consideration?

Mr. JONES. I am glad you asked me that question, Senator, because that has been a question that is raised to us in public forums regularly. Let me set the record straight. Those documents are not currently under review. By the same token, the documents are no longer the state-of-the-art, just as in the same way a computer from 1998 is no longer something that most folks would accept, or the absence of their Blackberry.

Those sexual harassment guidances have, in fact, become dated not the least of which because the law has changed. Not only has No Child Left Behind been passed, but an important Supreme Court decision has come down the pipe, and after reviewing the sexual harassment guidance it was the view of the Assistant Secretary that it would be important to look at where we should allocate resources to revise various documents that have become out of date.

The document itself is still available online, but in the same way that athletics guidance from the early eighties is no longer relevant because of Brown and its progeny of athletics Title IX decisions, that guidance we have viewed as no longer the state-of-the-art, and while it is still available, it is not something that is widely pushed for distribution.

Senator WYDEN. Well, it still looks to me from your answer that the issue of sexual harassment is being reviewed as we speak by the administration.

Mr. JONES. No, absolutely not, Senator——

Senator WYDEN. Then correct me if I am wrong, you just said that the state-of-the-art had changed and you mentioned several statutes. That suggests to me that you are now looking at sexual harassment again because, to use your words, the state-of-the-art has changed. Are you or are you not looking at sexual harassment changes?

Mr. JONES. No, we are not looking at changes to the law. We are not looking to change the booklet that was published a few years ago in part because that booklet has become outdated, and we are continuing to enforce civil rights complaints related to sexual harassment. I can say that first hand. I have reviewed the complaints, and I have reviewed the cases where we are working on that.

Senator WYDEN. So what needs to be reviewed as a result of the changes in these laws? Maybe that would be helpful. You have said that the laws have changed and, as a result, the administration is going to look at it again, but you are also saying that you are bringing these actions, so why don't we just get a sense from you what is it at this point that you think needs to be done, given these new laws that are on the books?

Mr. JONES. Well, right now, and again this is part of the planning process we have been engaged in for the last 2 months since the Assistant Secretary's team was completed, we are looking at all of the publications we put out. We have approximately 35 staff here in Washington to develop our publications. We just put out a publication on disability access for students in higher education, and we are reviewing where does the public need guidance, do we need guidance on retaliation? Do we need guidance on racial discrimination in high schools? Do we need guidance on age discrimination? All of these are statutes we enforce. We are looking at where should we be putting out new books, new pamphlets.

If, after that process, we decide sexual harassment is where we need a new pamphlet, that is where we will put our effort and publish one. If we decide what we need is how to understand 504 rights in high school related to transition services, that is where we will put out a publication, and that is under review right now.

Senator WYDEN. So in your view, with respect to sexual harassment rules, the administration is talking about updating its pamphlets?

Mr. JONES. We have looked at that among others. We have looked at that among other topics of issuing new pamphlets, but right now there is a sexual harassment pamphlet, and we are not in the process of changing that pamphlet or writing a new one because we have not decided where to focus our priorities.

Senator WYDEN. What else is the administration and your office doing on the sexual harassment issue, other than redoing the pamphlets?

Mr. JONES. We are continuing to enforce sexual harassment complaints as they come in the door, and we are doing so in an aggressive manner.

Senator WYDEN. And nothing else is being changed?

Mr. JONES. No.

Senator WYDEN. All right. Let us move on to some of our other panel members, and Coach Murphy, you sort of have been left out of this, and we are going to bring you back in.

Ms. MURPHY. Ask away.

Senator WYDEN. I would ask first if you think progress in sports would have been made if there had not been real Title IX enforcement?

Ms. MURPHY. Absolutely not, and I think that it goes to show that in 1995 that is when women's sports really started to take off, after the Brown lawsuit, and I have been at Brown since 1987, so I have experienced it in so many ways, and I can feel the pain of the scientists, because just imagine being on an all-boys team and having them being able to actually take shots at you and check, and so it is a little different in the physical environment.

But I do not think if Title IX legislation or challenges to the Title IX legal aspect—there is no way, there is just no way without Title IX we would even be close to where we are today, and I will tell you right now, from what I still experience, it is way still existing, and that is why I kind of said to him, you have got to keep enforcing it, because the only thing right now that schools pay attention to is when the NCAA comes in and they do an audit you know where you are on Title IX. That is when the schools—I know Brown does, because Brown is like, oh my God, we have got to make sure that we are in compliance, but other schools really take notice when that happens, so absolutely not.

Senator WYDEN. So you see the barriers that Dr. Brown and Dr. Richmond have described, and it sounds like we passed this way before.

Ms. MURPHY. Oh, God, yes, and I am not sure of the actual stats, because I am a coach, I am not a statistician, but I think it is only 35 percent are still in compliance with Title IX of most athletic institutions, and that is a shame. To start Title IX in 1972 and to not have anything happen of substance until 1995 is real shameful, and so I feel the pain of the engineers and the scientists, and I can only hope that when my 7-year-old girl grows up, that they are going to be one of these guys, because I would encourage them to do that.

Senator WYDEN. Dr. Brown and Dr. Richmond, we have received a letter from about 30 distinguished professors around the country talking about how serious these problems are with respect to the under-representation of women in science and engineering and technology. In fact, they actually use a higher number of women in engineering than we have been discussing today, and they are still extremely alarmed. Is this something of growing concern to professors on campus, women in particular? Dr. Brown? Dr. Richmond?

Dr. BROWN. Yes, absolutely, and I think that there has been sort of a gradual grassroots and then growing public recognition through these reports like the MIT report that the problems that one believed to be possibly only close to home, or in your own environment, or issues that were hard to talk about, are, in fact, common problems that can be addressed, and so I think there is a recognition on campuses and that on a positive note, from many lead-

ers, that improving diversity is good for everyone. That improves the research outcomes and the education as well, and so absolutely.

Senator WYDEN. Dr. Richmond.

Dr. RICHMOND. It is a very serious concern. It is hard for me to even articulate all the different stories that come in from women faculty, and particularly when it is your students that have gone on and faced discrimination in their jobs after they have left your institution it is particularly hard to listen to.

COACh conducts workshops, at national professional meetings to help women develop strategies to cope with the difficulties that they face in their departments. Listening to their stories before, and later their stories after our coaching, you just are amazed that such little things that we can teach them can have such a huge difference in their lives. They go on to spread the word to their colleagues.

But I think what is really important to understand in this hearing is again the fact that the scientific enterprise is terribly important in this country. We must make certain that women are participants in that scientific enterprise. Whatever solution or ideas we have that will give women the opportunity to be equal players in this field will enable them to do the excellent science that this country needs.

That is what women scientists in this country want. We want a level playing field. We do not want to be given special circumstances. We do not want to have any standards changed. We want to be able to have the opportunity to do our best science for ourselves, our children, and our country.

Senator WYDEN. Ms. Greenberger, what kind of facts are needed to bring a Title IX case in this area?

Ms. GREENBERGER. Well, let me just say one thing about bringing a Title IX case first, because there was some discussion about lawsuits. There have actually been very few, relatively speaking, Title IX cases in any area, including athletics, over the last 30 years, although those that have been brought have gotten often a lot of publicity, and people have paid attention to them.

And it is because it take so many resources, often by the time a case is resolved the student has moved on. Nobody wants to take on the school. It is an expensive thing to do, and that is where Government enforcement is so important, where doing those compliance reviews is so essential, and that is why I think it is so important that you are focusing on Government enforcement rather than the case per se.

But what it takes to show a violation of Title IX, whether it is in the form of a lawsuit or the Government, showing that there is a violation of Title IX obviously depends upon the facts and circumstances, but if there is, for example, biased counseling, where the school is steering young women out of areas of math and science or computers, that is a violation of Title IX.

If, in particular classes, these are for the computer geek nerds, guys, and the message to the students that goes out is that the guys go to these programs and classes, that is a violation of Title IX.

If faculty mentor male students and not female students, and that is allowed to continue, that is a violation of Title IX.

If research dollars in the universities are being steered, as I think the MIT study documented, to help male faculty and not female faculty, that is a violation of Title IX.

If women faculty end up with smaller offices, fewer research assistants, lower pay, less benefits, again documented in the study, that is a violation of Title IX.

If there is a sense of where the Committee assignments and faculties go, and what are the better and worse Committee assignments for advancing a career, and those preferable Committee assignments go to male faculty over female faculty, or in the hiring process, there are people on the recruiting or the hiring decision chain who say, women do not belong here because they have got their conflicts with family and they do not have time in order to put in everything that is necessary, that is a violation of Title IX.

Senator WYDEN. Let us do this. There is an important procedural vote on the Iraq resolution on the floor now. Do all of you have the time to stay? I think I would probably be gone about 15 minutes, and if you do, let us take a break for 15 minutes and then we will come back.

Ms. MURPHY. I am supposed to catch a plane at 6:05.

Senator WYDEN. Let us figure out how to get you out the door. Can the rest of you stay another 15 minutes? Then we will stand in recess for 15 minutes.

[Recess.]

Senator WYDEN. Let us come back to order. Thank you all for your patience, and we will just have a couple of additional questions.

Senator Bayh, are you satisfied with the progress the law has made in the science and engineering area? You were trying to solve these problems three decades ago, and made the point then that the intent and legislative history was to focus on academics. We are all pleased about the tremendous progress in sports, but you have correctly said that the focus was academics. Are you satisfied with the law's progress?

Senator BAYH. No, and I say that not to blame someone, but to point out reality, and I think having said that I think it is important for us to accept your criticisms and the observations of at least other Members of the panel. I am sure that Mr. Jones will take the message back.

I am so heartened by what we have done in athletics. I am not totally satisfied there, but I think if we apply that same degree of enforcement, and you cannot enforce unless you do enough reviews to find out if anything is wrong, perhaps more attention and resources could go into that.

Change never comes easily, never has. We had to fight a bloody civil war to get rid of slavery, and then it was 100 years later before we passed the 1964 Civil Rights Act, and still we have not been totally successful in wiping out discrimination—in fact, we have fallen short of the mark of providing equal opportunity for our minority citizens.

We made great progress in athletics, but we stepped on some toes in the process, but that is the price of progress. I would hope that this commission that is studying Title IX problem would be given free rein to really study it and come up with a true assess-

ment of what the members feel individually, or a minority and majority.

I am going strictly on hearsay, but as a person who has had a little something to do with this act originally, I think we ought to be charging out there full bore to try to do even better because we know how.

I think we have some very credible individuals on that commission, but if I understand correctly, they have received instructions from the Secretary as to what kind of report they should come up with—that they were told they should not reach a conclusion, that they should just consider the pluses and the minuses of the various points, and that it had to be a unanimous report.

Now, if I am wrong, I would be very glad. I hope I am, but if that is true, I think it is keeping that commission from doing its job. Forgive me, I guess that is not exactly the question you asked.

Senator WYDEN. It makes a pretty important point. It makes an important point.

Senator BAYH. If I am wrong, I am hoping Mr. Jones will tell me.

Senator WYDEN. Mr. Jones has chimed in throughout the afternoon. He is welcome to chime in again.

Mr. JONES. Senator, I have not been participating in the Title IX commission activities, but I can speak to the issue of direction of the commission and the issue of consensus. I do know that there is no direction to the outcome of the commission, the kinds of findings and the kinds of conclusions or recommendations to be made.

I do know that they are a fact-finding and recommendations commission. I can say the Secretary, prefers consensus, and I can reflect back to my work with the Special Education Commission. Up until the summer I was executive director, and the President wanted to see a consensus, because when you can get to consensus there is greater power in the voice, and I do know the Secretary is interested in seeing consensus around the work of his Commission on Title IX Athletics.

Senator BAYH. We operated in this body, as I recall, and I think you still try to, to the best of your ability to operate by consensus, so consensus is not new to me. But if, indeed, instructions have been given to members of the commission as to how they reach that consensus and what they consider and what they should not consider, then that worries me.

Senator WYDEN. I think you summed it up, Senator Bayh. I sort of majored in consensus. Senator Allen and I tried to be bipartisan before it was cool. That is why I listed some of the long list of measures we have worked on together for this year and a half, but you have got to fight injustice. That is the point of the Title IX statute, and I will tell you, Mr. Jones, I leave very troubled about the administration's approach on this. I want to be very specific about it.

It seems to me the office was basically shut down for a year and a half while everybody was waiting for somebody to come on in. You told us what is going on today as you were talking about allocating resources for various kinds of functions, and it looks to me like problems such as this question of the computer science graduates has gotten worse. And it does not seem to me that any of this is going to get investigated aggressively by your office.

I hope I am wrong, and time will tell, but I regard this as a very critical aspect of this Subcommittee's work, and we have worked very closely with a whole host of administration offices in the science and technology area, John Marburger, Sean O'Keefe, a whole host of officials that worked very cooperatively with us. Senator Allen has met me more than halfway on these issues, but I am not going to look the other way if there is stonewalling on this question of investigating and following up the evidence. The environment that Dr. Brown was talking about, and looking at the numbers that we have heard about today, it looks to me like a very serious set of problems that Title IX is designed to address.

So I think it is only fair that I give you an opportunity to have the last word on this, but I leave very concerned about how the administration is approaching this on the basis of what I have heard today.

Ms. GREENBERGER. Senator Wyden, I know you wanted to give Mr. Jones the last word, and I just wanted to insert something because I respect that, the importance of that.

You had asked a series of questions about the status of the sexual harassment policies, and since that was something that I brought up, I did not quite follow some of Mr. Jones' answers to your questions, and in particular, I understand his talking about pamphlets being updated, but a pamphlet is, of course, different than guidance and policy. And my understanding about the testimony of Mr. Reynolds during his confirmation hearings was specifically directed to the guidance and policy, not pamphlets, where he said that it was something that he would not commit would not be subject to review, and given the fact that it was put on the table, there obviously had been the kinds of concerns that were discussed.

But when Mr. Jones talked about these policies or pamphlets, I am not sure which, not being state-of-the-art, the sexual harassment guidance was issued in January 2001, so we are not talking about policies or guidance from the Seventies or the Eighties, we are talking about guidance and policies based on the most recent Supreme Court decisions issued in January 2001. I simply wanted to insert that, because state-of-the-art, that is pretty recent state-of-the-art policy guidance, and it is not the issue of pamphlets that I think is the subject of concern.

Senator WYDEN. Mr. Jones, you have been patient in terms of sticking around here for over 2 hours, so let us let you have the last word, and this will give you an opportunity to comment on the matter of the sexual harassment issue and the comments I just finished with respect to the administration's overall approach, and please proceed.

Mr. JONES. You have been very kind, Mr. Chairman, to allow me this opportunity at the end of the hearing.

Let me first get to the issue of whether the administration shut down OCR during the first months of this administration. I was appointed in June of 2001 as Deputy Assistant for that period, and I can say absolutely, unequivocally, that the administration continued to aggressively enforce civil rights laws and continued to conduct compliance reviews that were begun in the years before I arrived.

I had the honor of signing the last higher education system desegregation plan under the Fordice decision with the State of Virginia, which has been widely lauded, as well as overseeing the resolution of the Maryland universities complaint. We still have ongoing resource allocation compliance reviews that were started during the late Nineties that we are continuing.

Senator WYDEN. The point that was made, though, and let us clarify it, the point was that there were no compliance reviews with respect to science and math, those two areas, essentially for a year and a half, initiated by the administration. Is that correct or not?

Mr. JONES. That is correct, Senator. I will absolutely agree with that, but I wanted to assure you that the 6,000-plus complaints a year, we actually increased our timeliness on returns on those, and we did well with the compliance reviews underway.

Regarding the sexual harassment guidance and pamphlet, and I am sorry if I miscommunicationed, but there are three items involved here. There is the 1997 guidance, there is a 1998 pamphlet, or 1999 pamphlet, and a 2001, quote, "guidance," close quote.

The problem with the 2001 guidance is a matter of our obligations under administrative procedures. Any policy adopted by our office has to be out for public comment for 90 days. It was published on January 19, 2001, but had not been out for 90 days, and my career lawyers in my office and the career lawyers in the Office of the General Counsel said we simply cannot enforce under that policy the new interpretation in the 2001 guidance.

It very closely aligns with 1997. We still continue to enforce that guidance, and we enforce sexual harassment under the new Supreme Court decision, but it is the guidance itself that did not meet the requirements of law. It is like abiding by a treaty that does not have Senate consent. It has not reached the status of law.

This administration is continuing to look at that. It is one of the things that we are considering as areas in need of guidance, in addition to things like retaliation, in addition to disabilities, which are half of our complaints. And with the resource comparability. There are many areas we are weighing, and shortly we are going to have a plan of what we are instituting, new policy guidance in those areas, so sexual harassment is on the table.

I will also say our office has continued to provide regular technical assistance in the area of sexual harassment. In fact, and you can ask the Ranking Member, we have actually in the last year forged an innovative sexual harassment standard policy in collaboration with the Virginia School Boards Association, which can be used in any school district in Virginia, and the School Boards Association is encouraging its use. We are offering other States this as a model for their activities, so we are out there on the technical assistance front as well.

And lastly, as to whether these are serious issues. I want to agree with you, Senator, that we take enforcement very seriously. When we see these kinds of things pointed out to our office, we take them seriously. Ms. Greenberger's organization, in fact, filed with our 12 offices requests for compliance reviews. Those are nearing, the 2 months that we have been looking at them, a response to which will be going to her organization shortly. But I can say we take these kind of things very seriously and, given this dis-

parity in computer science graduates and the progress followed by decline, if that turns out to be the case, I am going to take that back to Assistant Secretary Reynolds and review it.

Senator WYDEN. Well, thank you all very much for your patience. This is not the last time we are going to discuss this in the Subcommittee, and we are adjourned.

Thank you.

[Whereupon, at 5:10 p.m., the Subcommittee adjourned.]

A P P E N D I X

PREPARED STATEMENT OF THE AMERICAN ASSOCIATION OF ENGINEERING SOCIETIES

The American Association of Engineering Societies (AAES), and its member societies want to thank the Committee for holding this important hearing on Title IX and the Sciences, and for allowing the following testimony to be submitted for the record. AAES applauds this committee for its work to increase the presence and retention of women and minorities in science and engineering professions, and would like to offer our services to this Committee to achieve that goal.

AAES is a multidisciplinary organization dedicated to advancing the knowledge, understanding, and practice of engineering in the public interest. Our members represent U.S. engineering-with over one million engineers in industry, government and education. Through its councils, commissions, committees, and task forces, AAES addresses questions relating to the U.S. engineering profession.

One of the primary goals of AAES is to improve diversity in the U.S. engineering profession. In order for the U.S. to remain technologically competitive, the engineering profession must better engage the knowledge and talents of our diverse population. Accordingly, it is imperative that all individuals—without prejudice—are provided with equality of opportunity to pursue and advance in engineering careers.

AAES strongly supports increasing the strength of the engineering workforce by enhancing diversity. By bringing more women and underrepresented minorities into the profession, engineering in the United States will be better able to solve the problems of the future and compete in the global marketplace. Promoting greater diversity in the profession requires a consistent, long-term effort focused on the education, recruitment, retention, and advancement of all groups, and particularly those who historically have been underrepresented. Such an approach will require the combined participation of businesses, government, professional societies, and the education community.

As the demographics of the United States continue to change, it is very apparent that the numbers of women and minorities in engineering at all levels, is not changing with the population. No where is this more apparent than in the data from the 2000 Census which shows underrepresented minorities now comprise over 25 percent of the U.S. population. This proportion is projected to continue upward, primarily because of the growth of the Hispanic population. From over one forth of the total population, underrepresented minorities comprise nearly 16 percent of undergraduates in engineering and 12 percent of the baccalaureates awarded in engineering in 2000, about half of their representation in the total population. Additionally, in engineering, women earned 9.7 percent of the bachelor's degrees in engineering in 1980 and only broke the 20 percent barrier in the year 2000. There are some disturbing indications in the undergraduate enrollments of women in 2000—their proportion of the total enrollment has declined.

In an effort to change existing trends, AAES works with other key stakeholders to advocate for strengthened math and science education at the kindergarten through 12th grade level; works to increase public awareness of the engineering profession; and provides information on the supply and demand for engineers.

To ensure a technologically literate society and a high-quality workforce, including top-quality engineers, the nation must ensure the best possible education and training (including continuing education) for people at all levels.

AAES supports public and private programs that improve the science and mathematics achievement of the nation's pre-college students and motivates them—with special attention to women and minorities—to pursue engineering and scientific careers. Challenging young children with high quality math and science education will excite them about learning and provide the opportunity to pursue high-wage engineering, science and technical careers.

To ensure a high-quality workforce, there must be appropriate public policies and sufficient funding to continue to improve undergraduate engineering education programs, to ensure access to engineering education for all segments of the population,

and to increase the attractiveness of engineering graduate study and faculty careers for U.S. students.

AAES encourages the interaction of engineering colleges, industry and federal agencies, including the National Science Foundation and national laboratories, to improve engineering education and to increase the participation of women and minorities, and is committed to policies that treat continuing education as an investment, not a fringe benefit. For example, the NSF has been proactive in its goal to support more women scientists and engineers through specific programs. One such program, ADVANCE, supports not only individual women, but activities that lead to institutional change.

In an effort to raise the public's awareness of the engineering profession and the specific roles that women and minorities play in it, AAES, along with support from the United Engineering Foundation and NASA, has established the Voices of Innovation (VOI) Radio Program. Each weekday, VOI provides its listeners with a two-minute sound portrait of engineering, providing a window into the lives of people who transform imagination and ingenuity into technological wonders. This daily program keys into the passion, excitement, and genius that inspires the men and women who make technological miracles a part of our everyday experience. VOI broadcasts began in September of this year and are currently heard on more than 40 public and commercial radio stations around the nation as well as Voice of America and the Armed Forces Radio Network. The initial response to VOI has been encouraging and AAES is enthusiastic about its future.

In order to fully identify and track the issues relating to diversity, AAES works with its Engineering Workforce Commission (EWC) to collect, store, and disseminate, timely and accurate information pertaining to students enrolled in and graduating from accredited engineering programs at colleges and universities nationwide. Data on the participation of women and minorities are tracked and reported in detail to assist policy makers in understanding the trends. The EWC annually surveys the U.S. engineering industry, and produces objective salary information on engineering professionals and educators. Additionally, the EWC produces analysis on the data collected. Providing information on the state of the engineering profession, the EWC's annual surveys are the most timely, thorough, and accurate data available.

As the Committee tackles the issue of diversity in the sciences, we respectfully ask that the following options be considered.

1. Establishment of public-private partnerships to ensure equality of opportunity and diversity in the sciences at all levels. The partnerships would involve government, industry, relevant associations and individuals who have the common goal of creating a more diverse workforce. The BEST (Building Engineering and Science Talent) Initiative is a prime example of this type of partnership.

2. Allow federal funding to support single-sex charter schools or single-sex math and science classes. Studies and present day experience have shown that school-aged males and females learn differently, and a single-sex educational environment, particularly in the areas of science and mathematics, has proven to be invaluable to young females. Although their mere existence has been hotly contested, all female charter schools can be found in New York and Illinois and have proven quite successful.

3. Increased funding of the Math and Science Partnerships Initiative. The Partnerships bring local school districts, university departments of math and science, engineering schools and other interested parties together. The focus of the Partnerships is on both the teachers and students, and due to that, students from a young age are encouraged to pursue their interests in science and mathematics.

4. Increased institutional graduate support for women at colleges and universities. Successful recruitment and retention of women at the graduate level helps to create the new faculty that we need to attract more women at the undergraduate level to science and engineering. Additionally, college and university leaders must be accountable for the work environment they lead. They must be held accountable under Title IX's provision of continuous improvement of the environment for women, and there are many approaches for doing that for both students and faculty members. For faculty, these include better work-family policies, including tenure clock extensions. For students, these include supporting mentoring opportunities, such as Women in Engineering programs.

In conclusion, AAES would like to thank the Committee for holding this very important hearing on Title IX and the Sciences. Title IX states that, "No person in the United States shall, on the basis of sex, be excluded from participation in, be

denied the benefits of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance (20 U.S.C. 38, Section 1681)." As a federation of engineering societies, representing over one million individual engineers, AAES completely supports the intent and goals of Title IX, and we look forward to working very closely with the Committee during its deliberations on this issue.

PREPARED STATEMENT OF WEPAN—WOMEN IN ENGINEERING PROGRAM AND ADVOCATES NETWORK

Statement of Organization and Mission

WEPAN is a not-for-profit, 501(c)(3) organization founded in 1990. WEPAN is dedicated to catalyzing change to enhance the success of women of all ethnicities in the engineering profession.

Statement of Position

Demographic trends indicate that by the year 2005, women will represent 62 percent of new entrants into the United States' labor force and under represented minorities will represent 51 percent (Judy and D'Amico, 1997). In addition, employment opportunities for SMET jobs during 1998–2008 are expected to increase by about 51 percent or about 1.9 million jobs. It is WEPAN's position that policies must recognize these demographic shifts and must address systemic changes to meet the national need for engineers. Without addressing the lack of women studying engineering and the under representation of women in the engineering workforce, the gap between the national need and the supply of engineers will not change. In essence, we put the nation as risk.

A principal effect of these population changes based upon recent trends and projections for coming decades, is that engineering's traditional talent pool of Caucasian men is rapidly becoming insufficient to meet future demands in both industry and academia. It is therefore imperative that greater emphasis be placed upon preparing the women and minorities who will be a majority of the available workforce to enter these fields—and whose representation within engineering has grown steadily, if slowly, in recent decades.

Women remain severely under represented at all levels in the U.S.: representing 9 percent of the engineering workforce; 20.5 percent baccalaureate degree recipients, 22 percent master's degree recipients, and 14.7 percent of doctoral degree recipients. (Engineering Workforce Commission of the American Association of Engineering Societies, Inc., 2001)

The response by policy-makers must, therefore, be viewed as a national priority. Policies must go beyond simple encouragement, which thus far has proven inadequate in bringing women to the engineering classrooms, laboratories and workforce. Beyond numbers, women represent a vital source of intellectual talent that cannot go untapped any longer.

Recommendations for Policy

WEPAN recommends the adoption of national, state and local policies that serve significantly to enhance science and mathematics education at all grade levels, while aggressively implementing initiatives that will increase enrollment and retention of women in engineering at the college level. We need to increase the public awareness of the role and mission of engineers so that "being an engineer" means something tangible to the general public. To encourage girls and women to consider and pursue careers in engineering, WEPAN believes that policies must address the two broad areas:

- The popular understanding of what engineering is, who engineers are, and how they contribute to society.
- The "culture" in which engineering is taught at the university level.

Popular Understanding of Engineering and Precollege Outreach

Only 8 percent of ALL students taking the SAT intend to major in engineering. Of this group, 19 percent are girls of all races and ethnicities. Girls are taking the necessary math and science classes in secondary school to major in engineering. Over 40 percent of high school physics and calculus students are girls (NSF, 1999; American College Testing, 1998). Girls are prepared for engineering majors. They are just not interested. Engineering is currently failing to interest students, male or female in becoming engaged in the profession. This general lack of interest may be attributed to a lack of awareness. In a 1998 Harris Poll, 61 percent of Americans described themselves as "not very well informed" or "not at all informed" about engi-

neering and engineers. Among women, the percentage increased to 78 percent respectively; among college graduates, 53 percent.

Addressing problems of how engineers and engineering are understood and perceived could be addressed, at least partly, through simple interaction (by students and their teachers alike) with representatives from within the field. Another avenue is reaching out to media- and tech-savvy youth of the early 21st century in ways they can understand. Depictions of science, engineering and technology in movies and television are more present than ever before in medical and crime shows. Sept. 11, 2001, has been accompanied by heightened visibility and increased public discussion and debate, both of which create opportunities for expanded understanding of the role of science and engineering in our daily lives. Educators and practitioners should capitalize on these opportunities that are relevant to young people.

Programs that supplement the science and math curricula in lower grades, provide mentoring at all levels, enlighten students about the importance of science and technology to society, and educate students about the broad range of career opportunities in engineering, need to continue to increase the representation of women in engineering. However, outreach alone is not sufficient to affect meaningful change. After-school programs or summer camps, while a valuable component, are not going to increase participation in numbers adequate to address the problem on a national scale.

What is called for, instead, is a systemic shift toward engagement with teachers, schools and entire school systems. Educators from kindergarten through graduate school must join with professional engineers in developing an innovative approach that is dynamic, systemic and synergistic. For example, Massachusetts has taken the lead by incorporating engineering principles as part of the states' educational standards, a first in the US. Texas has also taken a step in this direction by accepting an engineering based course as a science credit at the high school level.

University Culture

Addressing issues of the engineering "culture" in the university environment is imperative to ensure the long-term success of women who enter the field. The difficulties women students experience in attempting to retain their intrinsic interest in science and engineering in environments that undercut their confidence, motivation, and sense of belonging in the field, pose formidable obstacles to their completion of academic training and/or satisfactory performance in engineering careers.

Research strongly suggests that factors unrelated to academic performance are largely to blame for a disproportionate drop out rate among women engineering students:

- According to the 1998 report, *Women and Men of the Engineering Path*, women and men earn similar grades in engineering courses, and women who leave engineering have higher grades than men who leave. It is not, therefore, poor academic performance that drives women out of engineering, but higher levels of dissatisfaction.
- The persistence rates for women in math, science and engineering programs range from 30 to 46 percent, depending on the type of institution—far below the 39- to 61 percent rate for their male counterparts (Adelman, 1998).

A 1998 national pilot climate study by WEPAN found that, although male and female students responded similarly in many cases, perceptions of their college experience differed widely. Women, for example, generally rated their experience lower in areas relating to feelings of self-confidence, such as comfort level with lab equipment, the sense that engineering is the "right" major, and participation in classroom discussion. Many institutions participating in the pilot study have recommended changes at their institutions based on its results (Brainard, *et.al.*, 1999).

The recently released Goodman Research Group's (GRG) final report on the *Women's Experiences in College Engineering (WECE) Project (2002)* provides comprehensive quantitative evidence that women's assessments of (1) their self-confidence in their academic abilities, (2) the engineering department environment, and (3) the engineering classroom environment are vital factors in their persistence in engineering majors. The study also demonstrates that women who participate more frequently in engineering support activities, particularly those combining social and academic interaction, are less likely to leave engineering majors. As both Adelman (1998) and Goodman (2002) have documented, women students are not leaving engineering because they cannot make the grade or find the curriculum too challenging. Instead, it is the lack of social interaction and sense of community within the field of inquiry, and the divorce of curriculum from real work application (Goodman, 2002).

Margolis and Fisher's 2001 book, *Unlocking the Clubhouse*, asserts that confidence issues for women in computer science require and deserve institutional responses of attention, intervention, and remediation. In their well-structured longitudinal study, Margolis and Fisher explore multiple dimensions of this issue in careful detail. Their findings also counter casual myths (*e.g.*, about the so-called "natural" distribution of interest and aptitude) that have inhibited or misdirected earlier remedial efforts. Further, their model of undergraduate recruitment and retention raises the enrollment of women in undergraduate computer science from 7 percent in 1995 to 42 percent in 2000. And Fisher's work at Carnegie Mellon University provides a host of recommendations on how institutions can change the quality of the student experience to further promote gender equity in STEM (science, technology, engineering, mathematics) education.

Identifying recommendations and policies that can affect the culture within universities is no small task. WEPAN proposes the following:

- Link research funds to first- and second-year retention of engineering students in the researcher's home institution.
- Require that universities collect and publish data that is disaggregated by race and gender. A standard definition of first-and second-year retention would need to be defined and observed;
- Evaluation criteria for research grants should include status or improvement in enrollment, retention and graduation rates of undergraduate and graduate women and under represented minorities
- Performance evaluation for department heads within universities should include status or progress of recruitment, retention, and promotion of women faculty.
- Funding agencies should review guidelines and expand criteria to include the replication of tested programs and initiatives, not just a focus on new and original ideas.

WEPAN's final recommendation bridges public awareness, pre-college outreach, and university culture of engineering. At this time, the focus continues to be the pipeline. How do we get more kindergarten students to develop and sustain their interest in engineering. Most students do not have an opportunity to fully explore engineering until they reach college. All students, but girls in particular are not ready to narrow their choices and select a major such as engineering that precludes study in other areas. When students are asked to declare a major, given the stereotypes, lack of awareness, and male dominated environment, the choice to major in engineering loses far too often, particularly among women and people of color. It is time to develop alternate pathways and frameworks at the college level that can engage students in engineering beyond the first or even second year of college. Given the rigorous curriculum, this is a challenge. But engineers always meet challenges and we implore them to do so. Too many creative minds are being lost in the current process.

Since 1990, WEPAN has taken the lead in promoting change to increase the number and success of women in engineering. Our impact has been significant; yet, the systemic change now needed will require collaborative efforts and, more importantly, policy changes that have the real power to positively impact the demographics of tomorrow's engineering and science workforce.

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