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WOMEN IN ACADEMIC SCIENCE AND ENGINEERING

HEARING

BEFORE THE

SUBCOMMITTEE ON RESEARCH AND SCIENCE EDUCATION

COMMITTEE ON SCIENCE AND TECHNOLOGY

HOUSE OF REPRESENTATIVES

ONE HUNDRED TENTH CONGRESS

FIRST SESSION

OCTOBER 17, 2007

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WOMEN IN ACADEMIC SCIENCE AND ENGINEERING

WEDNESDAY, OCTOBER 17, 2007

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON RESEARCH AND SCIENCE EDUCATION,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
Washington, DC.

The Committee met, pursuant to call, at 10:10 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Brian Baird [Chairman of the Subcommittee] presiding.

BART GORDON, TENNESSEE
CHAIRMAN

RALPH M. HALL, TEXAS
RANKING MEMBER

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Subcommittee on Research and Science Education

Hearing on:

Women in Academic Science and Engineering

October 17, 2007
2:00 p.m. – 4:00 p.m.
2318 Rayburn House Office Building
Washington D.C.

WITNESS LIST

Dr. Donna Shalala
President
University of Miami

Dr. Kathie Olsen
Deputy Director
National Science Foundation

Dr. Freeman Hrabowski
President
University of Maryland Baltimore County

Dr. Myron Campbell
Chair of Physics
University of Michigan

Dr. Gretchen Ritter
Professor of Government
University of Texas at Austin

HEARING CHARTER

SUBCOMMITTEE ON RESEARCH AND SCIENCE EDUCATION
COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

Women in Academic Science and Engineering

WEDNESDAY, OCTOBER 17, 2007
2:00 P.M.—4:00 P.M.
2318 RAYBURN HOUSE OFFICE BUILDING

1. Purpose

On Wednesday, October 17, the Subcommittee on Research and Science Education of the House Committee on Science and Technology will hold a hearing to examine institutional and cultural barriers to recruitment and retention of women faculty in science and engineering fields, best practices for overcoming these barriers, and the role that federal research agencies can play in disseminating and promoting best practices.

2. Witnesses

Dr. Donna Shalala, President, University of Miami.

Dr. Kathie Olsen, Deputy Director, National Science Foundation.

Dr. Freeman Hrabowski, President, University of Maryland Baltimore County.

Dr. Myron Campbell, Chair of Physics, University of Michigan.

Dr. Gretchen Ritter, Professor of Government, University of Texas at Austin.

3. Overarching Questions

- What is the current status of women in academic science and engineering? How do recruitment, retention, promotion and attrition rates differ for men and women in these fields? How and why do these data vary by discipline and type of institution?
- What are the greatest barriers to gender equity in academic science and engineering? What have we learned about what works and doesn't work to recruit and retain top female scientists and engineers into tenure-track positions? To what extent are best practices in recruitment and retention already being implemented?
- What can the federal research agencies do to help identify, promote and disseminate best practices across the country? What responsibility do the agencies have to hold funded institutions accountable for subtle cultural barriers?

4. Overview

- Although women earn half of the Bachelor's degrees in science and engineering (S&E), they continue to be significantly under-represented at the faculty level in almost all S&E fields, constituting 28 percent (in 2003) of doctoral science and engineering faculty in four-year colleges and universities and only 18 percent of full professors.
- In 2006, the National Academies produced a report entitled, *"Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering."* The report was largely in response to the outcry over then Harvard President Lawrence Summers' 2005 remarks, in which he argued that biological differences may help explain female under-representation in academic S&E.
- The National Academies panel, in addition to dismissing the relative significance of any biological differences, made a series of recommendations to all stakeholders, including universities, professional societies and the Federal

Government, to address cultural and institutional gender bias in academic S&E.

- The National Academies panel main recommendation to Congress was to carry out regular oversight hearings to investigate enforcement activities. Most of the experts contacted in preparation for this hearing agreed that while the Federal Government could do a better job with enforcement of anti-discrimination laws at universities, the more subtle cultural barriers present a much greater challenge to women seeking academic careers.
- The National Science Foundation (NSF) established the ADVANCE program in 2000 to develop approaches for increasing the representation and advancement of women in academic science and engineering careers. While previous NSF programs for the advancement of women focused on support for individual scientists, the goal of ADVANCE grants is institutional transformation.

5. Current Status of Women in Academic Science and Engineering

According to data compiled by NSF, in 2003, women held nearly 28 percent of all full-time science and engineering (S&E) faculty positions. Specifically, they constituted 18 percent of full professors, 31 percent of associate professors and 40 percent of junior, or assistant professors.

Most of the social science disciplines and psychology are already dominated by women at both the graduate level and in faculty positions. The percentage of women earning Ph.D.'s in other S&E fields has grown steadily in the last 30 years, and has already exceeded 50 percent in the life sciences. However, in 2003 women constituted 34 percent of assistant professor appointments in the life sciences, and slightly less at research universities. Half of this drop-off can be accounted for by including only the available pool of Ph.D.'s[1] in the life sciences: 42 percent in 2003. But attrition is still high in the step from completion of training to faculty appointment. Female under-representation in life sciences faculties continues through the associate and full professor levels. Notably, while the physical sciences continue to have low representation at the graduate level (20 percent), relative to the available pool of Ph.D.'s the physical sciences actually show better representation for women in tenure-track faculty positions than the life sciences and other fields with a greater percentage of women Ph.D.'s. The figure below shows these data for assistant and associate professor positions across all fields.[2]

[1] In the case of assistant professor appointments, the available pool is the sum of Ph.D.'s earned by women in the six-year period preceding appointment.

[2] Figure and related data is this section from National Academies report, *"Beyond Bias and Barriers."*

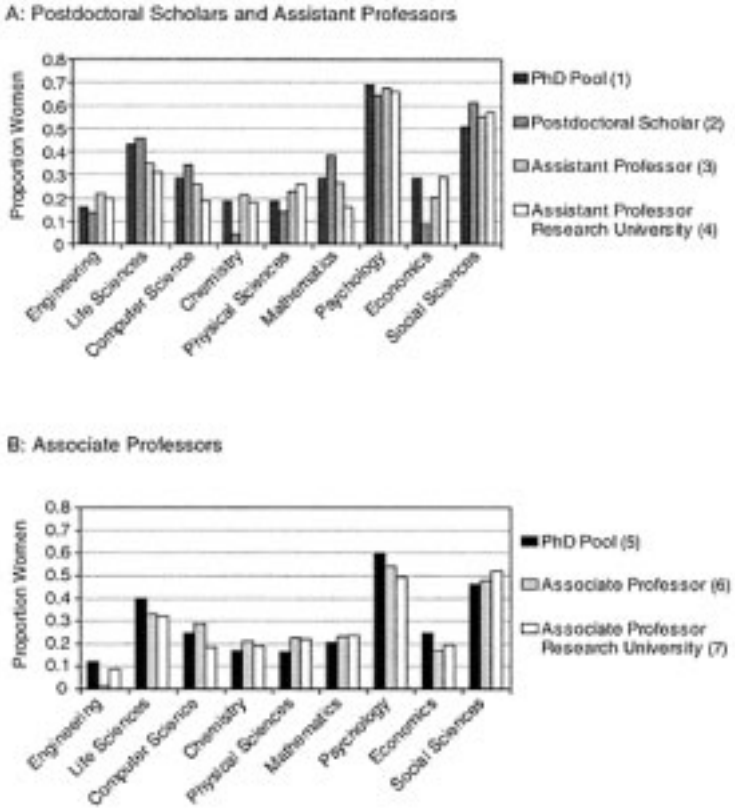

FIGURE 1-2 Comparison of the proportion of women in PhD pools with those in tenure-track or tenured professor positions in 2003, by field.

Women who start out on academic pathways in S&E fields leave for other career paths at higher rates than their male counterparts, even though for the fields in which attrition is highest, women show increased representation at the postdoctoral level. Postdoctoral positions are a necessary prerequisite to faculty jobs in most S&E fields. From among those who leave post-faculty appointment but pre-tenure review, men are more likely to move into other employment sectors and women are more likely to move into adjunct positions. However, in most fields, women and men faculty who are reviewed receive tenure at similar rates. As faculty move up in rank, there are again differences between men and women, this time in promotions, awards and even salary.

6. Institutional and Cultural Bias and Barriers

In 2006, the National Academies produced a report entitled, *"Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering."* The report was largely in response to the outcry over then Harvard President Lawrence Summers' 2005 remarks, in which he attributed what many thought to be a

greatly exaggerated level of significance to a biological explanation for female under-representation in academic S&E. The NAS panel reviewed the existing literature on gender differences in cognition and biology and concluded that, "if systematic differences between male and female scientific and mathematical aptitude and ability do exist, it is clear that they cannot account for women's under-representation in academic science and engineering."[3] Instead, the panel focused on the need to fix institutional, social and cultural bias and barriers.

To this end, the National Academies panel made a number of recommendations to all stakeholders. The panel called on university presidents and provosts to provide clear leadership in changing the culture and structure of their institutions, and deans and department chairs to take responsibility for implementing changes to recruiting, hiring, promotion, and tenure practices. They recommended that higher education organizations form an inter-institution monitoring organization and that scientific and professional societies help set professional and equity standards across the activities they lead, such as awards and conferences. The recommendations made to the Federal Government ranged from rigorous enforcement of federal anti-discrimination laws by enforcement agencies to provision of workshops to minimize gender bias by NSF and other federal funding agencies. The full list of recommendations is in the report summary available from the National Academy Press: *http://books.nap.edu/catalog.php?record_id=11741*

The status of women in academic S&E has improved appreciably in the last three decades, and institutions across the country are continuing to address institutional barriers to gender equity. However, the National Academies panel argues that changes in institutional policies are necessary but not sufficient—even many policies that appear on the surface to be equitable in fact disadvantage women. For example, many women who want children struggle with the intersection of the tenure clock and their biological clock. Many more men are also making work/life balance career decisions.[4] In order to attract top faculty candidates who want both career and family, a number of universities offer the possibility of an extension of the tenure clock—the number of years to tenure review—for assistant professors who have a child while under the clock. But in most cases young faculty feel pressure not to request this extension for fear that they will be judged differently in the tenure review process. In this case, cultural norms undermine a well-intentioned policy, and women, who are more often the primary caregivers for infants (especially if they breast feed), are disproportionably disadvantaged. Some universities have instituted an automatic rather than voluntary extension of the tenure clock in an attempt to overcome those cultural barriers.

The report also discusses at length a phenomenon known as "implicit bias," in this case an implicit assumption of what a scientist is supposed to look like, i.e., a man, and probably a white man. The panel cites a Swedish[5] study of peer-review scores, in which men received systematically higher competence ratings by their peers than equally productive women. In fact, women postdoctoral fellowship applicants included in that study had to be twice as productive (as measured by defined, quantitative measures of productivity) than their male counterparts to be judged equally competent. This field of research is still relatively young, but the collection of evidence supporting the notion of implicit gender bias in academic S&E continues to grow. Minority-group women, as members of two major demographic groups historically excluded from the scientific enterprise, face their own unique set of challenges.

The list of cultural norms that appear to disadvantage women also includes the favoring of disciplinary over interdisciplinary research and publications, and the only token attention given to teaching and other service during the tenure review process.[6] Thus it seems that it is not necessarily conscious bias against women but an ingrained idea of how the academic enterprise "should be" that presents the greatest challenge to women seeking academic S&E careers. Overcoming these cultural barriers is much more difficult than just enforcing anti-discrimination laws or making university policies more family friendly. And even among those who passionately advocate for change, there is no consensus about how or if to modify some of those core practices that have defined the academic enterprise for generations.

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[3] Critics of the NAS report disparage the panel for dismissing the significance of biology before all of the scientific evidence is in.

[4] Currently, 42 percent of women in tenure and tenure-track careers have children, while 50 percent of their male colleagues have children.

[5] Sweden has been named by the United Nations as a world leader in gender equity.

[6] While the reasons are unclear, it appears that women are more likely to engage in interdisciplinary and collaborative research, and to put more energy and time into teaching and mentoring activities than their male colleagues.

7. NSF ADVANCE Program

The National Science Foundation established the ADVANCE grant program to develop approaches for increasing the representation and advancement of women in academic S&E careers through institutional transformation. Nearly 30 institutions have been awarded five-year ADVANCE grants since 2001. While previous NSF programs for the advancement of women focused on support for individual scientists, the goal of ADVANCE grants is to tackle the institutional and cultural barriers to all women. These grants have enabled funded institutions to experiment with innovative recruitment and retention policies, as well as targeted mentoring, workshops on implicit bias, and other activities to raise awareness among departmental chairs and S&E faculty at large about the existence of real barriers to women scientists and engineers. As the witnesses in today's hearing will testify, the "rubber hits the road" at the departmental level, where Department Chairs are responsible for implementing the policies and goals established by their institutions' leaders.

Many of the activities funded under the ADVANCE program were cited by the National Academies panel as examples of policies and programs that seem to be making a difference. In particular, they recommended workshops to minimize gender bias, and NSF and other research agencies have already hosted such workshops in the physics and chemistry communities. Grantees share those and other best practices through their websites and annual meetings of principal investigators, and NSF plans to award Partnerships for Adaptation, Implementation, and Dissemination (PAID) Awards in 2008. Two of the witnesses on today's panel are at universities that have or had ADVANCE grants.

8. Questions for Witnesses

Donna Shalala

- Please describe the findings and recommendations of the National Academies report, *Beyond Bias and Barriers,* in particular the recommendations directed toward the Federal Government and that are relevant to issues of faculty recruitment, retention and promotion.
- What are the biggest challenges and most promising solutions to achieving gender equity in academic science and engineering?
- As President of a university, what policies have you instituted on your own campus to ensure gender equity, and how to do you ensure compliance at the departmental level?

Kathie Olsen

- Please describe what the National Science Foundation (NSF), through its ADVANCE program for institutional transformation, has learned about the biggest challenges and most-promising solutions to achieving gender equity in faculty recruitment, retention and general climate in science and engineering fields.
- What is NSF doing to broadly disseminate and encourage best practices identified through the ADVANCE program?
- In addition to the activities already described, what else can NSF and other federal research agencies do to promote and ensure a more favorable environment for women in academic science and engineering fields?

Freeman Hrabowski

- Please describe the programs that you have been able to carry out through your university's ADVANCE grant. What are the biggest challenges and greatest successes in trying to achieve institutional change toward greater gender equity on your campus? How do you ensure compliance at the departmental level?
- The National Academies report, *Beyond Bias and Barriers,* described a "conspiracy of silence" regarding minority-group women. What are the greatest challenges faced by minority-group women scientists and engineers? Have you been able to identify institutional policies or practices that successfully mitigate these challenges?
- Beyond funding ADVANCE grants at a handful of universities, what can the National Science Foundation and other federal funding agencies do to help identify and encourage best practices in faculty gender equity across the country?

Myron Campbell

- Please describe the efforts you have undertaken as Chair of your Physics Department to recruit and retain women faculty. How did you come to take this on as a priority? What are your biggest challenges and greatest successes?
- Beyond funding ADVANCE grants at a handful of universities, what can the National Science Foundation and other federal funding agencies do to help identify and encourage best practices in faculty gender equity across the country?
- Please describe the purpose of the American Physical Society (APS) workshop on gender equity that you participated in last May. What can APS and similar societies do to help promote gender equity in science and engineering fields?

Gretchen Ritter

- Please describe efforts on your own campus to identify and address any barriers to recruitment and retention of women faculty, especially in science and engineering departments.
- What are the biggest challenges and most promising solutions to achieving gender equity in academic science and engineering across the country?
- Beyond funding ADVANCE grants at a handful of universities, what can the National Science Foundation and other federal funding agencies do to help identify and encourage best practices in faculty gender equity across the country?

Chairman BAIRD. Good afternoon and welcome to our guests. Our distinguished panel is here, and we are joined by my dear friend and colleague, Ranking Member Dr. Vern Ehlers. This is a particularly exciting meeting—and I am supposed to—I guess I should say the hearing will come to order. So now, having said that, we can get to what really matters.

It is particularly exciting for all of us here on this committee, which has a passionate interest in science education. The Speaker of the House Nancy Pelosi is particularly committed to this issue as is our Full Committee Chairman Bart Gordon. And I want to also single out Eddie Bernice Johnson, who was previously the Ranking Member of this subcommittee. Sadly, Ms. Johnson cannot be with us today due to the death of her mother. We send our condolences to Eddie B. She is a dear friend and a tireless champion of women and minorities in science, and it is a deeply unfortunate juxtaposition of events that the hearing which she has long labored to help put together, she is unable to attend, but she wants us to send all of you here her regards, and we will convey to her, of course, testimony that we receive today.

Women are receiving Ph.D.s in steadily increasingly numbers. In fact, in some fields, women have achieved parity with men at the graduate level. Unfortunately, however, they still hold only 28 percent of full-time science and engineering faculty positions, and only 18 percent of full professor positions.

Today's hearing will explore what happens to the available pool of women who have stuck it out all of the way through a Ph.D. Those accomplished women leave academia in greater numbers than men, and those who stay in academia continue to be promoted, recognized for academic achievement, and paid at lower rates than their male colleagues.

A National Academies panel recommended that the Department of Justice and other enforcement agencies put more effort into enforcing anti-discrimination laws on university campuses; however, the same panel implied that the most intractable barriers to women in academic science and engineering are intractable precisely because they will not be overcome through even the most rigorous enforcement of the law. These are barriers created not by willful individuals or institutions. Rather, they are barriers created by the collective effect of many small and usually subtle incidents of subconscious bias on the part of well-intentioned individuals and even by some of the seemingly gender-neutral practices in academic science and engineering.

We invited today's witnesses to help us understand exactly what the barriers are, how we might continue to break them down, and specifically how the federal research agencies can improve the status of women in academic science and engineering.

We cannot afford to continue losing our best and brightest woman, or minorities, for that matter, from academic science and engineering careers. The seeds of progress in U.S. competitiveness, security, and well being are formed in our college and university research laboratories. The interaction and collaboration of diverse individuals with differing perspectives enriches the entire process and stimulates even greater discovery and innovation.

I am particularly interested in the importance of role models and mentors, both for minority students and women students, because I believe that is absolutely critical. Most of us who went on and got doctorates can point to someone in the pipeline who inspired us and led us to believe that we, too, could do what they are doing and that it is worth the effort and time and price to get there, and so I am particularly interested in your thoughts on that as well today.

I also want to note that this is the first in multiple hearings that we plan to hold in this committee to look at the involvement of women in STEM fields. In fact, we will hold a hearing soon on how we might encourage more girls to stick with math and science studies through high school, college, and beyond, since attrition occurs at every step of the way. Today we are looking at the attrition at the completed end of the continuum, so to speak, folks who have obtained Ph.D.s, but there are so many qualified young girls and women who have the mental capacity and the interest, but for some various reasons along the way, we lose from the pipeline in the STEM fields, and we want to do what we can to stop that and encourage greater continuation of the studies.

So I want to thank all of the witnesses—as you can see, we will introduce them in a moment—a particularity capable and impressive panel.

[The prepared statement of Chairman Baird follows:]

PREPARED STATEMENT OF CHAIRMAN BRIAN BAIRD

Good afternoon and welcome to this hearing on *Women in Academic Science and Engineering*. I want to thank my dear friend Ms. Johnson for requesting this hearing and for her tireless work over the years to increase diversity in science and engineering. Sadly, Ms. Johnson cannot be with us today due to the death of her mother.

Women are receiving Ph.D.s in steadily increasing numbers. In fact, in some fields, women have achieved parity with men at the graduate level. Unfortunately, however, they still hold only 28 percent of all full-time science and engineering faculty positions, and only 18 percent of full professor positions.

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soon on how we might encourage more girls to stick with math and science studies through high school, college and beyond, since attrition occurs at every step along the way.

I thank all of the witnesses for being here today and I look forward to your testimony.

Chairman BAIRD. And at this point, I will recognize my dear friend and colleague Dr. Ehlers. I think we have been joined by Ralph Hall, the senior Member of our committee. Ralph, thank you for joining us. Dr. Ehlers?

Mr. EHLERS. Thank you, Mr. Chairman, thank you very much for holding this hearing. It is a very important topic.

Understanding the difficulties that female faculty faces is challenging. The climate is changing, but it is still an uphill battle to get faculty of either gender to have frank conversations about this historically valid, volatile topic. Nevertheless, as the National Academies' 2006 *Beyond Bias and Barriers* report pointed out, higher education must change both the culture and structure of its institutions so that obstacles to women advancing in science and engineering are removed.

I have spent a lot of my time in Congress working to improve STEM education at the K–12 levels. And I have to comment that today's topic is not as distanced from elementary and secondary education as you might think. Without role models along every step of the way, we face an impossible task to encourage young girls to pursue careers in science and engineering, and it is very important to have elementary and secondary schoolteachers who are female, and obviously, enjoy math and science. The best role models tend to be happy ones, not women who are regretting their decision to stick it out in science and engineering because they are perhaps subject to pervasive negative attitudes from their colleagues. Students are quick to recognize which professors like their jobs, and students will be influence, accordingly, about their own career goals.

I have been fortune to have female colleagues in physics from the time I was an undergraduate student at Calvin College, straight though my graduate studies and to my time as a Physics Professor. But of course, these women were always far outnumbered by their male colleagues. Even through significant progress has occurred since I left academia, many institutions are still in need of dissolving antiquated perceptions and the actions that come with them about the appropriateness of women in science and engineering. And female students, occasionally, must also dissolve their perception.

I have always made a point in speaking to my students and to the public about this issue to point out how strange it is in America. You go to China, roughly 50 percent of the scientists are female. You go to Russia, you go to many other countries, and it is the same. It simply can't be true that American women are less capable in math and science than the women of Russia, China, and a number of other countries. It has to be a cultural issue, and we have to change our culture and recognize the problems of the culture and change the culture accordingly.

And I don't want to bore my colleagues here, but I have an example I have often given with my daughter, who had As all the way through elementary school, in every subject for that matter, but es-

pecially in math. She got to high school, started Algebra, got an A on the first test, A-minus on the second, B on the third and so forth. And I said we have to have a little talk. What is going on here? She said well, you know girls can't get math. We had never had that perception through eight years of education. She got to high school, that was the perception, and she felt she had to meet it. But after a little conversation, she went back to conquer the world and got As the rest of the way through and took calculus in college and became an English major, which was perfectly fine with me. I didn't expect her to major in science, but at least get enough so that it will help you in every career you have taken. And this happened to both of our daughters, and they both have done extremely well, partly because of the facility they learned in taking calculus, and also I asked them to take computer programming. Those are skills, those are ways of thinking, that are of value in almost any position you might take today.

I look forward to haring from our witnesses about some of the innovative programs that are making a difference in recruiting and retaining female faculty, and how we can build upon these innovative programs. Thank you very much, and I yield back.

[The prepared statement of Mr. Ehlers follows:]

PREPARED STATEMENT OF REPRESENTATIVE VERNON J. EHLERS

Understanding the difficulties that female faculty face is challenging. The climate is changing, but it is still an uphill battle to get faculty of either gender to have frank conversations about this historically volatile topic. Nevertheless, as the National Academies' 2006 *"Beyond Bias and Barriers"* report pointed out, higher education must change both the culture and structure of its institutions so that obstacles to women advancing in science and engineering are removed.

While I have spent a lot of my time in Congress working to improve STEM education at the K–12 levels, today's topic is not as distanced from elementary and secondary education as you might think. Without role models along every step of the way, we face an impossible task to encourage young girls to pursue careers in science and engineering. The best role models tend to be happy ones, not women who are regretting their decision to stick it out in science and engineering fields because they are subject to pervasive negative attitudes. Students are quick to recognize which professors like their jobs and be influenced accordingly about their own career goals.

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I look forward to hearing from our witnesses about some of the innovative programs that are making a difference in recruiting and retaining female faculty, and how we can build upon them.

Chairman BAIRD. Thank you very much, Dr. Ehlers.

[The prepared statement of Mr. Carnahan follows:]

PREPARED STATEMENT OF REPRESENTATIVE RUSS CARNAHAN

Mr. Chairman, thank you for hosting this hearing to examine institutional and cultural barriers to the recruitment and retention of women faculty in science and engineering fields. It is important for the Federal Government to encourage best practices to overcome these barriers.

Women earn half of the Bachelor's degrees in science and engineering (S&E), but they continue to be significantly under-represented at the faculty level in almost all S&E fields. It is important that Congress provide oversight to tackle this discrep-

ancy in order to be sure that the country benefits from having the best-and-the-brightest doing research and teaching.

Today we are going to follow through on the National Academies recommendation that Congress oversee the efforts to break-down the biases that are impeding women's entry and retention in science and engineering academia. We are going to find out what is working and learn what challenges remain. We hope to help spread the best practices and encourage the continued progress towards a more representative scientific faculty.

To all the witnesses—thank you for taking time out of your busy schedules to appear before us today. I look forward to hearing your testimony.

Chairman BAIRD. At this time, I want to introduce our witnesses, and I want to thank, particularly, our staff on the Science Committee for helping invite such a distinguished panel of witnesses.

And our protocol here is that you have five minutes to offer your comments. Obviously, each of you could probably give us an insightful half-day or full-day or multiple-day discussion of this issue, but we can keep the opening responses fairly brief, then we can have a good give and take. And it is a friendly committee here, and we look very much forward to your comments.

Our first speaker—I will introduce all of the witnesses, and then following that, each will offer their comments. Dr. Donna Shalala really needs no introduction. She is President of the University of Miami, before that, served for eight years as Secretary of Health and Human Services and has a long, distinguished career prior to that as well.

Dr. Kathie Olsen is the Deputy Directory at the National Science Foundation. Dr. Freeman Hrabowski is president of the University of Maryland Baltimore County; Dr. Myron Campbell, Chair of the Department of Physics, at the University of Michigan; and Dr. Gretchen Ritter, Professor of Government and the Director of the Center for Women's and Gender Studies at the University of Texas at Austin. Thank you to all of you for being here. Our witnesses, as I mentioned, will have five-minute testimony, and if any other Members wish to offer comments, they will be invited to do so. We have been joined by Dr. Jerry McNerney from California.

We will start now with Dr. Shalala. Thank you.

STATEMENT OF DR. DONNA E. SHALALA, PROFESSOR OF POLITICAL SCIENCE; PRESIDENT, UNIVERSITY OF MIAMI

Dr. SHALALA. Thank you very much, Chairman Baird, Ranking Member Ehlers, and Members of the Subcommittee. Thanks for the opportunity to testify, and I am going to specifically testify on the report of the National Academies' *Beyond Bias and Barriers, Fulfilling the Potential of Women in Academic Science and Engineering,* a panel that I chaired for the National Academy of Sciences. I am a member of the Institute of Medicine of the National Academies.

The report finds that while the U.S. clearly must take steps to maintain its scientific and engineering leadership in a climate of increasingly economic and educational globalization, we cannot take advantage of our talent and our human capital because women face significant barriers in every field of science and engineering. This crisis calls for a transformation of the academy, which requires action by educational leaders and the support of federal funding agencies, foundations of government agencies and of Congress.

Eliminating gender bias in universities requires immediate and overreaching reform and decisive action by university administrators, by professional societies, by government agencies and by Congress. Let me talk a little about our findings. I don't want to take too much time from my other very distinguished colleagues.

We found that women have the ability to and drive to succeed in science and engineering. Women who are interested in science and engineering careers are lost at every educational transition, which is a point that you made, Mr. Chairman. The problem is not simply that loss through the pipeline because in the rank of full professor at the top research universities, women, on the average, hold less than 15 percent of tenured faculty positions in the social, behavioral, and life sciences and dramatically less than that in all of the other fields of science and engineering. Women are likely to face discrimination in every field of science and engineering, and a substantial body of evidence establishes that most people—this is a very important finding: both men and women hold implicit biases.

Evaluation criteria contained arbitrary and subjective components that disadvantage women because women faculty are paid less, promoted more slowly, receive fewer honors and hold fewer leadership positions than men. Academic organizational structures and rules contribute significantly to the under-use of women in academic science and engineering. The consequences of not acting will be detrimental to this country's competitiveness.

Our recommendations are many, and let me just summarize them. We recommend to federal funding agencies and foundations to federal agencies and to Congress as follows: federal funding agencies and foundations should counter these biases and begin to make full use of our full talent pool in this critical area by making sure that all rules and regulations support the full participation of women. All science research funding agencies should provide workshops on and expand research support for gender bias, collect, store, and publish composite information for all funding applications and awards, provide funding opportunities for dependent care support including attendance at work-related conferences and meeting and interim technical or administrative support during dependent-care-related leaves of absence. The Packer Foundation and NIAID have funded such programs that could be models for other granting agencies. And expand support for research on the efficacy of organizational programs designed to reduce gender bias and access and advance a funded model program.

Federal agencies should also lay out clear guidelines, leverage resources and rigorously enforce antidiscrimination laws in all institutions of higher education to increase the science and engineering talent developed in this country.

On this point, I want to make a point as a leader of an institution that has a football team. I hear more about gender equity in our sports programs from a combination of federal agencies and the NCAA than I do about gender bias in the hiring and promotion of women at the institution. And one of the recommendations that we made here, which very much came out of my experience with sports—Freeman, luckily, doesn't have to worry about a football team, right? Chess—is that we need a similar kind of organization

like the NCAA that holds us accountable and that has incentives to make sure we are doing what we should be doing. I am an expert on NCAA rules. I know a lot about Title IX, but more because of sport programs than because of educational programs, and that is something that Congress can clearly fix.

Congress, because of the insidious ways in which bias can permeate even an environment that aspires to transparency, like the Academy, has to direct its full attention, as this committee is, to enforcing those antidiscrimination laws, including regular oversight hearings to investigate the enforcement activities of the Department of Education, the EEOC, the Department of Labor, and the science-granting agencies.

We discovered many challenges, but also promising solutions to the problems we identified. The most significant challenge is how deeply ingrained gender and racial biases are in our society. Too many excellent scientists and engineers opt out because of what they perceive as a hostile climate for women in hiring, tenure, promotion, and compensation. But ongoing efforts to identify and examine biases have begun to change recruitment, hiring, and retention processes at many universities, and they show a great deal of promise.

Let me give you some examples: in 2006, NSF, NIH, and DOD hauled in 60 department chairs of chemistry department, and worked with them to identify strategies that chemistry departments, universities and federal agencies could implement to encourage and enable broader participation of women in academic research careers. We recommended that NIH, DOE, and NSF do that in other disciplines. That is a pretty simple, straightforward process: bring in the department chairs and talk to them about what the research shows and what they might do to transform their own department. An NSF advanced funded program at the University of Wisconsin Madison provides onsite workshops for department chairs and search committee chairs. And an uncommonly effective model which I developed as the Chancellor of the University of Wisconsin at Madison is the Women in Science and Engineering Leadership Institute, a centralized, highly visible, administrative structure to address a number of impediments to women's academic achievement. It is endorsed by top-level administrators, and it uses the UW Madison as a living laboratory to study the problem and implement solutions.

For me as President of the University of Miami, my strategy is to do everything you can think of because we don't know one program is affected. They call me Boom-Boom because I believe in using strategy that anyone has successfully used to try to do something.

Last year, our faculty committee on women and minorities produced a report on diversity and tenure-tracked faulty, focusing exclusively on the areas of science, technology, engineering, math, and medicine. We did, recently, hire an associate dean for faculty diversity, which will work with the Provost, focused on our medical school in particular. We have a bridging program. We have a postdoc funding program. We run workshops for our search committees as well as for our faculty. We are focused, not just on gender, but also on race, and our workload relief program provides release from

teaching responsibilities for primary caregivers after the birth or the adoption of a child and for a one-year extension of their tenure clocks.

We can't afford to operate the old ways. I was once in Japan, recently, actually, and they kept saying to me what are you going to do to really be competitive with the rest of the world, and my answer was we are going to do something the rest of them are not going to do. We are going to use all of our talent. The only way the U.S.A. can be competitive, we have to reach women and minorities. We have to use all of our talent to be competitive.

Thank you, Mr. Chairman.

[The prepared statement of Dr. Shalala follows:]

PREPARED STATEMENT OF DONNA E. SHALALA

Chairman Baird, Ranking Member Ehlers, and Members of the Subcommittee, thank you for the opportunity to testify on the Report of the National Academies: *Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering.* The report finds that while the United States clearly must take steps to maintain its scientific and engineering leadership in a climate of increasing economic and educational globalization, it cannot take advantage of all of its human capital, because women face significant barriers in every field of science and engineering.

This crisis clearly calls for a transformation of academic institutions. That requires action by educational leaders and also the support of federal funding agencies and foundations, governmental agencies, and Congress.

We must remove the obstacles that are holding women back in science and engineering fields. Eliminating gender bias in universities will require immediate, overarching reform and decisive action by university administrators, professional societies, government agencies, and Congress. Nothing less than a coordinated effort across public, private, and governmental sectors will achieve the reforms necessary for America to retain its competitiveness on the global stage.

Findings

The report finds that:

- Women have the ability and drive to succeed in science and engineering
- Women who are interested in science and engineering careers are lost at every educational transition
- The problem is not simply that loss through the pipeline, because in the rank of full professor at the top research institutions women on average hold less than 15 percent of tenured faculty positions in the social, behavioral, and life sciences, and dramatically less than that in the all other fields of science and engineering
- Women are very likely to face discrimination in every field of science and engineering
- A substantial body of evidence establishes that most people—both men and women—hold implicit biases
- Evaluation criteria contain arbitrary and subjective components that disadvantage women because women faculty are paid less, promoted more slowly, receive fewer honors, and hold fewer leadership positions than men, and these discrepancies aren't based on any of the standard measures of performance
- Academic organizational structures and rules contribute significantly to the under-use of women in academic science and engineering
- The consequences of *not* acting will be detrimental to the Nation's competitiveness

Recommendations

The report's recommendations to federal funding agencies and foundations, to federal agencies, and to Congress are as follows:

Federal funding agencies and foundations should counter these biases and begin to make full use of our full talent pool in this critical area, by making sure that all

rules and regulations support the full participation of women. All science research funding agencies should:

- Provide workshops on, and expand research support for, gender bias
- Collect, store, and publish composite information for all funding applications and awards
- Provide funding opportunities for dependent care support—including attendance at work-related conferences and meetings, and interim technical or administrative support during dependent care related leave of absence—the Packard Foundation and NIAID have funded such programs that could be models for other granting agencies
- Expand support for research on efficacy of organizational programs designed to reduce gender bias. NSF and ADVANCE have funded model programs.

Federal agencies should lay out clear guidelines, leverage resources, and rigorously enforce existing anti-discrimination laws in all institutions of higher education to increase the science and engineering talent developed in this country.

Congress, because of the insidious ways in which bias can permeate even an environment that aspires to transparency, like the academy, must direct its full attention to enforcing anti-discrimination laws, including regular oversight hearings to investigate the enforcement activities of the Department of Education, the EEOC, the Department of Labor, and the science granting agencies.

Challenges and Solutions

In preparing this report we discovered many challenges, but also, promising solutions to the problems of achieving gender equity in academic science and engineering. The most significant challenge is how deeply ingrained gender and racial biases are in, and part of the fabric of, our society. People—both men and women—for the most part intend to be fair, but act on unexamined biases when evaluating others. Many excellent scientists and engineers are opting out of the academic career path because of the perceived hostile climate for women—in hiring, tenure, promotion, and compensation—particularly those who wish to combine family or community service with research and teaching. We are losing too many who could contribute to the Nation's science and engineering enterprise, and who could increase our chances of maintaining our position as a global leader in these critical areas.

But the landscape also includes some promising solutions. Ongoing efforts to identify and examine biases have begun to change recruitment, hiring, and retention processes at universities. One example is a 2006 meeting, *http://www.chem.harvard.edu/groups/friend/GenderEquityWorkshop/*, co-sponsored by NIH, DOE, and NSF, during which 60 chairs of chemistry departments were brought together for a two-day session to identify strategies that chemistry departments, universities, and federal agencies could implement to encourage and enable broader participation of women in academic research careers. The session covered demographics of the training "pipeline," research on biases that affect recruitment and hiring, and development action items. An NSF ADVANCE-funded program at the University of Wisconsin, Madison, provides on-site workshops for department chairs, *http://wiseli.engr.wisc.edu/*, and search committee chairs. These three-session workshops provide chairs an opportunity to explore the climate in their department, identify key issues, develop action plans, and discuss the impact of changes they have made. These examples are models that can be adopted across the country.

Another uncommonly effective model, developed when I was Chancellor of the University of Wisconsin, the Women in Science and Engineering Leadership Institute (WISELI), *http://wiseli.engr.wisc.edu/*, is a centralized, visible administrative structure with a mission to address a number of impediments to women's academic advancement.

- The center structure of WISELI allows the institute to bring the issues of women scientists and engineers from obscurity to visibility
- It provides an effective and legitimate means of networking women faculty across departments, decreasing isolation, advocating for and mentoring women faculty, and linking women postdoctoral fellows in predominantly male environments with a variety of women faculty
- WISELI's long-term goal is to have the gender of the faculty, chairs, and deans reflect the gender of the student body
- To accomplish these goals, WISELI will be a visible, campus-wide entity, endorsed by top-level administrators, which will use UW–Madison as a "living laboratory" to study the problem and implement solutions.

A Case in Point: The University of Miami

For me, as President of the University of Miami, the problem is very close to home. Leadership on this issue must begin at the top, but it can't be simply legislation from the top. It requires buy-in and accountability at every link in the chain of command. Within the past two years at the University of Miami, I have put in place an almost completely new senior leadership and decanal team, and we have made one of our very top priorities the task of addressing the issues of gender (and other) biases, and redressing inequities, in recruitment, hiring, promotion, retention, and compensation.

Our report provides a Scorecard that allows universities to track and evaluate their progress on these issues, and the University of Miami's is included in my written statement. It is a humbling experience indeed to complete one of these scorecards, even in a place in which there is the commitment and leadership we have in place here, but our completed scorecard is helping us as we move forward on these issues. Our strategies and programs to address the issues include the following:

- Last year, our *Faculty Senate's Committee on Women and Minorities,* produced a report on diversity and equity in the tenured and tenure-track faculty, by job class and gender in all the schools and divisions. We focused explicitly on the areas of science, technology, engineering, math, and medicine.
- We hired an *Associate Dean for Faculty Diversity and Development* for our Miller School of Medicine, who also will work with the Provost and me on university-wide programs and assessment.
- We developed a *Bridging Program* through which the Provost's office provides funding between the period of an opportunity/diversity hire, and the time that a tenure line opens within a department.
- Our *Post Doc Funding Program* is designed to identify promising new women and minority Ph.D. graduates who are prospective faculty hires, but not as accomplished in their research agenda as we would like. The participants are hired with the expectation that following the postdoc year—during which they will receive research and mentoring support and augment their scholarly profiles—they will enter a tenure-track position.
- *Salary equity* issues are being addressed directly by the Provost, who for two years has been working directly with the deans to first systematically identify inequities, and then to work with the Provost to address them.
- Our *Workload Relief Program* provides for a release from teaching responsibilities for up to one semester following a birth or adoption for faculty members who are the primary caregiver for the child, and they also are eligible for a one-year extension of their tenure clocks.
- The Provost has instituted a workshop for deans and associate deans to discuss in depth the university's performance in the area of recruitment and retention of women and minority faculty, and of the need to focus on and improve in this area. This renewed focus has yielded tangible results.

Conclusion

We can no longer afford to operate according to the old status quo. If the United States truly wants to maintain its lead in the global scientific and engineering marketplace, then policies must be geared to attracting and retaining the best and brightest—regardless of whether they are male or female.

The fact that women are capable of contributing to the Nation's scientific and engineering enterprise, but are impeded from doing so because of gender and racial/ethnic bias and outmoded "rules" governing academic success is deeply troubling and embarrassing. It also must be a call to action. All of us—faculty, university leaders, professional and scientific societies, federal agencies and the Federal Government—must unite to ensure that all our nation's people are welcomed and encouraged to excel in science and engineering in our research universities. Our nation's future depends on it.

Working Data for University of Miami Scorecard

D1—Formal Mentoring Programs for:

- Undergraduates—no
- Graduate Students—no
- Postdoctoral Scholars—no
- Pre-tenure Faculty—no

- Tenured Faculty—no

D2—Provide management training or workshops with an integrated component that addresses gender, and ethnic and racial equity for:

- Undergraduates—no; informal through student groups
- Graduate Students—no
- Postdoctoral Scholars—no
- Pre-tenure Faculty—no
- Tenured Faculty—no
- Department Chairs—yes
- Search Committee Chairs—no
- At our most recent academic leadership workshop the Provost spoke at length with supporting data on the university's performance in the area of recruitment and retention of women and minority faculty, and of the need to focus on this area.

D3—Is there a university-wide grievance policy?—No, but we have separate policies that deal with faculty, students and staff.

D4—Does the grievance policy apply to:

- Undergraduates—yes, please see:
  http://www6.miami.edu/umbulletin/info/serv/ombuds.htm
- Graduate Students—yes, please see:
  http://www6.miami.edu/umbulletin/info/serv/ombuds.htm
- Postdoctoral Scholars—yes, please see:
  http://www6.miami.edu/UMH/CDA/UMH_Main/
  1,1770,13610-1;14550-3,00.html
- Pre-tenure Faculty—yes, please see Section B4.10:
  https://www6.miami.edu/faculty-senate/FACULTYMANUAL07-08/
  FacultyManualFall2007-08.doc
- Tenured Faculty—yes, please see Section B4.10:
  https://www6.miami.edu/faculty-senate/FACULTYMANUAL07-08/
  FacultyManualFall2007-08.doc

D5—Is there an office or person designated to grievances?—Yes; Vice Provost for Faculty Affairs.

D6—To whom/what are sexual harassment cases brought? Vice Provost for Faculty Affairs.

D7—What percentage of sexual harassment cases were forwarded for action? 100 percent.

D8—Does the university have a central, written policy and budget to allow part-time appointments for faculty:

- Tenure-track—no
- Tenured—no

D9—Does the university have a university-wide written policy and budget to allow temporary relief from teaching or other modifications of duties with no reduction in pay for faculty:

- Family care—yes, please see Section C17.7:
  https://www6.miami.edu/faculty-senate/FACULTYMANUAL07-08/
  FacultyManualFall2007-08.doc
- Personal disability—no written policy; handled collegially

D10—Does the university have university-wide written policies providing full or partial replacement pay:

- For new biological mothers during leaves for disability related to pregnancy and childbirth during the academic year—yes, please see Section C17.7:
  https://www6.miami.edu/faculty-senate/FACULTYMANUAL07-08/
  FacultyManualFall2007-08.doc
- For adoptive mothers—yes, please see Section C17.7:

https://www6.miami.edu/faculty-senate/FACULTYMANUAL07-08/
FacultyManualFall2007-08.doc

- For biological fathers—yes, please see Section C17.7:
  https://www6.miami.edu/faculty-senate/FACULTYMANUAL07-08/
  FacultyManualFall2007-08.doc
- For adoptive fathers—yes, please see Section C17.7:
  https://www6.miami.edu/faculty-senate/FACULTYMANUAL07-08/
  FacultyManualFall2007-08.doc
- For unmarried partners—yes, please see Section C17.7:
  https://www6.miami.edu/faculty-senate/FACULTYMANUAL07-08/
  FacultyManualFall2007-08.doc

D11—Does the university have a formal pregnancy leave policy for:

- Undergraduates—no
- Graduate Students—no
- Postdoctoral Scholars—yes, please see:
  http://www6.miami.edu/UMH/CDA/UMH_Main/
  1,1770,13610-1;14652-3,00.html
- Pre-tenure Faculty—yes, please see Section C17.7:
  https://www6.miami.edu/faculty-senate/FACULTYMANUAL07-08/
  FacultyManualFall2007-08.doc
- Tenured Faculty—yes, please see Section C17.7:
  https://www6.miami.edu/faculty-senate/FACULTYMANUAL07-08/
  FacultyManualFall2007-08.doc

Donna E. Shalala, President of the University of Miami and former Secretary of Health in the Clinton Administration, chaired a committee of the National Academies that wrote the 2007 report *Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering.* The report is available on-line at *http://www.nap.edu/catalog.php?record_id=11741*

BIOGRAPHY FOR DONNA E. SHALALA

Donna E. Shalala became Professor of Political Science and President of the University of Miami on June 1, 2001. President Shalala has more than 25 years of experience as an accomplished scholar, teacher, and administrator.

Born in Cleveland, Ohio, President Shalala received her A.B. degree in history from Western College for Women and her Ph.D. degree from The Maxwell School of Citizenship and Public Affairs at Syracuse University. A leading scholar on the political economy of State and local governments, she has also held tenured professorships at Columbia University, the City University of New York (CUNY), and the University of Wisconsin–Madison. She served as President of Hunter College of CUNY from 1980 to 1987 and as Chancellor of the University of Wisconsin–Madison from 1987 to 1993.

In 1993 President Clinton appointed her U.S. Secretary of Health and Human Services (HHS) where she served for eight years, becoming the longest serving HHS Secretary in U.S. history. At the beginning of her tenure, HHS had a budget of nearly $600 billion, which included a wide variety of programs including Social Security, Medicare, Medicaid, Child Care and Head Start, Welfare, the Public Health Service, the National Institutes of Health (NIH), the Centers for Disease Control and Prevention (CDC), and the Food and Drug Administration (FDA). One of the country's first Peace Corp volunteers, she served in Iran from 1962 to 1964.

As HHS Secretary, she directed the welfare reform process, made health insurance available to an estimated 3.3 million children through the approval of all State Children's Health Insurance Programs (SCHIP), raised child immunization rates to the highest levels in history, led major reforms of the FDA's drug approval process and food safety system, revitalized the National Institutes of Health, and directed a major management and policy reform of Medicare. At the end of her tenure as HHS Secretary, The *Washington Post* described her as "one of the most successful government managers of modern times." In 2007, President George W. Bush handpicked Shalala to co-chair with Senator Bob Dole the Commission on Care for Returning Wounded Warriors, to evaluate how wounded service members transition from active duty to civilian society.

As Chancellor of the University of Wisconsin–Madison, she led what was then the Nation's largest public research university. She successfully strengthened undergraduate education, the university's research facilities, and spearheaded the largest fund-raising drive in Wisconsin's history. In 1992, *Business Week* named her one of the top five managers in higher education.

She served in the Carter Administration as Assistant Secretary for Public Development and Research at the U.S. Department of Housing and Urban Development. In 1980, she assumed the presidency of Hunter College of the City University of New York.

She is a Director of Gannett Co., Inc., UnitedHealth Group, Inc., and the Lennar Corporation. She also serves as a Trustee of the Henry J. Kaiser Family Foundation.

President Shalala has more than three dozen honorary degrees and a host of other honors, including the 1992 National Public Service Award, the 1994 Glamour magazine Woman of the Year Award, and in 2005 was named one of "America's Best Leaders" by *U.S. News & World Report* and the Center for Public Leadership at Harvard University's Kennedy School of Government. She has been elected to the Council on Foreign Relations; National Academy of Education; the National Academy of Public Administration; the American Academy of Arts and Sciences; the National Academy of Social Insurance; the American Academy of Political and Social Science; and the Institute of Medicine of the National Academy of Sciences.

Chairman BAIRD. Thank you. Dr. Olsen.

STATEMENT OF DR. KATHIE L. OLSEN, DEPUTY DIRECTOR, NATIONAL SCIENCE FOUNDATION

Dr. OLSEN. Thank you, Chairman Baird, Ranking Member Ehlers, and Members of the Subcommittee. Thank you.

We need the strength of our nation's full diversity in our science engineering and technological workforce, and as Dr. Shalala said, it is vital to our nation's continuing prosperity. There is no longer an issue of debate or lengthy discussion. Simply put, it is critical for all of us.

I would like to begin with a little story on how I ended up at the National Science Foundation, an agency where inclusiveness is at the very core of our vision and our mission. In 1986, I was a traditional faculty member, and I was writing an invited chapter for a very important publication. That was in the days when most of us only had DOT matrix printers—and I don't know if you remember that. But the secretary had the one and only crisp, laser printer that could produce a polished manuscript. So my department chair walked in when she and I were working on my manuscript, and he asked me poignantly, can't you type in front of the whole department. Now, I want to know how many men have been asked that question. Well, I can type, and I laughed it off, but what I did is I went in and typed a letter and printed it out on my DOT matrix printer, to the National Science Foundation, where I had spent time as a visiting scientist. They had recently asked me to consider returning permanently, and I knew that my contributions were valued there. So I used, as I said, my DOT matrix printer to print a letter to send to NSF, and I subsequently moved to Washington.

I want you to know that I have never forgotten that incident—obviously, I am telling it. I am proud of the work the National Science Foundation has done to improve the environment in science and engineering for the entire women of today and tomorrow and grateful for the opportunity that I have had to contribute.

I am particularly proud that NSF is an example of the principles that we advocate. NSF has numerous senior women in scientific and administrative roles, serving on our advisory committees, our

committee of visitors, as reviewers and as principal investigators on our major grants. We take the advice of our committee on equal opportunities in science and engineering, very seriously CEOSE—Dr. Bement and I just spent an hour with them today. We are constantly improving in order to stay in the forefront of inclusive management.

All of our managers and supervisors are trained in and are held accountable for good diversity management, and our newly instituted ongoing merit-review training for program officers will include discussion of implicit bias, based on your report, both its potential impact on the review processes they shepherd, but also on their own decision-making.

I am also very proud of ADVANCE, NSF's premier funding program, aspiring to improve the climate for women in science and engineering enterprise. From its inception in 2001, ADVANCE funding has gone to 58 institutions of higher education, all different types of sizes and institutions in 36 states, the District of Columbia and Puerto Rico. We know that what works in one institution or in one place may not work for all. Therefore, we have been careful to diversify these initial grants to ensure that, in total, the lessons learned will have broad applicability.

The idea behind ADVANCE is simple: sweeping intuitional transformation is the best hope for creating truly women-friendly environments in science and engineering. Like sleeping giants and like my former chair and my friend, entire campuses have been dozing on this issue. Funding targeted at individuals within institutions simply didn't go far enough. We learned that from our earlier programs like the research opportunities for women and career advancement awards. We realized that what needed was full institution-wide shakeup to bring about concrete changes. Already, ADVANCE results are measured in an increased number of female faculty hires, advancement towards salary parity and other tangible progress, as you can see from my testimony.

The new ADVANCE partnership for adaptation implementation and dissemination, PAID, was initiated in response to our community's identification of the growing need for the broad distribution of ADVANCE knowledge, strategies and results. PAID insures that ADVANCE successes can be duplicated across the country.

In fashioning welcoming environments for women in science and engineering, we are also fostering a better environment for other, under-represented groups and for men as well. Ultimately, our goal is to transform institution by institution, the entire culture of science and engineering in America and to be inclusive of all for the good of all.

Mr. Chairman, again, thank you for inviting me here today. NSF look forward to working with you to ensure that women continue to become leading scientists and engineers, Nobel laureates, CEOs, presidents of major universities, cabinet secretaries, and even Members of Congress. Our nation's future depends upon it.

And I just want to add, I can type, and now I am about 60 words per minute. I think it was a little faster when I was younger. And I will be happy to answer all of your questions. Thank you.

[The prepared statement of Dr. Olsen follows:]

PREPARED STATEMENT OF KATHIE L. OLSEN

Chairman Baird, Ranking Member Ehlers, and distinguished Members of the Subcommittee, thank you for the invitation to testify on the National Science Foundation's (NSF) role in advancing women's participation in academic science and engineering. The NSF considers this topic central for the continued vitality of the Nation's scientific enterprise.

The focus on women in science and engineering constitutes a longstanding and important component of NSF's strategic investment portfolio. A high priority within that portfolio is broadening participation of groups under-represented in science and engineering, namely, women, minorities, and persons with disabilities. Thus, some of the many NSF programs aimed at broadening participation in S&E focus specifically on women. These programs address the Learning goal in the NSF FY 2006–2011 Strategic Plan, *Investing in America's Future:* to cultivate a world-class, broadly inclusive science and engineering workforce, and to expand the scientific literacy of all citizens.

Increasing the number of women at all levels of the science and engineering academic workforce offers many benefits, including new and diversified perspectives to drive scientific research, as well as mentors and role models for undergraduate and graduate students that better represent the makeup of the student body. At the National Science Foundation, we are confident we can make an impact at the faculty workforce level because there is no shortage of scientific talent; women are earning doctorates in science and engineering in increasing numbers, but are currently less likely than their male peers to enter tenure track academic positions. For example, women have earned 23 percent of the doctoral degrees in the physical sciences since 1997, yet held only 14 percent of academic physical science faculty positions in 2003.

1. Describe what NSF through ADVANCE IT has learned about the biggest challenges and most promising solutions to achieving gender equity in faculty recruitment, retention, and general climate in science and engineering fields.

The most significant challenges to achieving gender equity in academic science and engineering include:

- The continuing importance of well-established networks from which women have been excluded historically
- The impact of implicit bias
- The feeling of isolation when there are only a few women in equivalent positions within academic Science, Technology, Engineering, and Mathematics (STEM) settings
- Unclear hiring, tenure, and promotion policies
- The "two-body problem," which arises from the finding that women scientists and engineers are more likely than their male colleagues to have partners who are also scientists and engineers.

Traditional networking routes used for faculty recruiting can hinder increasing the representation of women professors in STEM fields. Many faculty and academic leaders chairing search committees come from male-dominated educational and professional experiences; when they turn to their informal networks to recruit faculty talent, they tend to create disproportionately male applicant pools. Further, when the perception exists that qualified women are very rare, it is often assumed that a woman candidate will not accept an offer—and so an offer is not made.

Implicit bias in recruitment and reappointment committees also creates a challenge to improving the representation of women in STEM faculty positions, where committee members are not aware of their misperception of the achievements and potential of women candidates and colleagues. Greater service obligations placed on women faculty, such as disproportionate participation on department committees and undergraduate advising loads, are quite common. This is particularly likely for a department eager to make its gender diversity visible. Participation in these activities detracts from time available for research activities, and colleagues frequently see performance of service obligations as an indicator of a weak commitment to scholarship.

Isolation is also a barrier to women. Studies have shown that informal mentoring, which many departments rely on to assist junior faculty, is offered less often to women than to men. In addition, fewer opportunities are presented for the informal socializing that leads to important academic information sharing and the building of collaborations.

Many academic institutions do not have clear personnel policies and practices. In these situations, information is often circulated through informal networks, and thus is less accessible to faculty who are not a part of the informal communication loop. This lack of clear, inclusive communication not only leads to misinformation about policies and procedures, but also to confusion and a greater feeling of isolation. Unclear personnel policies can ultimately lead to mistaken career decisions, low morale, and inequitable treatment by decision-makers who are themselves unclear or misinformed about the policies.

There are significant barriers to the recruitment rates of women faculty in STEM fields that can continue to be barriers to retention, once they have been hired, which makes addressing these barriers doubly important. For instance, there is a greater likelihood that a woman will have a partner in an academic STEM field, and women continue to have greater responsibility for dependent care than do men. These realities make finding spousal employment and quality dependent care arrangements more crucial to the recruitment of new women faculty, as well as to the retention of women whose family situations change. When competing for promising candidates or for the retention of faculty members, industrial employment opportunities may offer significantly improved possibilities than academia for women's spousal placement and/or dependent care arrangements.

Potential solutions to these and other challenges have been developed by awardees of NSF's ADVANCE-Institutional Transformation Program, which began in 2001. Institutional transformation occurs through a top down, bottom up approach: when a committed senior leadership establishes policies that enhance the recruitment and retention of women and an institutional commitment to diversity, in cooperation with the individual members of the institution who initiate and incorporate change in their daily practice. The ADVANCE program will begin a multi-year program-level evaluation in 2008 in order to document the efficacy of the project level solutions that have been developed and implemented at the ADVANCE grantee sites. We know anecdotally that peer institutions, that have not received funding from ADVANCE, have adopted many of the solutions developed by ADVANCE Institutional Transformation grantees and we expect the program level evaluation will demonstrate this to be true.

ADVANCE awardees have become national leaders in the development of training experiences for department chairs, deans, recruitment committees, and tenure and promotion committees. Evidence indicates that awareness of research findings on implicit bias (one common focus of such trainings) has a significant impact on an individual's future decision-making. For example, those that evaluate faculty and write letters of reference for students become more cognizant of the impact of using gendered language (excitable vs. passionate) to describe an individual and their academic potential. Other initiatives focus on the development of mentoring programs, with training for people on both sides of the mentoring relationship.

Institutional changes have occurred with policies that ensure more thorough development of candidate pools, review of national information on the availability of candidates from diverse groups, and procedures that build in the use of effective approaches to successful recruitment. Many examples can be found by browsing individual awardee websites (*http://www.nsf.gov/crssprgm/advance/itwebsites.jsp*). In the case of ADVANCE at Hunter College in New York, women accounted for only 27 percent of new hires in the natural sciences before the Gender Equity Project, but from 2003 to 2006, after significant institutional change, women accounted for 61 percent of new hires.

Policy changes aimed specifically at work-family challenges include: allowing or automatically initiating a tenure-clock stop for faculty with new children or other emergent family obligations such as elder care. For example, Virginia Tech, a recipient of an ADVANCE grant, recently initiated part-time tenure track positions to better suit the long-term work-family arrangements of some faculty. Columbia University, another ADVANCE institution, is offering small grants to faculty for the additional child care costs that arise when traveling to professional meetings.

2. What is NSF doing to broadly disseminate and encourage best practices identified through ADVANCE?

In order to disseminate information, we employ two main strategies: the strategic design of the ADVANCE program itself, and the NSF's leadership role in the scientific community.

The ADVANCE program has evolved from its start in 2001. Our approach is to build upon what we have learned about institutional transformation and increased participation of women in academic STEM careers. Proposals for new institutional transformation grants are required to incorporate lessons learned from current ADVANCE grantees as well as relevant social science research. This ensures that new

grantees do not use time and resources reinventing the basics of institutional transformation. Instead, they build on what has been learned and use that to further innovate, contributing to our increased understanding of institutional change.

It is important to recognize that best practices and effective policies will differ depending on the type of institution. One of the great strengths of ADVANCE is that we have institutional transformation grants in a wide diversity of institutions, from public to private, small to large, primarily undergraduate to research intensive, and different levels of selectivity. To further our goal of greater dissemination of successful strategies from this wide variety of institutions, we established the Partnerships for Adaptation, Implementation and Dissemination (PAID) component of ADVANCE in 2006. Some PAID awardees are disseminating best practices through regional or national training. For example, the University of Wisconsin ADVANCE–PAID program provides training for teams from colleges and universities on ways to increase the hiring of women into STEM faculty positions. The University of Washington's ADVANCE–PAID provides leadership training workshops for STEM department chairs to improve their departmental climate. The workshops integrate issues of diversity throughout the meeting instead of holding a separate session on gender and minority issues. This ensures that diversity becomes an integral part of the everyday management and decision-making process.

ADVANCE Institutional Transformation awardees have developed a rich variety of materials that are available through their websites and the ADVANCE–IT web portal. For example, the "ADEPT" website at Georgia Tech is designed to train individual promotion and tenure committee members by utilizing an interactive training experience about the implicit biases that often interfere with gender equitable decision-making.

In addition, both PAID and IT awardees disseminate best practices at disciplinary conferences and at conferences for college and university leaders. Some PAID awards support groups of women in a particular STEM discipline nationally or within a region. PAID awardees disseminate best practices (such as effective mentoring) through meetings held concurrently with larger disciplinary conferences, and through the development of web-based alliances.

For the research communities that look to NSF and other federal agencies to support their work: along with the National Institutes of Health and the Department of Energy, we have co-sponsored a national workshop focused on gender equity for the department chairs of fifty major chemistry departments and another for the department chairs of fifty major physics departments.

At the request of the NSF Division of Chemistry, the University of Michigan ADVANCE IT grantee developed a brief training about implicit bias. The Chemistry Division at NSF has received training on this topic and it is now implemented at all Chemistry Division "panels" (groups of experts who meet together to review and make funding recommendations for proposals in their field). Through this effort in the Chemistry Division, hundreds of peer reviewers will be trained each year and will return to their home institutions with a new understanding of the ways that implicit bias diminishes equity in decision-making. Dissemination to other units in NSF is underway, including mandatory program officer training on implicit bias during the merit review process.

3. In addition to activities already described, what else can NSF and other agencies do to promote a more favorable environment for women in academic science and engineering fields?

Commitment to this goal must be reflected broadly across the organization and at every level within the organization. At NSF, the commitment to workplace diversity and enhancing opportunities for women and other under-represented minorities in STEM fields is prominently reflected in both our Strategic Plan and in our practice. In the senior leadership, besides myself, there are two female Assistant Directors, and the agency Inspector General is also a woman. We make it a priority to ensure that women are well represented at all levels throughout the scientific and support staff, on our advisory committees, our committees of visitors, and among our reviewers. To further focus attention on this important subject, our Committee on Equal Opportunities in Science and Engineering (CEOSE) advises us on how well we are doing and where we could do better.

The *Science and Technology Equal Opportunities Act of 1980* authorizes the NSF to make awards to encourage the education, employment, and training of women in science and technology. This testimony discusses several such awards, including, of course, the entire ADVANCE program. Additionally, I want to emphasize that in all our grants policies and practices, NSF is committed to the fair inclusion of women, and indeed, has been successful in maintaining a high standard. The 2005 Rand

study *"Gender Differences in Major External Federal Grant Programs"* found that, at NSF, there were no gender differences in the amount of grant funding requested or awarded. Additionally, our recent internal study on the Impact of Proposal and Award Management Mechanisms found that women and minorities have also not suffered disproportionately in the recent overall reductions in proposal funding rate. Within the Foundation, both the Biology and the Social and Behavioral Sciences Directorates have implemented practices to ensure women's participation in numbers appropriate to their representation in the field in all conferences, meetings, workshops, and international congresses for which those directorates provides funds.

Part of NSF's role as a leader in the scientific community is the communication of the importance of broadening the participation of women and other under-represented groups such as minorities and persons with disabilities in the science and engineering enterprise. Internally, this is communicated on an on-going basis through training opportunities and seminars. NSF has recently instituted a new requirement for on-going training in merit review for program officers. One goal of this training will be to ensure that the peer review process is free from the influence of implicit bias and to ensure agency staff are aware of the potential impact of implicit bias in their own decision-making. An example of how NSF leads the external community can be found in the most recent solicitation for chemistry-related instrumentation acquisitions, which requires a departmental plan for broadening participation as an addendum to each proposal. This demonstrates to the scientific community that NSF takes diversity seriously.

Finally, because of the global nature of the scientific enterprise and the growing importance of international scientific collaboration we see an international leadership role for NSF based on what has come from the ADVANCE IT sites. Dr. Bement and I, together with the Assistant Directors and leaders from the Directorate for Education and Human Resources have been actively participating in international meetings, bringing the lessons learned at NSF and from ADVANCE grantees to a global audience. We believe that NSF's international role in women's increased participation in academic science and engineering is in its early stages; we envision it expanding significantly through continued institutional commitment at NSF and through the ADVANCE Program.

Conclusion

Mr. Chairman, thank you again for the opportunity to testify before you today on this extremely important topic.

As you are well aware, NSF research and education efforts contribute to the Nation's innovation economy and help keep America at the forefront of science and engineering. At the same time, NSF supported researchers produce leading edge discoveries that can serve society and spark the public's curiosity and interest. Discoveries coming from dozens of NSF programs and initiatives are enriching the entire science and engineering enterprise, and making education fun, exciting and achievement-oriented.

NSF is committed to cultivating a science and engineering enterprise that not only unlocks the mysteries of the universe, but that also addresses the challenges of America and the world. To echo the findings of the NAS *Beyond Bias and Barriers* report, our nation cannot afford to neglect the lack of women in STEM careers. In order to preserve our competitive edge, we are firmly committed to aggressively pursuing and offering opportunities for everyone within the STEM enterprise—women and men.

Mr. Chairman and Members of the Committee, I hope that this brief overview conveys to you the extent of NSF's commitment to advancing science and technology in the national interest. I look forward to continue working with you, and would be happy to respond to any questions that you have.

BIOGRAPHY FOR KATHIE L. OLSEN

Dr. Kathie L. Olsen became Deputy Director of the National Science Foundation (NSF) in August 2005.

She joined NSF from the Office of Science and Technology Policy (OSTP) in the Executive Office of the President, where she was the Associate Director and Deputy Director for Science and responsible for overseeing science and education policy including physical sciences, life sciences, environmental science, and behavioral and social sciences.

Prior to the OSTP post, she served as the Chief Scientist at the National Aeronautics and Space Administration (NASA) (May 1999–April 2002) and the Acting Associate Administrator for the new Enterprise in Biological and Physical Research (July 2000–March 2002). As NASA Chief Scientist, she served not only as the Ad-

ministrator's senior scientific advisor and principal interface with the national and international scientific community but also was the principal advisor to the Administrator on budget content of the scientific programs.

Before joining NASA in May 1999, Dr. Olsen was the Senior Staff Associate for the Science and Technology Centers in the NSF Office of Integrative Activities. From February 1996 until November 1997, she was a Brookings Institute Legislative Fellow and then an NSF detail in the Office of Senator Conrad Burns of Montana. Preceding her work on Capitol Hill, she served for two years as Acting Deputy Director for the Division of Integrative Biology and Neuroscience at the NSF, where she has worked and held numerous other science-related positions.

Dr. Olsen received her B.S. with honors from Chatham College, Pittsburgh, Pa., majoring in both biology and psychology and was elected to Phi Beta Kappa. She earned her Ph.D. in Neuroscience at the University of California, Irvine. She was a Postdoctoral Fellow in the Department of Neuroscience at Children's Hospital of Harvard Medical School. Subsequently at SUNY–Stony Brook she was both a Research Scientist at Long Island Research Institute and Assistant Professor in the Department of Psychiatry and Behavioral Science at the Medical School. Her research on neural and genetic mechanisms underlying development and expression of behavior was supported by the National Institutes of Health.

Her awards include the NSF Director's Superior Accomplishment Award; the International Behavioral Neuroscience Society Award; the Society for Behavioral Neuroendocrinology Award for outstanding contributions in research and education; the Barry M. Goldwater Educator Award from the American Institute of Aeronautics and Astronautics–National Capital Section; the Barnard Medal of Distinction, which is the college's most significant recognition of individuals for demonstrated excellence in conduct of their lives and careers; and the NASA's Outstanding Leadership Medal. She has also received honorary degrees from Chatham College, Clarkson University, and University of South Carolina.

Chairman BAIRD. I think 60 words a minute is faster than my old DOT matrix printer used to print.

Dr. Hrabowski.

STATEMENT OF DR. FREEMAN A. HRABOWSKI, III, PRESIDENT, UNIVERSITY OF MARYLAND, BALTIMORE COUNTY

Dr. HRABOWSKI. I should start by saying, as I look at the quote "where there is no vision, the people perish," my own vision is to see an African American one day at the Nobel laureate level in science, an African American woman.

The most important point I can make today, as I am PI, is that the under-representation is not a women's issue. It is an American issue. Just as we have been able to make substantial progress on our campus, the fact is that it is not a minority issue that we are talking about.

As I talk, I want you to think about this parallelism between what happens with women and what happens with minorities, and what we have learned is that the success we have had in producing minorities in science has been a great foundation for producing——

Chairman BAIRD. Your microphone.

Dr. HRABOWSKI. Sorry.

Chairman BAIRD. You speak so eloquently and loudly, we didn't even notice.

Dr. HRABOWSKI. Big mouth. I come from Birmingham. We do that. The fact is that, as I think about it, the truth of the matter is that our successes come because we look at institutional change, first, from the perspective of the performance of African Americans

on our campus in science, and we are now leading the country in producing Blacks who go on to actually earn Ph.D.s.[1]

The success at the advanced level is especially significant. Let me give you one statistic: we have had a 48-percent increase in the number of women faculty in tenure-track positions since the beginning of the ADVANCE grant. Now, in comparison, we have had only a four-percent increase in the male faculty size. Now, in terms of the base, we have gone from 29 to 43 women, and for men, from 137 to 142. We know for a fact that that increase has everything to do with practices and policies that have been changed as a result of the NSF ADVANCE grant.

Most important, we have been working to change the culture of the institution. Let me just give you several of the most important points of culture change for us. Having the ability to conduct ongoing discussions with people, with chairs, with senior faculty with deans, and with others has been very important. Most critically, having the change to listen to the voices of those women—if you think about what Donna Shalala said about perceptions and biases, well, it is important to hear the voices of both men and women. To some people's surprise, they were very different in the way they thought about the climate in their environment.

Interestingly enough, usually junior men though more similarly to women. Senior men tended to say things were okay, and so the challenge was to—and the big challenge—and we can talk about this later—is to help the climate, to foster a climate in which people can say what they really think without being criticized or censured, to not have people thinking that because a woman talks about family issues that she is not a serious scientist, and to think about ways of developing policies that can help both men and women because we don't want backlash, which is the same issue you face with minorities, because what have learned is things that help minority students in science can help students, in general in science. Many of the practices that can help junior women can help junior men. So clarity of expectation, looking at the pathways that are expected for those people, ongoing discussions of faculty development plan for every faculty member, women and men, something we have done for all, family leave policy is much more flexible than what the State had talked about. Sometimes it may be a faculty member who has problems with a sick parent. Other cases, it may be about a child, so you never know. So the idea is much more flexibility there, but robust and honest discussions about the issues without people becoming defensive. It is amazing how defensive people can become if you can't build that trust.

And the most important point from my perspective is thinking about how to the get the faculty buy-in. The power rests in the hands of white males, and I don't say that to be negative, to be disparaging. It is a fact. The point is how we pull them into that, and what has made the difference on our campus in terms of producing minority scientist, in terms of increasing the number of women going on and moving up the ladder has been just that, getting the guys on board, having them understand that mentoring is what the

[1] Appended for the record by Dr. Freeman Hrabowski, III. "UMBC is recognized as the Nation's leading predominantly white university for producing African American undergraduates who go on to earn Ph.D.s in science and engineering."

old boy network is all about. We just want everybody to have that kind of networking possibility.

The most important thing that people can do is keep building on these practices to give people incentives to ensure that many more institutions look at themselves in the mirror. Thank you.

[The prepared statement of Dr. Hrabowski follows:]

PREPARED STATEMENT OF FREEMAN A. HRABOWSKI, III

UMBC as a National Model: The University as Mentor

My campus colleagues and I see the issue of advancing women and minorities in science and engineering as an issue about which all Americans should be concerned. Consequently, when we were considering the opportunity to apply for a National Science Foundation (NSF) ADVANCE grant, we concluded that I should serve as the Principal Investigator (PI) to emphasize the importance of this initiative to the entire campus and also the importance of men becoming more knowledgeable about the challenges women scientists and engineers face in the academy.

UMBC (the University of Maryland, Baltimore County) is recognized as a national leader in supporting and advancing women and under-represented minority (URM) students in science, technology, engineering, and mathematics (STEM). We are a public research university, emphasizing graduate programs in the sciences, engineering, and public policy, and building on a strong undergraduate liberal arts and sciences core. We enroll more than 12,000 students (9,500 undergraduate and 2,500 graduate), employ approximately 550 full-time faculty, and receive $85 million in external support annually for research-and-training contracts and grants. We are distinctive because of our demonstrated record of achieving diversity and excellence, particularly in science and engineering. It was especially gratifying when a recent *New York Times* editorial recognized UMBC for *"rocking the house when it comes to the increasingly critical mission of turning American college students into scientists."* [1]

Producing well-prepared scientists and engineers for our increasingly diverse workforce is perhaps our most important and lasting contribution to the Nation's economic development and national security. Thousands of Maryland's physicians, scientists, engineers, information technology (IT) workers, policy-makers, and other STEM professionals are among UMBC alumni. The National Security Agency (NSA), for example, employs hundreds of UMBC math and computer science graduates. We rank third nationally (based on NSF data[2]) in the number of computer science and IT degrees awarded and have been designated a Center of Academic Excellence in Information Assurance by the NSA. The campus has twice received the *U.S. Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring.*

UMBC has become a national model for diversity at a time when both the Nation is focused intensely on securing and strengthening its position in the global economy, and America's demographic profile is shifting dramatically. Our student body is among the most diverse nationally (40 percent minority, including 21 percent Asian, 15 percent African American, and four percent Hispanic and Native American). Particularly noteworthy are data from the American Society of Biochemistry and Molecular Biology (ASBMB) showing that UMBC ranked first nationally in total number of undergraduate biochemistry degrees awarded to African Americans in 2004–2005 (18 degrees). (The ASBMB also ranked UMBC seventh nationally in overall biochemistry degree production, with 63 degrees, and fourth nationally in the total number of biochemistry degrees awarded to Asian Americans, with 23 degrees.) Overall, we are recognized as the Nation's leading predominantly white university for producing African American undergraduates who go on to earn Ph.D.s in science and engineering.

With the support of our NSF ADVANCE grant, we have used our success in producing minority scientists and engineers, particularly those involving women of color, to develop mentoring initiatives designed to increase the participation of women faculty in STEM fields and to advance them through the faculty ranks and

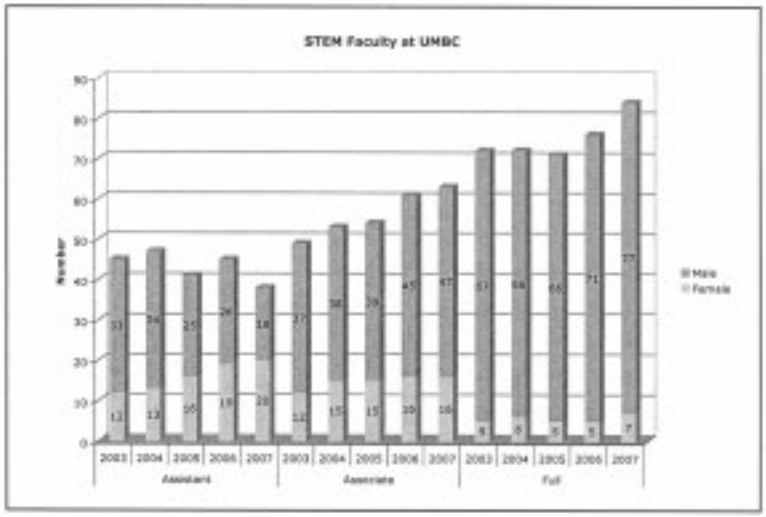
[1] Stapes, Brent, "Why American College Student Hate Science," *The New York Times,* May 25, 2006.

[2] National Science Foundation, WebCASPAR Integrated Science and Engineering Resources Data System.

into leadership positions. This comprehensive "university as mentor"[3] approach is designed to embed focused, continuous support of women scientists at all levels—undergraduate and graduate students and faculty throughout the ranks—into the fabric and foundation of the university's culture.

Framing Success for Women Faculty in STEM

The small numbers of women faculty in STEM is a long-standing national problem. A 2005 study shows that women faculty in the top 50 research universities are under-represented at all ranks, especially as full professors. The study also reveals that under-represented minority women "are almost non-existent in science and engineering departments at research universities" and are less likely than Caucasian women, or men of any race, to be awarded tenure or reach full professor status.[4] The UMBC ADVANCE Program uses a comprehensive approach based on lessons learned in producing minority scientists to meet these challenges. Our framework includes (1) developing, revising, and institutionalizing policies and practices, and allocating resources, in ways that support the recruitment, hiring, and advancement of women—including particularly minority women—for the faculty at all ranks; (2) engaging the campus broadly in ongoing discussions, informal and formal, that address issues of racial and gender diversity in STEM fields; and (3) establishing a system of targeted mentoring programs designed to create a clear and understandable pathway for STEM women to achieve tenure and promotion, and to transition to academic leadership positions at the university.



Since the inception of the ADVANCE Program at UMBC, the number of female tenure-track faculty has increased 48 percent from fall 2003 (N=29) to fall 2007 (N=43) compared to a four percent increase in male tenure-track faculty (fall 2003 N=137, fall 2007 N=142). Additionally, with the support offered through ADVANCE, the numbers of STEM women at the assistant professor and associate professor ranks have increased substantially—assistant professors by 58 percent (fall 2003 N=12, fall 2006 N=19); associate professors by 33 percent (fall 2003 N=12, fall 2006 N=16); full professors by 40 percent (fall 2003 N=5, fall 2007 N=7). These outcomes reflect the university's determination to make progress in this area coupled with

[3] Bass, S., Rutledge, J.C., Douglass, E.R., Carter, W.Y., "The University as Mentor: Lessons Learned from UMBC Inclusiveness Initiatives," Council of Graduate Schools, 2007.

[4] Nelson, D.J., Rogers, D.C., "A National Analysis of Diversity in Science and Engineering Faculties at Research Universities," National Science Foundation, January, 2005.

constituency education activities and changes in policies and practices that the campus has implemented over the course of the ADVANCE Program at UMBC.

Supporting Minority Achievement in STEM: Applying Lessons Learned to the Structural Components of ADVANCE at UMBC

It is difficult to understand and appreciate fully the challenges that women and minorities face in the sciences and engineering. Until quite recently, American higher education was relatively silent about these challenges—not simply because there was a lack of understanding about the issues, but also because of the discomfort many experienced when discussing issues having to do with gender and race. Today, however, there is growing recognition among leaders in the science community—at NSF and other agencies, for example—of the need to understand these challenges and address them though such initiatives as ADVANCE. Much of the work of our ADVANCE grant is based on our success over the past two decades in producing minority scientists and engineers though our Meyerhoff Scholars Program. What we have learned about institutional transformation—including culture change, the need for mentoring, and the importance of creating a strong sense of community—has made it possible for us to have the conversations necessary to address these challenges. These conversations have engaged faculty, students, and campus leaders, and have been instrumental in building trust, creating community, and focusing on the facts about the serious under-representation of women in STEM.

Preparing and Educating the Campus at All Levels

One successful strategy for developing a culture of inclusion for women faculty has been a campus-wide *Distinguished Speaker Series,* spotlighting the contributions of top women research scientists and focusing on issues that women faculty in STEM face in the academy. Modeling success, especially the achievements of top minority women scientists, provides a compelling demonstration of diversity and excellence for the entire campus. The distinguished speakers also give a special seminar on their research at the departmental level to highlight targeted impact on the field.

We have worked to engage all levels of campus administration and each STEM department in developing and implementing ADVANCE initiatives. *Chairs and Deans Meetings* are held at least once a semester to focus on progress and challenges. These meetings provide a regular forum for education and debate about best practices and highlight departmental success in creating supportive work climates for women. Outside experts regularly present current research to the Chairs and Deans on gender issues in science and engineering, with special attention to the particular experiences of minority women faculty. Chairs also raise issues based on their own efforts to affect departmental climate change and advance women and minority faculty in their departments. The STEM departments are further involved with ADVANCE through *Faculty Liaisons,* an initiative that includes nine and female faculty members, one from each STEM department, who serve as advocates for the ADVANCE program within their departments. In addition, *individual meetings* among each Chair and the ADVANCE Director and Lead Co-PI focus on providing targeted information for the department and identifying ways the program could most effectively support their faculty. Finally, through its *ADVANCE Excellence Awards,* the program regularly recognizes the contributions of individuals (including administrators and Chairs) to the success of women in STEM.

Recruiting and Supporting Minority Women in STEM

UMBC is committed to creating an environment of support and success that is attractive to the Nation's top prospective women and minority faculty in STEM. Accordingly, the Provost requires all departments planning to conduct a faculty search to submit a written *Faculty Diversity Recruitment Plan* for attracting a broad and diverse pool of applicants. This requirement is coupled with annual training on diversity recruitment presented by the Provost, Lead Co-PI, Director of Human Relations, and Senior Associate Dean of the Graduate School. Additional guidance is provided to departments by their respective Dean. Special attention is given to strategies and techniques for attracting applications from women and minority candidates and demonstrating a culture of inclusion to all candidates who visit campus. All female candidates for STEM faculty positions meet with faculty from *WISE* (our chapter of Women In Science and Engineering) and with representatives of the ADVANCE Program to make them aware of the resources and support available at UMBC. All male and female candidates meet with the Vice Provost for Faculty Affairs, who discusses support for balancing work and family issues, including information about *UMBC's Family Support Policy* and *flexible tenure timelines* for family and medical leave. In addition, the campus leadership (including the President, in his role as ADVANCE PI) is available to candidates to discuss these issues. The *AD-*

VANCE Research Assistantships for Chairs help STEM departments in successfully recruiting new women STEM faculty by offering one-year research assistantships which are added to the recruitment packages for these candidates.

Mentoring Minority Women for Success in STEM

Demonstrating a clear and successful path to promotion and tenure is central to the work of our ADVANCE Program. The *Faculty Horizons Program* was created with support from ADVANCE to help participants become successful faculty members in STEM, with particular attention focused on attracting women from under-represented groups. This initiative builds on lessons learned through the undergraduate and graduate Meyerhoff bridge program experience, and our *Graduate Horizons Program.*

This intensive two-and-a-half-day workshop focuses on mentoring. The program targets senior-level graduate students and post-doctoral fellows, particularly women interested in becoming tenured STEM faculty. The workshop has been held annually since 2003 and has attracted 252 participants, including 237 women, 118 of whom have been under-represented minority. Our *Faculty Horizons Program* receives more than 250 applications for each of its annual workshops and has been duplicated at Virginia Tech and Rice University.

The *Eminent Scholar Program* facilitates mentoring relationships between all new female STEM faculty and prominent researchers in their fields. This relationship is tailored to meet the specific needs of the junior scholar based on how effectively she has been mentored up to that point. ADVANCE also works closely with the WISE group on campus, an informal university network of STEM women, including a number of women of color, which meets monthly to provide a *community of exchange and support.* Before the ADVANCE initiative, the WISE group initiated an informal exchange of mentoring information through its monthly meetings. ADVANCE has expanded to develop this informal mentoring activity into a formal *Faculty ADVANCEment Workshop Series,* providing monthly workshops for all STEM faculty members on topics related to the tenure process, grant writing, resource negotiations, departmental politics, press relations, work/family issues, effective communication, and lab management.

Through ADVANCE, we also have learned a great deal about some of the special challenges women in STEM fields face, particularly minority women, because of the numerous campus and community demands that are made on their time. Maintaining a productive research agenda is one such challenge, and to avoid attrition of minority women from doctoral programs and academic positions, institutions need to be supportive of these promising scholars and help to protect their research agendas as they move toward either completing their doctorates or achieving promotion and tenure. In this connection, the *ADVANCE Research Assistantship Program for Current Faculty* provides competitively awarded funding for a research assistant (RA) to female and male faculty who actively support the advancement of women and minorities in STEM fields. These RA awards are intended to support associate professors who are close to promotion, compensate for high service loads, and serve as bridge money for faculty between grants. Further support is available through the

ADVANCE *Faculty Sponsorship Committee,* consisting of senior men and women faculty, which identifies and advises STEM women as they approach important milestones in their academic careers. The Committee offers guidance to STEM women about dossier preparation, balancing research and service obligations, and developing effective teaching portfolios as they anticipate third-year review or tenure with promotion. Together, these activities create a web of support that helps to guide women on a clearly defined path to success.

"Not Going It Alone"

"My soul was hungry for support." These are the words that Dr. Kristi Pullen, a brilliant young African American women and former Meyerhoff Scholar, wrote to me two years ago as she contemplated her future after earning her Ph.D. in biochemistry at one of the Nation's leading research universities. She had performed superbly in her doctoral program, solving protein structures using x-ray crystallography. But Dr. Pullen seriously considered leaving science for policy work in response to the profound sense of isolation she had experienced during her graduate studies. At this critical point in her career, reflecting on what "going it alone" had meant to her, Dr. Pullen concluded, *"I had all but completely given up on the idea of going into bench science [and] didn't particularly want to engage in it any longer. I have found this road to be a particularly lonely one, and I couldn't see myself walking it anymore."* Fortunately, Kristi has remained in science, in part because of the support and encouragement she received from my colleagues.

Moving forward, though, it's important to ask ourselves how can we create a culture of inclusion and a community of support to encourage talented minority women like Kristi Pullen to thrive as scientists and engineers in our universities? A university's institutional culture reflects its values, and inclusive academic cultures promote the advancement of women in STEM fields by identifying and addressing institutional barriers to success wherever they exist, and by cultivating a community of support. A *culture of inclusion* provides visible leadership and attends to climate and attitudes in all sectors of the campus—engaging faculty, administrators, staff, and students. A *community of support* listens carefully to the voices of women scientists, including women of color, and maintains a climate of openness that encourages the expression of wide-ranging views without concern of censure. Inclusion, in this sense, captures more than just a sense of possibility. Inclusion encourages an environment of high expectation and support, provides clear pathways to advancement, establishes best practices in mentoring, develops viable networks and communities of shared interests, prepares women to contribute to society as top researchers, and, in so doing, strengthens the experience for all faculty.

BIOGRAPHY FOR FREEMAN A. HRABOWSKI, III

Freeman A. Hrabowski, III, has served as President of UMBC (The University of Maryland, Baltimore County) since May, 1992. His research and publications focus on science and math education, with special emphasis on minority participation and performance.

He serves as a consultant to the National Science Foundation, the National Institutes of Health, and universities and school systems nationally. He also sits on several corporate and civic boards. Examples include the Carnegie Foundation for the Advancement of Teaching, Constellation Energy Group, the France-Merrick Foundation, Marguerite Casey Foundation (Chair), McCormick & Company, Inc., Mercantile Safe Deposit & Trust Company, and the Urban Institute.

Examples of recent awards or honors include election to the American Academy of Arts & Sciences and the American Philosophical Society; receiving the prestigious *McGraw Prize in Education,* the *U.S. Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring,* and the Columbia University *Teachers College Medal for Distinguished Service;* being named a Fellow of the American Association for the Advancement of Science and *Marylander of the Year* by the editors of the *Baltimore Sun;* and being listed among *Fast Company* magazine's first "Fast 50 Champions of Innovation" in business and technology. He also holds a number of honorary degrees, including most recently from Princeton University, Duke University, the University of Illinois, the University of Alabama-Birmingham, Gallaudet University, Goucher College, the Medical University of South Carolina, and Binghamton University.

He has co-authored two books, *Beating the Odds* and *Overcoming the Odds* (Oxford University Press), focusing on parenting and high-achieving African American males and females in science. Both books are used by universities, school systems, and community groups around the country.

A child-leader in the Civil Rights Movement, Dr. Hrabowski was prominently featured in Spike Lee's 1997 documentary, *Four Little Girls,* on the racially motivated bombing in 1963 of Birmingham's Sixteenth Street Baptist Church.

Born in 1950 in Birmingham, Alabama, Dr. Hrabowski graduated at 19 from Hampton Institute with highest honors in mathematics. At the University of Illinois at Urbana-Champaign, he received his M.A. (mathematics) and four years later his Ph.D. (higher education administration/statistics) at age 24.

Chairman BAIRD. That buzzer is the Pavlovian way of telling Vern and the rest of us and myself that we have got to go vote in about 15 minutes. We will have time, actually, for the rest of the testimony, and then we will have to adjourn briefly, or recess briefly and then come back to ask some questions.

It is outstanding testimony so far. We will surely want to come back. So Dr. Campbell.

STATEMENT OF DR. MYRON CAMPBELL, CHAIR, PHYSICS DEPARTMENT, UNIVERSITY OF MICHIGAN

Dr. CAMPBELL. Thank you, Chairman Baird and Ranking Member Ehlers for inviting me here to talk about this issue which is very important to me. I am the Chair of the Physics Department at the University of Michigan, and in this role, I have become much more aware of the hurdles, in spite of our best intentions, women have to overcome in order to be able to fully participate in careers in science and technology. As other members have said, we need all of our talents to move forward.

In your opening statements, you mentioned that in STEM fields, women comprise about 18 percent of the senior faculty, and in physics, I am sorry to say, it is worse. It is about five percent, probably one of the lowest. The physical sciences have many stages between student and practitioner that people have to go through, undergraduate, graduate, post-doc, assistant professor and so on, and it was pointed out there is a disproportionate attrition at every single stage. Consequently, the fraction of women who become full professions, as it is, is now about four percent.

And in trying to understand these issues and how to work on addressing these issues, I have come to four key understandings about the problems. And as you have just said, the first one is all of us have a responsibility to remove the barriers and effect change. I was at faculty meeting when this topic came up, and all heads turned towards the few women who were in the faculty meeting, saying what are you going to do about this issue. And it is not their responsibility. It is all of our responsibilities to work on this.

Second, there is not a single, magic-bullet solution that is going to fix this. There are going to be many small steps required to be taken to address this issue.

Thirdly, it is not just about the numbers. It is not just the five percent or the 18 percent. It is about the climate and it about how women are treated. I would like to share with you an anecdote. I am going to follow your DOT matrix story. When I became chair, one of the things I looked into was a—what written records we had about how the women in our department were treated. And one of the first things I did as the new chair was to go to everyone and apologize on behalf of the department for things that had happened to them that I though, if that had happened to me, I would have

quit. Truly, there are many issues like this that come up, so the climate is very important.

And finally, all of the things that we value in our physics department, our first-rate research, our excellence in teaching, our community outreach, all of this is being placed at risk by us not dealing with these climate issues.

Many of the other comments I had were the same—I want to talk about some of the impact, specifically, that ADVANCE has had in how we conduct our business in the physics department. One of the key things is understanding better how to do searches for new faculty. And many different aspects come into play here.

One is an understanding of how to read letters of recommendations. And once I looked at that a little bit and went back and looked at letters of recommendation from people that I know do know better, there is a lot of bias, still, in the letters of recommendation that has to be stripped away before you can accurately evaluate a candidate. The second thing is that we need to have a large pool of candidates. We cannot do a narrow search where we are looking in a field that may only have two or three candidates per year in the whole country. We need to look broadly.

Implementing these solutions over the last four years, the numbers of offers we have been making have gone equally to men and women. Unfortunately, the acceptance ratio to Michigan for those offers has not been that. And that caused me to say, well, we now have to turn our attention towards what do we need to do to bring more women to the stage of being able to apply for faculty positions. And that is going to bring me briefly to my recommendations.

One is encourage NSF to continue the ADVANCE program. It is been extraordinarily valuable. The second is I would also encourage NSF or other funding agencies to provide post-doctoral fellowships in the same way that they provide graduate fellowships. The key thing here is it changes the way in which the post-docs are selected. Currently, we are still in the model of selecting post-docs by looking at only a handful. By having a national competition for post-doctoral fellowships, we will have a broadened pool, and we can try to accomplish there what we have done with selecting our faculty.

And the third thing is a new awareness that scientists are now having babies, and our rules for doing such things—we have already mentioned this. For example, the American Physical Society is now offering grants to allow women with infants or small children to attend conferences, pay for daycare while they are there. These are small grants. They are $200. And if anyone thinks that taking a baby along to a conference is a luxury—but agencies cannot do this. They cannot support this, either in direct or indirect costs, because of the 821 Rule, so in my written testimony, I have specific recommendations for which 821 Rule should be modified to remove this particular prohibition.

Again, thank you for the opportunity to be here today.

[The prepared statement of Dr. Campbell follows:]

PREPARED STATEMENT OF MYRON CAMPBELL

Introduction

Chairman Baird, Ranking Member Ehlers and Members of the Subcommittee, thank you for the invitation to testify today. It is an honor for me to be able to contribute to the discussion of women in physics, and talk about the necessity of removing barriers to allow any member of our society to contribute to our nation's real and pressing needs in science and technology.

I joined the University of Michigan in September 1989 as an Assistant Professor. Prior to coming to Michigan I worked eight years at the University of Chicago, and prior to that I was a graduate student at Yale University. I was promoted to Associate Professor after three years and to Professor in 1998. My area of research is High Energy Physics and I am co-author on over 300 scientific papers, mostly with the CDF collaboration. I was appointed Chair of the Physics Department in 2004.

Women in Physics

My own appreciation of the issues of women in physics and some of the barriers came about four years ago during an unsuccessful attempt to hire a female assistant professor. During this process I became aware that the issue was about more than just the number of female faculty; that there were real barriers and biases which made it more difficult for talented women to participate in science.

Activities at Michigan

Three and a half years ago I was appointed the Chair of the Physics Department. Shortly after becoming Chair I invited the Committee on the Status of Women in Physics (CSWP)[1], a committee of the American Physical Society (APS), to conduct a site visit to assess the climate for women in our department. Over the last seventeen years CSWP has visited and evaluated over forty institutions. The overall assessment from the site visit report was that the climate at Michigan for women in physics needs serious improvement. There were several key points from the report I have used to understand how to proceed:

- It is not the responsibility of the women in the Department to effect change. Improvements will have to be driven by the combined efforts of the senior faculty.
- Problems exist at all levels and areas, and there is not a single solution or 'magic bullet.' Improvements will come from a large number of modest accomplishments.
- It's not just about the numbers. A major problem is the climate and how the women are treated. Bringing in additional female faculty must be accompanied by improving the climate.
- All of the Department's accomplishments—first rate research programs, excellent undergraduate and graduate education, and successful community outreach—are placed at risk by climate issues.

With these points in mind, we took specific steps to improve the environment for undergraduate students through renovation of our introductory courses and providing student-led study sessions for advanced courses. We are more closely monitoring the graduate students, and taking early intervention for students who might otherwise drop out of the program. We have changed some of the graduate program requirements to reduce the stress graduate students feel, without reducing our standards. We have taken steps to improve the climate for female faculty. We have also modified the way we conduct searches for new faculty—searches are now open across all sub-fields of physics represented in the department.[2] This change has resulted in our department making offers to nine women over the last four years, although, only one accepted.

Much of this effort has been through Departmental and University initiative and support, along with support from funding agencies for programs such as ADVANCE. To increase the number of women in faculty ranks it is necessary to increase the number of women participating at all levels which lead to careers in science—high school, undergraduate education, graduate school, and postdoctoral positions. A key area of difficulty is the postdoctoral position, the transition from graduate student to assistant professor. One of the ways to create diversity in the workplace is to create a broad pool of applicants. The current practice for hiring postdocs runs counter to this—often a faculty member will select a postdoc from only a few candidates,

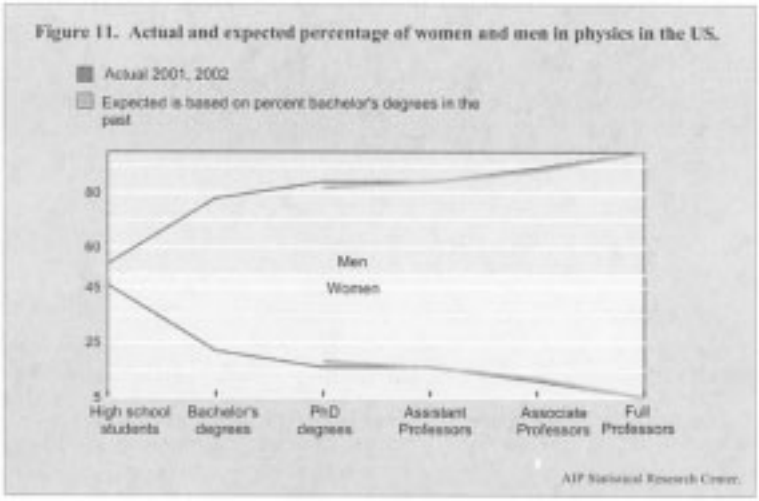
[1] *http://www.aps.org/programs/women/index.cfm*
[2] Advertisement in *Physics Today,* September 2007, page 101.

since the work the postdoc is required to do is narrowly defined. The few institutions which have privately funded postdoctoral fellowships (Chicago, Caltech, Princeton, Berkeley, Harvard, MIT) are able to draw a large application pool, and have been successful at bringing in a talented and diverse group of postdocs.

I attended a workshop on gender equity[3] held by the American Physical Society in May, 2006 where I shared some of my experiences with chairs and heads of other physics departments. The summary and recommendations from the workshop have been posted on the APS gender equity website. The department chairs attending the conference focused on four categories: Recruiting Students, Building a Respectful Environment, Faculty Hiring, and Faculty Retention. The consensus goal from the workshop was to double the number of women in physics over the next 15 years, which will require increasing the number of women working at all steps leading to a career in science.

Recommendations

I have several recommendations to the Subcommittee. The first is to encourage the NSF to continue the program *ADVANCE: Increasing the Participation and Advancement of Women in Academic Science and Engineering Careers.* I know firsthand this program has been of great benefit at the University of Michigan.[4] The practices, policies and procedures that have been developed at ADVANCE institutions should be integrated both into the NSF and other research and education institutions.



My second recommendation addresses the 'pipeline issue,' as illustrated in the chart provided by the American Institute of Physics.[5] The figure shows the decline in the percentage of women at various ranks, and the prediction in yellow based on the number of Bachelor's degrees awarded to women in the past. This chart shows that the pipeline explains the small numbers of women in physics and that the pipeline is the problem, highlighting the need for eliminating gender bias at every career stage. Universities such as Michigan can work on some stages of the pipeline on their own, for example promotion from assistant professor to associate professor, or improvement in undergraduate education. One of the findings of ADVANCE was that open, broad based, as opposed to narrow, searches provides a larger, more diverse pool of applicants. While our Department has been able to do this for graduate admissions and assistant professor searches, we have not been able to do this at the postdoctoral level. I recommend that NSF expand their Postdoctoral

[3] *http://www.aps.org/programs/women/workshops/gender-equity.cfm*
[4] *http://sitemaker.umich.edu/advance/home*
[5] *http://www.aip.org/statistics/trends/highlite/women05/figure11.htm*

Fellowships program to include Physics, similar to the existing programs in Astronomy and Biology. Such a program would draw a large pool of applicants.

My third recommendation is to eliminate some of the barriers to women, especially women with young children, which is codified in OMB circular A–21.[6] Section J.32 on Meetings and Conferences should be modified to specifically allow for women to take infants or small children to conferences and the cost of childcare during the conference should be an allowable direct or F&A expense. Section J.53 in a similar way should allow for the travel costs associated with having small children be an allowable direct or F&A expense. Section J.42 on recruiting costs should be modified to recognize that attracting top talent, either male or female, now often requires spousal recruitment,[7] which should be either an allowed direct or F&A cost.

Conclusion

Thank you again for the opportunity to testify today. I hope I can continue to be of service on this issue. Advances in science and engineering require the talent, hard work, and ingenuity of a large and diverse workforce. Women represent about half of our entering undergraduates interested in science and engineering, yet they represent a much smaller fraction of our scientific workforce. We all must work to remove barriers.

BIOGRAPHY FOR MYRON CAMPBELL

Education

1977–1982—Yale University, New Haven, CT; Ph.D., Physics Advisor Robert K. Adair

1973–1977—Otterbein College, Westerville, OH; B.A., Physics

Employment

2004–Present—University of Michigan, Ann Arbor, MI; Chair, Physics Department

1998–Present—University of Michigan, Ann Arbor, MI; Professor

1992–1998—University of Michigan, Ann Arbor, MI; Associate Professor

1989–1992—University of Michigan, Ann Arbor, MI; Assistant Professor

1989—University of Chicago, Chicago, IL; Senior Scientist

1985–1989—University of Chicago, Chicago, IL; Senior Research Associate

1982–1985—University of Chicago, Chicago, IL; Research Associate

1982—Yale University, New Haven, CT; Research Associate

Awards

Fellow of the American Physical Society, 1998

LS&A Excellence in Education Award, 1996

A.P. Sloan Fellow, 1990–1991

A.H. Compton Lecturer, University of Chicago, 1985

Professional Service

1990–present—CDF Executive Board

1993–1994—Femilab Users Executive Committee

1990–1993—SDC Technical Board

Departmental Committees (selected)

1998–1999—High Energy Theorist Search Committee; Undergraduate Concerns Committee

1996–1998—High Energy Experimental Search Committee, Chair

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[6] *http://www.whitehouse.gov/omb/circulars/a021/a021.html*

[7] *"Education in Nuclear Science,"* a report to the DOE/NSF Nuclear Science Advisory Committee, pp. 4–15 (November 2004), *http://www.sc.doe.gov/henp/np/nsac/docs/NSAC_CR_education_report_final.pdf*

1994–1997—Undergraduate Concerns Committee; Undergraduate Laboratory Committee

1993–1994—Department Computing Committee, Chair

1992–1993—HEP Spin Physics Search Committee

1991–1994—Graduate Admissions

College and University Committees (selected)

2003—LS&A Executive Committee

1997–1998—CRLT Advisory Board

1995–1999—LS&A Curriculum Committee

1994—University Task Force on Research Computing

Research Activities

My research activities are in the area of high energy hadron collisions. I am involved in the CDF (Collider Detector at Fermilab). My efforts in this collaboration have been in the area of triggering, i.e., identifying events of interest. My analysis efforts are directed towards studies of top production and decay systematics.

Physics Publications

2006

Top Physics: Measurement of the Top Quark Mass with the Dynamical Likelihood Method using Lepton plus Jets Events with b-tags in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.96 TeV
A. Abulencia et al., The CDF Collaboration, Phys. Rev. D 73, 092002 (2006).

Top Physics: Search for Anomalous Decay of Heavy Flavor Hadrons Produced in Association with a W Boson at CDF II
A. Abulencia et al., The CDF Collaboration, Phys. Rev. D 73, 051101 (2006).

B Physics: Evidence for the Exclusive Decay $B_c^{\pm} \rightarrow J/\psi\, \pi^{\pm}$ and Measurement of the Mass of the $B^{\pm}_c$ Meson
D. Acosta et al., The CDF Collaboration, Phys. Rev. Lett. 96, 082002 (2006).

Top Physics: Top Quark Mass Measurement Using the Template Method in the Lepton + Jets Channel at CDF II
A. Abulencia et al., The CDF Collaboration, Phys. Rev. D 72, 032003 (2006).

Top Physics: Precision Top Quark Mass Measurement in the Lepton + Jets Topology in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.96 TeV
A. Abulencia et al., The CDF Collaboration, Phys. Rev. Lett. 96, 022004 (2006).

Thesis Students

Name	Department	Candidacy	Degree
Kathy Copic	Physics	F03	W07
Fred Neill	Physics	F02	F03 (Masters)
John Carlson	Physics	W99	W02
Sarah Truitt	Physics	W96	W02
Eugene Guillian	Physics	F94	W99
Kevin Burkett	Physics	F94	W98
Bill Badgett	Physics	F90	F94

Chairman BAIRD. I appreciate the comment. My wife, a Ph.D. economist, is traveling to Seattle now for a conference, and I am

in care of two two-year, seven-month-old twins. It is not a luxury to leave them behind either.

I did acknowledge earlier, Mr. Neugebauer from Texas, as well, and I should inform my colleagues, I misspoke earlier. The Pavlovian conditioning is too strong in me. We aren't voting yet. We are just going back into session in a few minutes, so we have a little more time and less time pressure, which is good news.

Dr. Ritter, please.

STATEMENT OF DR. GRETCHEN RITTER, PROFESSOR OF GOVERNMENT; DIRECTOR, CENTER FOR WOMEN'S AND GENDER STUDIES, UNIVERSITY OF TEXAS AT AUSTIN

Dr. RITTER. Good afternoon. Thank you, Mr. Chairman, other Subcommittee Members. I am please to be with you today to talk about ways to increase women's participation in academic science and engineering.

It has been 35 years since the passage of Title IX, yet women continue to lag behind men in academic achievement, particularly in the STEM disciplines. Research suggests that these disparities are not due to differences in aptitude or native interest between men and women. Rather, the causes lie elsewhere, in the institutional structure and culture that discourage women's participation in science and engineering in limits their potential for success in those fields. While the era of explicit sex discrimination in higher education may be fading—hopefully fewer DOT matrix moments—implicit bias continues to play a significant role in determining opportunities for entry and advancement for women as well as minority faculty members.

There remain four great barriers to women's advancement in higher education: climate, which we have talked about today; professional assessment and rewards; work-family balance; and the absence of senior women. On this last barrier, I contend that the presence of women in senior ranks has a large impact on the overall institutional climate, on the strength of mentoring programs, on the impact of implicit bias and assessment, on the visibility of positive role models, and on the creation of a family-friendly institutional culture.

In addressing these barriers, universities should design a program that emphasizes four features: accountability, assessment, continuity, and leadership. Assessment will allow universities to determine whether their efforts to recruit and retain women faculty are successful, and if not, how they may be redesigned to increase the likelihood of success.

Regarding continuity, effort to increase women's participation takes sustained, continuous commitment to make a lasting difference. All too often, institutions put together a program. They do a good job. And then they stop. And when they stop, progress in recruiting and retaining women stops as well. We have to keep going. We have to sustain these efforts for the long-term. It is not a short-term effort.

What role can the Federal Government play? First, the NSF should expand the ADVANCE program beyond individual campuses, into other fields where women and minority faculty are under-represented, particularly, I would argue with social sciences,

because that will help with other areas. Social scientists really supply us with much of the research we need to understand these institutional barriers.

Second, the Federal Government should use Title IX enforcement as a means of advancing women in under-represented field. The original intent of Title IX was to ensure equal educational opportunity for both sexes. Yet relatively little has been done outside of athletics to make that mandate meaningful when it comes to addressing opportunities for advancement and achievement in traditionally male-dominated fields in higher education.

Like Dr. Shalala, I am on the women's athletic council at UT and we just went through out NCAA recertification. If we gave that kind of attention to gender equity and equal opportunity in academic fields, we would be doing so much better.

We now know that the academic achievement of young women in math, science, and engineering, depends on the presence of positive female role models and on women peers in the classroom. To support educational opportunity for women, we ought to leverage federal education and research funding to mandate Title IX compliance. Creating equal opportunity for women faculty will allow younger women to imagine themselves as the next generation's great scientists and inventors.

Thank you.

[The prepared statement of Dr. Ritter follows:]

PREPARED STATEMENT OF GRETCHEN RITTER[1]

Executive Summary

1. The largest remaining barriers to women's advancement in academic science and engineering include:
   a. *Climate*—Even when universities are successful in recruiting women and minority faculty, they tend to leave at greater rates due to climate concerns.
   b. *Professional Assessment and Rewards*—The professional assessment and reward structures of universities often allow for unconscious or implicit bias to play a role in providing disparate opportunities and rewards for equally qualified male and female faculty.
   c. *Work-Family Balance*—Within academia, our expectations about tenure, career trajectories and productivity, and the conduct of research and professional service to one's department and discipline, still presume that the full-time faculty are unencumbered by family responsibilities or caregiving expectations for children, partners, or elderly parents.
   d. *Absence of Senior Women*—The presence of women in the senior ranks has a large impact on climate, mentoring, the role of implicit gender bias in faculty assessment, the visibility of positive role models, and the creation of a family friendly institutional culture.
2. Universities should focus on the following in addressing these barriers:
   a. *Accountability*—Universities should implement procedures that promote accountability in their efforts to recruit and retain women faculty.
   b. *Assessment*—Universities should also assess their efforts to increase recruitment and retention of women in order to identify which efforts are most successful and which efforts are not.
   c. *Continuity*—These efforts take sustained, continuous commitment to make a substantial difference. Too often, when successful programs end, so does progress in the recruitment and retention of women faculty.

[1] The author wishes to thank Janet Ellzey, Kiersten Ferguson, J Strother Moore, Shelley Payne, Linda Reichl, Bev Vandegrift, Gregory Vincent, and Sharon Woods for their assistance in the preparation of this testimony.

d. *Leadership*—The universities that have made substantial gains in recruiting women faculty in under-represented fields are the ones that have a president or a provost who is forthright, articulate, and visibly committed to the value of having a diverse and equitable faculty.

3. The Federal Government should:

a. Expand the ADVANCE initiative to include minorities and women in other under-represented fields, especially in the social sciences.

b. Use Title IX enforcement as a means of advancing women in academic science and engineering.

I. Introduction

It has been 35 years since the passage of Title IX of the Educational Amendments of 1972, yet women continue to lag behind men in educational achievement, particularly in the STEM[2] disciplines. Research suggests that these disparities are not due to differences in aptitude or potential interest between men and women. Rather, the causes lie elsewhere—in the institutional structures and culture that discourage women's participation in science and engineering, and limit their potential for success in those fields.[3] While the era of explicit sex discrimination in higher education may be fading, social science research suggests that implicit bias continues to play a significant role in determining opportunities for entry and advancement for women (as well as minorities) in higher education. The barriers to women's achievement remain significant.

We cannot afford to tolerate women's continued exclusion from these fields. The absence of women in academic science, social science, and engineering has a negative impact in a variety of important areas. Having a diverse higher education faculty is important to the Nation's well-being. If the United States is to remain a world leader economically, and in scientific and technological innovation, we must recruit talented people from all sectors of our society to become scientists and engineers. If we want to encourage women to become engineers, African American men to become elementary school teachers, and Hispanic women to be business professionals and lawyers, then we need a faculty that shows our students that women and people from different racial and ethnic backgrounds can achieve and succeed in every field. Too often, I have had women students tell me that they came to college wanting to be scientists or engineers, but left that field because they felt isolated or discouraged when they had no women classmates or women professors.

We also need to have a diverse faculty in order to advance academic excellence. If we fail to recruit and retain women in economics or physics, then we deny ourselves the opportunity to benefit from the talent and insights of half of the population. If we have no black or Hispanic senior faculty in psychology or government, then we might have a faculty that is less motivated to exploring issues such as the impact of racial stereotyping on social achievement or the role that black churches play in national politics. Recruiting faculty from all sectors of the population allows us to draw on a broader pool of talent in building academic excellence. Retaining a diverse faculty means we benefit from having researchers and teachers whose approach to knowledge is shaped by a range of social experiences and interests. Women are more likely to enter technological and scientific fields because of their interest in social issues, like advancing children's health, or improving the lives of the disabled. So recruiting a more diverse faculty is likely to shape the research agenda and scientific innovations of the next generation.

Finally, it is worth remembering that American universities have always played a vital role in the development of our nation's economic, political and social leadership. It is part of the mission of public universities in particular to provide access to educational opportunities as a means of developing a diverse leadership for a democratic nation. With the advent of globalization, it is more important than ever that we encourage the development of leaders who operate well in an interconnected world marked by differences of race, religion, gender and culture. Public universities can provide both a social climate and an intellectual environment that is supportive of diversity and leadership. Since advances in fields like information technology will shape our economy and our society in decades to come, it is essential that women and minorities be recruited into those fields, as scientific leaders in a sector that will shape our nation's future. We will all benefit if the Michael Dells, Bill Gates,

[2] STEM is an acronym that stands for Science, Technology, Engineering, and Math.

[3] See the National Academies, *Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering* (Washington, DC: the National Academies Press, 2006).

and Steve Jobs of the next generation come from a more diverse cross section of our community. Our universities can help to make that happen.

II. Efforts at the University of Texas at Austin to Recruit and Retain Women in Science and Engineering

Currently, at the University of Texas at Austin, women make up 10.6 percent of the tenured and tenure track faculty in the College of Engineering, and 12.7 percent of the tenured and tenure track faculty in the College of Natural Sciences.[4] Among assistant professors, women make up 19 percent of the faculty in Engineering and Natural Sciences. Overall, at the university as of 2006, women constitute 18 percent of the full professors, 38 percent of the associate professors, and 39 percent of the assistant professors. Further, 24 percent of the tenured faculty are women at the university. So while there are fewer women in science and engineering, women are under-represented within the tenured and tenure track faculty university wide. According to the *AAUP Faculty Gender Equity Indicators 2006* report, the comparable figures for the proportion of women faculty at doctoral universities nationwide are 19 percent of the full professors, and 40 percent of the assistant professors.[5] This same report indicates that 26 percent of the tenured faculty are women at doctoral institutions nationwide. So the University of Texas at Austin is close to these national averages, but slightly below those averages.

There are programs at the University of Texas at Austin that seek to address the under-representation of women in academic science and engineering. The College of Engineering created the Women in Engineering Program (WEP) in 1992. This program seeks to recruit women students, and increase the proportion of women receiving undergraduate degrees in engineering at the University. The primary focus of their efforts has been to provide academic and peer support to first and second year women undergraduates. Within the College of Natural Sciences, the Women in Natural Sciences program (WINS) focuses primarily on issues facing women students at the undergraduate level. One successful WINS initiative that began in 2001 is the Honors Residential Program for women undergraduates in natural science. The students who participate in this program are found to have a higher level of academic success and retention than female students in natural sciences who do not participate in the program. The College of Engineering now offers a similar residential program for first year students, called WELD.

Both WEP and WINS offer K–12 programs as well, designed to encourage interest in sciences and engineering among middle school and high school girls. The "Science in Action Program" is aimed at area schoolgirls between the ages of 11–15. This day-long program allows students to participate and observe science demonstrations at the college's research labs. WINS also supports the work of Girlstart, a local nonprofit organization which promotes science and math learning among elementary and middle school girls. Likewise, each February, the College of Engineering hosts the "Introduce a Girl to Engineering Day," which attracts over 1,000 area schoolgirls to participate in demonstrations and workshops designed to promote interest in engineering. In addition to these efforts, the Center for Women's and Gender Studies (CWGS) has a school partnership agreement with the Ann Richards School for Young Women Leaders. The Ann Richards School is a public, all girls middle school that focuses on success in the STEM disciplines. Under the partnership agreement, CWGS provided mentoring and professional development support to the faculty and staff at the school. CWGS faculty also conduct research at the school to assess the effectiveness of its programs.

Less has been done at the graduate or the faculty level to promote the recruitment and retention of women in engineering and science. In the late 1980s and 1990s, Target of Opportunity funding was made available through the provost's office to assist in recruiting women and minority faculty in fields where they were under-represented. This funding made a substantial difference in the number of women faculty hired. In the College of Engineering, for instance, the number of tenured or tenure track faculty increased from just eight in 1987 to 21 in 1997. When this funding was withdrawn, hiring and retention efforts stalled, so that in 2002 there were still only 21 women faculty (nine percent of the total) in the College

[4] These figures are calculated from the *2006–7 Statistical Handbook* (Office of Information Management and Analysis, UT Austin). Please see table FS 8, pp. 119–120. For the College of Natural Sciences, the faculty in the Department of Human Ecology were not included in the calculation, since these are primarily social scientists.

[5] Martha S. West and John W. Curtis, *AAUP Faculty Gender Equity Indicators 2006* (Washington, DC: AAUP, 2006). See Figures 4 & 5, pp. 8 & 10.

of Engineering.[6] With the help of leadership by the dean and various department chairs in recent years, the number of women faculty in the college has now risen to 26, which still represents under 11 percent of the total tenured/tenure track faculty in the college. Within the College of Natural Sciences, over the past five years WINS has sponsored five workshops for chairs, executive assistants, and search committee members on best practices for diversity recruiting and has created an online faculty recruiting handbook. Three CNS departments have implemented these best practices, under the leadership of a strong Chair or search committee chair, and all three have doubled their representation of women faculty. Apart from these workshops and chair led efforts in particular departments (such as Computer Science), relatively little has been done to promote increased recruitment and retention of women faculty. To date, UT Austin has not participated in the ADVANCE program.

At the level of the university as a whole, efforts have been made to address the needs of women faculty and the situation of women in under-represented fields. In 1999, a report was done on the status of women, which revealed some faculty salary inequities by gender. The provost's office set aside funding to address those inequities in 2000. One barrier to professional achievement for women academics nationally involves work-family balance issues. Overall women are still more likely to have primary responsibility for addressing dependent care needs within families. Further, women academics are also more likely to be married to male academics (and to male professionals), which makes dual career issues of greater importance to women academics. UT Austin has sought to address these concerns in recent years by expanding the amount of university provided childcare that is available to faculty, and by reserving some spots at the childcare center for use in faculty recruitment. Funding is also available from the provost's office for faculty spousal hiring. Further, the university now offers a modified instructional duties policy, which is intended to allow faculty with substantial caregiving responsibilities for newborns to be relieved of their obligation to teach full-time for a semester while still receiving their full salaries.

In 2006, the university created the Division of Diversity and Community Engagement which is charged with promoting diversity and gender equity for students, staff, and faculty. This division is working with the provost's office to promote hiring that will increase the number of women and minorities on the faculty. The provost's office also recently created the Gender Equity Task Force which is charged with examining the situation of women faculty on campus and recommending policies that promote gender equity. The task force (which I co-chair, along with Dr. J. Moore, Chair of Computer Science) is expected to complete its work and issue its report next spring.

These efforts are important, but more remains to be done. Nationally, many universities have become aware that the advancement of women faculty in under-represented fields requires focused and continuous effort by the institution as a whole. UT Austin does not currently have a clear and effective leader on gender equity in our central administration. While the president and the provost have voiced support for gender equity, there need to be mechanisms created that will hold deans and department chairs accountable for their achievements in this domain. There also needs to be someone with authority in the higher administration whose primary responsibility includes oversight of efforts to increase the university's recruitment and retention of women in under-represented fields. Finally, more effort should be given to assessment, so that we know whether the programs and policies that we sponsor are effective and should be sustained.

III. Remaining Challenges, Promising Solutions

Nationally, there have been substantial increases in the number of women obtaining undergraduate degrees in the sciences, social sciences and engineering. The numbers of doctorates awarded have also increased substantially in many disciplines, yet this has not translated into comparable increases in the proportion of women faculty in these fields. What are the major barriers to the retention and promotion of women faculty within higher education nationwide? Further, how might these barriers be most effectively addressed within academia? In this section, I briefly highlight the most significant barriers to the advancement of women in under-represented fields in the areas of climate, professional assessment and reward, work-family balance, and the absence of senior women. Following the discussion of these challenges, I review the most promising areas where solutions may be

[6] These figures were obtained from a powerpoint presentation made by Dr. Sherry E. Woods, (Director of Special Projects in the College of Engineering), dated November 1, 2002.

sought to the problem of women's under-representation in academia. My recommendations in this area focus on accountability, assessment, continuity, and leadership.[7]

Climate

Institutional climate has a large impact on whether women and minority faculty thrive and are retained in fields where they are under-represented. Even when universities are successful in recruiting women and minority faculty, they tend to leave at greater rates due to climate concerns. Sometimes women and minority faculty have less access to the informal professional networks that are important to their professional success. They may feel as though their achievements and credentials are regarded as suspect by students and colleagues alike. There may be few people in their department with whom they can communicate about the particular challenges they face in establishing authority in the classroom, in responding to the needs and expectations of women and minority students, or in finding social connections with people from similar social backgrounds outside of the university. Women faculty (as well as many male faculty with substantial caregiving responsibilities) may sense that there is a lack of sympathy or support for their family responsibilities. Finally, if there are no senior women or minority faculty within their department (or administrators at their institution), then junior faculty are more likely to feel professionally isolated, and to doubt whether their institution will ever promote and retain someone like them.

To address some of these climate concerns, several things are helpful.[8] Universities should create strong mentorship programs that address concerns about intellectual community and social networks as well as professional development. They should also establish clear policies that promote a family friendly work environment for faculty. Where campus wide organizations for women and minority faculties exist, they should be supported and strengthened. Where they do not exist, they should be created. Support for interdisciplinary centers in racial, ethnic, or women's studies may also play a role in promoting intellectual community and social connection among women and minority faculty in a variety of fields. Finally, there should be forums, lectures, and workshops that promote frank and open discussions of climate issues on campus.

Professional Assessment and Rewards

The professional assessment and reward structures of universities often allow for unconscious or implicit bias to play a role in providing disparate opportunities and rewards for equally qualified male and female faculty. Like everyone in our society, academics employ information assessment shortcuts, or cognitive schemas, that filter information according to pre-existing understandings about how the world works. Such schemas include deeply rooted race and gender stereotypes.[9] These schemas, or unconscious biases, play a greater role in influencing assessments if they remain implicit and unaddressed, if assessments are made in a largely subjective fashion, and if the group conducting the assessment is not itself socially diverse. Typical university procedures for faculty recruitment, assessments for salary recommendations, and promotions evaluation all rely on assessment processes that are largely subjective and that may be conducted by a largely homogeneous group of evaluators. Further, the impact of these disparate assessments accumulate over time, so that over the course of their careers, women academics in under-represented fields may perpetually receive slightly smaller rewards and slightly fewer opportunities, until a decade or two down the line when they make receive lower salaries, are less likely to have advanced to the rank of full professor, and have less lab space than their equally accomplished male counterparts.[10]

Universities can do several things to alleviate the impact of unconscious bias on professional assessments or rewards. They can mandate that assessments be conducted in an objective fashion, with clear criteria for professional achievement and

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[7] Please note that since the Gender Equity Task Force at UT Austin is still collecting and analyzing data, the applicability of the recommendations in this section for UT Austin have yet to be determined.

[8] Also see Jean Waltman and Carol Hollenshead, "Creating a Positive Departmental Climate: Principles for Best Practices," Prepared for NSF ADVANCE at the University of Michigan, available at *http://www.umich.edu/%7Eadvproj/BestPracticesReport_FINAL_Aug07.pdf*

[9] See V. Valian, *Why So Slow? The Advancement of Women* (Cambridge, MA: MIT Press, 1998).

[10] JR Cole & B Singer, "A Theory of Limited Differences: Explaining the Productivity Puzzle in Science," in H. Zuckerman, JR Cole and J Bruer, eds., *The Outer Circle: Women in the Scientific Community* (NY: Norton, 1991).

productivity.[11] Where possible, professional assessments should be conducted blindly, without awareness of the race, ethnicity or gender of the person being evaluated. Yet, if a blind assessment is not possible (and there are often implicit indicators of race or gender in someone's professional record), then the assessors should be encouraged to be self-aware about the role that race and gender biases may play in their assessments. Self-awareness can decrease the influence that biases have on assessment. Finally, assessments should be conducted by diverse assessment teams. Universities should put in place procedures that insure the racial and gender diversity of faculty search committees, salary review committees, and promotion and tenure committees.

Work-Family Balance

The creation of family support policies at universities benefits the entire faculty and not just women. After the second world war, public and private social benefits programs were based on the presumption of a family structure that included a male breadwinner and a female caregiver. With the huge influx of women into the labor market, as well as changes in patterns of marriage, divorce, and childbearing, we no longer live in a society in which the breadwinner/caregiver model is applicable. But our employment policies and presumptions have yet to adjust to fact that most family caregivers are also paid employees, and that many caregivers have no other adult in the household to rely upon in sharing the duties of care and economic provision.[12] Within academia, our expectations about tenure, career trajectories and productivity, and the conduct of research and professional service to one's department and discipline, still presume that the full-time faculty are unencumbered by family responsibilities or caregiving expectations for children, partners, or elderly parents. Those presumptions are clearly unrealistic, and they are particularly harmful to women faculty who are more likely to be limited by the professional careers of their spouses, and more likely to have primary caregiver responsibility for family members. Further, to a greater degree than ever before, younger academic men are likely to have substantial caregiving responsibilities for their children, and to have spouses who work full-time. So both in the interest of gender equity, and in the interest of attracting men and women of talent into academic careers, universities must do more to support the family responsibilities of their faculty.

At the University of California at Berkeley, Drs. Mary Ann Mason and Marc Goulden have been national leaders in assessing the impact that work-family conflict has on the under-representation of women in academia, and in recommending policies and piloting programs intended to address these issues.[13] Most research universities now provide some childcare, unpaid childbearing leave, and stop-the-clock policies that extend the tenure clock for faculty with substantial caregiving responsibilities, as well as some assistance for dual career issues. In addition, Mason and Golden recommend that universities implement programs that create part-time tenured or tenure track options for faculty with substantial caregiving responsibilities, provide paid childbearing leave, provide emergency back-up childcare, assist spouses and partners of faculty with employment relocation services, provide re-entry post-doctoral fellowships for faculty who have taken time off to focus on family care needs, and create policies that insure family friendly calendars and scheduling for faculty.

Absence of Senior Women

In recent years, many universities have increased their efforts to recruit women faculty at the assistant professor level. These efforts are important and should be continued. Yet institutions often become frustrated by the difficulties they face in retaining and promoting the junior women they have recruited. Not only does this difficulty represent a failed investment by the university in their efforts to cultivate faculty talent, it may also reinforce negative stereotypes about women faculty, by suggesting that junior women are less likely to stay in academia or to succeed in getting promoted to the tenured faculty. It is little surprise, then, that some senior male faculty wonder whether efforts to recruit junior women are worthwhile. What this perspective neglects, however, is the important role that senior faculty women play in creating institutional cultures in which junior faculty women are likely to succeed. The presence of women in the senior ranks has a large impact on the cli-

[11] Claudia Goldin & C. Rouse (2000), "Orchestrating Impartiality: The Impact of 'Blind' Auditions on Female Musicians," *American Economic Review* 90:715–741.

[12] Joan Williams, *Unbending Gender* (NY: Oxford University Press, 2000).

[13] For more information on their research and on the Family Friendly Edge Project at UC–Berkeley, go to *http://ucfamilyedge.berkeley.edu/*

mate of a department and an institution, on the ability of institutions to provide mentoring that is supportive of diversity, on the role of implicit gender bias in faculty assessment and reward structures, on the service demands imposed on more junior faculty women, on the visibility of positive role models for junior faculty women and women students, and on the creation of a family friendly institutional culture within departments and colleges. For all of these reasons—and because the delay or departure of women faculty before they reach the senior ranks represents a loss of accumulated experience, insight, and potential innovations—more effort should be made to reward and retain women at or near the senior level.

In order to reward and retain women at or near the senior faculty level, universities should consider implementing some of the following policies and programs. They should fund efforts that result in more senior faculty women being hired. They should provide support for elder-care responsibilities, which are more likely to fall to women at the mid-career stage. They should provide research assistance and leaves for associate level faculty who undertake substantive service or administrative positions, such as associate dean, center director, or faculty senate chair. In fields where there are fewer women, the desire for diverse representation in administrative and service roles often leads to greater service demands on women at an earlier career stage. Efforts should be made to decrease the impact that such demands have on the research productivity of mid-career women faculty. Since women faculty are less likely to seek outside offers as a means of raising their salaries, efforts should be made to provide equity related and productivity based salary adjustments without having to rely on outside offers. Finally, attention should be given to the way in which endowed professorships and chairs are awarded to internal faculty. To counteract the possible impact of implicit gender bias and the greater professional isolation of senior women faculty, the awarding of endowed positions to internal faculty should be overseen by a diverse panel of senior faculty from across the campus.

Accountability, Assessment, Continuity and Leadership

For each of the areas discussed above, attention has been given to efforts that universities can undertake to reduce the impact of institutional barriers to the advancement of women in under-represented fields. This section concludes with additional suggestions of ways that universities nationally can promote the recruitment and retention of women in under-represented fields.

Universities should implement procedures that promote *accountability* in their efforts to recruit and retain women faculty. Accountability means requiring colleges and departments to report on their recruitment, promotion and retention efforts regarding the identification of a diverse pool or applicants, the proportion of applicants by sex and race, the composition of search committees, and the composition of governance committees that make hiring, promotion, and salary recommendation decisions. Accountability also means requiring deans and department chairs in fields where there is substantial under-representation to set goals for improving the representation of women faculty, and then providing or withholding resources in relation to their progress in achieving those goals. If, for instance, a department proves to be stubbornly unwilling to recruit any women faculty over a number of years, then they should be restricted in their ability to hire new faculty. Finally, accountability should include the ability and willingness of a dean or a provost to intervene when policies and procedures implemented to promote the recruitment and retention of women are not followed. For instance, if participants in a faculty search fail to make a good faith effort to identify and solicit applications from qualified women candidates, then a dean or provost should be willing to stop the faculty search until the failure to follow these procedures is corrected. Without accountability, goals and policies may be rendered meaningless.

Universities should also assess their efforts to increase recruitment and retention of women in order to identify which efforts are most successful and which efforts are not. *Assessments* of programs and policies should be done following standard social science protocols that promote objective evaluations. Program evaluations should be published, so that they may be scrutinized within the university community and by academics elsewhere. Where assessments provide strong evidence of the success of a program or policy, increased support should be given to that policy, and the policy should be replicated by other departments and colleges within the university. Where programs or policies do not succeed, an analysis should be done to identify the reasons for their failure, in order to improve the university's efforts in this area.

Continuity is also important to the success of these efforts. All too often, in the wake of a particular report or in response to an outspoken faculty leader, universities make short-term efforts to address gender equity concerns through one time

efforts to correct disparities in salaries or promotion rates, or with short-term initiatives intended to increase the number of junior women who are hired. But even in the case of successful programs, like the Target of Opportunity fund that was used to recruit women in under-represented fields at UT–Austin, when the program ends, so does progress in the recruitment and retention of women faculty. These efforts take sustained, continuous commitment to make a substantial difference. Not until the culture of an institution has thoroughly changed and there is a proportionate number of women in the senior faculty and administration of our universities should we consider letting up in our efforts to recruit more women in academic science and engineering.

Finally, to succeed these efforts take *leadership* from the highest levels of the university. The universities that have made substantial gains in recruiting women faculty in under-represented fields are the ones that have a president or a provost who is forthright, articulate, and visibly committed to the value of having a diverse and equitable faculty. Whenever searches are conducted for a new dean, provost, and president, strong candidates should have a record that verifies their commitment to faculty diversity and equity. Administrative leaders can help to set the tone for the entire institution. They can help to explain the value of equity and diversity to their senior faculty and department chairs. And they can hold deans and chairs accountable for their successes and failures in this area.

IV. Role of Federal Funding Agencies

The ADVANCE[14] initiative has made a substantial difference in the representation of women in science and engineering at several leading universities such as the University of Michigan. The ADVANCE program ought to be expanded in several respects: the initiative should be broadened to include women in all under-represented fields, particularly including the social sciences; the initiative ought to be aimed to increasing the proportion of minority faculty (along with women) in the STEM disciplines; and it ought to be broadened beyond individual universities. Regarding the last point, the PAID Awards clearly seek to have a broadening effect in encouraging the universities with successful ADVANCE programs to serve as models for universities elsewhere.

Including women from the social sciences in the ADVANCE grants is important for a number of reasons. Social scientists can provide the research needed to understand why women and minorities are under-represented in academia. They can also play a crucial role in designing programs aimed at rectifying those difficulties. Since social science participation is important to the success of ADVANCE grants, and since women social scientists are more likely to undertake research that examines the effects of gender bias, it would be helpful to include social scientists in the ADVANCE program. Further, on their own merits, it is important to have a diverse social science faculty since social scientists help to understand how society operates, and their research helps to address social problems such as the under-representation of groups in the economy, politics and education. Which social problems we choose to study will depend, in part, on who the social scientists are who conduct the research. Finally, the involvement of social scientists is important to changing the institutional culture of universities overall. Social science exists at something of a midway point between science and engineering on the one hand, and the fine arts and humanities on the other. Social scientists can play a crucial role in explaining the nature of this problem and formulating solutions regarding under-representation to both the positivists in the sciences and engineering, and to the humanists in the arts and humanities.

Another way to increase the impact of these efforts is through Title IX enforcement.[15] The Society of Women Engineers is among the groups now advocating for increased reliance on Title IX enforcement as a means of advancing women in academic science and engineering. In 2004, the GAO asked granting agencies to insure that grant recipients were in compliance with Title IX.[16] What this might mean in practice and whether such compliance reviews are being conducted is not entirely clear. Last year, Senators Boxer and Wyden called for an amendment to the *National Science Foundation Reauthorization Act* that would require the NSF to con-

[14] ADVANCE is an National Science Foundation program for "Increasing the Participation and Advancement of Women in Academic Science and Engineering Careers."

[15] Richard Zare, "Sex, Lies and Title IX: Federal Law Banning Sex Discrimination in School May do as Much for Academics as it has for Athletics," *Chemical & Engineering News* Vol. 84 (May 15, 2006): 46–49.

[16] GAO report 04–639: "Gender Issues: Women's Participation in the Sciences Has Increased, but Agencies Need To Do More To Ensure Compliance with Title IX," *www.gao.gov/new.items/d04639.pdf*

duct compliance reviews as well. The original intent of Title IX was to insure equal education opportunity for both sexes. Yet relatively little has been done (outside of the arena of athletics) to make that mandate meaningful when it comes to addressing opportunities for academic achievement and advancement for women in traditionally male dominated fields. We now understand more clearly than ever before that the academic achievement of young women in math, engineering, and science depends on the presence of positive female role models as well as women peers in the class room. To support equal academic opportunities for these young women, we ought to use the leverage of federal education funding to mandate Title IX compliance within the faculty of our research universities. Creating equality of opportunity for women within the faculty will have a big effect in allowing a young woman to imagine herself as one of the great scientists or inventors of her generation.

BIOGRAPHY FOR GRETCHEN RITTER

Dr. Gretchen Ritter is Professor of Government and Director of the Center for Women's and Gender Studies at the University of Texas at Austin. She is also currently serving as Co-Chair of the Gender Equity Task Force that was appointed by Provost Steven Leslie. She received her B.S. in government at Cornell University and her Ph.D. in political science from MIT. Professor Ritter specializes in studies of American politics, constitutional development, and gender politics from a historical and theoretical perspective. She has published two books as well as numerous articles and essays. Her current research examines the impact of work-family issues on gender equity in the United States. Professor Ritter has been a Faculty Fellow at Princeton University, a Liberal Arts Fellow at Harvard Law School, and has received a National Endowment for the Humanities fellowship.

DISCUSSION

Chairman BAIRD. Thank you, Dr. Ritter. I very much appreciate the comments and will now proceed to questioning. The standard procedure is that each Member gets five minutes for questioning. We rotate back and forth across the sides.

A question from me is I hear a lot of praise of the ADVANCE program. My assumption would be, probably, that institutions that have applied for the ADVANCE program are already pretty savvy to this. And so you have got—meaning that at least somebody in leadership at that institution says we need to address this; hence, they apply for the grant. So my question would be what can we do to expand that, learn from what has worked in ADVANCE and then expand that to other institutions?

Dr. Hrabowski, you are prompt with a hand up, so——

Dr. HRABOWSKI. I am, because, first of all, and I think Donna would agree with me on this, unlike in companies, presidents can't make people do many things at universities. It is called consensus building and shared governance and committees that take more time than you might expect sometimes.

What am I saying? So you can talk about bringing people——

Chairman BAIRD. They call it, Doctor, the faculty senate for a good reason.

Dr. HRABOWSKI. Touché. I will tell you this: it seems to me the people who are applying have some people on that campus who realize there are issues. But one of the reasons they are applying is there are challenges.

Now, this is one thing that I have to say, and I can say this as an African American. I have met so many scientists who are not aware of the issues or who don't necessarily believe there are these issues, and they are good people. But we are all products of our environment. Whether it is about increasing the number of minorities

on the faculty, or increasing the number of women, people need education at every level. It seems to me, as we develop these ADVANCE campuses, we need incentives to continue applying what we've learned and incentives to replicate.

To use what we are learning, we have a group of faculty from the University of Michigan on our campus, a group of people who came and worked with our faculty. It was great. And so I think we can—we need incentive, though, to do that kind of work. I also think that as we think about all of the NSF funding that goes out into the campuses, we need ways of substantively tying these issues together. I really believe so. People will listen to money. I mean when you talk about the money that you have.

I do want to recommend that you look at page four of my testimony. There is one point to be made here. This is a picture of all of the women who came our Faculty Horizons Program. Half of these women are women of color. I wanted to make this point about this. What it did for my campus was to say to the departments people exist who have Ph.D.s who are Black and Hispanic women. We need to look at those women, talk about developing them, helping them with post-docs, thinking about them for faculty positions so that while we want to continue increasing the number of women of color, the fact is there are more out there than we might think, and companies do a much better job than universities.

NSF can help us in bringing these women to our campuses, getting to know each other, and building that momentum.

Chairman BAIRD. Very well said. Dr. Shalala.

Dr. SHALALA. I just want to tell a quick story, parleying on what my colleague said here.

My proudest moment at the University of Wisconsin Madison was when an African American woman said to me that we had hired so many African American women she didn't have to like them all.

Chairman BAIRD. That is a great story. You know, we had tried to embody this earlier. I acknowledged the staff. I should note that when I mention staff, the senior staff are both doctorates in science, and they are both sitting right next to us, both women. This committee, particularly under Vern Ehlers's leadership on the Republican side, but Bart Gordon on the Democratic side, has made a commitment to this.

You mentioned the incentives, Dr. Hrabowski, but one of the things that I note is when you apply for tenure, it is basically your personal research productivity. You get about zero credit for having mentored—and I have been through this process—for having mentored young students. And so the incentives for our faculty to bring young students along the line and move them into the track towards graduate school is near nil. I don't know if you have identified any institutions that include some credit for mentoring or graduate students acceptance or admission along the way, but it would be an interesting thought—or if you have included it in your own practices. If you have a faculty member who mentors young students, do they get credit, because my experience has been that many times women faculty are particularly more interested in bringing along the next generation, but at their own detriment when it comes to tenure application.

Any thoughts on that? Dr. Olsen.

Dr. OLSEN. Actually, I have couple things. First of all, you know that we actually provide Presidential Awards for Mentoring, and his institution has won, I think, two. The Competes Bill also has some interesting comments on mentoring that the National Science Foundation is taking to heart. In the NSF geosciences Directorate, we have a requirement for the grant proposal that when they have graduate students in that, that they talk about the mentoring within that grant.

So we are really moving towards that because we know that mentoring does work.

Chairman BAIRD. Dr. Ritter, you look like you may have a though on that.

Dr. RITTER. Yeah, I think you are finding women and minority faculty doing more than their fair share of the mentoring is a real concern. I think what often happens, what has been noticed at our institution and happens elsewhere as well, is a lot of women get stuck at the midlevel and never make it to the senior level, essentially, because they are taking up more of a service burden because there are too few of them.

Chairman BAIRD. Dr. Hrabowski.

Dr. HRABOWSKI. The institutional culture has everything to do with this. It seems to me two things, number one, the NSF IGERT grants are great in terms of training and having incentives for people to get involved in working with students in this, but we are convinced that by having an individualized faculty-development plan for women and for faculty in general to know exactly what is expected and to make sure that the person isn't overwhelmed is very important because women are often asked to do far more than people even realize because they are good at doing it. And we need a culture, though, that makes sure that someone is working with that young woman to make sure she is not overdoing in some areas that will not help her move towards tenure.

Chairman BAIRD. I am going to move Dr. Ehlers.

Mr. EHLERS. Thank you, Mr. Chairman. First of all, two quick comments on the testimony. Dr. Shalala talked about sports and the NCAA. The obvious solution is to designate the sciences as sport.

Dr. HRABOWSKI. By the way, chess is a sport in Russia.

Mr. EHLERS. That is right. Chess already is a sport.

But there are two advantage to that. First the NCAA rules would apply, but secondly, you would also share in the football revenues.

The other comment is, Dr. Hrabowski, you made a comment about the politics, faculty politics. It reminds me of when I first got into politics. One of my colleagues commended me and said I am just amazed. You know, you come from academia, and you just really understand the politics around this place. I said, well, frankly, this is real politics. It is a lot easier than academic politics.

Dr. HRABOWSKI. Where the pie is much smaller.

Mr. EHLERS. Anyway, back to business. Pardon me.

First of all, insight from any of you on this: there are some professions that have done pretty well at achieving close to 50/50, medicine, law—that is not much a science, but nevertheless, it was traditionally male—and there are various other professions. Have

you any of you looked at that and analyzed how that happened as—particularly in medicine which is science related, compared to the problems you are encountering? Is there something unique about the universities that limits this?

Dr. CAMPBELL. This is exactly something that I have been curious about. How is that fire departments and police departments are more integrated than physics departments? How is it that the navy is more integrated than physics departments? And part of the answer, frankly, comes from the ability to have true, top-down decision made. And that is something that in many fields in academics, a top-down decision to try to do something like that is going to be met with resistance from everyone involved, and exactly the opposite effect is going to be achieved.

I don't think that the kinds of solutions that we are seeing in those other kinds of fields are practical here, and so many of the kinds of things that we have to do really are changing the climate, as we have talked about, and that has to occur at the stages where the everyday interactions and the everyday decisions are being made.

Mr. EHLERS. Thank you. Dr. Ritter, you wanted to answer that?

Dr. RITTER. Yes, I would just have a couple of things. One is that one issue in academia, I think, is the coincidence of tenure track with family formation creates particular stresses. I think one of the reasons why medicine has done better is that it is easier to be a successful professional and not have an 80-hour-a-week job. You can't do that as an assistant professor at a top research university.

Law, actually, I think it really depends on which field of law we are talking about. There are very, very few women partners still at major firms.

Mr. EHLERS. Dr. Shalala?

Dr. SHALALA. Thank you very much. Actually, we have done pretty well in medical schools in terms of students and in law schools in terms of students. It still gets narrower when you go to the top in terms of the tenure faculty appointment in medical schools. The reason the numbers look better is because women go into the clinical tracks, and there we can have flexibility in terms of how many hours you work. So we still see the same things in medical school in terms of chairman positions, tenure-track positions, moving to full professors, where the numbers aren't very good.

There is no question the pool is huge, and I think that is our fundamental point. Elementary and secondary education has done a terrific job in terms of encouraging young people, women in particular to go into science. We have these huge pools at the undergraduate level. At the graduate level it gets narrower. In the great research universities, it gets even narrower.

That is true in medicine, but in medicine, they have another kind of track called the clinical track, and that is where you will see larger percentages of women.

Mr. EHLERS. This relates to a follow-up question, and that is do you have any data or do you have any idea how many women will choose, in a particular situation, to go into some other profession rather than university teaching because of these factors?

Dr. HRABOWSKI. Let me start with women in general and women of color. As we have produced Ph.D.s on our campus and then sent

them other places, I have listened to the voices of those new Ph.D.s in science, women and women of color, and what I find is the quality of mentoring has been very uneven. When the advisor is very supportive, you will have a greater probability that that young woman will think about post-doctoral experiences and the possibility of going into university. Unfortunately, when the advisor has not understood the role that he could have played—and it is often he, quite frankly—or has just not understood the challenges she has faced, the person wants to leave the academy because companies are much more welcoming.

What others will tell you is, to the extent that it has been a terrible experience—and you talked about this earlier. If they have not had a great experience—and I talk about it in my testimony with a woman who just said it has just been a lonely road, and I don't want this anymore. So the quality of the experience while in grad school, the quality of mentoring will determine the extent to which the person may even consider the possibility of continuing on to a post-doc.

Mr. EHLERS. Dr. Olsen, you——

Dr. OLSEN. I just wanted to point out again, that right now, 52 percent of the majors in science in the undergraduate level are women, and one of the things that the National Science Foundation has been really fostering as well is the fact that a Ph.D. really opens up the way that you think. And people go to law school, not because they are going to practice law, but because it opens up opportunities, and I think people here, with the number of doctorates sitting up there, knows that earning that degree in science or engineering really can open up a lot of careers, and some are more supportive for women and industries tend to really—have gotten onto the childcare and these issues. I think the academy is learning that this is a critical component. But we are really trying to get more people, males, females, under-representeds, to actually major in science and engineering all of the way to the Ph.D. levels and then hopefully have a plethora of career opportunities for them, waiting for them.

Chairman EHLERS. Thank you.

Mr. BAIRD. Thank you, Dr. Ehlers.

You know, reflecting on my own graduate experience which was somewhat mixed in terms of the enjoyment level, it may be a manifestation of the superior intelligence of women that so many drop out of the graduate program.

Dr. McNerney.

Mr. MCNERNEY. Well, I have to say your testimony, all of you, has been energetic. It has been interesting, informative, and hopefully, we can make some progress here.

Dr. Shalala, in your testimony, you report a dreadful number, 15 percent of full professorships are women. Some of that might be due to legacy effects. Is there any more encouraging news in the last five or ten years on that subject, or is there any statistics in that?

Dr. SHALALA. There are statistics. It is not increasing much. We look specifically at the major research universities, so that is where the difficulty has been. We looked at the top research universities, where federal money is going, NIH money, NSF money, because we

though it was important that if the United States is investing its scientific moneys in the great research universities in this country, then we can expect them to expect that the personnel will be the most talented, so we focused there.

You know, the numbers are getting better, not fast enough given the pool. The interesting thing about the study—and I actually didn't want to chair this panel, not my subject of expertise. I sort of got talked into it by the National Academies into doing it. But what I learned was that the pools are there for the first time.

We used to say, you know, we got to develop the pools. That was our excuse. The pools aren't there. And what I mean by that is the 52 percent. There are women studying science, and that is why I give praise—somehow the elementary and secondary education has excited young women about science enough so they are majoring in it in our major colleges and minor colleges and universities, frankly. But to get them to the Ph.D. level, even when they get there, they don't seem to get the jobs at the major institutions. That is why we know that there are cultural issues. There are sensitivity issues. There are opportunity issues. There is a network that needs to be worked. That is why we are so optimistic, because it is not the pool issue anymore. It is our behavior.

Mr. MCNERNEY. Well, one of the things we have talked about this in this committee is the deterrent for people to go into science and research in general because the compensation is poor. The number of years it takes to get to a good position, and then once you are there, again, the compensation is that not that great compared to what you could be doing in industry, so I think we are in trouble in general on this issue, and one of the things I like to soapbox about is how we really can't afford to leave anyone behind. Our nation needs to pick up every single person of any color or any background or any religion, because we need them for our future challenges. And anything we can do to encourage that is something that is our responsibility and our duty, so we look forward to your good ideas.

Dr. Hrabowski.

Dr. HRABOWSKI. I really do want you to remember too, though—and I have to say this—that while we have a few more African Americans, for example, and Hispanics making it at the Ph.D. level, women or men, the fact is that you still only have about five percent of the Ph.D.s going to African American in the country, so there are still very few women of color, Black and Hispanic, from certain groups, who are at the Ph.D. level, and I think it is so important to keep thinking about both of these issues.

When I was a grad student in mathematics at Illinois, there was only one woman in the whole department of mathematics. She understood how alone I was, and she connected to me, and that is why I know from personal experience, quite frankly, that white women and kids of color, there is a connection there because of the loneliness that they feel, and it is important to think about how we keep building both of those pools.

Mr. MCNERNEY. Well, what specific steps would be most effective in terms of academic roles in terms of getting women and people of color to move into these spaces?

Dr. HRABOWSKI. Just to suggest that for the women that we get—it is so interesting to me. We need incentives to help institutions work with the researchers, mainly the guys, to pull women in as post-docs and to pull them in to think about faculty positions and to give them the kind of support that males just get naturally, in the bathroom, on the golf course, on the basketball court. I mean it may sound trite, but it is so true. I see it all the time. The woman just wasn't in the room when certain discussions were being held. And mentoring is a very important part of that. We still have many people who think mentoring is warm and fuzzy stuff, not realizing that we, males, in general, get much more mentoring than we realize.

Mr. MCNERNEY. Well, we certainly recognize the importance of mentoring all of the way from kindergarten on up, so that is something that we could think about in our role. Thank you very much. I yield back.

Dr. HRABOWSKI. Economic incentives, financial incentives. It makes the people listen to the money talk.

Mr. NEUBERGER. Well, as you can tell, at this end of the table, from here, that direction, are all doctors, and I dumb down the room by bringing a business guy into the room, and so I thank the Chairman for having this hearing.

Dr. Ritter, it is always good to have a fellow Texan here, and our Red Raiders are going to—speaking of football—going to come down and visit you all in just a few weeks, and I hope you will be kind to us.

I would like a little bit of bragging, before we talk some questions here. But I went to Texas Tech University and had the honor and privilege of representing Texas Tech University, where I believe we have about 12 schools there, and five of our deans are women. And so I think there is some progress being made, and obviously from listening to the panel today, I hear that we need to make some more progress.

I want to go along a couple of question. The title of this hearing, and we have gotten off on some interesting topics, but Women in Academic Science and Engineering, and when you look at some of the charts, in some areas, women are increasing in number, and in fact a majority in coming into some of the sciences, life sciences, and some of those. I think 52 percent, we use that number.

And so a couple of questions, will it take us time—I mean I come from a tradition—and probably what would happen today—I have two grandsons. I had two sons, and so we gave them Lincoln Logs and erector sets and microscopes and stuff like that, and if I had a granddaughter, I would want to be dress her up and dolls, and so we kind of set a precedent early on in kind of classifying what roles that young women have, and that is probably a maybe a mistake on granddaddy's part.

But the other piece of that is a lot of the women that are going into the sciences and going into law and medicine, that produces high income for them outside of the academic world. And so is the fact that a lot of women are not staying in the academic world related to the fact that they don't see a lot of role models in the academic world, or is this entrepreneurial economic opportunity out there that corporate America has provided where women seem to

be, in some fields, moving up through the ranks a little faster? Are they being funneled out in that way, instead of staying in academia?

Dr. Shalala.

Dr. SHALALA. You know, we didn't find that at all. We found that they were being turned off and discouraged moving up. There is just no way the economic incentives of the private sector is pulling off that many women, that there really are barriers here and discouragement and a lack of encouragement and a lack of mentorship, a lack of strategies, narrow search processes.

What my colleague here was talking about is, you know, if you really want to find a minority woman in science, you can't just pick some narrow field that you are going to recruit in. You have got to broaden your recruiting opportunities, and I am sure that Dr. Campbell found that in physics as well, that you have to try different strategies.

But you know, it is just—we are not convinced it is a pool problem. We are convinced that there are barriers and bias from both women and men that we have to overcome. Economic incentives help. Economic incentives, you know, as a businessman, changes behavior. And if we are going to plow billions of dollars into science in this country, our only issue is, not that you have got to hire women to do it, but you have got to hire the best people. And if that is the standard, we believe that women will get a fair shot. And we just have to make sure that we don't have those barriers there.

All of us have stories from our own careers, of crazy things that people have said to us, and we are lucky we are here today.

Mr. NEUBERGER. Dr. Olsen.

Dr. OLSEN. Yeah, I love data, okay, and there is this wonderful chart from Nelson and Rodgers, and it is in biology, where they show that both males and females in 2002 were equal numbers in terms of getting their Ph.D.s. But then when you saw the first faculty position, it was something like 70 percent males and 30 percent women. And yet, they are there, and they are asking did you want the faculty position or did you want to go elsewhere? And it turned out that the women were just not getting interviewed. And the women that did make it to the interview stage were then very successful in terms of getting the job, getting back to your report, in terms of the implicit thing.

But salary still is an issue, and this is true in academic, but throughout, women tend to make less salaries for the same positions as males. And what is interesting—and I will do a story—but when I was at my university, it was a research-intensive university. I had my own NIH grant, and I was co-PI on the grant, the PI on the NIH grant was out, and I realized that the post-docs on the grant that I was co-PI on were making more money than I was, and it was a shocker, and of course. It was—my personality—I got a raise! But the thing is that we don't know a lot of this stuff, and so it is really, again, the culture, the mentoring, in terms of what the salary is.

Dr. SHALALA. The professional journals have had to take off—send out the journal articles blind to make sure that you could overcome the bias. Members of my panel told me they used their

initials early in their careers when they sent out their journal articles to make sure they got a fair review of those articles.

Dr. CAMPBELL. I would like to come back to your question about is it the economic incentives? And all of my anecdotal evidence in talking to people who have decided to go out, the answer is no. That is not what the incentive is.

I would also like to come back to the question of mentoring. Mentoring is very important. This is one of the lessons that we have learned from ADVANCE. And in my department, we have now instituted formal mentoring for all junior faculty. In addition, we do take into account junior faculty's mentoring of students in their tenure-review process, so mentoring is something that is taken very seriously.

I also want to come back to your question about how long is it going to take? Again, this was something that was sponsored by NSF and the Department of Energy. The American Physical Society hosted a meeting of all of the chairs of physics departments, and I served on the panel for that, exactly addressing this kind of issue. And out of that meeting was a stated goal that we want to double the number of women in physics departments in 15 years. And the 15 years allows us to say there are two components to this problem: there is the here and the right now, and this is something that is being addressed with ADVANCE. And there is what are we going to do for training students who are coming up? What are we going to do to for undergraduates and graduate students and postdocs? Attention has to be placed there as well.

And finally, I can't not make a football comment. Michigan also has a football team, and it is my personal goal, I want a physics department which is going to make our football players proud to say I am from Michigan.

Mr. NEUBERGER. Dr. Hrabowski.

Dr. HRABOWSKI. Two points, you know, you may not know it, but a part of the mentoring for women is teaching them how to negotiate. It is very interesting that guys go in being much more aggressive, and older guys like us can be so responsive to the aggressiveness and just assume that the woman doesn't need it because she didn't ask for it. So the negotiating process is very important in all of this work.

And the other point is, in terms of things that can be done, I think that—and it was something that Dr. Campbell just said—the idea of using the societies, the different disciplinary society, and having leveraging with NSF with physics and chemistry and biology and the different subgroups to have sessions that focus on this, because if people haven't been around the discussions and a part of it, they tend to see it as something that is not as serious an issue. And it needs to be known that the country sees it as a very serious issue.

Chairman BAIRD. We are going to probably have time for just two more sets of questions, and then—this time, Pavlov was right. We do have votes coming up now.

Having been in academia and having been through a period when diversity training and sensitivity training was big at my university, followed by a drop in enrollment—totally unrelated, just the demographic bubble went down that year—and then it became

necessary to lay off a bunch of faculty, and it was taken for granted that the most recently hired faculty would be the first to go, which meant persons of color and women, and as a untenured white, male faculty member, I said we ought to stop that, which meant, frankly, that the women behind me would have been able to jump me. But it was the right thing to do, but you should have seen the outcry. This was within two year of this sensitivity-training workshop, and then suddenly, it is like wait a minute. It only goes so far here, bringing people on board.

The reason I preface with that without a hammer—it seems, you know, academia likes to think of itself as superior to every other institution in the world, but we have cited examples of police, military, business, et cetera, that I think is actually much more progressive than the academic world. And my question would be what kind of hammer can we use or should we use, and relate it to Dr. Shalala's observation about NCAA or Title IX. What would enforcement of Title IX—Dr. Ritter noted this—what would that enforcement look like? So what can we do to put some pressure on, from not just a positive model, which I think are very meritorious like the ADVANCE program, but real-world, pressure, consequences if you don't do it from federal funding or other operations.

Dr. RITTER. In terms of enforcement, I think there are a couple of things. One is I think that presidents and provosts need to be willing to hold their deans accountable, and deans need to be willing to hold their chairs accountable for things like whether or not they have diverse pools or their willingness to invite diverse candidates to campus, for their ability to meet goal that have been set and agreed upon. Unless you are willing to say you can't hire next year because you haven't made a good-faith effort to diversify your pool, then it is not going to have.

Chairman BAIRD. You have got to have that kind of top-down consequences.

Dr. RITTER. You have to have that kind of accountability. And in terms of Title IX enforcement, I do think we need to be thoughtful abut what effective compliance would look like there. I know there is a lot of debate about this right now, and I don't know that the right model is going to be something like the athletic model, but we can only improve on what we are doing now, because currently, virtually nothing is being done.

Dr. SHALALA. We talked in our panel, and we have some language in here about developing an NCAA type of organization, something between the universities and the government that would, as opposed to using a government agency as such, that would thoughtfully develop the goals and be realistic about it in terms of marching towards a much fairer system, and that, certainly, is worth looking into.

Unlike the NCAA, though, the Federal Government really does have the clout of money, requiring that—I mean NSF is a model for calling in department chairs. These are pretty straightforward things to do, but we should not be focusing just on NSF. The big dollars are in the National Institutes of Health, and if the NIH, through their institutions, aren't fully participating, then we don't have a chance of getting this done in the major research universities.

Chairman BAIRD. Well put. Dr. Campbell, you were going to say something?

Dr. CAMPBELL. Yes, our department did have a Title IX audit. NASA came in and audited our department for Title IX compliance, and the effect of that was almost nothing, that we were totally in——

Chairman BAIRD. Shucks, I thought you were going to say it rocked us.

Dr. CAMPBELL. So perhaps there are places where they clearly are in violation of the law, clearly are in violation of Title IX, but I think it is, as you said in your introduction, a much subtler problem, and has to do with the climate, and it does not have to do with a flagrant violation of the law.

Dr. HRABOWSKI. We have got to get people to believe that this is not just the right thing to do, but it is the best thing for science. And it seems to me that hammers don't work the same way in universities. This is my sixteenth year as President. Believe me; I know what I am talking about. But money does talk, and the idea of leveraging the federal funding, NASA, NIH, NSF, in such a way that you can encourage institutions that are making a difference in this area through grants and training, for example, that will be connected to the research infrastructure in such a way that places will want to be in this. I mean places want to be a part of NSF with the ADVANCE grant. "Every time I go to speak at a university, the first question they ask is how can you talk to us about what you're doing with NSF?" Presidents ask me, "Talk to my faculty, engineers, and tell us how great it is and what it does." I think if we can use the mechanisms we have and leverage opportunities to bring different national agencies together, institutions listen to the National Science infrastructure because they have the money, and there are ways of doing it without it coming across like a hammer, but rather in a way of highlighting the best in training and diversity and in science infrastructure.

Dr. SHALALA. I absolutely agree with that. I really think that to get this right we have to understand the culture that we come from and those incentives will make a difference. But it is also professional organization and accrediting organizations, and in addition to the major funders, the professional organizations have come a long way, but they have a long way to go yet.

Dr. OLSEN. But it is not just good for science, it is good for America. It is good for our economy and well being, and that is the point that needs to be infused throughout.

Chairman BAIRD. I think that might be an appropriate final comment for this hearing. I really have been enlightened and inspired by this hearing. I am grateful for the witnesses. We, unfortunately, have to go vote, but rather than holding you here for another set of questions, because the votes can take longer than we would like, I would just express my gratitude on the part of the Committee for all of your work on this, and we look forward to pursuing this vigorously in the future, and this hearing now stands adjourned.

[Whereupon, at 3:22 p.m., the Subcommittee was adjourned.]

Appendix:

Answers to Post-Hearing Questions

ANSWERS TO POST-HEARING QUESTIONS

Responses by Donna E. Shalala, Professor of Political Science; President, University of Miami

Questions submitted by Representative Vernon J. Ehlers

Q1. Many of you emphasized that as higher education administrators, you do not mandate change but encourage it in little ways at all levels. What would be the worst thing(s) Congress could do legislatively? What would be the best thing(s) Congress could do to help improve the environment for female faculty in S&P

A1. The worst thing Congress could do legislatively would be to mandate a one-size fits all solution for all university campuses: For example, mandating that the professoriate be 50 percent women. While such a goal would be desirable, using a federal mandate to obtain it is not. The effect of a *de facto* quota would likely be to increase tensions among faculty and thus actually worsen the campus climate for women.

The *Beyond Bias and Barriers* report recommends several actions at the federal level. One of the primary recommendations is for Congress to mandate that federal grant-making agencies implement a Title IX review of recipient organizations. Such a review would be based on data collected by individual institutions and organized and maintained by an inter-institutional NCAA-like oversight organization. Congress could partially fund such an inter-institutional effort, and those institutions that participate could be provided technical assistance with data collection procedures and compliance with anti-discrimination laws. In conjunction with regular Congressional oversight hearings of federal enforcement and granting agencies, such an approach could be very effective in encouraging adequate enforcement of anti-discrimination laws.

Another option is for Congress to increase funding for federal agency programs, such as the NSF ADVANCE program, whose goal is to test a variety of data collection and anti-discrimination compliance programs *in situ* on campuses across the Nation. Such a strategy has been shown to not only stimulate research at our nation's universities and colleges but also to improve the recruitment and retention of women in science and engineering programs and careers. To support campus efforts, Congress could request that federal agencies support regular national meetings of scientists and engineers to disseminate the strategies found to be successful through such research efforts.

Questions submitted by Representative Ralph M. Hall

Q1. When asked about how medicine has overcome biases barriers present in science and engineering, you mentioned a clinical track in the University of Miami's medical program that many women choose. Can you explain this clinical track and explain how it differs from the other tracks available in the school of medicine? Why does this track attract more women than other tracks?

A1. **The University of Miami's Miller School of Medicine's clinical-educator track:** The clinical-educator track at the Miller School of Medicine is intended for faculty members whose primary professional activities are teaching and clinical services, as opposed to research. The intent of having different tracks is to allow promotion criteria to match the professional focus of a faculty member. Faculty members who focus their time and talent on clinical and education duties would not be promoted if the only criteria were based on achievements in research. In the clinical-educator track, promotion is based on tangible contributions in clinical-education. For the assistant and associate professor level, impact should be in the local, regional and State environment; national contributions are required to achieve full professor status.

Current implementation of a track system remains challenging nationwide. The definition of tangible contribution in education is elusive. In research, contributions are literally counted, in terms of numbers of publications, the prestige of the journal in which faculty members publish and sustained level of grant funding. We lack similar quantifiable means of measuring education impact. Thus, even in current clinical-educator tracks, promotion standards remain slanted toward publication and grant funding.

Over time, the goal is to align promotion and tenure criteria to reward educators' academic impact. This would mean a promotion review that recognizes factors such as curriculum development, innovation in clinical care or education, and impact on policy and funding of medical education.

Why does this track attract more women than other tracks? Nationwide, women in academic medicine are more likely than men to choose roles in clinical care and education rather than research. At UM, more than half of women faculty members define their roles as mainly in teaching and clinical services. Factors contributing to this trend in professional choice may include the time pressures of familial responsibilities and child-bearing, a lack of female role models and mentors in academic medicine, and perceived barriers for women to succeed in research.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Kathie L. Olsen, Deputy Director, National Science Foundation

Questions submitted by Chairman Brian Baird

Q1. Another witness from the panel, Myron Campbell, recommended that the National Science Foundation (NSF) create a postdoctoral fellowships program analogous to its Graduate Research Fellowships program to enable faculty to draw from a larger pool of applicants. One of the findings from the ADVANCE program has been that open, broad based searches result in a larger, more diverse pool of applicants. Dr. Campbell argued that while universities can implement this process on their own with respect to recruiting new assistant professors, most don't have the resources to do the same for post-docs, who are most often recruited through small, informal networks to the exclusion of everyone else. Has NSF considered creating a postdoctoral research fellowships program? Please elaborate on any plans to create such a program or explanation for not pursuing this option.

A1. The National Science Foundation (NSF) currently has several postdoctoral research fellowship programs managed within the research Directorates and Offices (see attached list of programs). For example, the Directorates for Biological Sciences (BIO) and for Social, Behavioral, and Economic Sciences (SBE) currently jointly sponsor a program of Minority Postdoctoral Research Fellowships and Supporting Activities that provides postdoctoral fellowships, research starter grants, and travel grants. This program was evaluated in 2004 by SRI International (EEC 9815246), which concluded that the program was meeting its broad goal of preparing scientists from under-represented ethnic groups at advanced levels for academic positions and leadership in industry and government. In addition, many postdoctorals are supported by NSF through research awards made to university faculty members and to research centers.

We also note that several ADVANCE projects are working on the development of systemic approaches to facilitate the identification of a more diverse pool of talented potential postdoctoral fellows for universities to track and develop as future faculty. For example, in late 2006, Rice University created a National Female Ph.D. and Postdoctoral Database (*http://www.advance.tice.edu/database/*), drawing from applicants to its ADVANCE-funded workshop on "Negotiating the Ideal Faculty Position." At this time there are over 700 scholars in the database, and hundreds of visitors to the site have made use of it as part of recruitment outreach. Taking a different approach, the University of Illinois Chicago ADVANCE program recruited nationally in order to bring in a cohort of ADVANCE-supported postdoctorals to increase the number of well qualified female candidates for faculty positions.

Q2. Title IX of the Education Amendments of 1972 prohibits discrimination on the basis of sex in education programs and activities receiving any federal financial assistance. A 2004 GAO Report (GAO–04–639) found that only Department of Education had conducted the required periodic compliance reviews, and that the granting agencies had not effectively coordinated the implementation of compliance reviews. Please describe how NSF has responded to the GAO recommendations in the three years since the report, including any plans to implement periodic compliance reviews as well as efforts to coordinate implementation with other granting agencies.

A2. As for the second question, NSF takes seriously its responsibility to ensure that the educational and research institutions that it funds comply fully with Title IX. Every grant awarded by NSF includes a clause whereby the grantee contractually agrees to comply fully with Title IX.

In addition, in accordance with the recommendations in the GAO report, we have been working diligently to develop a post award Title IX compliance program. To that end, since the issuance of the GAO report, we have been exchanging ideas and information with other agencies that are establishing or refining their post-award compliance review programs, such as NASA and the Department of Energy, to ensure that the reviews are meaningful and effective.

In 2005, NSF conducted an on-site post-award Title IX compliance review at Columbia University. After the review was completed, we assessed our newly-developed approach to conducting compliance reviews, and engaged in additional dialogue with other Federal grant-making agencies. NSF determined that a more coordinated Federal approach to such reviews might be appropriate to ensure consistency, and to avoid the prospect of agencies engaging in duplicative efforts.

Subsequently, NSF had a series of conversations with the Office of Science and Technology Policy suggesting that the National Science and Technology Council ("NSTC") take on the development of a coordinated Federal research agency approach to Title IX post-award compliance reviews—the NSTC Research Business Models Subcommittee of the Committee on Science has been tasked with this coordination.

Question submitted by Representative Vernon J. Ehlers

Q1. Many of you emphasized that as higher educational administrators, you do not mandate change but encourage it in little ways at all levels. What would be the worst thing(s) Congress could do legislatively? What would be the best thing(s) Congress could do to help improve the environment for female faculty in S&E?

A1. It appears that this question is addressed to the three current higher educational administrators that were on the panel; Drs. Donna Shalala, Freeman Hrabowski, and Myron Campbell.

Attachment

NSF Postdoctoral Program	Managing Directorate or Program
Polar Regions Research	Office of Polar Programs (OPP)
Biology Research	Biological Sciences (BIO)
Mathematical Sciences	Mathematical & Physical Sciences (MPS)
Astronomy & Astrophysics	Mathematical & Physical Sciences (MPS)
Discovery Corps	Mathematical & Physical Sciences (MPS)
Earth Sciences	Geosciences (GEO)
Science & Society	Social, Behavioral, & Economic Sciences (SBE)
International Research	Social, Behavioral, & Economic Sciences (SBE)
Minority & Supporting Activities	Crosscutting: Social, Behavioral, & Economic Sciences (SBE) and Biological Sciences (BIO)

ANSWERS TO POST-HEARING QUESTIONS

Responses by Freeman A. Hrabowski, III, President, University of Maryland, Baltimore County

Questions submitted by Representative Vernon J. Ehlers

Q1. Many of you emphasized that as higher educational administrators, you do not mandate change but encourage it in little ways at all levels. What would be the worst thing(s) Congress could do legislatively? What would be the best thing(s) Congress could do to help improve the environment for female faculty in S&E?

A1. Congressional legislative action on behalf of women in science and engineering has profound implications, not only for those it seeks to benefit, but also for those charged with its enforcement. Consequently, the worst thing Congress could do is produce expedient legislation not informed by the substantial body of research that addresses the unique challenges women in these fields are facing in America's colleges and universities. Responsible legislative action should reflect current studies in the field in order to create effective, multi-faceted, approaches to achieving gender parity in science and engineering (S&E).

Women's full potential in academic S&E across our nation will be realized only through a long-term, bipartisan Congressional commitment to transforming institutions of higher learning. The accumulated disadvantages women experience in these fields reflect a powerful history of institutional bias and discrimination in academe. In short, such a legacy can be remedied only by sustained Congressional mandates for compliance, expanded roles for key federal funding agencies, and authorization of additional targeted resources for critical initiatives. Accordingly, Congress should consider taking the following actions to improve the environment for women in S&E:

1) *Continue Funding the NSF ADVANCE Grant Program:* Through its effective administration of institutional transformation grants, the NSF ADVANCE Program has demonstrated a record of excellence in establishing innovative models and comprehensive programs that have substantially increased the participation of women faculty in S&E. The NSF ADVANCE Program's funding of transformation initiatives across a broad spectrum of institutions (liberal arts colleges, community colleges, Historically Black Colleges and Universities, women's colleges, and research universities) has been fundamental to its success. Consequently, to ensure the national impact of these efforts, Congress should continue funding the NSF ADVANCE Program as a way to engage many more colleges and universities in this vital enterprise.

2) *Expand Funding to Sustain and Replicate Success of NSF ADVANCE Campuses:* In oral testimony before the House Subcommittee on Research and Science Education, I stressed the importance of expanding NSF ADVANCE funding in order to *sustain* and *replicate* the success of exemplary ADVANCE campuses. NSF provides no funding for sustainability and offers only modest support for narrow replication efforts through the Partnerships for Adaptation, Implementation, and Dissemination (PAID). The lack of federal funding in these areas jeopardizes the future impact of the NSF ADVANCE Program because many successful campuses do not have sufficient funding of their own to sustain and replicate their efforts. As the initial rounds of NSF support end for ADVANCE campuses, we are quickly learning that a short-sighted approach to continued funding is stalling our efforts to help meet the continuing demand for a highly educated S&E workforce. I urge Congress to expand the mandate of the NSF ADVANCE Program to provide funding for sustaining and replicating exemplary campus initiatives. The recent reassignment of the NSF ADVANCE Grant Program to the Directorate for Education and Human Resources under new leadership offers an unprecedented opportunity for collaboration with undergraduate and graduate science education initiatives.

3) *Establish Dedicated Federal Funding of Scholarship Programs and Training Grants for Under-represented Minority Undergraduate and Graduate Students in STEM:* Although encouraged by the modest increase in NSF's overall funding, I am concerned that NSF resources for science education have decreased in recent years. Efforts to remedy the crisis in science education funding for innovative programs have been caught in a series of fiscal Continuing Resolutions in Congress. In addition, current limitations for federal scholarship funding and training grants have significantly impeded full participation by under-represented minorities in S&E. I strongly urge Congress to look at successful training models such as the Meyerhoff Scholarship Program at UMBC.

4) *Support Full Anti-Discrimination Compliance and Enforcement:* Meeting the Nation's demand for a well-trained and inclusive S&E workforce requires greater diligence in anti-discrimination compliance and enforcement efforts. Federal agencies (especially NSF, NIH, and NSA) should leverage their funding to provide incentives for research universities to recruit, support, and advance women and minority faculty in STEM. This incentive-based approach should be coupled with a mandate that federal agencies extend the enforcement of anti-discrimination laws at universities through regular compliance reviews as a condition of continued funding. Expanding the application of Title IX of the Civil Rights Act beyond athletics to include academic areas as well, especially in S&E, would result in even more substantial advances for gender equity.

ANSWERS TO POST-HEARING QUESTIONS

Submitted to Myron Campbell, Chair, Physics Department, University of Michigan

These questions were submitted to the witness, but were not responded to by the time of publication.

Questions submitted by Representative Vernon J. Ehlers

Q1. Many of you emphasized that as higher educational administrators, you do not mandate change but encourage it in little ways at all levels. What would be the worst thing(s) Congress could do legislatively? What would be the best thing(s) Congress could do to help improve the environment for female faculty in S&E?

ANSWERS TO POST-HEARING QUESTIONS

Responses by Gretchen Ritter, Professor of Government; Director, Center for Women's and Gender Studies, University of Texas at Austin

Questions submitted by Representative Vernon J. Ehlers

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A1. The worse thing that Congress could do is to say that this is just a problem for the universities. Taking a completely hands-off approach is not likely to result in significant efforts to improve the situation of women faculty in under-represented fields on many campuses.

One of the best things Congress could do legislatively is to ask for greater accountability from universities. Research universities depend upon federal research funding. Colleges and universities at all levels receive other forms of federal educational assistance. In order to continue to receive this assistance, Congress should ask universities to be accountable in providing equal opportunity and a supportive work environment for female faculty in under-represented fields. Applying Title IX standards in academia (as we do in sports) would create positive incentives for universities to recruit and retain talented women in science and engineering.

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