FULFILLING THE POTENTIAL OF WOMEN IN ACADEMIC SCIENCE AND ENGINEERING ACT OF 2008

HEARING

BEFORE THE

SUBCOMMITTEE ON RESEARCH AND SCIENCE EDUCATION

COMMITTEE ON SCIENCE AND TECHNOLOGY

HOUSE OF REPRESENTATIVES

ONE HUNDRED TENTH CONGRESS

SECOND SESSION

MAY 8, 2008

Serial No. 110–100

Printed for the use of the Committee on Science and Technology

Available via the World Wide Web: http://www.science.house.gov

U.S. GOVERNMENT PRINTING OFFICE

42–121PS WASHINGTON : 2008

For sale by the Superintendent of Documents, U.S. Government Printing Office
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FULFILLING THE POTENTIAL OF WOMEN IN ACADEMIC SCIENCE AND ENGINEERING ACT OF 2008

THURSDAY, MAY 8, 2008

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

The Subcommittee met, pursuant to call, at 10:00 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:

Fulfilling the Potential of Women in Academic Science and Engineering Act of 2008

May 8, 2008
10:00 a.m. – 12:00 p.m.
2318 Rayburn House Office Building
Washington D.C.

WITNESS LIST

Dr. Lynda T. Carlson
Director of the Division of Science Resource Statistics, Directorate for Social, Behavioral and Economic Sciences
National Science Foundation

Dr. Linda G. Blevins
Senior Technical Advisor in the Office of the Deputy Director for Science Programs, Office of Science
Department of Energy

Dr. Donna K. Ginther
Associate Professor of Economics
Director of the Center for Economic and Business Analysis, Institute for Policy Research
University of Kansas

HEARING CHARTER

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

Fulfilling the Potential of Women in Academic Science and Engineering Act of 2008

THURSDAY, MAY 8, 2008
10:00 A.M.—12:00 P.M.
2318 RAYBURN HOUSE OFFICE BUILDING

1. Purpose

On October 17, 2007, the Research and Science Education Subcommittee held a hearing on *Women in Academic Science and Engineering,* during which we examined 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.

On Thursday, May 8, the Subcommittee will hold a hearing to obtain comments on a draft bill that would provide for federal programs to address the needs discussed in the previous hearing.

2. Witnesses

- **Dr. Lynda T. Carlson,** Director of the Division of Science Resource Statistics, Directorate for Social, Behavioral and Economic Sciences, National Science Foundation.
- **Dr. Linda G. Blevins,** Senior Technical Advisor in the Office of the Deputy Director for Science Programs, Office of Science, Department of Energy.
- **Dr. Donna K. Ginther,** Associate Professor of Economics and Director of the Center for Economic and Business Analysis, Institute for Policy Research, University of Kansas.

3. Overarching Questions

- What are the elements of an effective program of workshops to educate participants about gender bias in academic science and engineering and to provide them with strategies to overcome such bias? By what metrics should such workshops be evaluated?
- What demographics data do federal science agencies already collect in their grant making processes? What demographics data do universities collect on their faculty search and hiring, tenure review and promotion processes? What data are needed to better understand and track gender disparities in academic science and engineering?
- Does the proposed legislation adequately address the federal role in programs and policies to help overcome cultural and institutional barriers to gender equity in academic science and engineering?

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 30 percent (in 2006) of full-time doctoral science and engineering faculty at U.S. colleges and universities and only 19 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 National Academies panel, in addition to dismissing the relative significance of any biological differences (in response to former Harvard President Lawrence Summers' February 2005 remarks on this topic), 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.
- On October 17, 2007, the Research and Science Education Subcommittee held a hearing on *Women in Academic Science and Engineering* in which we explored broadly the findings and recommendations of the National Academies panel. Sections 5 and 6 below are taken directly from the 2007 hearing charter, except for updates where more recent data have become available.
- Today the Subcommittee will receive comments on draft legislation that incorporates several of the recommendations from the National Academies panel that were also discussed during the previous hearing, including workshops to increase awareness of implicit gender bias in grant review, hiring, tenure, promotion, and selection for other honors based on merit; extended grant support for caregivers; and improved demographic data collection on federal grant-making.

5. Current Status of Women in Academic Science and Engineering

According to data compiled by NSF, in 2006, women held 30 percent of all full-time science and engineering (S&E) faculty positions at U.S. colleges and universities. Specifically, they constituted 19 percent of full professors, 34 percent of associate professors and 42 percent of junior professors, a category that includes both instructors at two-year colleges and assistant professors at four-year institutions.

As seen in this figure from the *Beyond Bias and Barriers* report, 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.

[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.

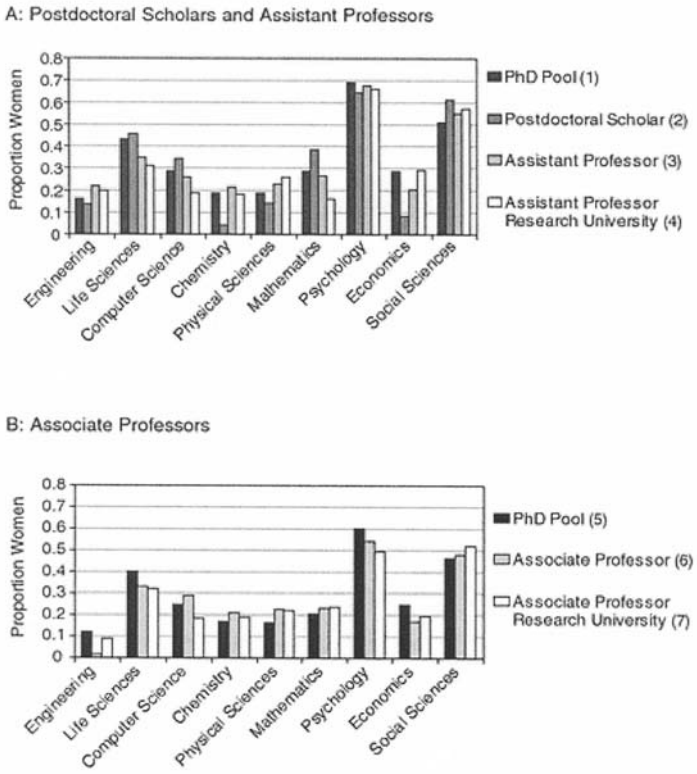

FIGURE 1-2 Comparison of the proportion of women in PhD pools with those in tenure-track or tenured professor positions in 2003, by field.

We present the 2003 data in this charter because those data were analyzed and presented in a way that more recent data have not been. However, since the last hearing, NSF has published 2006 data as part of *Science and Engineering Indicators 2008.* From 2003 to 2006, the representation of women in full-time senior faculty positions (associate and full professors) at all universities has increased by one to two percent in all of the major natural sciences fields—where chemistry is included in physical sciences—and by just under one percent in engineering. Not surprisingly, psychology and the social sciences saw slightly larger increases, but in no S&E field other than psychology do women represent more than 30 percent of senior faculty positions.

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 post-doctoral level. Post-doctoral 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."[2] 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 better data collection, 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: *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.[3] 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[4] study of peer-review scores, in which men received systematically higher competence ratings by their peers than equally productive women. In fact, women post-doctoral 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. A similar claim has just been reported in *Nature News* by a woman physicist who was a post-doctoral fellow at DOE's Fermi Lab in Illinois until 2005.[5] 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

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

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

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

[5] *Nature News,* Vol. 452, 24 April 2008, Pg. 918.

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.

7. Workshops on Gender Bias

In January 2006, officials from the Department of Energy (DOE), NSF and National Institutes of Health partnered in support of a workshop on gender bias for chemistry department chairs from across the country. The goal for this conference was to "develop and implement strategies to significantly increase the number of women chemists in tenured academic positions in our research universities and eliminate the gender biases that negatively impact their career progress." In addition to department chairs, participants included lab heads from DOE National Labs and representatives of societies and federations. The workshop did result in a report of the challenges and issues addressed.[7] However, the federal agencies did not sponsor any long-term follow-up of the departments whose chairs participated. The physics community followed with a similar workshop in May 2007.[8] Today's DOE witness participated as an advisor in both the chemistry and physics workshops and will address the elements of an effective workshop in addition to metrics for evaluation.

8. Questions for Witnesses

Dr. Carlson

- The draft bill requires federal science agencies to collect annual composite information on demographics, field, award type and budget request, review score, and funding outcome for all applications for research grants to universities supported by those agencies. How much of these data are already collected by the National Science Foundation (NSF) for their own grants? What level of effort and resources are required by NSF to collect all of the data as listed in the draft?
- Assuming that the Director of the Office of Science and Technology Policy established a uniform policy for collecting and reporting such data based on the NSF model, what level of effort and resources would be required of NSF to store and publish the data from all of the federal science agencies?

Dr. Blevins

- Based on your own experience in helping to organize workshops to address gender bias in the chemistry and physics communities in 2006 and 2007, what are the elements of an effective workshop? In answering this question, please address workshop content, format, speakers, and participant categories, in addition to any other elements that are important to an effective workshop.
- What metrics should be used to evaluate the success of such workshops in changing individual behavior and institutional culture related to gender equity in academic science and engineering?
- Are there challenges in overcoming gender bias that are unique to the National Laboratories? Should the workshops have sessions that are tailored specifically to National Laboratory participants?

Dr. Ginther

- What data are needed to better understand gender disparities in university departments of science and engineering?
- The draft bill provides for a program of workshops on gender bias in academic science and engineering. What are the elements of an effective workshop? In answering this question, please address workshop content, format, speakers,

[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] *http://www.chem.harvard.edu/groups/friend/GenderEquityWorkshop/GenderEquity.pdf*

[8] *http://www.aps.org/programs/women/workshops/gender-equity/index.cfm*

and participant categories, in addition to any other elements that are important to an effective workshop. What metrics should be used to evaluate the success of such workshops in changing individual behavior and institutional culture related to gender equity in academic science and engineering?

- The draft bill requires a uniform federal policy for extending the period of grant support for federally funded researchers with caregiving responsibilities. Do you have any recommendations for what such a policy should look like?
- Does the proposed legislation adequately address the federal role in programs and policies to help overcome cultural and institutional barriers to gender equity in academic science and engineering?

Chairman BAIRD. I want to thank everyone for joining us for this very important hearing on the role of women in science and ways we can continue to support advanced practice among women in science. We have had a number of hearings in this subcommittee on this. My dear friend and Ranking Member, Dr. Ehlers, is very interested in it, and of course, Eddie Bernice Johnson, the author of the legislation before us today is quite interested in this as well.

Under normal circumstances I would have a long statement written for me by staff, but we have votes on the Floor possibly fairly early this morning, and in the interest of hearing witnesses, I will enter my own opening remarks into the record and would recognize now Dr. Ehlers for comments if he wishes to make some.

[The prepared statement of Chairman Baird follows:]

PREPARED STATEMENT OF CHAIRMAN BRIAN BAIRD

Good morning and welcome to this hearing on the discussion draft of *Fulfilling the Potential of Women in Academic Science and Engineering Act of 2008.* I want to thank my dear friend Ms. Johnson for bringing this important legislative proposal before the Subcommittee.

According to NSF, women earned more than half of all science and engineering Bachelor's degrees in 2005, although they continue to earn only 20 percent in engineering, computer science, and physics. Similarly, while there remain considerable differences across fields, women are receiving science and engineering Ph.D.s in steadily increasing numbers. However, even in the life sciences where women now earn more than 50 percent of Ph.D.s, they hold only 30 percent of all associate and full professor faculty positions—and that's by far the highest number for all natural science and engineering fields.

In October of last year, we held a hearing on *Women in Academic Science and Engineering* to review the findings and recommendations of a National Academies panel that carefully examined the reasons why the attrition rate for women in academic science and engineering continues to be higher than for men at every step along the academic pipeline.

The panel found that most of the barriers to women in academia are not created with intent to discriminate. In fact, even policies that seem gender-neutral in theory might not be so in practice. They recommended that federal science agencies sponsor workshops on gender bias in order to raise awareness of and provide strategies to overcome the collective effect of many small and subtle incidents of subconscious bias that are often built into academic culture. The draft bill under consideration creates a program of such workshops.

The National Academies panel also highlighted the need for better data collection, to understand the extent of gender inequity and to have a basis for evaluating policies to address the gap. The draft bill therefore requires federal science agencies to collect detailed demographic data on the grant making process, and encourages universities to collect better data for the purposes of evaluating the gender bias workshops.

In today's hearing we seek feedback on these and other provisions of the *Fulfilling the Potential of Women in Academic Science and Engineering Act of 2008.* We also welcome suggestions for other programs or language that we might consider including.

We cannot afford to continue losing our best and brightest women from academic science and engineering careers. The programs in this bill are a small but critical part of what is needed to tackle the barriers that women face. But Congress has a limited role in helping to overcome what are ultimately cultural and institutional barriers. The universities, disciplinary societies, funding agencies and other stakeholders need to step up to do their part, and I am happy to see such a movement starting to take hold.

I want to thank Congresswoman Johnson once again for her tireless work to promote the role of women and minorities in science and engineering. I thank all of the witnesses for being here today and I look forward to your testimony.

Mr. EHLERS. Thank you, Mr. Chairman, and I would agree on that. I don't have a long opening statement. I have a short one. Nevertheless, I ask consent to enter it into the record and also just

want to thank Dr. Ginther for being here. I've had the pleasure of talking to her on the telephone, persuaded her to come, and I very much look forward to her testimony. I am sure she has much to offer to this hearing.

[The prepared statement of Mr. Ehlers follows:]

PREPARED STATEMENT OF REPRESENTATIVE VERNON J. EHLERS

Today we are examining legislation introduced by my colleague, Congresswoman Johnson from Texas, which addresses the biases and barriers women face in science and engineering faculty departments. I thank Representative Johnson for preparing this thoughtful legislation and appreciate her willingness to delve into the details and receive testimony from our witnesses today.

In October this subcommittee held a hearing on the challenges faced by female faculty in science and engineering. Our witnesses were a dynamic group who spoke about the institutional changes needed and highlighted some of the programs the Federal Government currently supports in this area. We learned that effective institutional change must be systemic, and that sometimes bias hides behind even the simplest language used in recommendation letters.

Today we are going to talk about specific actions the Congress can take to address these biases. I hope that we are able to take what we learn from our witnesses today and incorporate some of their ideas into the final legislation. All of us want to ensure that equitable educational opportunities for women pursuing faculty positions are the norm and not the anomaly at U.S. colleges and universities. Important to this effort is making certain that we have a good understanding of the current situation so that we can be sure that federal efforts achieve the intended impact.

I look forward to hearing from our witnesses today.

[The prepared statement of Ms. Johnson follows:]

PREPARED STATEMENT OF REPRESENTATIVE EDDIE BERNICE JOHNSON

Thank you, Mr. Chairman. The National Academies report, *Beyond Bias and Barriers,* provided clear guidelines to universities, federal agencies, professional organizations and to Congress on what actions to take to reduce gender bias at the university faculty level.

As the legislation has developed, there has been a faint expression of concern over being heavy-handed with our scientists and universities.

One thing that I hope to learn from today's hearing, as well as from feedback submitted to the Science Committee, is how we can encourage 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.

Beyond Bias and Barriers also recommended that higher education organizations form an inter-institution monitoring organization, and that scientific and professional societies help set professional and equity standards for the activities that they lead, such as awards and conferences.

I have attempted to incentivize the formation of such an inter-institution monitoring organization, through a one-time competitive grant through the Department of Education's Fund for the Improvement of Post-secondary Education.

The provision was accepted into the *Higher Education Act,* but during conference, it was stripped out.

I am frustrated, Mr. Chairman, by the uphill battle in getting equality for women when it comes to reaching the higher echelons of scientific achievement.

As stated in *Beyond Bias and Barriers,* "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."

While I do not intend to be heavy-handed toward our universities, I do feel that not nearly enough is being done to educate persons of influence on the subtle gender bias that exists and is holding women back from achieving at the same level as men.

Why have our federal agencies not already developed institutional policies that are sensitive to women scientists?

Why is there no federal guideline for administrative leave for the purpose of caregiving?

Why is there no funding mechanism to provide for interim technical or administrative support during a leave of absence related to care giving?

Why is there no centralized, federal policy to extend grant support time-tables for researchers who take a care giving leave of absence?

What are federal agencies doing to protect whistleblowers who speak out when anti-discrimination laws are not enforced?

Why is NSF's Survey of Earned Doctorates suddenly repressing data on women and minorities in science?

Mr. Chairman, for the record, I am submitting the most recent report, from 2006, entitled, "2006 Doctorate Recipients from United States Universities: Summary Report." [1]

Beginning with the very first data table, A–1, the NSF suppresses data when the numbers are small—the reason given is to "protect confidentiality."

Look for yourselves. The data suppression begins on page 113, and it stretches all the way to page 174.

Mr. Chairman, any scientist worth her salt will tell you that incomplete data is not worthy of publication.

This is exactly the kind of practice that we must stop. I will fight this for as long as I am in Congress and long afterwards.

I am also submitting an article from *Inside Higher Education* that highlights the NSF's suppression of this critical data on women and minority Ph.D. attainment.

I am ashamed that the NSF has suppressed this data. I hope that Jaqui C. Falkenheim, the NSF project manager for the survey, or whoever at that agency decided that this was a good idea, will be told that they are wrong.

I strongly recommend that the NSF immediately return to full disclosure of data reporting—even if the numbers are embarrassingly small—so that taxpayers, including myself, can understand the complete truth about the sad state of women and minority achievement in the sciences in our nation.

With that said, I want to thank you, Mr. Chairman, and Ranking Member Ehlers, for your attention to this bill.

I thank the Diversity & Innovation Caucus for pushing this issue as well.

I thank the American Association of University Women, National Coalition for Women and Girls in Education, the Society of Women Engineers, the National Science Teachers Association, the American Chemical Society and others for supporting this bill.

The American Association of University Women and the National Coalition for Women and Girls in Education have both written support letters, and I ask your permission to also submit these for the record.

Thank you for your indulgence, Mr. Chairman. I yield back.

[The prepared statement of Mr. Carnahan follows:]

PREPARED STATEMENT OF REPRESENTATIVE RUSS CARNAHAN

Mr. Chairman, thank you for hosting this important hearing on the role of gender in science and engineering.

While the status of women in science and engineering academia has improved over the last three decades, there are still barriers to achieving gender equity. NSF published 2006 data in *Science and Engineering Indicators 2008* that demonstrated some increases in women represented in full-time senior faculty positions at all universities. However, women represent no more than 30 percent of senior faculty positions in science and engineering fields other than psychology. This is an unfortunate statistic and one that the draft legislation under the Committee's consideration today seeks to address.

One of the proposals included are workshops to increase awareness of implicit gender bias in grant review, hiring, tenure, promotion, and selection for other honors based on merit. I realize that one such workshop occurred recently at the Department of Energy and look forward to hearing Dr. Blevins' opinions about the workshop's successes and/or failures.

I would like to thank today's witnesses, Dr. Carlson, Dr. Blevins and Dr. Ginther. I look forward to hearing all of our witness's testimonies.

Chairman BAIRD. I thank all of the witnesses. Dr. Ginther, you know it is hard to turn down our good friend, Dr. Ehlers. And I

[1] An updated version of the *2006 Doctorate Recipients from United States Universities: Summary Report* is available at *http://www.norc.org/projects/survey+of+earned+doctorates.htm.* The version of the report Representative Johnson refers to is available at the Science and Technology Committee main office, located in Room 2321 of the Rayburn House Office Building.

thank all our witnesses. And with that, I will introduce the witnesses so that we can begin the testimony.

Dr. Lynda T. Carlson is the Director of the Division of Science Resource Statistics in the Directorate for Social, Behavioral and Economic Sciences at the National Science Foundation. Dr. Linda G. Blevins is Senior Technical Advisor in the Office of the Deputy Director for Science Programs at the Department of Energy. And Dr. Donna K. Ginther, as introduced by Dr. Ehlers, is an Associate Professor of Economics and the Director for the Center for Economic and Business Analysis in the Institute for Policy Research at the University of Kansas.

As our witnesses should know, we ask folks to limit their testimony to five minutes and then we follow by questions. This is generally a friendly, bipartisan committee. It is not like the spooky ones you see on TV. So we look forward to your comments, we will have good discussion, and I thank you for being here.

Dr. Carlson.

STATEMENT OF DR. LYNDA T. CARLSON, DIRECTOR, DIVISION OF SCIENCE RESOURCES STATISTICS (SRS), NATIONAL SCIENCE FOUNDATION (NSF)

Dr. CARLSON. Chairman Baird, Ranking Member Ehlers, and Members of the Subcommittee, I am Lynda Carlson, Director of NSF's Division of Science Resources Statistics or SRS. I appreciate the opportunity to appear before you today.

SRS is one of the 14 major statistical agencies, and our major responsibility is for data collection and analysis related to the entire science enterprise. We produce biennial Science and Engineering Indicators as well as Women, Minorities and Persons with Disabilities in Science and Engineering reports. NSF cannot support the proposed legislation as the data collection and analysis requirements will be excessive. Let me illustrate with these examples.

First, NSF itself as part of the grants process currently collects annual composite information on demographics, field, award type, budget request, review score, and funding outcomes for all of its proposals and awards. However, principal investigators, or PIs, are not, nor can they be required to provide demographic information as a condition of obtaining an award because of the *Privacy Act*. Hence, the demographic information collected is incomplete. For example, the number of PIs who submitted proposals and did not declare a race or ethnicity in 2007 was nearly as large as those who provided a response. And over the last 10 years, the proportion of new principal investigators reporting their gender has declined.

Second, I will refer to some lessons we learned in conducting two surveys that characterize R&D conducted in the federal sector, survey of Federal Funds for Research and Development and Survey of Federal Science and Engineering Support to Universities, Colleges, and Nonprofit Institutions. For these surveys, SRS must obtain data from science funding agencies on the type of activity supported and on the funding recipient. It has been increasingly difficult for SRS to obtain high-quality data in a timely manner from the queried agencies. Agencies do not usually keep detailed information about the science fields that they support. And even when

an agency does maintain data by field, it may not conform to SRS's data characterization system.

In short, different agencies maintain their records in quite different ways to meet their particular needs, and SRS does not have the authority to require funding agencies to maintain or transfer needed data.

As a result of such issues, SRS commissioned the National Research Council's Committee on National Statistics to form a panel and hold a series of workshops to assist us in revising these surveys. The panel was recently formed, and the first workshop will be held in June of 2008. The resulting recommendations are expected to be released in early 2009.

A third and final example speaks to efforts to collect data on gender. The *NSF Authorization Act of 2002* required NSF to examine differences in amounts requested and award by gender in major federal external grants. SRS contracted with the RAND Corporation to conduct the survey. The results were released in 2005. For this study we had intended to collect data on grants by gender from NSF, USDA, all of HHS, and the Departments of Defense and Energy.

Data collection was only feasible from NSF, NIH, and USDA. Adequate data on grants, applications, and awards were not available for the Department of Defense or Energy or the remainder of HHS. From this effort we learned that better tracking of gender differences will require that all agencies maintain a data system that stores information on all grants and investigators and that all agencies include key personnel characteristics for each investigator in the application form, among other requirements.

Mr. Chairman, I hope that these examples illustrate the complexities of the data collection requirements called for in this legislation. The Chief Financial Officer's Grants Policy Committee, which is charged with oversight of government-wide grants policy initiatives, might be able to provide additional insight into such a data collection.

Thank you.

[The prepared statement of Dr. Carlson follows:]

PREPARED STATEMENT OF LYNDA T. CARLSON

Chairman Baird, Ranking Member Ehlers, and Members of the Subcommittee, I am Lynda Carlson, Director of the Division of Science Resources Statistics (SRS) within the National Science Foundation (NSF). I appreciate the opportunity to testify on Representative Johnson's proposed legislation on gender biases and barriers. However, NSF cannot support the proposed legislation as its requirements will be excessive as they exceed current data collection capabilities.

NSF's Division of Science Resources Statistics (SRS)

The Division of Science Resources Statistics (SRS) is the federal statistical agency responsible for data collection and analysis related to the entire science and engineering (S&E) enterprise. The Division's responsibilities include data collections and analyses related to the S&E workforce, the education of scientists and engineers, and research and development (R&D), including federal funding of R&D. We annually collect data on R&D in academe and industry, and we periodically collect data on R&D funding activities by states and nonprofits. SRS staff is responsible for writing and producing the biennial *Science and Engineering Indicators* report for the National Science Board, as well as the biennial report *Women, Minorities and Persons with Disabilities in Science and Engineering,* which is required under Section 37 of the *Science and Engineering Equal Opportunities Act.*

Data Collection on Grants Portfolio

NSF currently collects annual composite information on demographics, field, award type and budget request, review score and funding outcome for NSF proposals and awards. NSF publishes a summary of these data in the annual Merit Review Report, including principal investigator (PI) demographics on proposals and awards. However, PIs are not, nor can they be, required to provide demographic information because of the *Privacy Act;* therefore, the demographic information collected is incomplete. For example, the number of PIs who submitted proposals and did not declare a race/ethnicity in 2007 is nearly as large as the number who declared minority status. In the last ten years, the proportion of new PIs who choose to report their gender has been declining.

Furthermore, the process for collecting and correlating review scores across programs and directorates within NSF is complex. For example, differences in average review scores across programs and field of research are as likely to reflect different reviewer community norms as to reflect differences in the actual quality of proposals received. Given the variety of review processes and scoring systems used throughout Federal Government, coupled with the complexity of correlating scores even within agencies, it would be virtually impossible for SRS to provide a report to Congress with review scores that are in any way comparable across the federal science agencies.

Lessons Learned from Other SRS Surveys

Over the last several years, SRS has been in the process of redesigning two surveys that characterize R&D conducted in the federal sector: (1) "Survey of Federal Funds for Research and Development," or Federal Funds Survey; and (2) "Survey of Federal Science and Engineering Support to Universities, Colleges, and Nonprofit Institutions," or Federal Support Survey. The surveys are being redesigned to better reflect how R&D is actually conducted in today's economy. The redesign was guided in part by a 2005 study that SRS commissioned from the National Research Council's Committee on National Statistics (CNSTAT), entitled "Measuring Research and Development Expenditures in the U.S. Economy."

For the two aforementioned surveys, SRS must obtain data from S&E funding agencies on the type of activity supported and on the recipient of the funding, among other indicators. It has been increasingly difficult for SRS to obtain high quality data in a timely manner from the queried agencies. Moreover, agencies do not usually keep detailed information about the fields of S&E that they support. Further, even when the agency does maintain data by field, those data may not conform to SRS's data categorization system. Different agencies maintain their records in quite different ways to meet their particular needs and operating procedures. SRS may have to work with individual agencies for significant periods of time to obtain more comparable data. Because of poor data quality and incomplete agency reporting, data on field of S&E research has not been collected as part of the Federal Support Survey since 1999.

In response to the issues we have encountered in conducting these two surveys, SRS has commissioned CNSTAT to form a panel and hold a series of workshops to assist us in their revision. The panel, "Modernizing the Infrastructure of the NSF Federal Funds Survey," was recently formed, and the first workshop will be held in June 2008. The panel's report and recommendations, which may help streamline data collection for SRS, are expected to be released in early 2009.

As part of the redesign effort for another SRS survey entitled, "Survey of Research and Development Expenditures at Universities and Colleges," issues with field of study data have been elucidated. Recent site visits to sixteen academic institutions have indicated that many academic institutions do not capture research field of study at the proposal stage. Once a proposal has been funded, the ability to capture the field of study for individual proposals varies considerably across institutions from easy to quite difficult. Institutions have indicated that it would require some effort to educate faculty on how to code their research by field, as the methods are not straightforward, especially as more and more research is interdisciplinary.

Lastly, SRS is also revising the existing taxonomy(s) of Fields of Science in order to capture new and emerging fields. SRS is developing a schema to revise the taxonomy in a manner that would allow it to be updated on a continuous basis. We expect this project to be finalized in two to three years. We will engage in significant consultation with the other science funding agencies as part of this activity.

Lessons Learned from a Study of Grants by Gender

The *NSF Authorization Act of 2002* required NSF to "examine differences in amounts requested and awarded, by gender, in major federal external grants." SRS

contracted with the RAND Corporation to conduct the survey, and the results were published in a 2005 report entitled, "Gender Differences in Major Federal External Grant Programs."

The report covered several federal science agencies, or federal agencies responsible for at least two percent of federal R&D obligations to universities. We had intended that the study collect data on grants by gender from NSF, the Department of Defense (DOD), the Department of Energy (DOE), the Department of Agriculture (USDA), and the National Institutes of Health (NIH). Data collection was only feasible from NSF, NIH and USDA; adequate data on grant applications and awards were not available from DOD or DOE. According to the report:

> "[There are] numerous limitations in the information collected in federal agencies' grant application and award data systems. Such limitations hinder the ability to track gender differences in federal grant funding. Better tracking of gender differences in such funding would require that all agencies awarding significant grant funding do the following:
>
> - Maintain a data system that stores information on all grant applications and investigators, including co-investigators. Ideally, each agency would have a single data system rather than separate systems for each sub-agency or grant program and the agencies would agree on a common list of key data elements.
> - Include in the application form key personal characteristics for each investigator, including gender, race and ethnicity, institution (in a way that can be easily categorized), type of academic appointment for investigators in post-secondary education, discipline, degree, and year of degree.
> - Fill in missing personal information, including gender, where possible from other applications by the same investigator.
> - Record the amount requested and awarded for each proposal and any score assigned to it by the peer reviewers.
> - Clearly identify initial proposals and awards, supplements that involve new funding, and amendments that involve no new funding."

Cost of Survey Implementation

Current, simple federal surveys conducted by SRS cost approximately $800,000 annually to implement. The costs are incurred by a survey firm contracted to collect and process the data. This expense does not include the cost of SRS staff, who provide oversight and administration of the survey efforts, or the costs of collection and reporting incurred by each of the individual federal agencies.

If NSF were tasked to expand its data collection efforts to include the more complex project-specific and demographic data envisioned in the proposed legislation, SRS would require additional funding, or we would have to reduce other ongoing survey efforts. These costs do not include the additional SRS staff time and resources that would be required to facilitate the data surveys, nor the additional costs that would be incurred by other federal agencies in setting up the requisite data systems and annually reporting the data to SRS.

Conclusion

Mr. Chairman, I hope that I have been able to articulate NSF's unique role in gathering and analyzing data about the Nation's S&E enterprise. I hope my comments help feed the discussion about how to collect indicators adequately to help our nation measure our progress in ensuring that there is no gender bias in science and technology.

In summary, however, SRS does not have the ability to require funding agencies to maintain such records. If Congress seeks to require such a collection, the Grants Policy Committee, which is charged with overseeing government-wide grants policy initiatives and making policy recommendations to the Office of Management and Budget, might be able to provide additional insight.

SRS does welcome the opportunity, however, to continue to be involved in discussions on this important draft legislation, as we are constantly striving to improve our contribution to the policy process. NSF looks forward to collaborating with our sister agencies and the broader S&E community to more effectively collect and report on important data related to innovation and competitiveness. Thank you for the opportunity to appear before you, and I am happy to answer any questions.

BIOGRAPHY FOR LYNDA T. CARLSON

Since 2000, Dr. Lynda Carlson has been the Director of the National Science Foundation's Division of Science Resources Statistics. In that role, she is responsible for all activities of the Division, a federal statistical agency within NSF. Prior to coming to NSF, Dr. Carlson was at the Energy Information Administration (EIA) of the Department of Energy where she held a variety of positions over 23 years. She is internationally known for the design and development of the Nation's energy consumption surveys, including the development of a unique statistical sampling frame of commercial buildings. Dr. Carlson's last position at EIA was that of Director of the Statistical Methods Group with responsibility for all statistical activities throughout EIA.

Dr. Carlson received her M.A. and Ph.D. from the University of Illinois at Urbana–Champaign in Political Science and her B.A. from Brooklyn College, CUNY. She is a Fellow of the American Statistical Association and member of various groups such as AAPOR and AAAS. She has served on a series of OMB committees, is a member of the Federal Committee on Statistical Methodology, and has served on several NAS committees. In 2000, she received the highest departmental award from the Department of Energy for her service to that agency.

Dr. Carlson has written on energy consumption, survey methodology, and the science and engineering enterprise.

Chairman BAIRD. Thank you, Dr. Carlson. Dr. Blevins?

STATEMENT OF DR. LINDA G. BLEVINS, SENIOR TECHNICAL ADVISOR, OFFICE OF THE DEPUTY DIRECTOR FOR SCIENCE PROGRAMS, U.S. DEPARTMENT OF ENERGY

Dr. BLEVINS. Chairman Baird, Ranking Member Ehlers, and Members of the Subcommittee, thank you for the opportunity to testify today. I would like to provide you with some information about two gender equity workshops.

In January of 2006, the academic chemistry community pioneered a format for a gender equity workshop. The workshop got its start because the chemistry community observed that 50 percent of their bachelor's degrees went to women, and 35 percent of their Ph.D.s went to women, but only 13 percent of the faculty members in the top 50 university chemistry departments were women. Top 50 refers to departments that receive the most federal research dollars. The workshop thus targeted the participation of the chairs from these departments.

Around the time of the chemistry workshop, two National Academies reports were released, *Rising Above the Gathering Storm* and *Beyond Bias and Barriers.* These two reports reinforced the DOE Office of Science's motivation to be involved in gender equity workshops.

In May of 2007, the physics community hosted a workshop of its own based on the chemistry model but adding some different features. Each of these workshops, while organized by the relevant research community, has involved the major funding agencies for the given scientific field. For example, the chemistry workshop was cofunded and advised by DOE, NSF, and NIH. The physics workshop involved DOE and NSF.

I would like to highlight a few important points about the workshops. First, the workshops are community-driven. The steering committees are made of distinguished research scientists within the discipline, and the workshops are designed to create a sense of ownership of the outcomes within each scientific community. Involvement of high-level federal officials from the relevant funding program seems significant in reinforcing the importance of the top-

ical matter. The workshop concept uses demographic data and social science to examine the underlying causes of gender gaps in science. Data-driven science is emphasized over anecdotes, and social science is presented objectively. Planning such a workshop involves an enormous amount of work.

Each community has a unique demographic and a unique culture, which means each workshop may have different features. For example, because women are under-represented at all levels in physics, that workshop had a session on education issues that did not appear in the chemistry workshop.

Each workshop brings an experienced and influential group together to tackle tough issues. Attendance is limited to about 100 people, and participants include department chairs, speakers that include social scientists, federal officials, and opinion leaders.

For physics, managers from 13 DOE national laboratories were invited along with the top 50 chairs. Workshops include lectures, panel discussions, and break-out sessions. Interactive theater and implicit bias demonstrations can shift perspectives and encourage community action. Action items are developed in the break-out sessions, and participants are asked to select and commit to carrying them out. Tools such as interactive websites allow the organizers from the communities to track progress over time.

The metrics for success proposed and used so far by the communities have been attitude changes as measured using approved pre- and post-workshop surveys and tracking of the documented commitment by the participants to implement action items and their regular follow-up progress reports. For the chemistry workshop, these metrics are already demonstrating early success.

The workshops have not revealed differences between federally funded research and development centers and universities and their potential for implicit bias. There are some other differences, though. First, FFRDCs do not always have discreet disciplinary units like academic departments. Second, while universities have tenure, FFRDCs have various promotion systems, and these differences create challenges for designing common workshops.

So development of this workshop series is being driven by the scientific communities and has demonstrated some initial success. The model for these workshops continues to evolve. The agencies funding and advising these workshops have forged good working relationship with each other and with the communities working to achieve gender equity. And the innovative nature of each workshop and of the workshop concept has drawn, and continues to maintain, DOE's interest in participating.

Thank you again, Mr. Chairman, for the opportunity to speak before you today, and I would be happy to answer questions.

[The prepared statement of Dr. Blevins follows:]

PREPARED STATEMENT OF LINDA G. BLEVINS

Chairman Baird, Ranking Member Ehlers, and Members of the Subcommittee, thank you for the opportunity to testify today. I would like to provide you with the history of the DOE Office of Science's involvement in several gender equity workshops.

The 2005 demographics of academic chemistry departments as reported by *Chemical and Engineering News* told a striking story that motivated the design of a new workshop series. First, an impressive 50 percent of chemistry Bachelor's degrees

were awarded to women and 35 percent of chemistry Ph.D. degrees went to women.[1] Despite these strong training numbers, only 13 percent of the faculty from the "top 50" university chemistry departments in the U.S. were women.[2] This disparity between the fraction of women obtaining Ph.D. degrees and the fraction of women serving as university faculty led the chemistry community to develop a workshop concept that targeted the participation of the chairs of the top 50 university chemistry departments. Workshop organizers engaged the major federal funders of chemistry research—the Department of Energy (DOE), the National Science Foundation (NSF), and the National Institutes of Health (NIH)—for financial support and workshop involvement. A steering committee, whose members were well-recognized academic chemists respected for their research contributions, was established. The workshop used demographic data and social science to examine the underlying causes of the gender gap in university chemistry departments.

Around the time of the chemistry workshop, the National Academies report, *"Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future,"* focused broad public attention on issues relating to the future of the physical sciences workforce in the United States. Soon after, another Academies report, *"Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering,"* helped raise awareness that unintentional biases can limit women's participation in science. These two reports reinforced the DOE Office of Science's motivation to support gender equity workshops.

The chemistry workshop, "Building Strong Academic Chemistry Departments through Gender Equity,"[3] was held January 29–31, 2006, and included lectures, panel discussions, and breakout sessions. Academic leaders, social scientists, and funding agency senior managers discussed demographic data and social science findings and used the breakout sessions to apply their broad, collective experience to identify action items for further work. A thought-provoking interactive theater skit on the first night demonstrated potential for implicit bias in academic mentoring, with actors staying in character to address audience questions. The social science presentations argued that most men and women exhibit unintended or implicit bias and that gender schemas[4]—hidden assumptions about a person's behavior based on gender—can slow women's advancement in academia and other career paths. At the conclusion of the workshop, the chairs committed to carry out at least two action items apiece from lists developed in the workshop breakout sessions.

A report describing the chemistry workshop and resultant action items for university and college departments, institutions, and funding agencies was released in 2006. Action items dealt with issues such as educating others about implicit bias and developing policies that facilitate hiring of women, including spousal hiring. Forty-five of the 56 chairs who attended the workshop visited an interactive website and selected action items to implement. Results of pre- and post-workshop attitudinal surveys administered by the Committee on the Advancement of Women Chemists (COACh)[5] showed measurable changes in the chairs' views. The interactive website was developed by COACh to track progress in the chairs' implementation of action items. At the end of the first and second years after the workshop, COACh received progress updates from chairs. Twenty-five chairs have followed up with COACh to report progress this year. The high participation rate in selecting action items and following up with progress reports has been encouraging.

The chemistry workshop resulted in shifts in attitude among the university chemistry department chairs who participated. These shifts were measured using an approved survey instrument developed by COACh and the steering committee. Before the workshop, the chairs generally felt that the principal factors limiting their ability to hire women were beyond their administrative control-factors such as too few applicants, candidate loss to other departments, and lack of spousal employment opportunities. After the workshop, however, chairs were more likely to report the limiting factors were those they could affect, such as low faculty commitment to hiring women and lack of financing. Additionally, chairs' perceptions of the factors slowing the progress of women chemistry faculty changed. A paper reporting these results will appear in the archival literature.[6]

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[1] *C&E News* Vol. 83 No. 44, pp. 38–39, 31 October 2005; also Vol. 84 No. 30, pp. 43–52, July 2006.

[2] "Top 50" is defined by federal research expenditures. *C&E News* Vol. 83 pp. 38–39, 31 October 2005.

[3] *http://www.chem.harvard.edu/groups/friend/GenderEquityWorkshop/index.html*

[4] Valian, V. (1998). *Why so slow? The advancement of women.* Cambridge, MA: M.I.T. Press.

[5] *http://coach.uoregon.edu/*

[6] "Promoting Gender Equity in Academic Departments: A Study of Department Heads in Top-Ranked Chemistry Departments," J. Greene, P. Lewis, G.L. Richmond, and J. Stockard, *Journal of Women and Minorities in Science and Engineering,* In Press (2008).

Inspired by the first workshop and follow-up within the chemistry community, the physics community approached the major funders of physics research—the DOE Office of Science and the NSF Mathematical and Physical Sciences Directorate—about hosting a similar workshop in their field. Workshop proposals were submitted and successfully reviewed at both agencies. A respected physics workshop steering committee was formed, and the time-intensive planning process began. The American Physical Society's Committee on the Status of Women in Physics[7] (APS CSWP) spearheaded the planning effort with advice from the funding agencies. The workshop, "Strengthening the Physics Enterprise in Universities and National Laboratories,"[8] was held May 6–8, 2007.

It was clear from the beginning that physics demographics were very different from those of chemistry: In 2005, only 21 percent of Bachelor's degrees and 14 percent of Ph.D. degrees in physics were awarded to women,[9] while 2002 data showed that only about seven percent of faculty members in the Nation's top 50 university physics departments were women.[10] Thus, in contrast to chemistry, women were under-represented in the science of physics at every level. Most of the physics workshop design was similar to that of the chemistry workshop, but a session on undergraduate and graduate education was added to address the demographic imbalance. Managers from DOE national laboratories were involved because of the importance of physicists to the missions of the national laboratories. Results from the pre- and post-workshop surveys are currently being analyzed, and implementation of action items is being tracked by the APS CSWP. A report from the physics gender equity workshop is in the final stages of preparation.

Inspired by the gender equity workshops, the chemistry community organized a department chair workshop addressing racial and ethnic equity, held September 24–26, 2007 with sponsorship from DOE, NSF, and NIH. The materials sciences and engineering community is currently planning a gender equity workshop of its own, with anticipated co-funding from DOE and NSF, to be held May 18–20, 2008.

The remainder of my testimony will focus on the questions proposed in the invitation letter for this hearing.

1. Based on your own experience in helping to organize workshops to address gender bias in the chemistry and physics communities in 2006 and 2007, what are the elements of an effective workshop? In answering this question, please address workshop content, format, speakers, and participant categories, in addition to any other elements that are important to an effective workshop.

To provide a little background, I personally attended the 2006 chemistry gender equity workshop and was a federal advisor to the steering committees for the 2007 physics gender equity workshop and the 2007 chemistry racial and ethnic equity workshop. A few observations can be made about the workshop series as a whole. Each workshop requires months of hard preparation work by the relevant scientific communities before the meeting occurs. A distinguished steering committee, comprised of five to ten highly respected researchers, encourages university department chairs to attend a given workshop and participate fully. At least one steering committee member should be expert in the social sciences addressing women in science to provide insight and planning advice from that perspective. The workshops have been structured by the communities and, as a result, the communities accept a strong sense of ownership of the outcomes. Follow-up activities that include reports of progress on action items are as important as the workshop itself, as they maintain attention on the action items.

Workshop attendance is by invitation and is typically limited to about 100 people to facilitate information exchange. Participant travel expenses are supported by federal agencies so that cost is not an impediment to participation. The chairs are selected from departments that produce the most Ph.D.s and/or receive the most federal research dollars. Such chairs are typically role models and have the ability to influence their own faculty as well as other department chairs. Bringing such a peer group together encourages mutual cooperation toward common goals. Steering committee members sometimes engage funding agency officials in encouraging chairs to attend. When a chair is unavailable, special effort is made to have him/her nominate an influential colleague with demonstrated departmental leadership. Each

[7] *http://www.aps.org/programs/women/*
[8] *http://www.aps.org/programs/women/workshops/gender-equity/index.cfm*
[9] *http://www.aip.org/statistics/*
[10] "A National Analysis of Diversity in Science and Engineering Faculties at Research Universities," Dr. Donna J. Nelson, Norman, OK. January, 2005. *http://cheminfo.chem.ou.edu/?djn/diversity/briefings/Diversity%20Report%20Final.pdf*

workshop audience includes a few opinion leaders, defined as either distinguished disciplinary scientists with sway over their colleagues or other scientists with unique expertise relevant to equity for under-represented groups in science. These opinion leaders are carefully chosen by the steering committee for their potential to stimulate discourse throughout the workshop. The presence of high level federal officials from the relevant disciplinary funding programs seems important, as they reinforce the importance of gender equity among the science community participants.

For workshop content, data-driven science is emphasized over anecdotal evidence. Social science is presented objectively and dispassionately. Breakout sessions have ranged from unstructured discussions of generic questions to structured scenario analyses. Inviting a science writer to help produce a workshop is also a good idea. Creative touches such as interactive theater and implicit bias demonstrations can shift perspectives and create group experiences that encourage community action.

2. What metrics should be used to evaluate the success of such workshops in changing individual behavior and institutional culture related to gender equity in academic science and engineering?

The success metrics proposed and used by the communities have been (1) attitudinal change as measured using pre- and post-workshop surveys and (2) tracking of the documented commitment by participants to implement action items and to provide follow-up via interactive websites. Efforts have been made to keep the pre- and post-workshop surveys similar so results for different community cultures and workshop features can be compared. Involvement of COACh with survey instruments has helped maintain continuity. Survey results are still being analyzed from workshops held after the chemistry gender workshop. The chemistry department chairs who reported back to COACh two years after that workshop have described implementation of a number of new policies to encourage gender equity, including reduced teaching load after childbirth, stopping the tenure clock, mandatory mentoring plans for junior faculty, more inclusive appointment procedures for influential committees, changes in interview methods to better assure fairness, and scheduling of faculty meetings during business hours. Communities planning future workshops may consider developing other metrics that could be evaluated by the funding agencies as part of proposal merit review.

A recurring theme from these workshops and other stakeholder input is the need to collect and track demographic data. Increased percentages of women could indicate that positive changes are taking place. Some science communities, like chemistry and physics, have ready access to data from professional societies. Others, like the materials sciences and engineering community, need to develop sources for such data.

3. Are there challenges in overcoming gender bias that are unique to the National Laboratories? Should the workshops have sessions that are tailored specifically to National Laboratory participants?

The workshops have not revealed differences in the potential for implicit bias between Federally Funded Research and Development Centers (FFRDCs) and universities. Social science research and understanding suggest that implicit bias would exist in many technical environments, which might include universities, national laboratories, and other FFRDCs. Thus, approaches to identify and raise awareness of implicit bias could be similar in any of them.

The physics gender equity workshop did, however, highlight some organizational differences between FFRDCs and universities that create workshop planning challenges. First, FFRDCs do not necessarily have discrete disciplinary units as do academic departments. FFRDC managers lead groups, divisions, directorates, branches, centers, etc., with various disciplines represented among tens to hundreds of scientists. The development of surveys that would apply to both university and FFRDC structures as well as the selection of chair rank- and scope-equivalent FFRDC managers have proven to be challenging in organizing workshops and devising data collection tools. A single FFRDC manager with full responsibility and authority to identify problems and implement changes for a scientific discipline may not exist. Second, universities typically have tenure systems, while FFRDCs can have various promotion systems. Some FFRDCs have versions of tenure; some operate more like corporations. No one model applies to all.

To date, workshop information has emphasized academic practice; it must be adapted to be relevant to FFRDCs. Structuring some workshop sessions specifically for FFRDCs is a good suggestion that may provide more information more useful for them.

Despite their organizational differences, laboratories have been influenced by findings from the gender equity workshops. For example, Brookhaven National Labora-

tory undertook an activity inspired by the two gender equity workshops. Brookhaven had sent a representative to the 2006 chemistry workshop and another to the 2007 physics workshop. These individuals returned to the laboratory with specific ideas about steps that could be taken toward improving gender equity and, after discussion, laboratory management decided to form a new team. The Family Friendly Committee, a group of 15 laboratory employees from various job levels, was commissioned by the laboratory director and met nine times during its first year. The Family Friendly Committee, in turn, formed subcommittees to consider such topics as alternate work schedules, leave policies, and family services. The subcommittees examined current practices at Brookhaven and developed some 15 suggestions for improvement. These recommendations are currently being assembled into an internal report to laboratory management. The Family Friendly Committee also hosted two distinguished gender equity experts for day-long visits to the laboratory. Each of their seminars attracted about 100 people.

The workshop series continues to be driven by the scientific communities, which have been encouraged by the demonstrated success of their initial efforts. Each science discipline has a unique culture and demographic. These differences necessitate somewhat different features for each workshop. The model for these workshops continues to evolve, and communities wanting to organize such workshops for themselves continue to propose innovative ideas for consideration by appropriate funding agencies. The agencies funding and advising these workshops have forged good working relationships with each other and with the communities working to achieve gender equity. The innovative nature of the workshop concept has drawn and maintains DOE's interest in participating.

That concludes my testimony, Mr. Chairman. Thank you, again, for the opportunity to speak before you today. I would be happy to answer any questions the Committee may have.

BIOGRAPHY FOR LINDA G. BLEVINS

Dr. Linda G. Blevins is a Senior Technical Advisor in the Office of the Deputy Director for Science Programs in the Department of Energy's (DOE) Office of Science. She joined the staff of the Deputy Director for Science Programs in November 2007 to provide technical advice on many aspects of science program management. From April 2006 through November 2007 she served as Technical and International Advisor in the DOE Office of Basic Energy Sciences. From July 2004 through March 2006, she was the National Science Foundation (NSF) Program Director for Combustion and Plasma Systems while on a leave of absence from the DOE Combustion Research Facility at Sandia National Laboratories (SNL), where she began working in 2000. From 1996–2000, Dr. Blevins was on the research staff of the National Institute of Standards and Technology (NIST) in the Building and Fire Research Laboratory. She received a Ph.D. from Purdue University in 1996, a M.S. from Virginia Tech in 1992, and a B.S. *summa cum laude* from the University of Alabama in 1989. All of her degrees are in mechanical engineering.

Dr. Blevins has served on the Executive Board of the California Biomass Collaborative, the Executive Committee of the Western States Section of the Combustion Institute, the University of Alabama (UA) College of Engineering Leadership Board, and the UA Mechanical Engineering Advisory Board. She is a University of Alabama Department of Mechanical Engineering Distinguished Fellow. Dr. Blevins is also a member of the American Society for Engineering Education, the American Society of Mechanical Engineers, the Combustion Institute, the American Institute of Astronautics and Aeronautics, Pi Tau Sigma, Tau Beta Pi, and the Women's Council on Energy and Environment. She was a contributor to the book, *Giving Much/Gaining More: Mentoring for Success,* written by Emily M. Wadsworth and published by Purdue University Press in 2002. At Purdue, she was a NSF Fellow, a Clare Boothe Luce Fellow, and a Link Foundation Energy Fellow.

Her areas of research expertise are soot formation, instrumentation for probing high temperature gas/particle mixtures, gaseous pollutant and particulate formation, and combustion of natural gas, coal, and biomass. Her research at NIST and SNL was funded by the National Aeronautics and Space Administration, the Strategic Environmental Research and Development Program, the DOE, the Air Force Research Laboratory, and the NIST Advanced Technology Program intramural program. She is author or co-author of 22 archival journal articles and more than 75 reports and conference papers.

Dr. Blevins currently serves on the Research Business Models Subcommittee of the National Science and Technology Council's Committee on Science. As part of her role in the Office of Science, she serves as the program manager for cross-cutting efforts such as the National Academies' America's Energy Future project. Dr.

Blevins also advises the Deputy Director for Science Programs on Office of Science policies related to the management of science programs and research portfolio integration across the program offices within the Office of Science and DOE and with other federal agencies.

Chairman BAIRD. You folks are amazing. We had four seconds left on your time clock. This is unprecedented. Let us see if Dr. Ginther can hit the mark as well. Dr. Ginther, thank you very much.

STATEMENT OF DR. DONNA K. GINTHER, ASSOCIATE PROFESSOR, DEPARTMENT OF ECONOMICS; DIRECTOR, CENTER FOR ECONOMIC AND BUSINESS ANALYSIS, UNIVERSITY OF KANSAS

Dr. GINTHER. Chairman Baird, Ranking Member Ehlers and distinguished Members of the Subcommittee, thank you for the opportunity to testify today on the pending legislation. I am an economist specializing in research on academic labor markets. My NSF-funded research examines the question, does science discriminate against women?

My research shows that women who have children are less likely to enter academic science careers. Thus, the single most important step that Congress can take to help women is to allow universities to count childcare facilities toward indirect costs in order to expand the availability of childcare for academic caregivers.

I have been asked to comment on data availability related to gender disparities and specific proposals of the Act. I comment on these now.

In terms of data, I used the NSF's survey of doctorate recipients in my research. This is an excellent data source. However, with all data, there are some limitations. I find that there are no gender gaps in the promotion of scientists who tenure or full professor. I find, however, gender gaps in the promotion of social scientists, specially in my own discipline of economics, and I find gender gaps in salary at the full professor level.

However, I cannot attribute all of these gender gaps to bias because there are key factors missing in the data that might explain the gender gap. The first is productivity. There is no availability of annual publications, citations, and annual patents. Second will be dual career concerns. We don't have information on spouses' education, employment, and earnings. Finally, it would be useful to have information on caregiving, time women spend in childcare and house time work.

Now, I turn to specific aspects of the proposal. In terms of the workshops on gender bias, the goal is that information about implicit bias will lead to changes in behavior. First, when implementing these workshops, a valid research design is essential. Treatment and control groups should evaluate the same proposal, and then any difference in evaluation can be judged as a result of these workshops on bias. We need to evaluate the workshops based on outcomes.

Second, it is important to provide training for the principal investigators who supervise post-docs because this is where the system seems to break down for women.

Third, I recommend that we expand these workshops to include mentoring activities for both post-docs and junior faculty. Mentoring for junior faculty complements mentoring for evaluators and treats both sides of the problem.

Second, the Act calls for extending grant support for caregiving. Both the NSF and NIH provide for no-cost extensions of grant monies, and these practices should be implemented across federal funding agencies.

Finally, I have been asked to comment on the federal role in gender equity. First and foremost, the Federal Government should provide grant support to caregivers through direct and indirect costs. We should count daycare facilities toward indirect costs, therefore subsidizing access to daycare on campus, and federal guidelines should be modified to allow charging grants for childcare during conferences and for travel for small children to conferences.

Second, we need to provide financial support for improved data collection and research analysis in order to understand the gender disparities and point to solutions to these problems.

Third, we need to evaluate gender intervention programs based on outcomes and disseminate best practices. ADVANCE can provide a model for other federal agencies.

Mr. Chairman, once again, I thank you for the opportunity to testify today. The under-representation of women in academic science results from more than implicit or explicit bias. Although bias may play a role, my research suggests that the difficulties women face in balancing work and family in the post-doctoral years cause too many women to leave science. Immediate childcare support on campus for graduate students, post-doctoral students and faculty, better data, and greater access to that data and rigorous evaluations of interventions will allow for a more complete picture of the problem and point to necessary solutions. I will be happy to answer any questions about my testimony.

[The prepared statement of Dr. Ginther follows:]

PREPARED STATEMENT OF DONNA K. GINTHER

Introduction

Chairman Baird, Ranking Member Ehlers and distinguished Members of the Subcommittee, thank you for the invitation to testify today. It is an honor for me to comment on specific provisions in the legislation pending before the Subcommittee.

My research, professional, and university service has centered on understanding the issues related to the advancement of women in science and social science careers and engaging in institutional transformation efforts to affect change for women academics. I have published eight articles and written six additional working papers on the topic of gender differences in employment outcomes in academia.[1] In 2003 I received a National Science Foundation grant to investigate "Gender Differences in Employment Outcomes for Academics in Science and Social Science" SES–0353703, which has provided financial support for this research agenda. In addition, I have served as a co-Principle Investigator for two NSF ADVANCE Institutional Transformation grant proposals submitted by the University of Kansas. I serve on the Board of Directors of the Committee of the Status of Women in the Economics Profession of the American Economics Association where my main duty is to run national mentoring workshops for junior faculty. Finally, I am currently the Chair of the Faculty Compensation Committee at the University of Kansas where I have worked to create and implement tenure stop-clock and modified instructional duties policies for faculty engaged in family caregiving responsibilities. In these many ca-

[1] These publications and working papers are listed in the references.

pacities, I feel qualified to comment on *Fulfilling the Potential of Women in Academic Science and Engineering Act of 2008.*

My research shows that women who have children are less likely to enter academic science careers. The single most important step Congress can take to fulfill the potential of women in academic science is to allow universities the opportunity to count child care facilities toward indirect costs in order to expand availability of childcare for academic caregivers.

Summary of Research Results

Many studies, most recently the National Academies Report, *Beyond Bias and Barriers,* have documented gender differences in hiring, salary, and promotion. However, interpreting the causes of gender disparities in employment outcomes requires an in-depth examination of the data.

Economic theory provides the underpinnings of my research on these issues. Economists start by assuming that employment outcomes are determined by market forces. Wages and hiring are determined by the supply of and demand for Ph.D. scientists. Equally productive workers, regardless of gender, will be paid the same and hired in similar numbers given market forces. Given these assumptions, one should not observe hiring, promotion, and salary differences by gender. However, persistent gender wage and employment differentials persist on average in the market as a whole (Altonji and Blank, 1999) and for scientists in particular (Ginther, 2001 2006).

Beginning with Becker's seminal work on discrimination (Becker, 1971), economists have developed models to understand gender and racial disparities in employment outcomes. Becker argues that taste-based discrimination (prejudice) will be eliminated by competitive forces. As a result, bias and prejudice are ruled out as explanations of the gender gap unless all other possible explanations posited by economic theory have been disproved. One alternative to discrimination, individual "preferences" or choices, are most-often used to examine the gender gap. Preference-based explanations argue that gender differences in employment outcomes result from choices, in particular differences in productivity. Since theory holds that equally productive workers are paid or promoted the same, it follows that gender differences in employment outcomes are the result of differences in productivity. A second preference-based explanation is that women choose to marry and have children, which in turn affects their attachment to their careers and overall productivity.

If the researcher cannot explain the gender differences in employment outcomes using one of the above explanations, then the residual gender difference in hiring, promotion, or salary may be attributed to discrimination. However, economists continue to search for rational explanations—ones that will not be eliminated by competitive forces. Statistical discrimination suggests that imperfect information on the part of employers generates wage differentials. In this model, an employer attributes the average characteristics of a group to an individual member of this group—essentially, the employer uses a stereotype in making hiring decisions or setting wages. As a result, we observe gender differences in employment outcomes. However, direct measures of statistical discrimination are difficult to come by. Thus, discrimination may be inferred when other plausible explanations have been ruled out.

Given these principles, my research poses the question: Does Science Discriminate Against Women? I have evaluated gender differences in hiring, promotion, and salary. I find that gender differences in hiring are largely explained by the presence of children—mothers are less likely to obtain tenure-track jobs in science and social science (Ginther and Kahn forthcoming, 2006). Once women are on the tenure track, we find no significant gender differences in promotion to tenure or full professor in the sciences (Ginther and Kahn forthcoming). However, women are much less likely to get tenure or be promoted to full professor in the social sciences, especially in economics (Ginther and Kahn 2004, 2006). Finally, I find that female full professors in the sciences earn significantly less than men and the gap is not fully explained by observable characteristics (Ginther 2001, 2003, 2004, 2006c).

Although I document substantial gender gaps in promotion and salaries, I cannot rule out the fact that productivity differences explain the salary gap in science and the promotion gap in social science. Also, the results in Ginther and Kahn (forthcoming) suggest that factors related to marriage and children during the postdoctoral period reduce the number of women in tenure track academic science.

Until we have better data, as an economist, I am not in a position to conclude that bias is the sole determinant of the gender gap in science.[2]

Data Needed to Understand Gender Disparities

My research on gender differences in employment outcomes has used the Survey of Doctorate Recipients collected by the NSF. The SDR is the best data available for studying career outcomes of science doctorates. Like all data, the SDR is not without limitations. Namely, the SDR lacks information on academic productivity, publications and citations that would allow researchers to determine whether productivity instead of bias is the underlying cause of the gender gap in salary and promotion.

Although the SDR has collected information on publications and patents, the data are not available in every year of the survey and therefore cannot help us understand the point in a person's career where things turn around. Further, the SDR does not contain information on the quality of publications measured by citations. First and foremost, we need information on academic productivity measured by publications, citations, and journal impact in order to discern whether productivity differences explain the gender gap. Second, information on the size and duration of federal grants would provide another indication of scientific productivity. One could then examine the correlation between grant funding, publications, and citations to create a measure of the return on the federal investment in science. Finally, patent applications and patents granted from the U.S. Patent and Trademark Office could be included in the data set.

In 2003, I submitted "Gender Differences in Employment Outcomes for Academics in Science and Social Science" SES–0353703 to the NSF. This grant proposed to merge publication data from Thomson–ISI's *Web of Science* onto the SDR. I submitted this grant because reviews of the previous proposal indicated that SDR data without productivity measures was insufficient to answer the research question that I had posed. My grant was funded in 2004, and the creation of the SDR Productivity Database has been a work in progress ever since.

Essentially, a proposal to merge SDR data with other data sources puts legitimate research of importance to Congress at odds with the *Confidential Information Protection and Statistical Efficiency Act of 2002.* It took until 2006 for NSF to establish a policy permit matching SDR data with other sources. Since 2006, I have drafted several revisions of the data matching proposal as NSF gathered the necessary data to make the match a reality. In the interim, the NSF funded a research conference, "Collaborative Research: Workshop on linking NSF SED/SDR Data to Scientific Productivity" SRS–0725475 which brought together researchers interested in using the SDR Productivity data, statistical experts on linking data sets, and staff from the NSF Division of Science Resource Statistics to discuss the issues involved in creating the data with the least amount of matching error, ensuring its confidentiality, and providing access to the research community.[3]

The creation of the SDR Productivity Database is still a work in progress. Since my original proposal, I have expanded the scope to including matching the SDR with U.S. Patent and Trademark Office patent data as well. I am exploring the possibility of merging information from the NIH trainee database as well as their grants database onto the SDR in order to examine the effect of early NIH fellowship awards on later career outcomes. Once the data are created, I plan to use it to evaluate the gender gap in salary and promotion in academic science in order to draw more definitive conclusions about the explanations for the gap.

Additional data beyond productivity would provide greater insight into the underrepresentation of women in science. To understand the effect of marriage and children during the post-doctoral period on the gender gap in obtaining a tenure track job, new questions would need to be added to the SDR survey instrument. These would include:

- Number, length, and institutional affiliation of post-doctoral appointments
- Spouse information including education, employment and earnings
- Childcare and housework time This series of questions would allow researchers to determine whether the post-doctoral process, work-family tradeoffs, or a combination of both lead to fewer women in academic science.

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[2] Better data does make an important difference. In Ginther and Kahn (2004) we collect publication data and find that the gender gap in promotion in economics cannot be explained by productivity differences. These results indicate that bias likely explains the gender promotion gap in economics.

[3] Information from this conference is available at *http://www.albany.edu/?marschke/Workshop/*

In addition to the SDR, I recommend that federal agencies such as the NSF and NIH work with professional societies to collect information on the demand for scientists. In particular, researchers could make use of data on the number of academic and non-academic jobs available in scientific fields.[4] Information on the demand for scientists measured by the number of job openings could then be compared with the number of doctorates granted in the Survey of Earned Doctorates. This comparison would allow researchers and policy-makers to identify the effect of supply and demand on the market for scientists.

Workshops on Gender Bias

The proposed legislation mandates holding national workshops to educate grant review panels and department chairs about methods that minimize the impact of gender bias in evaluation. These workshops are likely modeled after an initiative in academic chemistry departments (*http://www.chem.harvard.edu/groups/friend/GenderEquityWorkshop/*). The goal of these workshops is to inform individuals about gender bias and its impact with the hope being that rational scientists who are presented with research that contradicts their prior beliefs will change both their attitudes and behavior. These changes will then translate into better outcomes for women in academic science. I strongly support the goal of this initiative.

However, I have a few comments and concerns about this proposal. First, the effectiveness of the proposed workshops needs to be judged by its impact on evaluation *outcomes*. All too often, people assess attitudes before and after a workshop and if the attitudes have changed, the workshop is judged a success. Attitude change is often fleeting, and success should be measured not simply by reference to internal states but by reference to external outcome variables.

To evaluate the effectiveness of the gender bias workshops, a valid research design is critical. First, I suggest having a treatment and control group evaluate the same request for funds in a funding panel setting. The funding agency could use previously evaluated proposals from prior years as the control group and then have a "treatment" review panel that participated in a gender workshop evaluate the proposals a second time. Any differences in evaluation between the treatment and control group scores can then be attributed to the gender bias workshop—the 'treatment.' Second, the review panel should focus on funding for individuals such as postdoctoral fellowships. This would reduce any bias related to the quality of the research proposal and would mimic evaluations of individuals that occur throughout scientific careers (e.g., for promotion and tenure). Researchers should then compare the evaluation scores of the same proposal by the treatment and control groups. If there are statistically significant differences in evaluations, this would be evidence that bias has a causal effect on funding outcomes. Once this fact has been established, it would make sense to implement these workshops as broadly as possible.

A second concern has to do with the problem of motivation among workshop participants. Changing beliefs is difficult, and workshops like this will be successful if the people who attend are motivated by the purpose and methods. I posit that this will not be a problem for grant review panelists, who are working on behalf of the funding agencies. However, I remain skeptical about the workshops' effectiveness among department chairs. While this may vary depending on the discipline, in Economics (where faculty typically believe in efficient labor markets), department chairs are likely to be a hostile audience. I think these workshops have to be structured and participants motivated very carefully to impact these decision-makers.

Third, my research shows that women leave academic science during the postdoctoral period. Gender workshops focused on grant review panelists and department chairs would seem to miss the most critical group that could affect change for women in academic science—the post-doctoral supervisors. Thus, it makes sense that principle-investigators who are supervising post-doctoral students would be an important target audience for these workshops.

Finally, I recommend that the Subcommittee consider expanding the scope of the workshops to include mentoring activities for post-doctoral students and junior faculty in the science disciplines. COACh in chemistry and CeMENT in economics provide excellent examples of existing initiatives. I am currently serving as the Coordinator of the CeMENT National mentoring workshops for the Committee on the Status of Women in the Economics Profession. These workshops are funded by the NSF and the American Economic Association and are designed to help junior economists overcome the tenure hurdle, with a special focus on addressing the unique chal-

[4] For example, the American Economic Association publishes *Job Openings for Economists* which contains a monthly list of all jobs for economics doctorates. This information could be compiled annually to get a count of jobs available as a measure of demand for economists.

lenges that women face at the beginning of their careers. The workshops are aimed at junior faculty in institutions where tenure is primarily based on research output. At the workshops, participants are arranged into small groups based on their research areas and matched with senior mentors. The format and curriculum are designed to create and cement relationships among the participants, as well as between the participants and the mentors. Large group sessions address the publication process, grant writing, teaching, professional activities, the tenure process, and work-life balance. Small group sessions consisting of researchers in the same field provided feedback on junior scholar research papers and grant proposals.

As with most mentoring workshops, the participants are pleased with the information provided to them. However, the evaluation of the program does not end with participant surveys.

CeMENT is now in its third wave of six randomized trials designed to evaluate the effect of mentoring on career outcomes. Each workshop has had over 80 applicants of which approximately half are randomly invited to the workshop. The CeMENT research team follows the CeMENT treatment and control groups for several years to evaluate whether or not mentoring has an impact on publications, grants, and ultimately, the tenure decision. CeMENT is the only experimental evaluation of mentoring that we are aware of. We hope to have preliminary results to report in the coming year.

The mentoring workshops can complement the proposed workshops for review panels, postdoctoral supervisors, and department chairs. By providing information and education to both sides of the process, we can have a larger impact and expect to see more change than addressing either side independently.

Extending Grant Support for Caregiving

Both the NSF and NIH provide for no-cost extensions of grant monies. The NIH website indicates that grants can be extended because of caregiving responsibilities (*http://grants.nih.gov/training/faq_childcare.htm*). These practices can and should be implemented across federal funding agencies.

Federal Role in Gender Equity

Throughout this testimony I have argued for the need for better data to evaluate gender disparities, more effective evaluation of gender bias workshops, and the addition of mentoring workshops. I will now make specific recommendations that will allow the Federal Government to directly address barriers to gender equity in academic science.

1. Provide grant support to caregivers through direct and indirect costs. Availability of daycare on campus is in short-supply. No faculty member can be productive if they are preoccupied with the care of their children while they are at work. The Federal Government should allow universities to count facilities for daycare provided on campus towards indirect costs, in particular, the number of spaces available for infant care.[5] This would provide a subsidy for the expansion of daycare centers on campus which would free up the time of caregivers. In addition, I want to echo Myron Campbell's testimony before the Committee in recommending that Federal OMB guidelines[6] be modified to allow faculty members to charge grants for the cost of childcare during a conference, or the cost of having small children travel to conferences be charged against direct or indirect grant costs (*http://democrats.science.house.gov/Media/File/Commdocs/hearings/2007/research/17oct/Camp bell_testimony.pdf*).

2. Provide financial support for improved data collection and research analysis to better understand gender disparities in academic science. The SDR Productivity Database described previously is very much a work in progress. Additional funding could expand the scope of the database and improve its quality. In particular, information on publications, citations, and patents should be updated with each new wave of the SDR. Both the NSF and President Bush's science advisor, John Marburger, cite the need to devise new measures of the status of science and technology (S&T) in the economy, as it is widely believed that current formulations insufficiently represent current S&T practices. Linking existing data sets together provides several advantages in producing new information on S&T because of the time it takes to implement changes to existing national surveys. I justify matching existing data along a number of dimensions. First, innovation in the U.S. changes

[5] According the NIH website *http://grants.nih.gov/training/faq_childcare.htm,* no NIH grantee covers childcare as an indirect cost.

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

more rapidly than the data are collected. Researchers and the NSF can save time by matching existing data sets to measure and understand changes in innovation. Second, matched data are complementary to and enhance existing national surveys. The findings from research using the matched data can help in reformulating national surveys and suggest modules that could explore more fully phenomena discovered in the matched data. Third, matched data provide increased flexibility for research. Researchers will not need to wait up to ten years to gain access to revised national surveys. Finally, matched data will allow researchers and policy-makers to examine questions that have not been adequately addressed because of data limitations.

In addition to matched data, questions should be added to the SDR that directly address the post-doctoral experience, education and employment of the spouse, and time allocated to caregiving duties.

Once these data are created, steps must be taken to maintain the confidentiality of the data while providing broad access to the research community. I recommend two approaches to confidentiality. First, synthetic data could be site-licensed to individuals in research community to allow preliminary estimates to be performed. Second, the NSF should explore technological solutions for maintaining the confidentiality of the SDR Productivity Database such as a virtual private network with encrypted access. Final estimates could be performed on the secured data.

3. Evaluate gender intervention programs and disseminate best practices. Since its inception in 2001, the NSF ADVANCE program has funded 32 institutional transformation grants as well as several leadership grants such as the CeMENT workshops. Each institution has devised interventions to improve the climate, hiring, retention, and compensation of women in science. This year, the NSF has begun an evaluation to document the effectiveness of institutional transformation programs. It is my hope that the evaluation results in a series of best-practices that can be used as a model for other federal agencies.

Conclusion

Mr. Chairman, once again I thank you for this opportunity to testify today. The under-representation of women in academic science results from more than implicit or explicit bias. Although bias may play a role, my research suggests that the difficulties women face in balancing work and family and in the post-doctoral years cause too many women to leave science. Immediate childcare support on campus for graduate students, post-doctoral students, and faculty, better data and greater access to the data, and rigorous evaluation of interventions will allow for a more-complete picture of the problem and point to the necessary solutions.

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BIOGRAPHY FOR DONNA K. GINTHER

Donna Ginther is an Associate Professor of Economics and the Director of the Center for Economic and Business Analysis at the Institute for Policy Research at the University of Kansas. Prior to joining the University of Kansas faculty, she was a research economist and associate policy adviser in the regional group of the Research Department of the Federal Reserve Bank of Atlanta from 2000 to 2002, and taught at Washington University from 1997 to 2000 and Southern Methodist University from 1995 to 1997. Her major fields of study are scientific labor markets, gender differences in employment outcomes, wage inequality, scientific entrepreneurship, and children's educational attainments.

Dr. Ginther has been published in several journals, including the Journal of the American Statistical Association, Journal of Economic Perspectives, Demography, and the Papers and Proceedings of the American Economic Association. She has also received research funding from the National Science Foundation, the National Institutes of Health, and the Ewing Marion Kauffman Foundation. She is currently a member of the Board of the Committee on the Status of Women in the Economics Profession of the American Economic Association in charge of organizing the CeMENT national mentoring workshops.

A native of Wisconsin, Dr. Ginther received her doctorate in economics in 1995, Master's degree in economics in 1991, and Bachelor of arts in economics in 1987, all from the University of Wisconsin–Madison.

DISCUSSION

Chairman BAIRD. I thank the witnesses for a very informative and concise and relevant testimony. I will recognize myself for five minutes and follow that with Dr. Ehlers. We have been joined by the way by Dr. Bartlett. Thank you Dr. Bartlett.

Dr. Carlson, one of the questions I have, as you describe the situation, it sounds like you are gathering a fair bit of data, but it is incomplete and variable across the agencies that are submitting the data. You also describe that you have got a—you are in some consultative process to try to perhaps improve that set. If that consultative process is successful, could you gather the sort of data that is requested in this legislation, and would it be of use to you to do so?

Dr. CARLSON. Data on gender and ethnicity and race is—an individual cannot be forced to provide that as part of the *Privacy Act.* So there is no way that one can compel that. It is actually an issue

of working with the individual agencies to have them request the data needed, and there is no way that we can actually push the agencies to do that. I think that really the best way is to work through the Chief Financial Officer's counsel, and that might be a way to handle that.

Chairman BAIRD. Dr. Blevins, these workshops you described, I was very pleased to hear that you focus on data, research-based information about what are the obstacles for women continuing the science career path. We had a prior hearing where, among others, Dr. Shalala spoke, and one of the things that came up was the point you have all made, essentially that really just the number of baccalaureate level folks is pretty good for women. There is this drop down the road a ways. What specifically about your workshops addresses that would be one point, and the second would be if, as this legislation recommends, we would require there be these training workshops, how would we make sure that the caliber of the workshop is good? I have had the opportunity in my own academic career to participate in both gender and ethnic sensitivity type workshops, and the caliber quite frankly varied a great deal. What are your thoughts on that?

Dr. BLEVINS. Okay. So the first question, what specific about the workshop addresses this fall off——

Chairman BAIRD. Yeah, the data——

Dr. BLEVINS.—in the statistics?

Chairman BAIRD. Specifically the research data that tells us what causes the fall off. Dr. Ginther pointed a few points out.

Dr. BLEVINS. Right. I think the workshops focus on all sorts of things. One is the idea of implicit bias and gender schemas, and the other is just sort of policies and practices of the universities and the institutions that might not make them very good places to work. For example, a graduate student might not find a faculty career very attractive. That has come up several times because of the types of policies and practices. One example of that is just a simple one which was surprising to me, is when do you hold your faculty meetings? I mean, some folks hold them on Saturdays or, you know, at 5:00 in the evening. And so that is kind of a simple one that can sort of make the environment better for men and women actually. All of these things are really geared toward that.

Chairman BAIRD. As a father of two twins, I appreciate that, three-year-old boys.

Dr. BLEVINS. And so it is really a rich format with a very experienced group of department chairs, federal officials, and scientists of all types. They come together and bring a lot of expertise into these break-out sessions. And for example, at the physics workshop, one of the universities talked about how it was implementing a part-time tenure track. So there are a lot of interesting and different ideas that come out of them.

How do we keep the caliber of the workshops high or how do communities keep the caliber? I think the key concept here is to make them data-driven and to really focus on data so that people don't walk out of the room kind of thinking, well that is somebody else's problem and not mine. I think if you really focus on the data from the social science and whatnot, these people who attend really take ownership I think in this issue. And so, we talk a lot about

how to make them different from what has been held in the past, and I think it is more than just everyone getting around, telling their stories about how bad it is for them. We try to avoid that, and we really try to keep it data-focused.

Chairman BAIRD. Sounds like you achieved that, and I am sure Dr. Ginther, her data set would be—Doctor, your data set seems quite relevant to that. One quick question, and then I will recognize Dr. Ehlers. Has anyone estimated the cost—I support the idea of considering providing indirect costs for childcare. Have we got an estimate of the cost of that?

Dr. GINTHER. I checked with the NIH and they say it is permissible to use childcare facilities toward indirect costs, though no grantees do so. So I don't know how it would—you know, I don't know the specifics of how it would be implemented. It is possible, and I don't know why other institutions aren't doing it.

Chairman BAIRD. Dr. Ehlers is recognized.

Mr. EHLERS. Thank you, Mr. Chairman. Dr. Ginther, you recommend the establishment of a valid research design to measure the effectiveness of the workshops proposed by this legislation. Can you suggest how that might be incorporated into the legislation and would you recommend that these workshops start out on a pilot basis with a good evaluation mechanism?

Dr. GINTHER. I think that whenever you are evaluating an intervention, you need to have a treatment and control group. So if you are targeting, say, grant reviewers, you would have a treatment group that goes through the gender bias workshop. And then you would have a control group that doesn't, and then they would look at the same proposal and then you look at the evaluations coming out of the treatment and control group, compare the two, and see whether or not bias played a role in the evaluations, whether or not there were average differences. Women are evaluated better by the people who have the gender bias training. That would prove scientifically that these workshops have a significant effect.

We are doing a similar approach with our mentoring workshops in the American Economic Association. We have held three so far, and we have about 80 participants who are randomly assigned to a treatment and control group, and then we look at these young scholars as their careers evolve and we see whether or not the mentoring workshops actually have a significant effect. And then once we have shown that or failed to show that, then we can sort of say, these policies are important and should be disseminated widely across the disciplines. But I agree with Dr. Blevins' point, that each discipline has a specific set of issues and these need to be discipline-specific in order to be effective.

Mr. EHLERS. Another question. If work/family trade-offs are at least a significant factor, maybe an extremely significant factor, but the question is, does your research indicate that these trade-off decisions are more acute in science and engineering than in other disciplines?

Dr. GINTHER. I have not evaluated the humanities, but I have evaluated science and social science and I find that women tend to leave the doctorate and getting on the tenure track in both disciplines. What I have also found is that each discipline is different. So in engineering, for example, you see women entering tenure-

track jobs at higher rates than men, but they are more likely to drop out of the tenure track if they have a child. So these work/family trade-offs really seem to affect every woman in academia. But I think they are more likely to affect women in that period of purgatory known as the post-doc. You know, you don't have faculty status, you don't have student status, and it is not clear whether or not there is a job going to come out at the other end; and therefore, you know, judging by what is happening in the data, I can't prove this definitively but judging by what happens, they decide to opt out.

Mr. EHLERS. Does this happen in the post-doc level?

Dr. GINTHER. Yeah.

Mr. EHLERS.—it is more or less permanent, right?

Dr. GINTHER. Yeah, I mean it is an irrevocable decision.

Mr. EHLERS. But if they are on tenure track, they may drop out for a few years.

Dr. GINTHER. Now, on the tenure track, I find no significant differences in the science of women making it through. So women and men are promoted to tenure and to full professor at equal rates once they get to the tenure track in science. Not true in social science.

Mr. EHLERS. I see. That is interesting. So in other words, we scientists are more fair-minded——

Dr. GINTHER. I would state it a little differently. You scientists pre-screen your tenure track applicants. There is a screening mechanism called post-doc, and social scientists don't have post-docs on average. And so then you see the screening happening on the tenure track.

Mr. EHLERS. Okay. Sorry. I thought I had discovered something new. Dr. Blevins——

Chairman BAIRD. I think you were engaging in confirmation bias.

Mr. EHLERS. But I hide my biases very well. I do have lots of them. Dr. Blevins, do you have any indication that the attitude perception shifts resulting from the workshops resulted or led to institutional change? Do you follow-up on this?

Dr. BLEVINS. In fact, follow-up is being done for the chemistry workshop. I have a Committee on the Advancement of Women Chemists, and they have an interactive website and they have collected input. And in fact, there have been some anecdotal pieces entered into the website about some of the changes, and I have written about some of those in my testimony. Let me see if I can—I remember that there were things about changing the way they interviewed candidates and creating more concrete criteria by which everyone would evaluate the candidates in writing, working on this childcare issue, changing their faculty meeting times and things like that. In fact, I think nearly half of the chairs that attended have gone in and entered updates to the website two years later, which is I think a very high success rate.

Mr. EHLERS. All right. I think my time has expired. I am afraid we have to go vote.

Chairman BAIRD. Yeah, we are down to five minutes voting, and without boring you with the details of what lies ahead for us, what lies ahead for you is about a 45-minute wait. And we regret that, but we will likely—I don't foresee us likely coming back before

11:15. So let us just give everybody that as a predictable time. It is possible we run over a few minutes, but Dr. Bartlett, a couple minutes. The challenge is I don't know how tight they are holding the votes right now.

Mr. BARTLETT. Thank you very much. I have a markup in a subcommittee so I cannot come back after the vote. We only have a couple of minutes before we need to run for votes. Anything that we can do to encourage more of our young people, particularly women, who have largely been under represented in these areas to go into science, math, and engineering is enormously important. I just read a statistic yesterday that really alarmed me. Sixty percent of all of the patents that come to our patent office come from inventors outside the United States. This year China will graduate six times as many engineers as we graduate and more than 50 percent of all of the students in our sciences for post-college education are foreign students. So we face enormous challenges, and we just pretty much ignored a full 50 percent of our potential by not encouraging women to go into these disciplines.

I am very much concerned about any discrimination, but I am even more concerned about a culture which does not appreciate people in these areas. I just think we need to change the culture so that these careers are valued. Culture gets what it appreciates, and we just don't appreciate these careers. We appreciate singers and dancers and football players, and so if it was just who gets invited to the White House where they slobber all over them rather than academic figures, they are sports and entertainers and so forth. Don't you think we really need a culture change in this country? And you are very effective representatives, three very attractive women, bright, and you know, you just need to be out and about more so that people can see, gee, there really is an opportunity for women in these disciplines, isn't there? Thank you very much for your testimony. I am sorry we don't have more time for conversation. Thank you very much.

Chairman BAIRD. Thank you, Dr. Bartlett. Thank you. Please indulge with your patience. I apologize for the interruption. It is beyond our control. But we will rush off and vote and come back as quickly as we can. But I think it is very improbable we would be back before 11:15. So let us make it 11:10 if you would. Let us try to come back at 11:10 just in case we get lucky early, and then we will reconvene. Thank you very much.

[Recess.]

Chairman BAIRD. The meeting will now come to order again. We apologize profoundly to our witnesses. It has not been our finest hour over on the Floor. A series of procedural votes make it very unpredictable. Dr. Ehlers and I have agreed mutually that we have respect for the witnesses who have traveled so far and made such effort to give us good testimony. We are going to miss a couple of votes in order that we can be here and hear from you.

So with that, Dr. Ehlers, I will recognize you because I know you have some further questions, and then I will resume. We don't have any other with us. It is possible that Eddie Bernice Johnson from Texas will join us as well, but Dr. Ehlers, I will recognize you for five minutes.

Mr. EHLERS. Thank you, Mr. Chairman, and first of all I want to follow up with several questions for Dr. Ginther since she traveled a great distance to be here. NSF is working to establish a productivity database. Once this information is available, can you speak to how it will expand the existing knowledge base and understanding of the advancement of female faculty members?

Dr. GINTHER. If I may sort of make one small correction, I proposed to create the productivity database with the survey of doctorate recipients as part of a grant that I submitted in 2004, and the goal of creating this data was to merge publications, citations, and patents onto the survey of doctorate recipients, and this is a work in progress. But the goal is to see what other factors may explain why women have not advanced or don't participate in science at the same numbers as men. And so does productivity, for example, explain why women in economics are less likely to get tenure? How do these other variables—you know, as economists, we assume that people are paid and promoted based on how productive they are, and in academia, you can measure productivity much better than you can in say the private sector.

So my goal with the creation of this data is to see if there are gender differences in productivity and how they affect the careers of men and women in science. And there are also positive externalities to creating these data because you can examine a number of other questions, like why has science in the United States slowed down in terms of the number of publications relative to the rest of the world? So the goal is to create the data, and there is a great interest in the research community for using it. And hopefully it will sort of help us narrow down why women are not as prevalent in science and social science.

Mr. EHLERS. In a nutshell, it seems to me what I have heard said this morning is that women are not as productive or don't seem to advance so much primarily because of the childcare issue.

Dr. GINTHER. That is what my research indicates, yes.

Mr. EHLERS. Okay. And just a quick question of Dr. Carlson and Dr. Blevins. Do you find that also in your experience and in the research you have reviewed?

Dr. CARLSON. We have not really looked at that, so I can't comment on that.

Mr. EHLERS. Okay. But that indicates that is not a matter of sexual bias so much as the practical aspect of how is the childcare within the family handled. I am drawing a conclusion. I wanted to ask you to support or disagree with it.

Dr. Ginther, one other question I had, including all principal investigators in the workshops seems like it would be difficult. Can you recommend another method to reach the PIs who directly oversee post-docs regarding improving the post doctoral experience for women?

Dr. GINTHER. I would say that, you know, before you reach all PIs, just do a test, you know, to see if sort of providing them information about bias and other barriers that women face in science and in the post-doc period matters. Have a treatment and control group. And then if it does, then you can sort of selectively identify PIs, especially those who have a number of post-docs that they supervise and try to disseminate it that way.

So, you know, I agree it would be really prohibitively expensive to train each PI, but it would be really useful to know whether or not training the PIs would matter, and if it does, you can disseminate this information to the professional societies and help them to get the message out.

Mr. EHLERS. It is not clear to me. I really appreciate what you are saying. It seems to me you have got a good handle on things, but how would you proceed to design pilot programs to institute this?

Dr. GINTHER. Okay. So you take an agency like NIH which funds a significant number of post-docs, and you say a condition of funding is that you take a random sample of 100. You take 50 and you train them and then you take 50 and you don't, and then you sort of do a survey and follow up on the progress of their post-doc mix. And NIH gives millions of dollars for post-doc training. They have traineeships and fellowships, and then you can evaluate how these women and men differentially progress out of the post-doc and into careers.

Mr. EHLERS. That is interesting being a physical scientist, I hadn't thought of NIH as being the first test bed, but you are obviously right. They have more money for post-docs.

Dr. GINTHER. Yeah, 70 percent of all life scientists have to have a post-doc before advancing to an academic career. And now I think the median is more than one.

Mr. EHLERS. Okay. My time has expired. I yield back.

Chairman BAIRD. Dr. Blevins, did you want to comment further on the question line that Dr. Ehlers was pursuing there? You looked like you might have——

Dr. BLEVINS. Well, I want to qualify that I am also a physical scientist, not a social scientist, but I think some of the social scientists who have spoken at our workshops might differ some with what you said. So I would just urge you to talk to some of the folks who have come to the workshops and spoken as well.

Chairman BAIRD. What would they tell us?

Dr. BLEVINS. Well, I think the issue of implicit bias is something that men and women experience and hold and are not always aware that they do. And these are the things that I learned at the workshop from the social scientists. While any one thing might seem like a small thing to which somebody might be overreacting, if you add up the sum total of all these things over a course of a person's career, there is a concept of accumulation of disadvantage that comes into play. So I have to say I am a little uncomfortable going outside of my comfort zone on this. That is because I am not a social scientist, but I would just say that the prevailing sentiment at the workshops has been that it is more than just a childcare issue.

Chairman BAIRD. Hence we might make some dent into—I am not even sure retention is the right word but advancement may even be a better word—differentials if we provided childcare. But that might not be sufficient, maybe necessary but not sufficient. Would that be a fair statement?

Dr. GINTHER. I think the issue is complex, you know. I am not saying that there is no such thing as bias in science. But for bias to explain everything, it would have to show up in a lot more

places than it does. You know, women in science, once they get on the tenure track, are equally likely to get tenure and to become full professor. But at the full professor level, for some reason, there is a 13 percent pay gap that I can't explain by observable characteristics. Now I don't have every observable characteristic. I don't have their productivity. And you know, as an economist, we believe people are paid according to their productivity. And it is only until I can disprove that I will even be able to publish this research in the economics profession.

Chairman BAIRD. Well, you can just prove that by visiting Congress. Hang around here for a while. You will see that productivity is not necessarily directly correlated to pay.

Dr. GINTHER. Hey, but your pay is set, right?

Chairman BAIRD. Yes, QED. The question remains. So we have had people tell us in this committee that childcare is a factor but there are also cultural factors, that there are implicit biases, et cetera. What happens to the women who leave—there is an implicit assumption here it is a bad thing to leave academia. Dr. Ehlers and I might not always agree with that. We've left. What happens to the women who don't go on into the academic field or the professional field? It would be one thing if we said, well, X percent higher numbers of women drop out from that profession, and we assume that is a bad thing. But if they go onto things that they personally deem to be more rewarding, either financially or monetarily, it may be a bad thing in terms of lost productivity, but is it a bad thing for the women themselves? I am playing devil's advocate here, you recognize that. Any thoughts on that?

Dr. GINTHER. This is sort of my area of expertise. What happens is if you leave science or if you leave any professional career, your human capital quickly depreciates. And if you want to re-enter the labor force, you are not going to be able to do so. And I think that is especially true—and receive the same pay as when you left. And I think that is especially true in science because science moves so quickly. If women leave science, they are not going to be able to come back and be scientists once they leave. And so you know there is a loss in human capital.

Chairman BAIRD. But the assumption there is that they go somewhere that is somewhat of a dead end instead of going somewhere—for example, as competitive as the field is in the professions, maybe people—I am speculating, it may not be true. Maybe they are leaving an academic career to go to a private enterprise career, make more money and have more success. I don't assume.

Dr. GINTHER. I think it is true in certain disciplines, like, you know, engineering. The track out of a Ph.D. in engineering is into the private sector because the jobs there pay better than academia. But some jobs, I mean, you can't really do particle physics in the private sector. And so as a result, I mean, you kind of have an option of the labs at the university or not doing particle physics. So I can't really comment on what they end up doing, but we see in all levels, highly educated women are leaving the labor force now outside of academia, and it seems to correlate with having children.

Chairman BAIRD. Yeah. So we have got to address that. There is no question. But Dr. Blevins seems to be asserting there is much more to it than that, that there are these biases, et cetera. So

hence, that is the workshop component that is—back to this legislation per se, that is the workshop component and that is the rationale. What is not in this legislation, and Dr. Ehlers, I am running over here, but what is not in this legislation that you believe should be if we are to try to redress some—and obviously the issue Dr. Ginther has raised already about indirect costs for childcare. What else is there?

Dr. GINTHER. Well, there is how to spend direct costs from your grants toward covering issues like childcare for travel. I think Mr. Campbell testified previously that the R&D rules are too restrictive about that.

Chairman BAIRD. Okay. Other thoughts? Dr. Ehlers, I recognize you for other questions.

Mr. EHLERS. I have no further questions, Mr. Chairman.

Chairman BAIRD. Neither do I, and with that, I thank the witnesses for their patience, and we apologize for the interruptions and the distractions. It is a difficult environment. They have not yet asked Dr. Ehlers or I how we would run the schedule here, but I can assure you it would be much different.

So thank you for your time and thanks for the guests who joined us today as well in the audience, and with that, this hearing stands adjourned. And if people have follow-up comments they wish to offer, please feel free to do so. Thank you.

[Whereupon, at 11:26 a.m., the Subcommittee was adjourned.]

Appendix 1:

Answers to Post-Hearing Questions

ANSWERS TO POST-HEARING QUESTIONS

Responses by Lynda T. Carlson, Director, Division of Science Resources Statistics (SRS), National Science Foundation (NSF)

Questions submitted by Representative Eddie Bernice Johnson

Q1. I realize that your testimony specifically discusses the NSF Division of Science Resources Statistics, also called the SRS. Is there cross-talk between SRS and the Survey of Earned Doctorates, *which is currently repressing statistics on minority Ph.D. grantees? What is being done to rectify this data repression?*

A1. The Division of Science Resources (SRS) is the federal statistical agency with responsibility for data and analysis on the science and engineering enterprise, writ large. As part of that responsibility SRS conducts the *Survey of Earned Doctorates (SED),* which is a survey of all Ph.D. recipients from U.S. academic institutions.

Last full during a review of its data protection procedures conducted in light of newly issued guidelines for the *Confidential Information Protection and Statistical Efficiency Act of 2002* (CIPSEA), SRS implemented more stringent rules to protect the confidentiality of data provided by respondents to the SED. This additional protection resulted in a decrease in the number of cells in which data were published in the SED 2006 Summary Report as compared to SED Summary Reports published in previous years. Tables that individuals special ordered from the survey contractor also had fewer cells with published data. The cells affected related primarily to race/ethnicity, citizenship and gender.

After publishing the 2006 SED tabulations, NSF/SRS received many complaints from the user community about the availability of less information for under-represented minorities than previously released. A great deal of the concern related to the fact that SRS implemented the changes without input from the user community. Users strongly suggested that SRS solicit user input as to how best to design the tables to meet a broad spectrum of user needs. NSF has listened to this concern. The following statement was released by NSF in May:

> *"SRS will be releasing the race/ethnicity, citizenship and gender data collected for the 2006 Survey of Earned Doctorates (SED) as in previous years. There are privacy and confidentiality issues that must be addressed, particularly in the context of small data sets. The question of how to aggregate the data in future years will be addressed with the data user community over the next few months and new tables will be developed to release data from the 2007 SED."*

Tables containing 2006 SED data with the same level of detail as in previous years for race/ethnicity, citizenship and gender can be requested through a link on the NSF/SRS website at *http://www.nsf.gov/statistics/srvydoctorates/2006/sed06data.htm.*

The same web page has a comment box requesting suggestions for ways to redesign the SED data tables so that they will address both issues of privacy/confidentiality and the needs of data users. SRS is also asking interested parties to take part in a web survey on the redesign of the SED data tables. We hope that interested parties will avail themselves of both the comment box and the web survey to help SRS redesign the tables. SRS is also engaging in an extensive outreach effort to solicit information about the ways in which SED data are used and to garner suggestions for alternative ways to present the data.

NSF/SRS understands the importance of reporting on the progress of under-represented minorities in science and engineering (S&E). This consideration will guide the development of alternative data displays that will document the role of under-represented minorities in S&E and the redesign of tables to display this information to the maximum extent possible.

To meet the needs of users for 2007 data from the SED on a similar schedule as in previous years, SRS will release in late 2008 high-level summary statistics of 2007 SED data in an InfoBrief (see *htt;://www.nsf.gov/statistics/infbrief/nsf08301/* for the 2006 InfoBrief). Concurrently SRS will be redesigning the tables for the full 2007 SED Summary report, which is planned for release in spring 2009.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Linda G. Blevins, Senior Technical Advisor, Office of the Deputy Director for Science Programs, U.S. Department of Energy

Questions submitted by Representative Eddie Bernice Johnson

Q1. Dr. Ginther expressed concern about motivation among workshop participants. She cites her own discipline, economics, as being particularly hostile to this kind of workshop. Did you find this to be a problem at all in the workshops that you participated in? Are there best practices specifically to overcome any reluctance on the part of invited participants?

A1. For the chemistry and physics workshops, some department chairs were motivated to attend and some were not. Each chair was first contacted by a steering committee member. The steering committee members were able to use their considerable influence in the scientific community to convince most department chairs to attend; however, a few were reluctant. The reluctant participants were then contacted by the federal program managers in the sponsoring agencies; some were called several times. Convincing the last few chairs to attend required a great deal of work by both the steering committees and the federal advisors.

Q2. How often do you think that gender bias workshops should be held for each discipline in order for attitudinal changes to spread throughout the community, and not just among the department chairs who participate directly in the workshops?

A2. We do not currently have enough data to make this prediction. To date, no community has held more than one gender equity workshop. The workshops have been driven and owned by the communities, and the communities are currently examining their outcomes. The assessment results from the first round of workshops should inform decisions of whether or not to hold follow-on workshops.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Donna K. Ginther, Associate Professor, Department of Economics; Director, Center for Economic and Business Analysis, University of Kansas

Questions submitted by Representative Eddie Bernice Johnson

Q1. Can you propose more specifically how universities can count childcare facilities toward indirect costs?

A1. Availability of daycare on campus is in short-supply. No faculty member can be productive if they are preoccupied with the care of their children while they are at work. Some institutions include on-site childcare as a fringe benefit, which for grants purposes is considered a direct cost.[1] However, in practice, the number of childcare spaces on campus is so limited that enrolling a child in daycare is akin to winning the lottery. Furthermore, if on-site childcare is available, often it is for children who are one year or older. Infant daycare slots are extremely difficult to come by.

The Federal Government can create incentives for on-site childcare by allowing universities to count childcare facilities, building depreciation, and operation and maintenance as part of indirect costs associated with grants. According to the NIH website (*http://grants.nih.gov/training/faq_childcare.htm*): "The HHS Division of Cost Accounting found that many grantees offer subsidized child care centers and have negotiated costs associated with such centers into their employee benefit rates. No grantee was identified that covers such costs through indirect costs." This statement indicates that it might be possible for universities to include childcare space available on campus in their calculation of indirect costs.

My sense is that funding agencies such as NSF and NIH would need to be instructed by OMB to allow childcare space to count toward indirect costs in much the same way that these costs are calculated for laboratory space. Since infant care is a crucial issue for most faculty (and in the shortest supply), the availability of infant spaces should be counted at a higher indirect cost rate than spaces for older children.

If universities were allowed and encouraged to count childcare spaces towards indirect costs, this would provide a subsidy to the provision of childcare on campus. It would benefit all faculty, but would likely benefit female faculty more since on average they shoulder the burden of caregiving responsibilities.

Q2. Would childcare be listed as an individual investigator cost? I can tell you that some Science Committee Members as well as the public would be displeased that research monies are being spent on childcare. Can you suggest a tenable alternative?

A2. I would not recommend listing childcare as an individual investigator cost. All U.S. taxpayers receive tax breaks for childcare expenses. Allowing individual investigators to charge grants directly for all childcare expenses would be a huge subsidy to individual investigators relative to the average worker. The primary beneficiaries would likely be male investigators with children.

However, I support Myron Campbell's testimony before the Committee which recommended that Federal OMB guidelines[2] be modified to allow faculty members to charge grants for the cost of childcare during a conference, or the cost of having small children travel to conferences be charged against direct or indirect grant costs (*http://democrats.science.house.gov/Media/File/Commdocs/hearings/2007/research/17oct/Campbell_testimony.pdf*). It is very difficult to attend conferences when an investigator has small children. Speaking from personal experience, when I have attended conferences my husband and I have paid for our parents to come to our house to help with the children. Fortunately, we have the funds to cover these expenses. However, most individual investigators are not so lucky. Thus, the only direct childcare costs charged to grants would be for out-of-town travel either to pay for childcare when an investigator is attending a conference or to pay for children to travel to conferences with their investigator-parent. Currently, investigators can charge travel expenses towards research grants. Allowing these additional charges would just increase the travel portion of the researcher's budget.

[1] In the University of Kansas F&A agreement, on-site childcare is not counted as a fringe benefit.

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

Appendix 2:

Additional Material for the Record

[DISCUSSION DRAFT]

110TH CONGRESS
2D SESSION

H. R. _____

To increase awareness of the existence of and to overcome gender bias in academic science and engineering through research and training, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

Ms. EDDIE BERNICE JOHNSON of Texas introduced the following bill; which was referred to the Committee on

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A BILL

To increase awareness of the existence of and to overcome gender bias in academic science and engineering through research and training, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the "Fulfilling the Potential of Women in Academic Science and Engineering Act of 2008".

SEC. 2. FINDINGS.

The Congress finds the following:

1 (1) In its 2007 report, Beyond Bias and Bar-
2 riers, the National Academies state that, to maintain
3 its scientific and engineering leadership amid in-
4 creasing economic and educational globalization, the
5 United States must aggressively pursue the innova-
6 tive capacity of all of its people—women and men.
7 (2) Women make up an increasing proportion
8 of science and engineering majors at all institutions
9 of higher education, including at top-rated programs
10 such as those at the Massachusetts Institute of
11 Technology where women make up 51 percent of its
12 science undergraduates and 35 percent of its engi-
13 neering undergraduates.
14 (3) For women to participate to their full po-
15 tential across all science and engineering fields, they
16 must see a career path that allows them to reach
17 their full intellectual potential; much remains to be
18 done to achieve that goal.
19 (4) The Federal Government provides over 60
20 percent of research funding at institutions of higher
21 education.
22 (5) Women are a small portion of the science
23 and engineering faculty members at major research
24 universities, and they typically receive fewer institu-

1 tional resources for their research activities than
2 their male colleagues.
3 (6) It is not lack of talent, but unintentional bi-
4 ases and outmoded institutional structures that are
5 hindering the access and advancement of women.
6 (7) The representation of women in leadership
7 positions in our institutions of higher education, sci-
8 entific and professional societies, and honorary orga-
9 nizations is low relative to the numbers of women
10 qualified to hold these positions.
11 (8) Neither our institutions of higher education
12 nor our Nation can afford such underuse of precious
13 human capital in science and engineering.
14 **SEC. 3. DEFINITIONS.**
15 In this Act, the following definitions shall apply:
16 (1) DIRECTOR.—The term ''Director'' means
17 the Director of the Office of Science and Technology
18 Policy in the Executive Office of the President.
19 (2) FEDERAL SCIENCE AGENCY.—The term
20 ''Federal science agency'' means any Federal agency
21 that is responsible for at least 2 percent of the total
22 Federal obligation for research and development at
23 institutions of higher education, according to the
24 most recent data available from the National Science
25 Foundation.

1 (3) INSTITUTION OF HIGHER EDUCATION.—The
2 term "institution of higher education" has the
3 meaning given such term in section 101(a) of the
4 Higher Education Act of 1965 (20 U.S.C. 1001(a)).

5 **SEC. 4. WORKSHOPS TO ENHANCE GENDER EQUITY IN ACA-**
6 **DEMIC SCIENCE AND ENGINEERING.**

7 (a) IN GENERAL.—The Director, through the Na-
8 tional Science and Technology Council, shall carry out a
9 program to organize and hold national workshops that
10 educate members of grant review panels and institution
11 of higher education department chairs about methods that
12 minimize the effects of gender bias in evaluation, including
13 of Federal research grants, for hiring, tenure, and pro-
14 motion, and for selection for any other honor based on
15 academic merit.

16 (b) PLANNING AND COORDINATION.—In carrying out
17 the workshop planning and coordination activities under
18 this section, the National Science and Technology Council
19 shall consult with scientific and professional societies and
20 organizations that represent the major science and engi-
21 neering disciplines or that have the primary mission of ad-
22 vancing the participation of women in science and engi-
23 neering, as appropriate.

24 (c) CHARACTERISTICS OF WORKSHOPS.—The work-
25 shops shall have the following characteristics:

1 (1) There shall be at least 1 workshop every 3
2 years in each of the major academic science and en-
3 gineering disciplines supported by the Federal
4 science agencies.
5 (2) Invitees to workshops shall include—
6 (A) the chairs from at least the top 50 in-
7 stitution of higher education departments in the
8 relevant discipline, as determined by the
9 amount of Federal research and development
10 funds obligated to each department in the prior
11 year based on data available from the National
12 Science Foundation's Division of Science Re-
13 sources Statistics;
14 (B) members of any standing research
15 grant review panels appointed by the Federal
16 science agencies in the relevant discipline; and
17 (C) in the case of major science and engi-
18 neering disciplines supported by the Depart-
19 ment of Energy, the individuals from each of
20 the Department of Energy National Labora-
21 tories responsible for the hiring and oversight of
22 the research staff in the relevant discipline.
23 (3) Activities at the workshops shall include re-
24 search presentations and interactive discussions or
25 other activities that increase the awareness of the

existence of gender bias in hiring, tenure review, promotion, grant evaluation, award selection, and other forms of formal recognition of individual achievement and provide strategies to overcome such bias.

(4) Research presentations and other workshop programs, as appropriate, shall include a discussion of the unique challenges faced by women from historically underrepresented groups.

(d) EVALUATION.—Not later than 5 years after the date of enactment of this Act, the Director shall transmit to the Committee on Science and Technology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate a report evaluating the impact of the program carried out under this section to reduce gender bias towards women engaged in research funded by the Federal Government. In determining the effectiveness of the program, the Director shall consider, at a minimum—

(1) the rates of participation in the workshops authorized under this section;

(2) the results of attitudinal surveys conducted on workshop participants before and after the workshops;

1 (3) any institutional policy or process changes
2 reported by participants from institutions of higher
3 education; and
4 (4) for institution of higher education depart-
5 ment chairs and Department of Energy National
6 Laboratory employees who participated in at least 1
7 workshop 3 or more years prior to the due date for
8 the report, trends in demographic data, such as hir-
9 ing, tenure review, promotion, grant evaluation,
10 award selection, and other forms of formal recogni-
11 tion of individual achievement, for the faculty or re-
12 search scientists in the departments or programs
13 represented by those individuals.
14 (e) AUTHORIZATION OF APPROPRIATIONS.—Each
15 Federal science agency is authorized to contribute funds,
16 from funds which are otherwise authorized, to support the
17 workshop and evaluation requirements under this section,
18 including—
19 (1) providing grants to organizations, including
20 the organizations identified under subsection (b), to
21 plan and organize the workshops; and
22 (2) reimbursing the travel and lodging costs of
23 invited speakers and workshop participants.

1 **SEC. 5. EXTENDED RESEARCH GRANT SUPPORT FOR CARE-**
2 **GIVERS.**

3 The Director, through the National Science and
4 Technology Council, shall develop a uniform policy to ex-
5 tend the period of grant support for federally funded re-
6 searchers who have caregiving responsibilities.

7 **SEC. 6. COLLECTION OF DATA ON FEDERAL RESEARCH**
8 **GRANTS.**

9 (a) IN GENERAL.—Each Federal science agency shall
10 collect standardized annual composite information on de-
11 mographics, field, award type and budget request, review
12 score, and funding outcome for all applications for re-
13 search and development grants to institutions of higher
14 education supported by that agency.

15 (b) REPORTING OF DATA.—

16 (1) The Director shall establish a policy to en-
17 sure uniformity of reporting required under sub-
18 section (a).

19 (2) The National Science Foundation shall be
20 responsible for storing and publishing all of the
21 grant data collected under subsection (a) in conjunc-
22 tion with the biennial report required under section
23 37 of the Science and Engineering Equal Opportuni-
24 ties Act.

1 **SEC. 7. ANNUAL REPORT.**

2 The Director shall submit to the Congress concurrent
3 with the Administration's budget submission an annual re-
4 port describing the activities undertaken under the Act
5 during the prior fiscal year.

May 7, 2008

AAUW

The Honorable Eddie Bernice Johnson
1511 Longworth House Office Building
United States House of Representatives
Washington, D.C. 20515

Dear Congresswoman Eddie Bernice Johnson:

On behalf of more than 100,000 bipartisan members of the American Association of University Women (AAUW), I would like to thank you for your leadership in introducing the Fulfilling the Potential of Women in Academic Science and Engineering Act of 2008. AAUW believes this legislation will help increase U.S. competitiveness by reducing the gender barriers at college and universities that often deter women from entering science, technology, engineering, and mathematics (STEM) fields.

This legislation makes many important strides by directly addressing concerns raised in the National Academies' report, "Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering," which found that women face a lifetime of subtle biases that discourage them from careers in STEM fields. Under this legislation, the Director of the Office of Science and Technology Policy will coordinate national anti-gender bias workshops, publish demographic and funding data for grant applications, extend grant support for researchers on leave for caregiving, and submit to Congress an evaluation of the program's impact.

AAUW supports efforts to increase the representation of women in STEM fields. The shortage of American scientists threatens our nation's ability to compete and innovate in the coming years, especially as the outsourcing of jobs to, and importing of scientists from, other nations continues to grow. "Beyond Bias and Barriers" attests that attrition rates for women moving towards careers in academic science are greater than those for men at nearly every critical juncture, from early expression of interest in science and engineering to representation among tenure-track faculty applicants.[1] Furthermore, after entering the workforce, women scientists and engineers in both academia and the private sector earn less and advance more slowly than men. This can deter all but the most persistent women from pursuing these paths.

As noted in the Commission on Professionals in Science and Technology's publication, "Professional Women and Minorities," women now make up 25 percent of the labor force in science, engineering and technology fields (although that proportion varies widely, with fewer women in occupations that require a high level of math skills, such as engineering).[2] This means that a significant pool of untapped talent remains. If women and members of other traditionally underrepresented groups joined the STEM workforce in proportion to their representation in the overall labor force, the shortage of STEM professionals would disappear.[3] This bill will help us move closer to that goal.

I thank you for your leadership in advancing opportunities for women in STEM fields and look forward to working with you and your office to enact this legislation. If you have any questions, please contact me at 202/785-7720, or Tracy Sherman, government relations manager, at 202/785-7730.

Sincerely,

Lisa M. Maatz
Director of Public Policy and Government Relations

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[1] **National Academies of Science.** *Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering: 2006*, **National Academies Press. Washington, D.C., 2006.**
[2] **Commission on Professionals in Science and Technology.** *CPST (2006) Professional Women and Minorities: A Total Human Resources Data Compendium. 16th ed.* **Washington, D.C.**
[3] **Congressional Commission on the Advancement of Women and Minorities in Science, Engineering and Technology Development [CAWMSET],** *Land of Plenty: Diversity as America's Competitive Edge in Science, Engineering, and Technology*, **(September 2000).**

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national coalition FOR WOMEN & GIRLS IN EDUCATION

May 7, 2008

The Honorable Eddie Bernice Johnson
1511 Longworth House Office Building
United States House of Representatives
Washington, D.C. 20515

Dear Congresswoman Johnson:

We are writing on behalf of the National Coalition for Women and Girls in Education (NCWGE), a nonprofit coalition of more than 50 organizations dedicated to improving educational opportunities for women and girls. We would like to thank you for your leadership in introducing the Fulfilling the Potential of Women in Academic Science and Engineering Act of 2008.

The recent National Academies' report "Beyond Bias and Barriers" argues that women face a lifetime of subtle biases that discourage them from careers in STEM. As a coalition dedicated to improving the diversity of our nation's science, technology, engineering, and mathematics (STEM) professions, we recognize that your legislation is a critical first step to ensuring that talented and accomplished women scientists and engineers are provided with an equitable work environment that will allow them to fully participate and excel in STEM careers, so that they may more fully contribute to scientific innovations in the U.S. and worldwide.

Our nation must acknowledge that while women make up almost half of the U.S. workforce, they continue to be underrepresented in STEM professions, particularly in higher academic faculty ranks and in leadership positions. In order to alleviate this problem, action must be taken at the federal and institutional levels to eliminate the challenges impeding women's access to these positions, including gender biases in the workplace and outmoded institutional practices.

In our efforts to improve the status of women in STEM fields, we strongly support the provisions of this legislation. Under this legislation, the Director of the Office of Science and Technology Policy will coordinate national anti-gender bias workshops, extend grant support for researchers on leave for caregiving, collect and make public federal science agencies grant recipients' demographics, field, award type, budget request, review score, and funding outcome, and submit to Congress an evaluation of the program's impact. The passage of this legislation will help transform our nation into a larger and stronger scientific and engineering workforce that is more inclusive and representative of the general U.S. workforce.

NCWGE would like to thank you for your effort and leadership in the advancement of women in STEM. We look forward to working with you and your staff to pass this legislation. If you have any questions, please feel free to contact Lisa Maatz at 202-785-7720 or Jocelyn Samuels at 202-588-5180.

Sincerely,

Lisa M. Maatz
Chair, NCWGE
American Association of University Women
202-785-7720

Jocelyn Samuels
Vice-Chair, NCWGE
National Women's Law Center
202-588-5180

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