

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

**HEARING CHARTER**

*Broadening Participation in STEM*

**Tuesday, March 16, 2010  
10:00 a.m. – 12:00 p.m.  
2318 Rayburn House Office Building**

**1. Purpose**

On Tuesday, March 16, the Subcommittee on Research and Science Education of the House Committee on Science and Technology will hold a hearing to examine institutional and cultural barriers to broadening the participation of students pursuing degrees in science, technology, engineering, and mathematics (STEM), efforts to overcome these barriers at both mainstream and minority serving institutions, and the role that Federal agencies can play in supporting these efforts.

**2. Witnesses:**

- **Dr. Shirley M. Malcom**, Head of the Directorate for Education and Human Resources Programs, American Association for the Advancement of Science
- **Dr. Alicia C. Dowd**, Associate Professor of Higher Education, University of Southern California and Co-Director of the Center for Urban Education
- **Dr. Keivan Stassun**, Associate Professor of Physics & Astronomy, Vanderbilt University, and the Co-Director of the Fisk-Vanderbilt Masters-to-PhD Bridge Program
- **Dr. David Yarlott**, President of Little Big Horn College, and Chair of the Board of Directors for the American Indian Higher Education Consortium
- **Ms. Elaine Craft**, Director of the South Carolina Advanced Technological Education National Resource Center, Florence Darlington Technical College

**3. Overarching Questions**

- What is the current status of underrepresented groups in science and engineering? How do these data vary by discipline and type of institution? What role do different types of institutions, such as minority serving institutions and institutions that primarily serve undergraduates, play in broadening participation?
- What are the greatest challenges to achieving more diversity in science and engineering? How do challenges vary by type of institution and demographic subgroup? Are there policies, programs or activities with demonstrated effectiveness

in increasing the participation, recruitment, and degree attainment of underrepresented groups in STEM?

- What role can the Federal Government play in addressing challenges and barriers to broadening participation in STEM? How are programs at NSF in particular helping to broaden participation in STEM, and how do those programs need to be changed, if at all? How can existing programs and institutions best leverage each other's expertise and experience toward a common goal of increasing diversity in STEM?

#### 4. Background

According to a recent report by the National Science Board, *Science and Engineering Indicators 2010*<sup>1</sup>, undergraduate enrollment in higher education has risen steadily from 14.5 million in 1993 to 18.7 million in 2006, with increases projected to reach 20.1 million in 2017. In conjunction with increased enrollment, the number of science, technology, engineering, and mathematics (STEM) bachelor's degrees has also risen to nearly 486,000, and for the last 15 years STEM degrees have accounted for one-third of all bachelor's degrees awarded. The composition of individuals earning bachelor's degrees in STEM has changed over time. Since 2000, women have earned more than half of all STEM bachelor's degrees, but this percentage varies widely among fields with women being disproportionately underrepresented in physics, computer science, and engineering. The number of minorities receiving bachelor's degrees in STEM has also grown slightly, with black students earning 8 percent of all degrees in 2007, Hispanic students earning 8 percent, and Native Americans earning 0.7 percent, up from 7 percent, 6 percent and 0.5 percent in 1995, respectively.

Despite these gains, concern remains over the number of minority students earning STEM degrees. The proportion of STEM bachelor's degrees earned by minority students (17 percent) is much lower than the representation of minorities within the U.S. population (37 percent). Also, the fraction of the college age population, ages 18-24, represented by minorities is expected to grow to 55 percent in 2050, heightening concerns that the current gap may continue to widen. At the same time, the need for a background in STEM is becoming increasingly more important, with the Bureau of Labor Statistics projecting that STEM occupations will grow by 21.4 percent between 2006 and 2016, compared to the projected growth in all other occupations of just 10.4 percent<sup>1</sup>. Furthermore, as students progress past the undergraduate level in their academic careers, the gap among ethnic groups becomes more evident with just 11 percent of STEM doctoral degrees awarded to underrepresented minorities. Trends also indicate that there have been marginal increases in the participation of underrepresented minorities at the faculty level. In 2007, within the top 100 research universities, just 4 percent of the faculty members in biology were underrepresented minorities, with computer science, physics, and civil engineering having minority representation of 3 percent, 3 percent, and 6 percent, respectively<sup>2</sup>. In light of shifting demographics and the growing importance of

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<sup>1</sup> <http://www.nsf.gov/statistics/seind10/start.htm>

<sup>2</sup> Nelson, Donna. 2007. A National Analysis of Minorities in Science and Engineering Faculties at Research Universities. [http://chem.ou.edu/~djm/diversity/Faculty\\_Tables\\_FY07/FinalReport07.html](http://chem.ou.edu/~djm/diversity/Faculty_Tables_FY07/FinalReport07.html)

STEM, many companies and experts believe we must further the development of this untapped talent pool, as we will be relying on them to make future discoveries and innovations as well as to fill the skilled workforce.

Many experts have also asserted that broadening the participation of underrepresented minorities in STEM holds the added benefit of creating a diverse learning environment for all STEM students. Research has demonstrated that a diversity of viewpoints and backgrounds increases creativity, and a leads to a stronger, more productive workforce overall.

### *The Role of NSF*

In 1980, Congress passed the Science and Engineering Equal Opportunities Act, which called on the National Science Foundation (NSF) “to promote scientific and engineering literacy and the full use of the human resources of the Nation in science and engineering.” NSF has taken this charge seriously, incorporating broadening participation related goals throughout its strategic plan. For fiscal year (FY) 2011, NSF has requested \$788 million for programs and activities with either a specific focus or an emphasis on broadening the participation of underrepresented groups and/or the types of institutions engaged in STEM education and research.

NSF’s broadening participation programs are supported primarily through the Education and Human Resources (EHR) Directorate. The types of activities supported by EHR include: improving research capabilities at minority-serving institutions; developing effective recruitment and retention strategies for underrepresented groups; improving the transition of students across educational junctions; research to understand and address gender-based differences in STEM education and workforce participation; and direct financial support for underrepresented students. In addition to the broader activities supported by EHR, NSF’s research directorates support programs and activities targeted toward specific disciplines. For example, the Directorate for Computer & Information Science & Engineering has a program specifically for broadening participation in computing; the number of undergraduate degrees earned in computer science has been declining over the last few years and historically the field has not been pursued by underrepresented minorities or women.

Of particular note in the EHR budget is the proposed restructuring of programs to broaden participation in STEM at the undergraduate level. NSF is proposing a new comprehensive broadening participation program that builds on three existing programs: Historically Black Colleges and Universities Undergraduate Program (HBCU-UP), Louis Stokes Alliances for Minority Participation (LSAMP) and Tribal Colleges Undergraduate Program (TCUP), and newly invites proposals from Hispanic Serving Institutions, citing the mandate in Sec. 7033 of the *COMPETES Act*. Funding for this newly consolidated program would be \$103 million in FY 2011, a \$13 million or 14.4 percent increase from the total FY 2010 funding for HBCU-UP, LSAMP and TCUP.

During the March 10 Subcommittee hearing<sup>3</sup> on NSF's FY 2011 budget request, the NSF Director, Dr. Arden Bement, provided a more detailed description of NSF's vision for the consolidated program. Dr. Bement stated that the goal of the program was to build on the successes and lessons learned from the targeted programs, and to put the combined program in the position to grow not only within NSF, but to create opportunities to leverage the program and its activities across Federal agencies and with the private sector. Four potential funding tracks within the comprehensive program were also outlined. Specifically, the program would include: 1) Louis Stokes Model Alliances: this track would be based on the current program and would establish inter-institutional networks, including at least two minority-serving institutions, for the sharing of information and the development of curriculum; 2) Transformational Initiatives: this track would focus on building capacity and the integration of research and education with an emphasis on activity-based learning and educational transition points; 3) Targeted Initiatives: this track recognizes the differences between institution types as well as cultural differences among underrepresented groups, and would support focused efforts that address those specific needs; and 4) Research: this track would complement the other tracks and support research on specific barriers and issues, but would also address grand challenges in broadening participation.

#### *The Role of Other Agencies*

Other Federal science and engineering agencies such as NOAA, NASA, and DOE also support programs designed in whole or in part to increase the number individuals from underrepresented groups entering STEM fields. The types of activities supported by these agencies generally include building research capacity at minority-serving institutions, providing financial support to students from underrepresented groups who are pursuing STEM degrees related to the mission of the agency, and providing research and other hands-on experiences to students, including summer internships.

## **5. Questions for Witnesses**

*Dr. Shirley M. Malcom*

1. What is the current status of and trends for the involvement of underrepresented groups in science and engineering? How do these data vary by discipline and type of institution? What are the greatest challenges to achieving more diversity in science and engineering?
2. Please describe AAAS's efforts to increase the participation of women and underrepresented minorities in science and engineering careers, including the consulting services and legal resource materials provided to individual universities and colleges by the Center for Advancing Science & Engineering Capacity.
3. What role can the Federal Government play in addressing challenges and barriers to broadening participation in STEM? How are programs at NSF in particular helping to broaden participation in STEM, and how do those programs need to be changed, if

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<sup>3</sup> [http://science.house.gov/publications/hearings\\_markups\\_details.aspx?newsid=2753](http://science.house.gov/publications/hearings_markups_details.aspx?newsid=2753)

at all? How can existing programs and institutions best leverage each other's expertise and experience toward a common goal of increasing diversity in STEM?

*Dr. Alicia C. Dowd*

1. Please provide an overview of your research on diversity in science, technology, engineering and mathematics (STEM). What are the greatest challenges to achieving more diversity in STEM? What are the particular challenges for increasing the participation of Hispanic students in STEM fields? Are there policies, programs or activities with demonstrated effectiveness in increasing the participation, recruitment, and degree attainment of underrepresented groups in STEM?
2. What are the current research gaps for understanding and addressing STEM diversity? Is the current National Science Foundation (NSF) support for research in these areas adequate in terms of both the level of funding and the nature of the programs supporting such research? Do you have any recommendations for changes to NSF's existing portfolio of diversity and diversity research activities?
3. How can existing programs and institutions best leverage each other's expertise and experience toward a common goal of increasing diversity in STEM?

*Dr. Keivan Stassun*

1. What are the greatest challenges to achieving more diversity in science and engineering? To what extent do these challenges vary by discipline? What are the particular challenges for a major research university such as Vanderbilt?
2. Please describe the Fisk-Vanderbilt Masters to PhD Bridge Program, including a description of the development of the inter-institutional partnership, how the program has changed and expanded over its history and any characteristics that you feel are central to the program's success. What do you believe are the challenges to replicating the successes of this program at other institutions, including at other major research universities?
3. What role can the Federal Government play in addressing challenges and barriers to broadening participation in STEM? How are programs at NSF in particular helping to broaden participation in STEM, and how do those programs need to be changed, if at all? How can existing programs and institutions best leverage each other's expertise and experience toward a common goal of increasing diversity in STEM?

*Dr. David Yarlott*

1. As Chair of the Board of Directors for the American Indian Higher Education Consortium, please describe the role of Tribal Colleges and Universities (TCUs) in broadening the participation of Native American students in STEM fields, including a description of how these institutions, and the challenges they face in implementing successful STEM programs, compare to other minority serving institutions and to mainstream institutions.
2. Please describe the STEM programs at Little Big Horn College. Are there programs or activities that have been effective at increasing recruitment and degree attainment in STEM? How is Little Big Horn College partnering with other institutions in

STEM? What are some of the unique challenges Little Big Horn College faces in STEM education and are these challenges similar across TCUs?

3. What role has the NSF's Tribal Colleges and Universities Program (TCUP) played in the development of STEM degrees and programs at Little Big Horn College and at other TCUs? How has the TCUP program served your institution's needs, and how does this program need to be changed, if at all?

*Ms. Elaine Craft*

1. Please provide a description of your institution, its STEM programs, and the demographics of your student population and faculty. How do the demographics within your STEM programs compare to the demographics institution-wide, and to the demographics of the community you serve?
2. Does your institution have particular policies, programs and activities with demonstrated effectiveness in increasing the participation, recruitment, and degree attainment of underrepresented groups in STEM? How does your institution interact or partner with other institutions and organizations to achieve these goals? What do you believe are the greatest challenges to achieving more diversity in science and engineering?
3. What role can the Federal Government play in addressing challenges and barriers to broadening participation in STEM? How are programs at NSF in particular helping to broaden participation in STEM, and how do those programs need to be changed, if at all? How can existing programs and institutions best leverage each other's expertise and experience toward a common goal of increasing diversity in STEM?