

**2002 BIENNIAL REPORT TO CONGRESS**

# **CEOSE**

**Committee on Equal Opportunities in Science & Engineering**



Committee on Equal Opportunities in Science & Engineering  
**2002 Biennial Report to Congress**

## Executive Summary

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The Committee on Equal Opportunities in Science and Engineering (CEOSE) is charged with advising the National Science Foundation (NSF) in its efforts to develop a competent and diverse 21st century workforce that will ensure the continued leadership of America in a global economy in which scientific and technological innovations play a major role.

While progress has been made in the inclusion of more members of traditionally underrepresented groups (African-Americans, Hispanics, and American Indians/Alaskan Natives) in science, technology, engineering, and mathematics (STEM), there are still critical areas that must be addressed. The following concerns set the tone for the Committee's deliberations during 2001-2002:

- *Increased participation of women in science and engineering (S&E) education and employment.* While the proportion of women earning bachelor's degrees in S&E doubled from 1966 to 2000, the proportion remains significantly lower than that of women earning bachelor's degrees in non-scientific areas. Women also remain underrepresented in the total S&E workforce.
- *The failure to cultivate the vast pool of untapped talent among women and ethnic minorities.* Minorities earned only one-tenth as many S&E doctoral degrees as their white counterparts, a shortfall that remains a concern. Additionally, even though women comprise half of the college-educated workforce, they continue to fill only 10% of the country's engineering jobs.
- *Increased participation of underrepresented minorities in graduate S&E education.* African-Americans, Hispanics, and Native Americans are as likely as whites to major in S&E at the bachelor's degree level, but they remain less likely to graduate from high school, enroll in college, and graduate with a bachelor's degree. While the number and proportion of doctorate degrees in S&E awarded to members of these groups have increased, the overall proportion remains low.
- *Increased participation of persons with disabilities in science and engineering and accommodations for older scientists and engineers in the labor force.* Although persons with disabilities make up 7.5% of the total college-educated workforce, they constitute just 1% of the total S&E doctorates awarded. Approximately 64% of all employed disabled scientists and engineers are over age 50, with many not experiencing the onset of their disability until age 40 or older.

### **CEOSE made significant progress in the years 2001-2002.**

- As of October 1, 2002, NSF Important Notice No. 127 requires that both merit review criteria, including Criterion 2 which addresses the broader social impact of all proposals submitted to NSF, must be addressed in the Project Summary of all proposals submitted. This is a significant accomplishment for the Foundation that will have an immediate and substantive impact. CEOSE has strongly endorsed such proactive measures.
- Ongoing dialogues between CEOSE and the Director and Deputy Director of NSF and other key Foundation leaders ensured that broadening participation and embedding diversity in NSF programs remain priorities.

- A detailed examination of all NSF programs across all Directorates is being undertaken to examine ways to link existing programs to create a continuous pathway from K-12, through undergraduate programs, graduate programs, post-doctoral, and on to STEM careers in order to keep students on the STEM pathways.
- To make gaps and areas requiring attention readily apparent to policymakers and others, the Division of Science Resources Statistics (SRS)<sup>1</sup> will now present disaggregated data by race/ethnicity and gender.
- With the goal of easing the burden of student loan debt and making continued STEM education more financially feasible, as of FY 2003, NSF will increase the graduate student stipend to \$25,000, an increase that will set the standard for other government agencies.
- A database of over 200 names to date of women, underrepresented minorities, and persons with disabilities was developed for consideration for positions on NSF panels, as rotators, and as members of advisory boards. The database will be updated and its usefulness reviewed on an ongoing basis.
- NSF has accepted a CEOSE recommendation and is funding an exploratory Mentoring Initiative to be held in 2003. The proposed focus of the Initiative will be the identification of model examples of mentoring that can be replicated in order to increase the participation of women, underrepresented minorities, and persons with disabilities in STEM careers, as well as a research agenda for further study. A report of the results of the Initiative will be widely disseminated via print materials and the Internet.
- Recognizing that students who are not engaged in science and math learning in K-12 are usually lost to STEM pathways, CEOSE worked with NSF's Directorate for Education and Human Resources (EHR) to encourage the expansion of activities and efforts at the K-12 level. These include replicating and adapting successful programs and best practices at the K-12 level, enhancing relationships with the Federal and State Departments of Education to encourage the enhancement of science and math skills for teachers, creating continuous pathways from K-12 and beyond, and developing methods to track students throughout the entire educational process.

Over the course of the next two years, the Committee will continue to pursue specific strategies and issues raised during the 2001-2002 period, as well as a number of new initiatives. A detailed list of issues of interest can be found beginning on page 15.

<sup>1</sup> The Committee especially thanks Dr. Joan Burrelli of SRS for her assistance in the preparation of this report.

# Introduction

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The continued leadership of the United States in the global economy of the 21st century will depend on the country's success in building and sustaining a competent and diverse science, technology, engineering, and mathematics (STEM) workforce that draws on the energies and talents of every segment of the nation's rich human resources. This more inclusive, globally engaged workforce must both mirror and build upon the strengths of America's diverse population.

While strides have been made in recruiting and retaining women, underrepresented minorities (African-Americans, Hispanics, and American Indians/Alaskan Natives) and persons with disabilities in STEM education and careers, many resources remain untapped. And, while this under-representation is socially unjust, it is also a serious and increasingly damaging under-utilization of vitally needed ideas and perspectives.

Further, because the awarding of a doctorate degree is the gateway to a faculty position, the under-representation of women, minorities, and persons with disabilities in doctoral STEM programs remains a concern. Traditionally underrepresented groups in faculty positions act as role models; add new and creative perspectives of additional segments of the population to research agendas; and help to shape education to motivate and include all members of our society.

As the key Federal agency charged with promoting and advancing scientific progress in the United States, NSF plays a crucial role in encouraging and supporting a more fully developed role for traditionally underrepresented groups in STEM. CEOSE is charged with advising NSF in these efforts. Before examining in detail the Committee's concerns, activities, and accomplishments during the years 2001–2002, it is helpful to review both the current status and the progress made by women, underrepresented minorities, and persons with disabilities in STEM education and in the STEM workforce at large.

# Women

From 1966 to 2000 the proportion of women earning bachelor's degrees in science and engineering (S&E) has doubled, representing significant progress. However, even though the life sciences have been increasingly successful in attracting women, the proportion of women earning bachelor's degrees in non-scientific fields remains substantially higher than those earning degrees in STEM areas, indicating a critical need for additional progress in this area.

The paucity of women earning doctoral degrees in S&E fields is even more dramatic.

Not surprisingly, women also remain significantly underrepresented in the total S&E workforce, especially when compared with their presence in the total labor force or in the college-educated labor force. And for those women who do obtain doctoral degrees in S&E, with the exception of the most recent doctoral recipients, they are far less likely to be tenured than their male colleagues<sup>2</sup>.

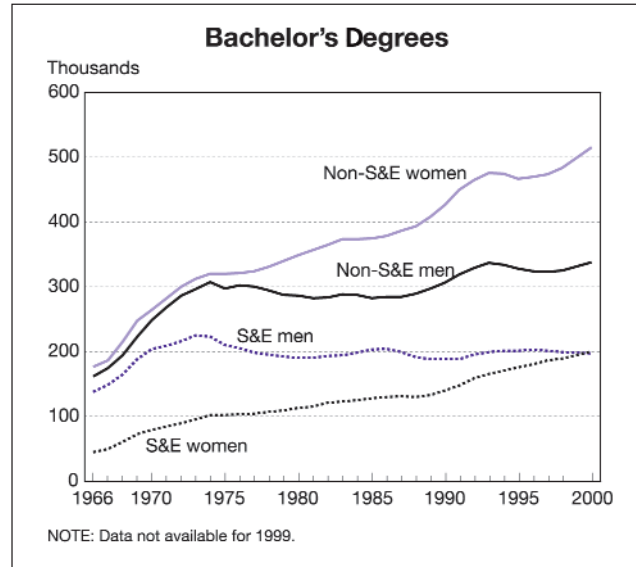


Figure 1: Bachelor Degrees  
Source: Tabulations by National Science Foundation/Division of Science Resources Statistics; data from Department of Education National Center for Education Statistics: Integrated Postsecondary Education Data System Completions Survey.

Doctoral degrees				
Field	1966	1976	1986	2000
	Percent awarded to women			
Total, all fields	11.6	23.3	35.4	43.8
Total, science and engineering	8.0	16.8	26.6	36.2
Engineering	0.3	1.9	6.7	15.7
Physical sciences	4.5	8.5	16.3	24.5
Earth, atmospheric, and ocean sciences	3.0	9.7	17.0	30.4
Mathematics	6.1	11.3	16.6	24.6
Computer sciences	0.0	0.0	12.0	16.5
Agricultural sciences	1.4	6.3	17.3	29.1
Biological sciences	14.8	22.5	33.6	44.8
Psychology	21.5	32.8	51.2	66.6
Social sciences	10.5	21.2	33.6	42.9
Total, non-science and engineering	18.2	31.7	49.3	56.7

Figure 2: Doctoral Degrees  
Source: National Science Foundation/Division of Science Resources Statistics, Survey of Earned Doctorates.

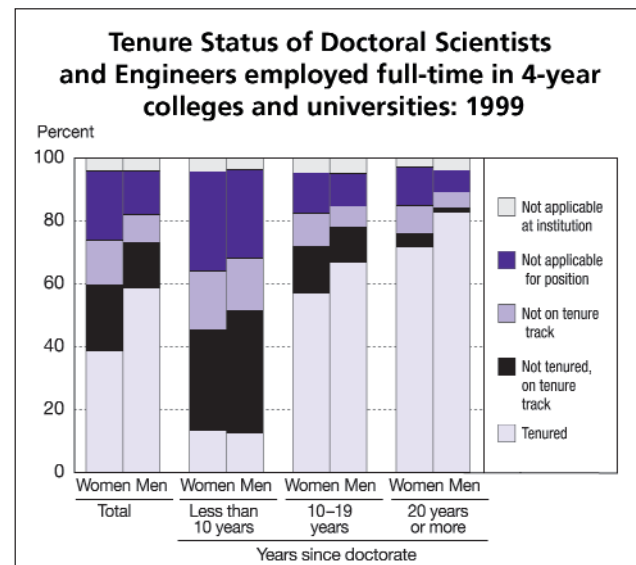


Figure 3: Tenure Status  
Source: National Science Foundation/Division of Science Resources Statistics, Survey of Doctorate Recipients.

<sup>2</sup>U.S. Census Bureau, Statistical Abstract of the United States: 2000 National Science Foundation/Division of Science Resources Statistics, 1999 SESTAT

# Minorities

Encouragingly, in recent years traditionally underrepresented minorities have been as likely as whites to major in S&E at the bachelor's degree levels.

However, since these groups are less likely in general to take science and mathematics courses in high school, complete high school, and graduate from college than whites, the percentage of S&E degrees awarded remains well below that for whites. Equally, while the number and proportion of doctorates in S&E fields have increased over the last decade, the overall proportion of those awarded to minorities remains relatively low.

The representation of minorities in S&E occupations also remains low, with minorities in 1999 constituting 21.4% of the entire U.S. workforce and just 7.2% of the total S&E workforce<sup>3</sup>. While there is not a significant increase in minority participation in S&E careers, it is also true that science is increasingly becoming an unattractive career pursuit among all groups. Contributing factors include:

- (1) increased time to get the Ph.D.;
- (2) individuals being led into multiple postdoctoral positions;
- (3) inadequate compensation;
- (4) inability to find permanent positions that allow for independent work;
- and (5) difficulty in obtaining research support from government and private sources. These barriers are in addition to others that have been traditionally identified.

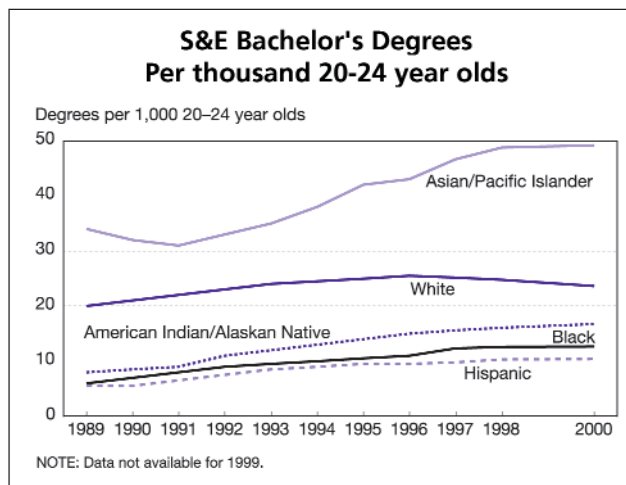


Figure 4: Bachelor's Degrees in S&E per thousand 20-24 year olds  
Source: National Science Foundation/Division of Science Resources Statistics, Science and Engineering Degrees by Race/Ethnicity of Recipients: 1989-1996 and 1991-2000.

Citizenship and race/ethnicity	1989	1992	1995	1998	2000
Proportion of degrees in S&E					
Total	32.8	32.8	34.0	34.3	33.4
U.S. citizen and permanent residents	32.4	32.5	33.9	34.2	33.2
White, non-Hispanic	31.8	31.8	33.0	33.1	32.1
Asian/Pacific Islander	50.9	48.6	49.1	49.4	47.9
Black, non-Hispanic	30.6	31.5	32.3	32.7	32.1
Hispanic	32.2	32.8	33.3	34.2	32.8
American Indian/Alaskan Native	31.2	30.4	32.9	32.9	33.0
Other/unknown race/ethnicity	30.3	33.6	34.6	35.9	34.3
Nonresident aliens	46.6	42.9	39.9	37.9	39.3

Figure 5: Bachelor's Degrees in S&E  
Source: National Science Foundation/Division of Science Resources Statistics, Science and Engineering Degrees, by Race/Ethnicity of Recipients: 1989-1996 and 1991-2000

Race/ethnicity	1990		2000	
	Number	Percent	Number	Percent
Total, U.S. citizens and permanent residents	15,364	100.0	17,064	100.0
American Indian/Alaskan Native	43	0.3	88	0.5
Black, non-Hispanic	374	2.4	728	4.3
Hispanic	468	3.0	704	4.1
Asian/Pacific Islander	1,009	6.6	1,736	10.2
White, non-Hispanic	13,170	85.7	13,415	78.6
Other/unknown race/ethnicity	300	2.1	393	2.3

Figure 6: Doctoral Degrees in S&E  
Source: National Science Foundation/Division of Science Resources Statistics, Survey of Earned Doctorates.

<sup>3</sup>U.S. Census Bureau, Statistical Abstract of the United States: 2000; National Science Foundation/Division of Science Resources Statistics, 1999 SESTAT.

# Persons with Disabilities

Currently persons with disabilities make up approximately 1% of the total of all those earning science and engineering doctorates.

While persons with disabilities make up 7.5% of the college-educated U.S. workforce, they constitute a lower portion (6% in 1999) in S&E occupations.

Among employed scientists and engineers, approximately 64% with disabilities are over age 50, while just 33% of those without disabilities are over age 50<sup>4</sup>. For many persons with disabilities employed in STEM fields, the onset of their disability occurred after the age of 40, requiring attention to the development of accommodations for scientists and engineers who become disabled during the course of their careers.

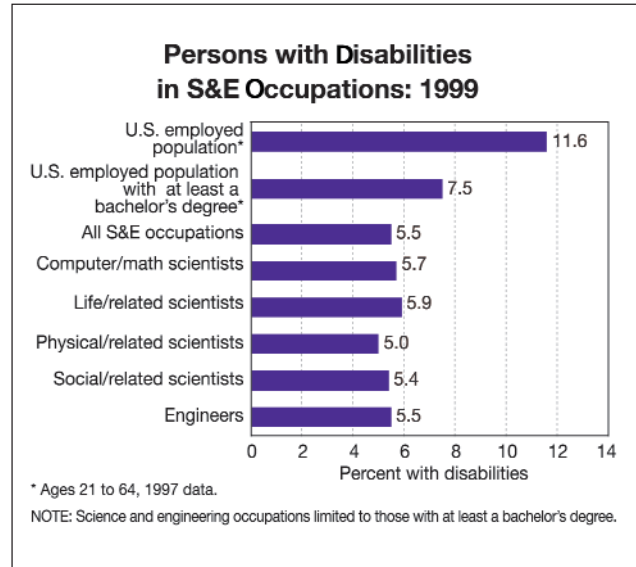


Figure 7: Persons with disabilities in S&E Occupations  
Source: NSF/Division of Science Resources Statistics, 1999 SESTAT; U.S. Bureau of the Census, Survey of Income & Program Participation.

Field	1989	1993	1995	1997	2000
Total, science and engineering . . . . .	21,731	25,441	26,535	27,245	25,462
Number reporting disability . . . . .	200	331	357	320	316
Percentage reporting disability . . . . .	0.9	1.3	1.3	1.2	1.2
Science, total . . . . .	17,188	19,745	20,527	21,131	20,132
Number reporting disability . . . . .	175	286	294	278	281
Percentage reporting disability . . . . .	1.0	1.4	1.4	1.3	1.4
Engineering, total . . . . .	4,543	5,698	6,008	6,052	5,330
Number reporting disability . . . . .	25	45	60	40	35
Percentage reporting disability . . . . .	0.6	0.8	1.0	0.7	0.7

NOTE: Includes both physical and cognitive disabilities.

Figure 8: S&E Doctoral Degree Recipients  
Source: National Science Foundation/Division of Science Resources Statistics, Survey of Earned Doctorates.

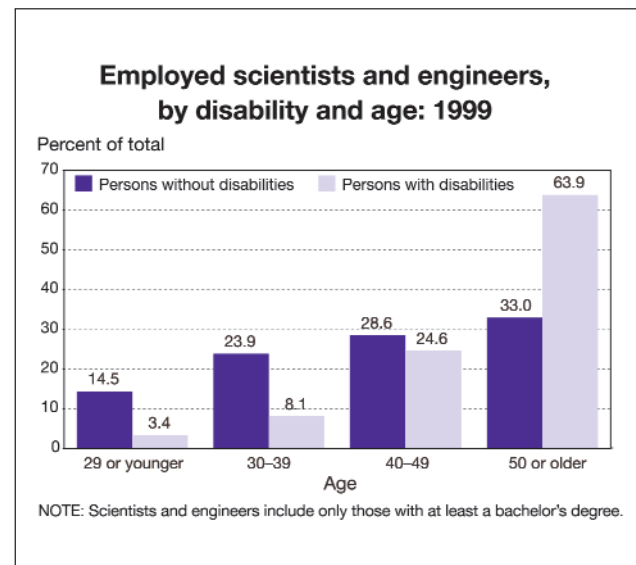


Figure 9: Employed Scientists and Engineers, by disability and age: 1999  
Source: National Science Foundation/Division of Science Resources Statistics, 1999 SESTAT.

<sup>4</sup>National Science Foundation/Division of Science Resources Statistics, 1999 SESTAT.



## Areas of Focus Suggested by CEOSE Discussions

CEOSE believes that the following actions should be undertaken to increase the participation and broaden the acceptance of pathways taken by underrepresented groups in STEM.

- Because of the significant increase in the number of STEM bachelor's degrees awarded to traditionally underrepresented groups, but the lack of a corresponding increase at the graduate level, additional programs and policies need to be put into place to provide linkages and bridge programs between academic tiers.
- In an effort to set a sustainable and realistic goal, CEOSE and NSF should consider the implementation of a set goal for doctoral degrees awarded to members of underrepresented groups.
- Research should be conducted into the educational outcomes of underrepresented groups in STEM in order to develop more effective strategies to encourage those at risk of leaving to continue on the pathway toward advanced degrees in STEM.
- Alternative pathways to STEM careers should be examined and considered as a way to increase the participation of underrepresented groups.
- Successful mentoring programs at all levels should be identified and closely examined in order to replicate their success.
- Promotion and tenure policies should be examined at all institutions to uncover those with innovative and proven practices that result in women, minorities, and persons with disabilities achieving tenure and promotional opportunities in higher numbers.
- Industry best practices may well inform and improve the efforts of both NSF and educational institutions to promote the inclusion of women, minorities, and persons with disabilities in STEM and efforts should be made to identify them.

# The Role of CEOSE

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## *The Charge and Focus of the Committee*

The National Science Foundation has been charged with the task of addressing issues of equal opportunity in science and engineering for women, minorities, and persons with disabilities in an effort to foster a diverse workforce representative of the American populace (42 U.S.C. 1885c). The United States Congress has charged the Committee on Equal Opportunities in Science and Engineering with advising NSF in its efforts to ensure the fulfillment of its mission. CEOSE has undertaken its role by promoting the inclusion of all citizens, regardless of gender, ethnicity, or disabilities in the nation's STEM workforce. Implicit in this approach is the vision of a nation in which every segment of the population is empowered and enabled to participate fully in STEM. While progress has been made in the last two decades, the rate of change is unacceptably small and there are specific discrepancies that must be addressed.

With the goal of developing specific benchmarks and goals with which to measure future progress, during 2001-2002 CEOSE focused on identifying concrete action items. While examining data in order to identify both successful and unsuccessful models is a key goal, CEOSE also seeks to identify barriers and the institutional changes needed to remove them, as well as look for ways NSF can catalyze these changes. The Committee believes that positive outcomes can be achieved by focusing on concrete results and by continually identifying ways and actions in which the Committee can directly assist in facilitating the inclusion of all groups in STEM.

As America moves towards an increasingly technological job market and knowledge-based economy, and as changing demographics result in a larger population of women, minorities, and persons with disabilities, broadening the participation in STEM of these groups is more important than ever before.

## **CEOSE and NSF: Programs and Issues**

The Committee and NSF have made great strides in the years 2001 and 2002 in increasing awareness of diversity and diversity issues within NSF.

- *Merit Review Criterion 2:* CEOSE believes that the NSF Important Notice No. 127 internal enforcement initiative is one of the most significant accomplishments made during this period.
- *Ongoing Dialogues with NSF Decision-Makers:*
  1. Recognizing that communication and the spirit of cooperation are always critical factors in successfully addressing and increasing awareness of diversity issues, CEOSE has actively worked to engage in an ongoing series of dialogues, both externally and internally at NSF. Dr. Rita Colwell, Director, and Dr. Joseph Bordogna, Deputy Director, were kept closely informed of all activities and concerns of the Committee and CEOSE worked

closely with NSF to encourage the development of programs geared toward women, minorities and persons with disabilities across the Foundation, not just within a specific Directorate. Also discussed with Drs. Colwell and Bordogna was the need to:

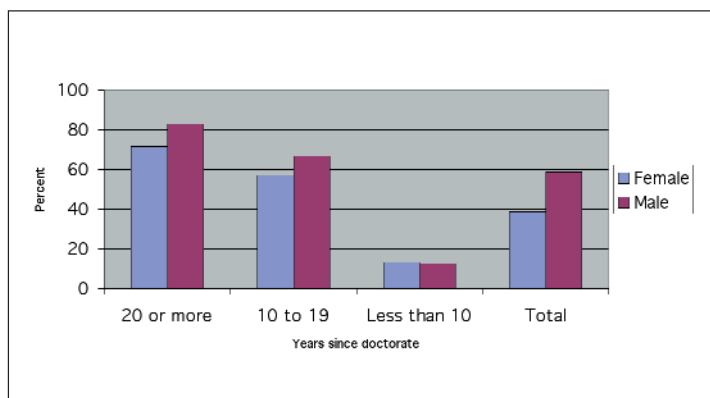
- Increase the number of doctoral degrees awarded to women, minorities, and persons with disabilities.
- Consider dual NSF Program appointments in which officers would work with more than one Directorate in order to enhance communication.
- Explore the appointment of representatives from each of the top 20 universities to serve as liaisons between those institutions and minority programs in order to better and more effectively identify students for participation.
- Consider partnering with corporations interested in finding ways to build science and technology capabilities and the STEM workforce.
- Ensure that the progress made in embedding diversity awareness within NSF remains in place during leadership transitions at the Foundation.

2. The Committee has begun to work with the National Science Board Committee on Education and Human Resources. The Chair of that Committee met with CEOSE to discuss issues of mutual concern, and the Chair and Vice-Chair of CEOSE made a presentation to the EHR Committee. These dialogues pointed out areas of cooperation for the future:

- *Increasing Diversity Awareness within NSF:* Recognizing that NSF is a large and diverse organization and that its charge to promote the progress of science; advance the national health, prosperity, and welfare; and to secure the national defense necessitates involvement in a wide range of activities, CEOSE believes that actively working to promote awareness of diversity should be extended to every Directorate and office within the Foundation. As part of the Committee's ongoing efforts to advise, inform, and raise awareness of diversity issues on a Foundation-wide basis, Committee members served as liaisons to all of the Directorate Advisory Committees.
- *Creating Pathways from K to Career:* The Committee examined ways to broaden participation in the existing programs at NSF and in all Directorates by creating a variety of mechanisms to link existing programs with the goal of creating a continuous pathway from K-12, undergraduate school, graduate school, post-doctoral, appointments and on to STEM careers. Specifically, CEOSE recommended that NSF look for ways to strengthen the Research Experience for Undergraduates (REU) program to allow students to participate for multiple years. CEOSE also recommended extending research programs to high school students. Finding ways to involve the counselors and teachers who play a key role in course selection – especially in the crucial K-12 years – would also be productive. CEOSE also worked with the NSF Directorate for Education and Human Resources (EHR) to find ways in which successful programs could expand their focus to allow greater emphasis on broadening participation. One model of interest is the ADVANCE Program that seeks to increase the participation of women in academic science and engineering careers by supporting new approaches to improving the climate for women in academic institutions and facilitating their advancement to the highest ranks of academic

leadership. Creative approaches are valued and, while the program is open to everyone, individuals from underrepresented groups are encouraged to apply for the ADVANCE fellowship awards. While establishing new programs to encourage diversity should remain an ongoing initiative, creating fellowships and scholarships for minorities and persons with disabilities within existing NSF programs, along with providing supplements for undergraduates to do a year of training in research after receiving their bachelor's degrees, should be considered as viable options.

- *Using Disaggregated Data to Increase Awareness:* In order to make existing gaps more readily apparent and to make data provided by NSF more useful to policymakers and others, CEOSE worked with the Division of Science Resources Statistics (SRS), the central clearing house within NSF for the collection, interpretation, and analysis of data and the entity charged with providing data to be used for policy formulation, to present disaggregated data regardless of the size of individual cells on women, minorities, and persons with disabilities by race/ethnicity, and gender. These comprehensive disaggregated data will assist a variety of institutions in evaluating existing policies and adapting them, where necessary, to broaden participation of all groups in STEM. While this step does represent considerable progress, several areas of concern remain:
  - SRS experiences continued difficulty in obtaining data on persons with disabilities.
  - In some cases, data samples are so small that actual results must be suppressed in order to protect the confidentiality of the survey respondents.
  - For small populations, targeted surveys may be required in order to obtain adequate data.
  - It is difficult to locate and efficiently survey the unemployed.
  - A standard error must be identified for particular groups.
  - S&E fields should be refined to incorporate more multi-disciplinary and cross-disciplinary areas.



*Figure 10: Percentage of doctoral scientists and engineers employed full-time in four-year colleges and universities who have tenure, by years since doctorate and sex: 1999*  
 Source: National Science Foundation/Division of Science Resources Statistics, Survey of Doctorate Recipients.

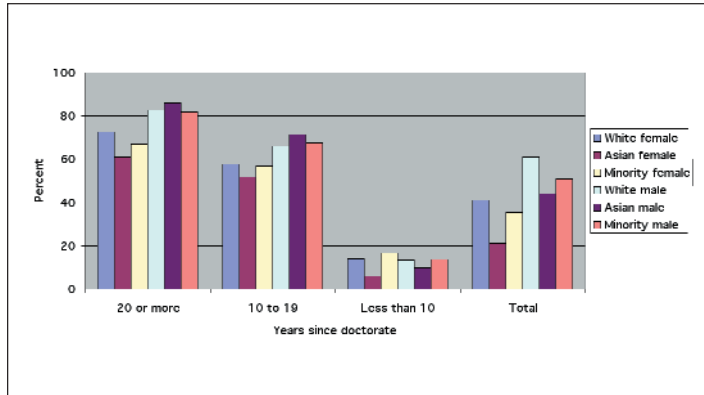


Figure 11: Percentage of doctoral scientists and engineers employed full-time in four-year colleges and universities who have tenure, by years since doctorate, sex and race/ethnicity: 1999  
 Source: National Science Foundation/Division of Science Resources Statistics, Survey of Doctorate Recipients.

- Increasing the Graduate Student Stipend:* The research experience is often recognized as one of the key factors in retaining students in STEM pathways. Recognizing that the financial burden many minorities and persons with disabilities face is often greater than that of the general public, CEOSE strongly supported the NSF action to increase the stipend for graduate students to \$25,000 per year in FY 2003. This financial incentive may help to ease the burden of student loan debt and make the participation of a broader variety of students more feasible in the enriching research experience provided by NSF – ultimately resulting, it is believed, in higher numbers of women, minorities, and persons with disabilities choosing STEM careers.

## 2001-2002 CEOSE Accomplishments

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### *Increased Reviewer Diversity*

CEOSE recognizes that putting mechanisms in place that make it easier to encourage inclusiveness serves the cause of diversity well. In order to see more women, minorities, and persons with disabilities appointed to key positions as NSF reviewers and panelists, and as rotators and advisory board members, CEOSE members have provided over 200 names of candidates. This information has been merged with the NSF reviewer database to provide easy access to NSF program officers, and will be revised and updated on an ongoing basis. CEOSE will monitor the effectiveness of this effort and will consider adding sources such as professional society membership directories to increase the availability of information about candidates.

### *Implementation of Merit Review Criterion 2*

Each year NSF receives approximately 30,000 new or renewal support proposals for research, graduate and postdoctoral fellowships and math/science/engineering projects. From those proposals, approximately 9,000 new award grants are given each year, primarily to colleges and universities, academic consortia, nonprofit institutions, and small businesses.

As revised by the National Science Board in October 1997, every proposal submitted to NSF is required to specifically address two criteria. They are:

Criterion 1: What is the intellectual merit of the proposed activity?

- How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields?
- How well qualified is the proposer to conduct the project?
- To what extent does the proposed activity suggest and explore creative and original concepts?
- How well conceived and organized is the proposed activity?
- Is there sufficient access to resources?

Criterion 2: What are the broader impacts of the proposed activity?

- How well does the activity advance discovery and understanding, while promoting teaching, training, and learning?
- How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)?
- To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships?

Although Criterion 2 was to be addressed on an equal level with Criterion 1 in every grant proposal, enforcement of this requirement has not been uniform. However, NSF has now made it a requirement that as of October 1, 2002 both Criterion 1 and Criterion 2 must be addressed in the Project Summary of any proposal submitted to NSF.

Further, NSF has addressed the use of Merit Review criteria by Reviewers and Program Officers, as well as broadening participation in the reviewer pool as specific goals in the agency Government Performance and Results Act (GPRA) performance plan.

*Development of the 2003 Mentoring Initiative:*

Plans are now in place to hold a Mentoring Initiative in fall 2003 in conjunction with the American Association for the Advancement of Science (AAAS). The key objective of the working session will be to identify ways to increase the participation of women, minorities, and persons with disabilities in STEM, to examine research gaps in the mentoring area for all groups, and to lay the groundwork for a grant solicitation in mentoring. The development of a research agenda for further targeted study is also a primary goal.

Drawing on the talent pool of recipients of the prestigious Presidential Awards for Excellence in Science, Mathematics, and Engineering Mentoring (PAESMEM), the AAAS Mentoring Awards, and the National Science Board Awards, the invited attendees will participate in the session, along with a cohort of science and engineering graduate students from underrepresented groups and members of Minority Serving Institutions.

Unlike other mentoring conferences and workshops, the Mentoring Initiative will be unique in that it will result in actual mentoring models that can then be implemented nationally.

*Expansion of K-12 Activities:*

Students with the potential to pursue careers in science, technology, and engineering often make the decision to enter – or not enter – the STEM pathway during the middle and high school years. However, early course selection, the influence of parents, teachers and counselors, and the fact that conventional methods of teaching science and math may not be the most effective way to engage the interest of students from underrepresented groups often cause these students to self-select out of the STEM pathway well before they enter college.

CEOSE has worked to establish a close relationship with NSF's Directorate for Education and Human Resources (EHR) to encourage the expansion of activities at the K-12 levels.

*Specifically, CEOSE supports:*

- Building on the success of the REU program, mechanisms to involve high school students in a research experience should be considered. Possible funding sources could include the Research Experience for Teachers (RET) program in which one or two students could be supported, along with a teacher. The Urban Systemic Initiative (USI) includes a K-12 systemic change component that may also provide a funding source. Additionally, the Louis Stokes Alliances for Minority Participation (LSAMP) offers high school bridge programs that could be utilized.

- Exploring the awarding of pre-college grant supplements in order to attract high school graduates to the academic experience. A paid summer research experience can keep promising students from taking other summer work due to financial considerations.
- Creating accountability systems to measure the progress and accomplishments of projects designed to improve science and math skills at the K-12 level so that best practices can be identified and funding concentrated on programs and projects achieving the greatest results.
- Establishing partnerships with elementary and secondary institutions and exploring the utilization of the "No Child Left Behind" Presidential initiative to enhance participation in STEM of U.S. citizens at the K-12 level and above.
- Developing mechanisms to track students through the entire educational process (from K-12 on) in order to keep students from leaving or dropping out of STEM pathways.
- Collaborating with the United States Department of Education and State Departments of Education to help encourage the development of stronger science and math skills for K-12 teachers.
- Identifying best practices across the entire spectrum of K-12 through career development through examples such as those uncovered in the Building Engineering and Science Talent (BEST) initiative. CEOSE believes that while funding for seed programs is somewhat less challenging to obtain, funding the most promising programs on an ongoing basis is often more problematic. Those programs that have been identified as the most promising by the BEST initiative should be considered top funding priorities.



## 2003-2004 CEOSE Initiatives

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Over the course of the next two years, the Committee will focus efforts and attention on the following areas:

- Developing specific strategies to increase the number of minority S&E Ph.D.s.
- Discussing progress in embedding diversity in all NSF programs.
- Continuing to evaluate effectiveness of NSF programs in broadening participation.
- Examining alternative pathways to STEM careers.
- Examining different ways of doing science to encourage diversity.
- Making careers in STEM more attractive and rewarding (e.g. family friendly).
- Making certain that the concerns of all communities underrepresented in science and engineering are considered, including reviewing disaggregated data on small groups.
- Monitoring the rate of compliance for Merit Review Criterion 2.
- Exploring ways to eliminate barriers to broadening participation in postdoctoral awards.
- Evaluating the impact of REUs on student outcomes, especially for retention in undergraduate school and students proceeding to graduate school.
- Exploring the possibility of increasing the participation of women, minorities and persons with disabilities through supplements to existing grants, as is currently done with REU undergraduate supplements and through other incentives.
- Continuing to examine linkages with existing programs to create a continuous pathway.
- Examining why the focus on enrolling international students at the graduate level supercedes efforts to focus on enrolling U.S. citizens, specifically those who are underrepresented in S&E.
- Exploring ways to infuse stronger science and math skills for teachers and changing standards for requirements and resource allocation with the U.S. Department of Education and State Education Departments.
- Considering current and potential efforts to increase networking for graduate students to share information on the tenure process, publishing, writing grants, and developing a sense of the profession.
- Examining the use of supplements to existing grants (as is currently done with REUs) in order to avoid losing promising students to paid internships that may divert their attention from STEM pursuits.

- Expanding the Committee's focus on persons with disabilities.
- Examining barriers to a potential career in research such as:
  - Increased time to get a Ph.D.;
  - The fact that the profession and the pathway to it is poorly defined in K-12;
  - Financial burdens of higher education, including student loans and unpaid internships;
  - The lack of publications during Ph.D. study.

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