



Report from the AdCom Broadening Participation Subcommittee

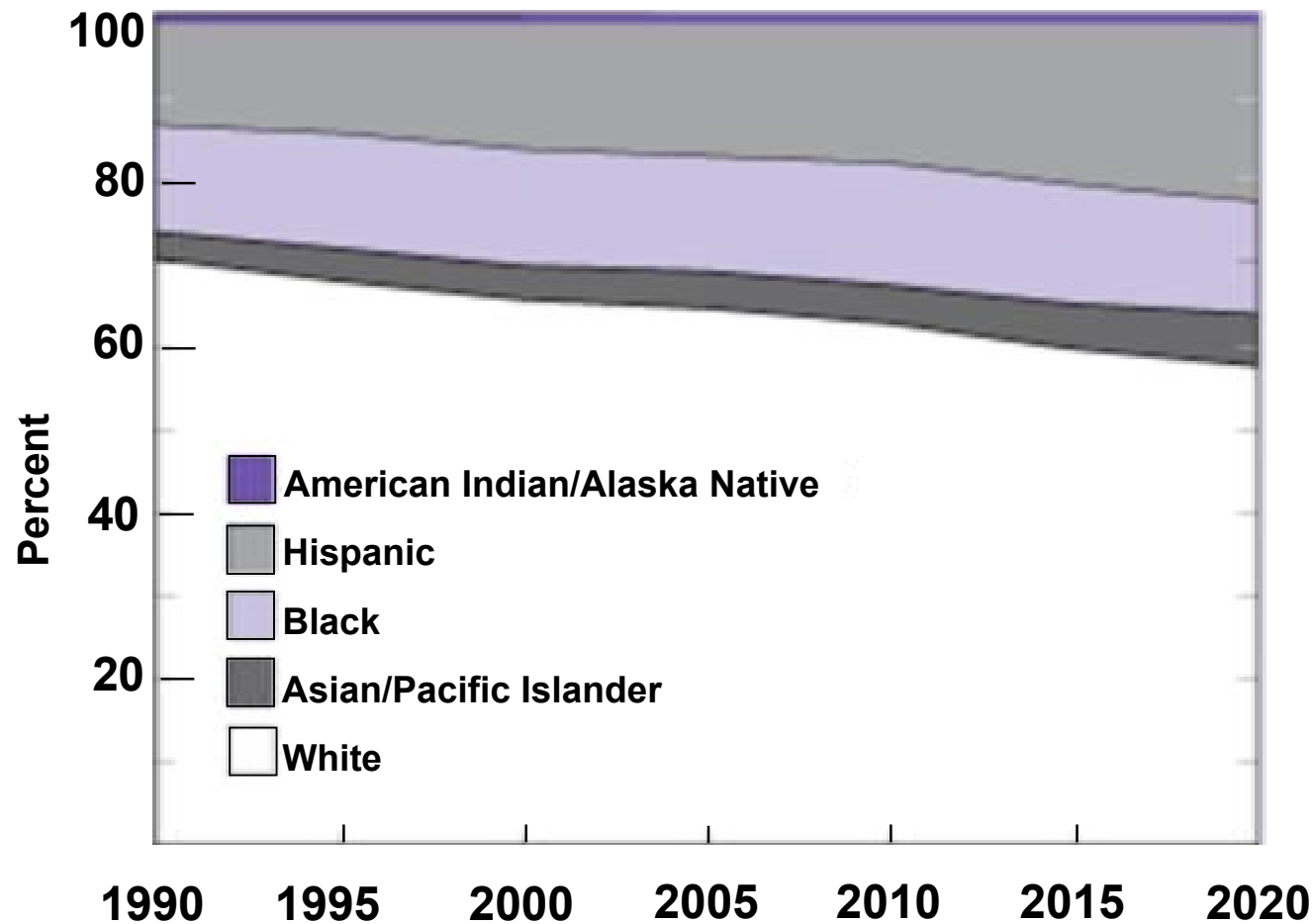
*Engineering Advisory Committee Meeting
April 24, 2008
NSF*



Charge to the Broadening Participation Subcommittee

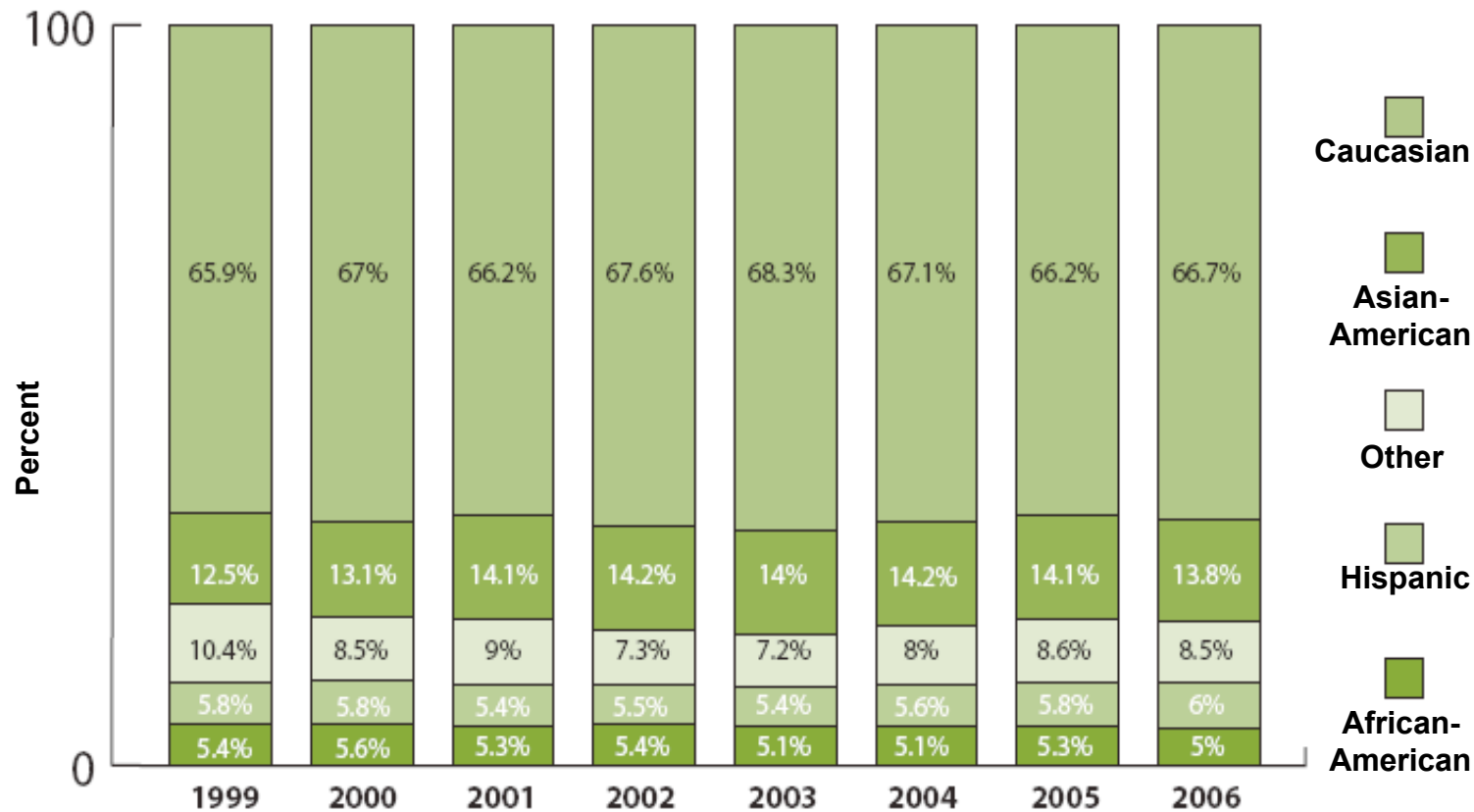
To assess and recommend activities that have the potential to strengthen diversity and hence promote excellence across the engineering community. In this way, the broader impacts of NSF supported engineering research and education in the US will be maximized, and US global competitiveness will be strengthened.

U.S. College-age Cohort



Sources: U.S. Census Bureau, Population Division, 1990 Census; Population Projections Program. Projections of the Resident Population by Age, Sex, Race, and Hispanic Origin: 1999–2100 (2000).

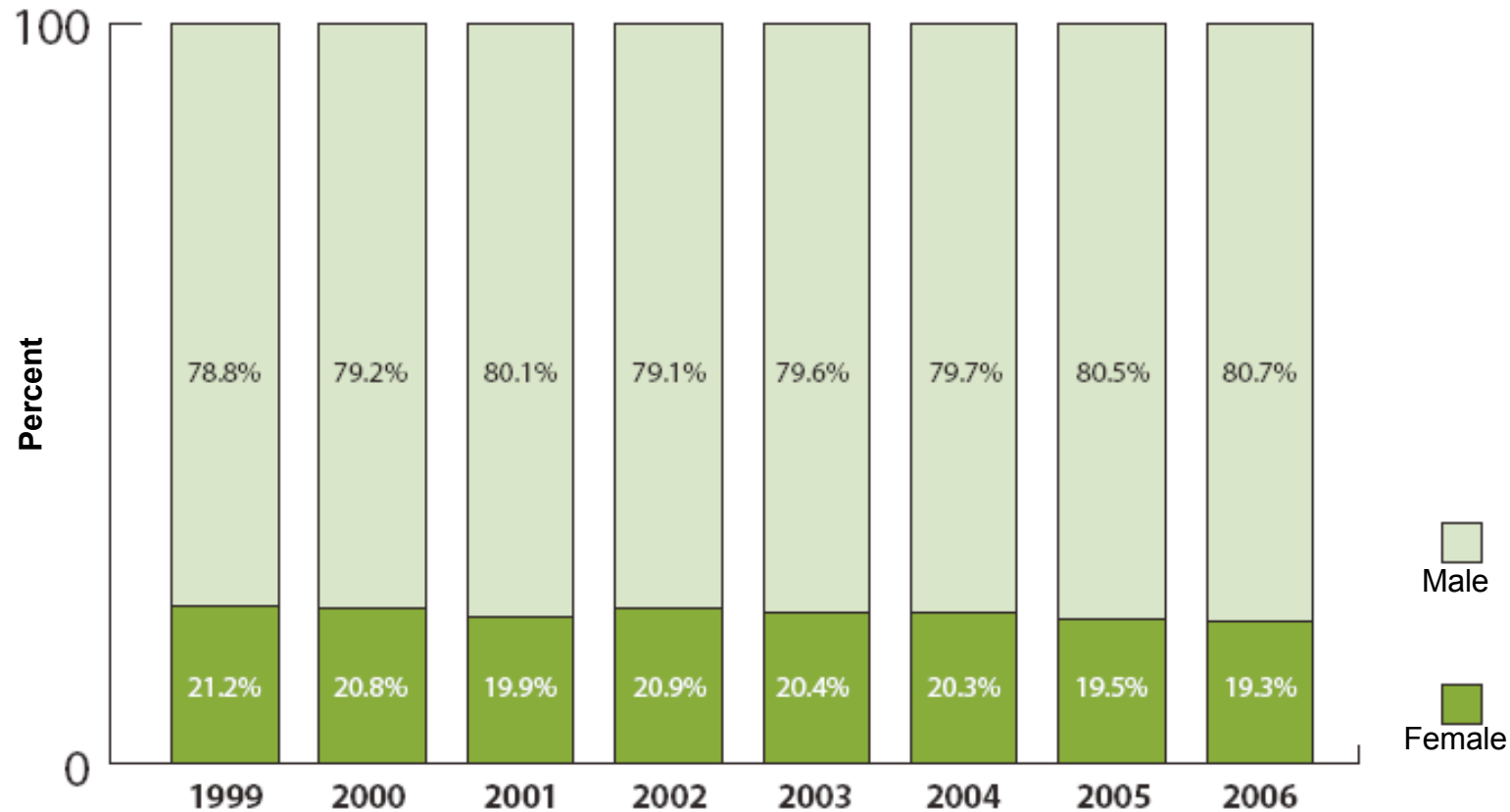
Engineering Bachelor's Degrees by Ethnicity



Source: Gibbons, Michael T. (2007). "Engineering by the Numbers," *Profiles of Engineering Colleges*, American Society for Engineering Education. www.asee.org/colleges
 Data on ethnicity do not include foreign nationals or students in schools from Puerto Rico.



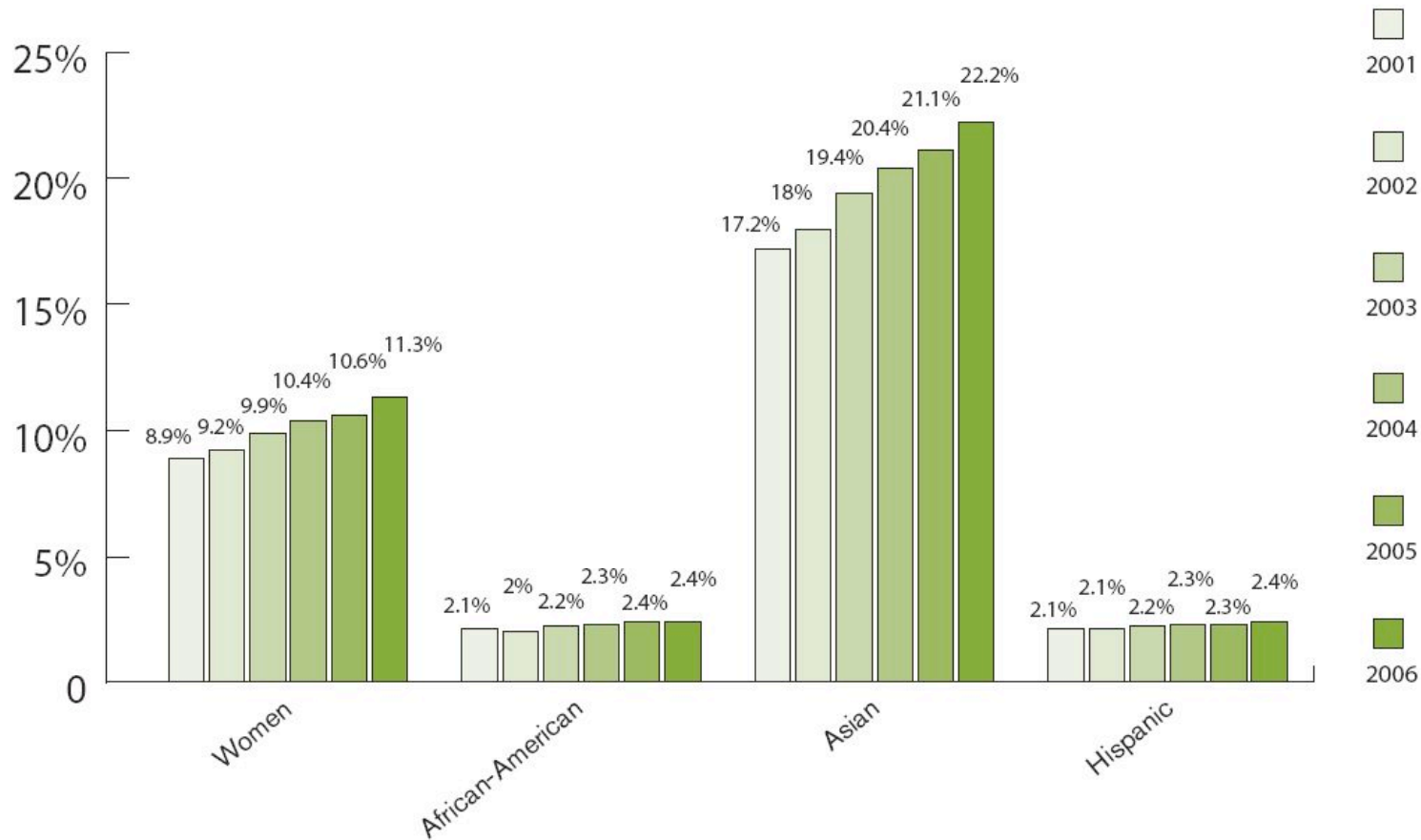
Engineering Bachelor's Degrees by Gender



*Source: Gibbons (2007), "Engineering by the Numbers."

**As compared to 1983–2002 data from the NSF *Science and Engineering Indicators*.

Engineering Faculty Members



Source: Gibbons (2007), "Engineering by the Numbers."

Data on women include faculty from the University of Puerto Rico, Mayaguez, & Polytechnic Univ, Puerto Rico.

*As compared to 2003 data from the NSF Division of Science Resources Statistics.

AdCom Broadening Participation Subcommittee Meeting



- Tuesday March 4th 2008 at the Denver airport
- Intense review of current NSF Engineering plans
- Intense brainstorming session for new suggestions for NSF
- Multiple revisions to report - consensus in the end
- Members:
 - *Steve Castillo, NMSU*
 - *Marshall Jones, GE Research*
 - *Cato Laurencin, U. Virginia*
 - *Matt Tirrell, UCSB*
 - *Greg Washington, OSU*
 - *Margaret Murnane, CU Boulder*
 - *Mary Juhas, liaison to NSF ENG*



Assessment of BP Plan

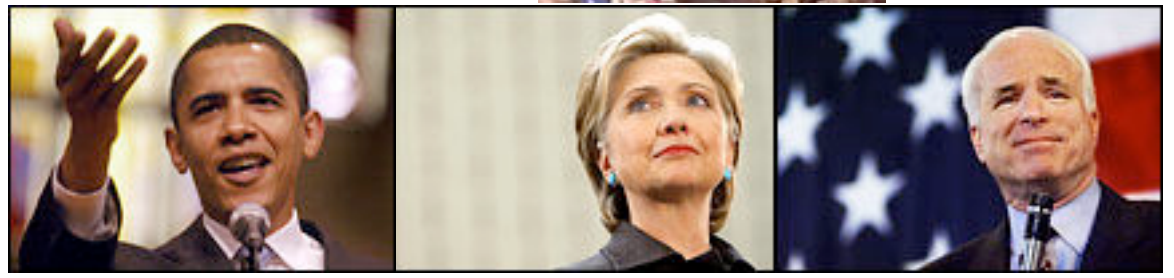
- The BP Subcommittee gives its strongest possible support to the proposed NSF Broadening Participation in Engineering Plan. It represents a core set of programs that are needed to sustain current levels and to promote incremental growth.
- The BP Plan will need champions within the NSF Directorate for Engineering to ensure that the current plan is successful and that it continues to innovate in order to achieve significant future growth in BP.
- Universities, NSF, Centers and single-PIs will need to be more innovative and strategic to enhance broadening participation e.g.
 - Curriculum reform for introductory courses to increase attractiveness
 - Need to develop Best Practices for many activities - outreach, RET, recruiting, and resource allocation at universities (ERC program very effective).
 - Significantly expand programs that work
 - Highlight examples of excellent BP and BI to NSF community

The Greatest Threat to American Engineering



The face of American engineering

Is not the face of America



NSF-wide and Engineering-specific Broadening Participation Recommendations



Recommendation 1: Broaden participation in NSF activities by increasing the diversity of scientists and other STEM experts who provide merit review for NSF proposals, either as ad hoc reviewers or as panelists.

Recommendation 2: Provide training for staff throughout the Foundation on NSF priorities and mechanisms for broadening participation and workforce development, effective outreach efforts, reviewer selection, and avoiding implicit bias in the review process and program management.

Recommendation 3: Clearly communicate broadening participation and workforce development guidance and best practices within the Foundation and throughout the STEM community. Establish two websites, one for the general public, and one internal to NSF to facilitate broad dissemination and consultation.

Recommendation 4: Enhance the accountability and tracking of NSF-supported broadening participation efforts by requiring PIs to report outcomes of broadening participation activities as part of the reporting process for grant support. Establish Foundation-wide reference codes for all broadening participation funding activities. Incorporate broadening participation efforts as a performance indicator in NSF Program Officer performance plans.

Recommendation 5: Maintain and regularly update the NSF portfolio of broadening participation programs to facilitate Foundation-wide coordination of efforts to more actively engage all people, from all types of institutions, and all regions of the nation in the science and engineering enterprise.

Recommendation 6: Conduct external, third-party evaluations of the programs within the NSF broadening participation portfolio to determine effectiveness and impact.

Recommendations of Engineering Diversity Working Group span entire range of NSF activities



- **K–12**
- **Undergraduate**
- **Graduate**
- **Post-doctoral research**
- **Faculty**
- **Workshops**
- **NSF review process**

Recommendation for K - 12 I



- Expand the Research Experiences for Teachers (RET) program significantly and maintain overall success in broadening participation.

The BP Subcommittee strongly supports expansion of the RET program.

- *In addition to a research experience, many K-12 teachers are seeking more sophisticated help e.g. exposure to new teaching methods, applets and hands-on learning materials.*
- *It is not clear to the BP subcommittee that research-oriented engineering faculty in general have the required training to perfect the RET experience.*
- *Develop Best Practices regarding RETs e.g. consider creative partnerships between Colleges of Engineering and Education.*

Recommendation for K - 12 II



- Partner with the Education and Human Resources Directorate in support of programs that engage pre-college students in pre-engineering programs - especially those that partner with universities.
- Continue the Tribal College initiative with the goal of replicating the pre-engineering curriculum development model.

- *NSF must support programs that build awareness of engineering in pre-college environments. An example is the Project Lead the Way high school pre-engineering program.*
- *Programs that build awareness of engineering in communities with high populations of under-represented groups should be especially encouraged. Such programs lend relevance to the rigorous preparation in mathematics and science needed to succeed in a university engineering education environment.*
- *Consider research exposure for high school students. Middle and High school STEM programs which expose students to a university research campus have a high impact in terms of % of those students ultimately seeking STEM degrees at the college level.*

Recommendation for Undergraduate students I



- Expand the Research Experiences for Undergraduates (REU) program to include a broadening participation theme.

The BP Subcommittee strongly supports expansion of the REU program, and believes that this will attract a diverse set of students to engineering.

- *In the case of REUs, most faculty provide good mentorship for undergraduates, so that expanding this program should be straightforward.*
- *The BP Subcommittee also urges NSF to partner with universities to promote curriculum reform in engineering at the undergraduate level. By developing courses that highlight the contribution to society that engineers make, as well as the opportunities for teamwork, more undergraduates might choose engineering as a career path. Curriculum Reform is **STILL** needed, especially in Mech Eng and ECE.*
- *The NSF LSAMP Bridge to the Doctorate program can provide significant opportunities for supporting promising minority students in their pursuit of advanced STEM degrees with the ultimate destination being the professoriate.*

Recommendation for Undergraduate students II



- Engage in regular outreach activities at the annual meetings of the engineering societies that represent women and minorities. Highly visible “NSF Sessions” that include proposal writing and other valuable outreach activities should be considered. (NSBE, SHPE, AISES, SWE)

Good idea! Add NOBCCHE which includes chemical engineers.

In the case of partnering with engineering societies, NSF might also consider sponsoring the engineering societies to innovate on successful programs in Physics and Chemistry that help departments optimize their environments so that they are attractive to a diverse group of students.

- *Site Visit Program administered by the American Physical Society*
- *Coach Series of Workshops. (COAChing Women to Succeed in Academic Careers in the Chemical Sciences).*

CSWP Site Visits - What Matters for a Good Climate



- Critical mass of students, postdocs and faculty
- Supported and positive female faculty and female postdoc role models
- High expectations for all students, good mentoring
- Family leave, childcare on campus for faculty, postdocs, students

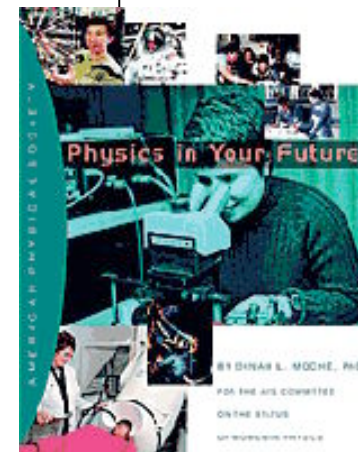
- Cultivate a sense of community

- Friendly informed faculty
- Student lounge
- Student organization with elected representatives involved in department affairs e.g. student reps on committees, attending faculty meetings
- Picnics, pizza, holiday party where everyone attends
- Positive image on web page

Good Management!

- Respect and attention to ethics for everyone
- Charismatic and positive department chair
- Willingness to change and experiment e.g. **Modern and Flexible Curriculum**

Modern, flexible curriculum!



Recommendation for Undergraduate students II



- Engage in regular outreach activities at the annual meetings of the engineering societies that represent women and minorities. Highly visible “NSF Sessions” that include proposal writing and other valuable outreach activities should be considered. (NSBE, SHPE, AISES, SWE)

Good idea! Add NOBCCHE which includes chemical engineers.

Consult with and duplicate other successful programs such as

- Meyerhoffer Program*
- Isiah Warner’s program at LSU*
- Jim Gates program at Maryland*
- Calvin Mackie’s national mentorship program*

Recommendation for Graduate and Postdoctoral Research:



- Develop a broadening participation graduate award that is portable - similar to the Graduate Research Fellowship Program - and encompasses all ENG divisions.
- Develop a portable research initiation grant to broaden participation of post-docs in ENG.

- *The BP Subcommittee strongly supports these recommendations. We believe that the award of a prestigious NSF Graduate and Postdoctoral Awards will be a very effective enticement for under-represented students to stay in academe. Faculty diversity will be increased, resulting in an increased number of role models. Such Fellowships will considerably enhance students' resumes.*
- *GRS could be coupled with LSAMP to provide minority students a clear pathway to the Ph.D.*
- *NSF should consider working with universities to support parental leave for graduate students and postdocs.*



News, Views and Careers for All of Higher Education

Jan. 30

Making Room for Baby

By Lisa M. Krieger Mercury News

Stanford University on Thursday promised its women graduate students 12 weeks of paid maternity leave, a bold step aimed at attracting and retaining female intellectual talent. The policy -- believed to be the second of its kind among major U.S. universities -- also guarantees that new mothers can maintain full-time student status and eases their return to classwork, research, and teaching.

“It is vital to the nation that we retain those women who seek graduate degrees,” said Arthur Bienenstock, Stanford's vice provost and dean of research and graduate policy, who announced the policy at a meeting of the Faculty Senate, the university's legislative body. “Otherwise, we will lose our lead in innovation and ultimately our standard of living, as well as national security,” he said.



Recommendations for Faculty I

- **Implement the BRIGE (Broadening Participation Research Initiation Grants in Engineering) program.**
 - Expand the BRIGE to provide funding for a faculty mentor.
- **Initiate a career advancement award to broaden participation of senior faculty (> 3 years in academe) and complement the BRIGE program.**

- *The BP subcommittee believes that it is a good idea to target BRIGE at new faculty.*
- *NSF could consider creating another funding source to broaden participation of faculty who need to be retained and to succeed in academe.*



Recommendations for Faculty II

- Promote technical collaboration with international scholars, hold periodic international workshops for U.S. women ENG faculty and grad students to promote international exchanges.
- Promote collaboration between minority-serving institutions and R1s through expanded research-oriented workshops at minority-serving institutions.

The BP subcommittee strongly endorses these recommendations.

Additional BP Subcommittee Recommendations for Faculty III



- **NSF should encourage universities to create positions that might be termed associate deans for career equity. These positions would serve to -**
 - Develop Best Practice procedures to assure career advancement, over the entire arc of a career, based on merit and accomplishment.
 - Eliminate situations where women and under-represented minorities are cumulatively left behind in salary, resources, lab space or other aspects of career advancement.
 - Ensure equitable workload.
 - Ensure credit for outreach, effective broadening participation!!!
 - Ensure attractive role models for graduate and undergraduate students.
 - Monitor recruiting and retention of faculty - demographics and \$\$\$\$
 - NSF could stimulate the effectiveness of such positions by providing support for comparative research across institutions, and by requiring these data as part of large infrastructure or center grants.

SUMMARY

5

TABLE S-1 Evidence Refuting Commonly Held Beliefs About Women in Science and Engineering

Belief	Evidence	Where Discussed
(1) Women are not as good in mathematics as men.	Female performance in high school mathematics now matches that of males.	Chapter 2
(2) The matter of “under-representation” on faculties is only a matter of time; it is a function of how many women are qualified to enter these positions.	Women’s representation decreases with each step up the tenure-track and academic leadership hierarchy, even in fields that have had a large proportion of women doctorates for 30 years.	Chapter 3
(3) Women are not as competitive as men. Women don’t want jobs in academe.	Similar proportions of men and women science and engineering doctorates plan to enter postdoctoral study or academic employment.	Chapter 3
(4) Behavioral research is qualitative; why pay attention to the data in this report?	The data are from multiple sources, were obtained using well-recognized techniques, and have been replicated in several settings.	Chapters 2-5
(5) Women and minorities are recipients of favoritism through affirmative-action programs.	Affirmative action is meant to broaden searches to include more women and minority group members, but not to select candidates on the basis of race or sex, which is illegal.	Chapter 4
(6) Academe is a meritocracy.	Although scientists like to believe that they “choose the best” based on objective criteria, decisions are influenced by factors—including biases about race, sex, geographic location of a university, and age—that have nothing to do with the quality of the person or work being evaluated.	Chapter 4
(7) Changing the rules means that standards of excellence will be deleteriously affected.	Throughout a scientific career, advancement depends upon judgments of one’s performance by more senior scientists and engineers. This process does not optimally select and advance the best scientists and engineers, because of implicit bias and disproportionate weighting of qualities that are stereotypically male. Reducing these sources of bias will foster excellence in science and engineering fields.	Chapter 4

continued

Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering



ISBN: 0-309-65454-8, 346 pages, 6 x 9, (2006) Committee on Maximizing the Potential of Women in Academic Science and Engineering, National Academy of Sciences, National Academy of Engineering, and Institute of Medicine

TABLE S-1 Continued

Belief	Evidence	Where Discussed
(8) Women faculty are less productive than men.	The publication productivity of women science and engineering faculty has increased over the last 30 years and is now comparable to men's. The critical factor affecting publication productivity is access to institutional resources; marriage, children, and elder care responsibilities have minimal effects.	Chapter 4
(9) Women are more interested in family than in careers.	Many women scientists and engineers persist in their pursuit of academic careers despite severe conflicts between their roles as parents and as scientists and engineers. These efforts, however, are often not recognized as representing the high level of dedication to their careers they represent.	Chapter 5
(10) Women take more time off due to childbearing, so they are a bad investment.	On the average, women take more time off during their early careers to meet their caregiving responsibilities, which fall disproportionately to women. But, by middle age, a man is likely to take more sick leave than a woman.	Chapter 5
(11) The system as currently configured has worked well in producing great science; why change it?	The global competitive balance has changed in ways that undermine America's traditional science and engineering advantages. Career impediments based on gender or racial or ethnic bias deprive the nation of talented and accomplished researchers.	Chapter 6

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the traditional model to an inclusive model with provisions for equitable and unbiased evaluation of accomplishment, equitable allocations of support and resources, pay equity, and gender-equal family leave policies. Otherwise, a large number of the people trained in and capable of doing the very best science and engineering will not participate as they should in scientific and engineering professions.

Additional BP Subcommittee Recommendations for Faculty IV



- **NSF could consider grants for what might be termed “re-entry” faculty, i.e., those who needed to take some time off for family reasons but wish to relaunch or resume an activity research and teaching career.**
- **Another best practice endorsed by the BP Subcommittee is making parental leave the default option on the birth of a child, eliminating the need to request such a leave.**



Recommendations for Workshops

- NSF plans to hold broadening participation workshops for department chairs from each of the major ENG disciplines, e.g., chemical, mechanical, electrical, computer, civil, industrial, materials ...
- NSF is also planning a workshop series that provides continuity and sends a strong message to women and minority faculty that they have support from NSF to pursue and realize successful academic careers.

- *Need workshop series to get BP message out for as long as it takes...*
- *Ask departments to report on progress periodically*
- *May need more sophisticated workshop planning and follow-up than the previous Chemistry and Physics gender equity/multicultural workshops for department chairs. Follow-on surveys indicated that although the vast majority of Chemistry Chairs changed their behavior after the Chemistry workshop, the majority of the Physics Chairs did not. (This is feedback from Prof. Geraldine Richmond, who pioneered the Chemistry COACH workshop series and the workshop for Chemistry Department Chairs).*



Recommendations for Proposal Review Process

- The unintended bias slides should be used in training of all ENG panels. BUT all program officers should be trained before using them.
- New data at <http://www.mentornet.net/news/newsart.aspx?nid=32&sid=1>
- There should be on-line examples of excellence in the broader impacts criterion. There is a perception in the entire NSF community that the broader impacts review criterion is not as important as intellectual merit.

10th Anniversary Talent for Tomorrow Drive



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MENTORNET NEWS – March 2008

The Mentoring Gap:

The study focuses on *Behavioral Ecology*, a journal that changed its review policy in 2001 from single-blind, where the reviewers of a paper submitted for publication are aware of the author's identity, to double-blind (Budden *et al.*, 2008). In doing so, the journal provided an opportunity to examine the effects of this change on the demographics of authors publishing in the journal.

In the four years following the change in how articles were reviewed, there was a 7.9% increase in the number of female first authors (from 23.7% to 31.6%) representing a 33% growth in the female first author population (Budden *et al.*, 2008). Because the period of data collection extended across nearly ten years, it was possible the change may have resulted from a growth in the numbers of women in the discipline. However, [NSF data](#) indicate female ecology graduates increased by just 2.4% across the same period, less than a third of the reported increase in female first authors. Furthermore, Budden and colleagues (2008) analyzed data from a very similar journal that continues to practice single-blind review. That analysis failed to demonstrate a commensurate increase in female authors (25.0% to 26.3%). The same finding was documented across a number of other single-blind ecology journals. The findings suggest that where a peer review process is used, a double-blind process is more desirable, especially whenever there is a discrepancy between the positive reviews and the demographic make-up of the author pool.

Although not directly studied in this piece of research, the study's authors believe that a double-blind review process has important implications for other kinds of authors, including junior and international researchers. Budden *et al.*, (2008) argue that "the consequences of this shift may extend beyond publications. If females are less successful in publishing research on account of their gender, then given the current practices associated with appointment and tenure, and the need for women to dramatically out-compete their male counterparts to be perceived as equal, any such publication bias impedes the progress of women to more advanced professional stages."

Further Recommendations to BP Plan



- NSF should become a clearinghouse for best practices in recruitment and retention of underrepresented groups at every career level (K – faculty).
 - This could be done through BP forums including grantees who come to NSF to share best practices or through ongoing workshops for departments chairs.
- NSF needs to hold universities accountable. Universities need to develop and implement best practices such that resources are distributed based on a merit system, as well as developing effective mentoring for students and faculty.
- Currently, women and minority students and faculty may be performing multiple BP outreach/service activities - but not getting credit or release from other work. Women and minority faculty cannot shoulder the entire BP effort, in addition to the need to outperform peers.



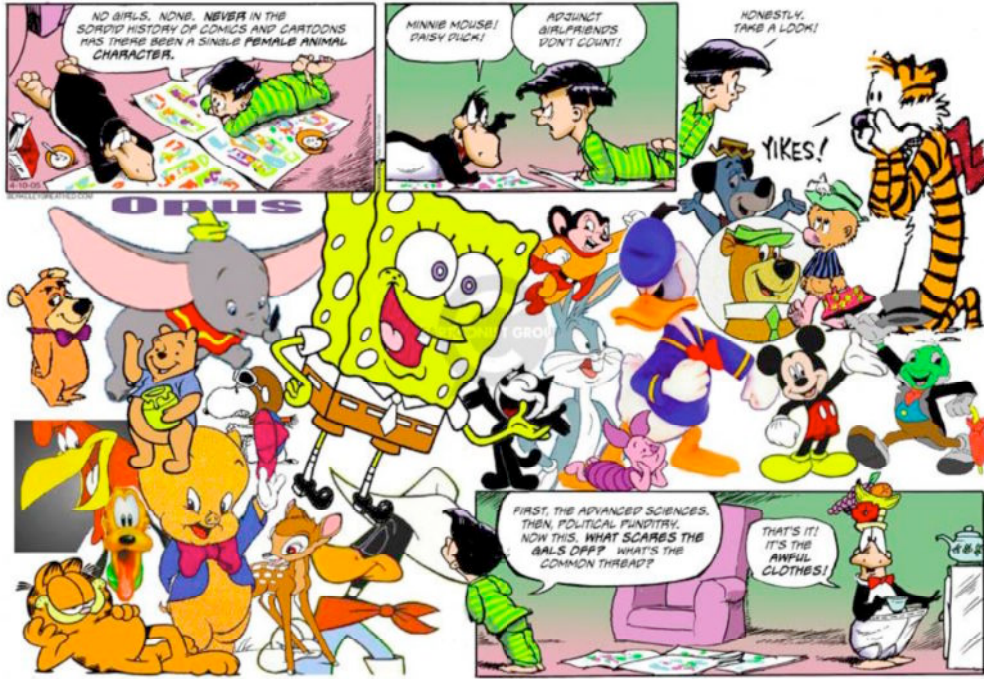
Further Recommendations to BP Plan

- Can BP be incorporated in the scoring of ENG proposals?
- One way to codify BP in proposals is to specifically ask what has the PI done previously to BP and has it been successful?
- For emerging technical areas, NSF brings in people to announce its interest so the community understands it and can respond to solicitations. NSF should do the same with BP. The plan does not address faculty training.
- Innovations for a Competitive America (a set aside of \$20M - \$50M) for high risk, high reward projects aimed at broader impact.

What new programs and procedures would you recommend?



- Leverage international students in Africa (English speaking countries), the Caribbean, and Central and S. America to help leverage those populations in the US
 - The connection between these students and their US counterparts is significant and could be leveraged to build a center of gravity
- Leverage successful partnerships with other government agencies where it makes sense
 - NASA has strong outreach programs and has had success in mass media for outreach. Many of these programs are now being implemented at the National Institute of Aerospace (NIA).



OPINION

★ THE DENVER POST 7B

