Chapter 6

Fostering Diversity in Education in the SBE Sciences

We as a nation cannot afford to educate only those who can afford college and the associated perks that influence decisions about admissions (notably, standardized tests). We cannot de facto limit access to gatekeepers who transmit information and provide guidance in negotiating the state and local education apparatus. This kind of an education "system" is unevenly functional at best. It wastes talent and forecloses opportunity. That is why higher education—all sectors and kinds of institutions—must adopt and, most of all, invest in a doctrine of excellence for all.
Dr. Eleanor L. Babco, Executive Director, Commission on Professionals in Science and Technology [36]

Current Context

Key Needs

Explicit attention to diversity in education and training is essential to any consideration of the future workforce in the United States.[37] Diversity in the United States is not just a core value; diversity in the workforce also affects the country's capacity to nurture democracy and encourage civic participation, maintain competitiveness in an increasingly global economy, enhance the quality of education, and promote the health and safety of all citizens. Numerous studies demonstrate that diversity in education contributes to broadening perspectives, encouraging tolerance, and promoting the development of critical thinking and related skills. Beyond the substantive enrichment of the social, behavioral, and economic sciences by scholars bringing diverse sets of interests, questions, and skills, learning is strengthened when guided by faculty and mentors of diverse backgrounds and expertise. In particular in higher education, SBE faculties teach large and diverse pools of students and thus are strategically well situated to introduce them to science.

Building a scientific workforce that mirrors the U.S. population challenges all fields of science, including the social, behavioral, and economic sciences. Demographic trends portend an increasingly diverse U.S. population in the 21st century. From 1990 to 2000, the country's minority population increased by 35 percent and the non-Hispanic white population by 3.4 percent. The U.S. Census Bureau forecasts that these trends will continue. Non-Hispanic whites will comprise 53 percent of the population by 2050 (a projected drop from 69 percent

[36] Eleanor L. Babco, *Trends in African and Native American Participation in STEM Higher Education* (Washington, DC: Commission on Professionals in Science and Technology, 2003), p. 11.
[37] This chapter focuses on outreach to and training of persons of color and women in the SBE sciences. Inclusive training in the SBE sciences also commends attention to persons with disabilities. The National Workshop and this report do not specifically address issues of access and opportunities for this population of researchers, though the issue is important.

in 2000), Hispanics will account for the largest share of population growth, and the African American population will nearly double. Consistent with this overall pattern, the traditional college-age population will also increase by an estimated 16 percent from 2000 to 2015. Of these new students, it is estimated that 80 percent will be non-white and nearly half of these will be Hispanic.[38]

Absent intentional efforts to alter recruitment and retention in higher education, the achievement gap between minority populations and non-Hispanic whites will persist or widen. In 2000, African Americans constituted just over 12 percent of the population, but earned 9 percent of all bachelor's degrees and 6 percent of all doctoral degrees; Hispanics totaled 12.6 percent of the population, but earned only 6.3 percent of all bachelor's degrees and 3.8 percent of all doctorates.[39] Completion rates for bachelor's degrees captures the problem: According to a report from the American Council on Education (cited above), in 2000, 28 percent of non-Hispanic whites completed baccalaureate degree programs compared to less than 17 percent of African Americans, and 11 percent of Hispanics.

Although the presence of persons of color in science and engineering, including in the SBE sciences, has increased in recent decades, the absolute numbers and proportions are still quite small.[40] For most minority groups, there is both underrepresentation and attrition in these fields. The one exception is Asian Americans and Asian permanent residents who in 2000 constituted 3.6 percent of the U.S. population and 8.9 percent and 10.0 percent of those receiving bachelor's and doctorate degrees.[41] For other minority groups, the picture looks as follows: In 2000, African Americans earned 8.3 percent, Hispanics 7.2 percent, and Native Americans 0.7 percent of bachelor's degrees in science and engineering and an even lower proportion of doctorate degrees (African Americans earned 4.2 percent; Hispanics, 4.3 percent; and Native Americans, 0.5 percent of all PhDs). Focusing only on the SBE sciences as a subgroup, the drop off is much the same: At the bachelor's level, 9.8 percent and 7.9 percent of the degrees were, respectively, earned by African Americans and Hispanics in comparison to African Americans and Hispanics earning only 6.4 and 5.2 percent, respectively, of all SBE doctorate degrees.[42]

In comparison to other fields of science, the SBE sciences have over time made more progress in attracting, retaining, and granting degrees to historically underrepresented minorities (African Americans, Hispanics, and Native Americans), especially African Americans. At the bachelor's,

[38] American Council on Education, *Investing in People: Developing All of America's Talent on Campus and in the Workplace* (Business-Higher Education Forum) (Washington, DC: American Council on Education, 2002), p. 13.
[39] Felice J. Levine, Havidan Rodriguez, Carla B. Howery, and Alfonso R. Latoni-Rodriguez, *Promoting Diversity and Excellence in Higher Education through Department Change* (Washington, DC: American Sociological Association, 2002), p. 6.
[40] Faculty of color and women are also underrepresented at institutions producing most of the PhDs and receiving most of the R&D funds.
[41] The natural and physical sciences and engineering confer larger proportions of degrees to Asians than to other minority groups. In 2000, Asian citizens and permanent residents earned 5.2 percent of the doctorates in the SBE sciences in comparison to their earning 11.2 percent and 17.1 percent of the doctorates in the natural and physical sciences and engineering, respectively.
[42] National Science Foundation, Division of Science Resources Statistics, WebCASPAR, Survey of Earned Doctorates: Doctorate Records File-Doctorate Institutions, AY 1973-2001 (compiled by WESTAT for NSF in May 2003).

master's, and doctorate degree levels, the overall differences are modest, but stable. For example, in 2000, underrepresented minorities received 12.3 percent of the doctorates awarded in the SBE sciences in comparison to their only receiving 7.2 percent and 6.3 percent of the doctorates in natural and physical science and engineering, respectively.[43] Even for the SBE sciences, however, the overall numbers are small and well below the presence of underrepresented minorities in the general population or the need for this scientific talent pool to sustain SBE research and education.

Better recruitment and retention of women is also needed at the doctorate degree level in the SBE sciences, especially in certain fields and subfields. As in science and engineering generally,[44] women earn more than half of all bachelor's degrees in the SBE sciences, but they earn lower proportions of doctoral degrees. In disciplines such as geography, sociology, psychology, and anthropology, women earn more than half of the doctorates, but in economics and political science, women are underrepresented. In 2000, 27 percent of doctorates in economics and 37 percent of those in political science were conferred on women. These proportions are somewhat greater than in the physical sciences but less than in the biological sciences.[45] Within subfields, considerable variation also exists. In psychology, for example, women are much more likely to receive PhDs in developmental, school, or clinical psychology than in experimental or cognitive psychology.

Impediments and Challenges

Currently there is a gap between aspiration and implementation in achieving more inclusive education in the SBE sciences, with challenges and impediments varying at different levels of education. At the K-12 level, for example, the challenge is to craft and institute SBE programs that reach out to diverse students and prepare teachers for a sector of education where the SBE sciences have had only minimal presence. The initiatives outlined in the K-12 section of this report should be directed explicitly to persons of color, to men and women, and to recent and more experienced scholars to attract them to the challenge of conveying SBE education to children and youth in ways appropriate to their developmental levels. The challenge for postdoctoral and early career preparation is also formidable, more because of the absence of funding than the absence of testable models. While intentional programs for underrepresented minorities do not exist in great numbers, a number of available strategies seem promising for the SBE sciences.

Despite examples of innovation, higher education in the SBE sciences requires reinvention to realize the goal of achieving excellence and inclusiveness for all. Some of the strategies considered previously with respect to undergraduate and graduate education and the

[43] Ibid.

[44] Overall 36.2 percent of women earn doctorate degrees in science and engineering—markedly less than the 50.4 percent of all bachelor's degrees awarded to women. Commission on Professionals in Science and Technology, Professional Women & Minorities (Washington, DC: Commission on Professionals in Science and Technology, 2002), p. 53 [Retrieved from http://www.cpst.org/pwmchap.cfm on January 3, 2004.]

[45] American Sociological Association. Table on Percentage of Doctorate Degrees Earned by Women in Selected Disciplines, 1966-2001. [Retrieved from http://www.asanet.org/research/docsocscigen.html on January 4, 2004.]

recommended components of an action plan could ameliorate some of the most serious obstacles to the education of underrepresented minorities and women. Challenges range from the very structure of the curriculum, ad hoc versus department-wide opportunities and planning, and the amount of faculty time devoted to mentoring and advising, to outreach strategies, admissions criteria, the fit between pedagogy and learning styles, and the amount of student exposure to research training. In addition, there is a need for greater attention to diverse work sector opportunities and to student aspirations and goals. Absent incentives to change and a culture that supports it, faculties and departments can be passive or resistant—seeing change more as taking on new tasks than as transforming old ones.

The programs and transformations that would facilitate the development and training of students and early career professionals of color are similar to those that more generally seem to engender professional growth and development. Any differences are more of degree than of kind. Foremost among the needs are more financial support, better mentoring and guidance throughout the education process, improved training in the conduct of SBE sciences, and greater access to professional information and networks. Capacity building in quality and quantity is needed across the SBE sciences, but the need for increased numbers of underrepresented minorities to contribute to the social, behavioral, and economic sciences is especially acute. For underrepresented minorities in particular, challenges appear at the earliest steps on the path to career development and persist beyond doctoral training. Some that warrant special emphasis include:

First, at the K-12 level, substantial disparities exist among school systems in access to materials and human resources. SBE science courses are rare even in secondary schools. For example, when Advanced Placement courses are present, they are more likely to be in schools where there are many other AP courses in science. There are also serious challenges to attracting teachers well trained in SBE sciences to K-12 teaching, given that science in these fields is less frequently taught by SBE-trained scientists than in other science and engineering fields. With fewer teachers trained in SBE sciences in K-12 education and a low proportion of persons of color pursuing advanced degrees in SBE fields, the probability of having teachers well tutored in their fields serve as positive role models and mentors for students of color is further diminished.

Second, insufficient attention has been paid to faculty development and capacity building in the SBE sciences in Historically Black Colleges or Universities (HBCUs) and other minority serving institutions.[46] In science generally, but far less so in the SBE sciences, HBCUs have been important pathways into graduate training. Approximately 40 percent or more of bachelor's degrees in the life, mathematical, and physical sciences earned by African Americans were conferred by HBCUs while only about 20 percent of the social science bachelor's degrees were

[46] An examination of the participation of HBCU faculty in NSF-funded research in the social, behavioral, and economic sciences is reported in Gregory N. Price, "National Science Foundation-sponsored Basic Social Science Research at Historically Black Colleges and Universities: Assessment and Implications" (Paper delivered at the 2004 Annual Convention of the Allied Social Science Associations, San Diego, CA, January 2004).

earned at HBCUs. Given the critical role of HBCUs in doctoral degree production,[47] there is need to work with and strengthen the research and student-support infrastructure of SBE departments at these institutions.[48]

Third, targeted outreach efforts need to be mounted at all levels of education in the SBE sciences to attract students of diverse backgrounds and aspirations. Outreach to high school students could include summer internship programs, assistance with college applications and SAT preparation, or other strategies that could make the college experience in SBE sciences attractive and attainable. Similarly outreach to HBCUs, community colleges with highly diverse student bodies, and other minority serving institutions is needed to engage students with the rewards of graduate education and training as well as career opportunities. Given the large number of students of color in community colleges, these institutions like the HBCUs are ripe for both faculty development and student training in the SBE sciences.

Fourth, is the challenge of broadening the criteria for admissions to college and to graduate school. Barriers to using broader admissions criteria include institutional inertia, confusion about options, and concerns that alternatives will be no better and will take more time. The submission of portfolios by those applying to programs, the weighting of research and other related work experience, an emphasis on written work (including personal statements), and the examination of grades to identify areas of strength and progress over time can be used to complement or even substitute for standardized tests.

Fifth, faculty members bring limited experience in working as a group on department-wide activities. While there are overall benefits to embracing collective goals, it is particularly important on issues of diversity. How this is done will vary. There is no one-size-fits all solution; disciplines and fields differ depending on institutional culture and mission. Departments can leverage their human and financial resources if they work more systemically on strategies and plans. Changing the entrenched culture and a traditional reward system that has emphasized autonomous accomplishment requires long-term, sustainable effort.

Sixth, effective mentoring and guidance are far too often absent for persons of color and women as SBE students, early career faculty, and mid-career scientists. Limited guidance, information, and support (e.g., on how to map careers, what to study, how to negotiate graduate school, how to land first jobs, and how to prepare proposals and publish) can affect career productivity. In many SBE undergraduate and graduate programs, mentoring relationships are generally left to chance, with current reward structures providing few incentives for improved mentoring. Guidance, feedback, and supervision on substantive work; help in navigating learning environments; support in making transitions (e.g., from non-research institutions to graduate school); advice on

[47] Eleanor L. Babco, *Trends in African American and Native Participation in STEM Higher Education* (Washington, DC: Commission of Professionals in Science and Technology, 2003).

[48] Federally financed R&D expenditures at HBCUs in the social and behavioral sciences are extremely small in comparison to the natural and physical sciences and engineering. Over the past ten years, it is about five percent of the total federally financed R&D expenditures. See National Science Foundation/Division of Science Resources Statistics, WebCASPAR, Survey of Scientific and Engineering Expenditures at Universities and Colleges: R5/6/2003 Expenditures, FY 1973-2000.

balancing education, career, and family; and help in building networks of contacts are essential to professional growth and development, but are rarely provided with enough intentionality to students and junior scholars.

Seventh, glass ceilings persist for persons of color and women in all science and engineering specialties whether in the academy, government, research institutions, or industry. This pattern holds true across the SBE disciplines. An NSF Program like ADVANCE seeks to address organizational constraints through its Leadership and Institutional Transformation Awards. The fuller inclusion of the SBE sciences in such funding initiatives could yield better knowledge and models for change.

Best Practices

A variety of successful programs have been established that recruit minority students; provide them with financial support through stipends and other means; expand their opportunities through mentoring, networking, and other direct methods of training; and in general provide guidance and encouragement at the undergraduate level, through graduate education, and into productive careers.[49] In addition, innovative programs have been established that produce systemic changes in departments and other organizational units, thus improving the quality of education for all students. Some examples of these programs, often initiated by the SBE scientific societies, include:

- The American Economic Association (AEA) dedicates talent and resources to enhancing the undergraduate and graduate school experience of underrepresented minorities. With support from NSF, among others, the AEA for more than three decades has operated a summer program for undergraduates with an emphasis on minority scholars and scholarships. Under the auspices of AEA, the Department of Economics at Duke University is currently partnering with North Carolina A&T State University on this program. Also, in 1998, with leadership from the AEA's Committee on the Status of Minorities in the Economics Profession, the AEA commenced the Economics Pipeline Project that provides graduate students of color with an additional mentor to assist and advise at critical junctures throughout students' graduate careers. All participants attend a pipeline workshop each year where they have an opportunity to meet other minority students and their mentors.

- The Ralph Bunche Summer Institute (RBSI) of the American Political Science Association (APSA) is currently supported through the NSF Research Experiences for Undergraduates (REU) Program. The RBSI is a five-week, intensive program designed to simulate the graduate school experience; provide guidance and mentoring; and expand academic

[49] In addition to initiatives specific to the social, behavioral, and economic sciences, there are a number of national programs that provide support to undergraduates, including in the SBE sciences, through cooperating institutional support. For example, the Ronald McNair Postbaccalaureate Achievement Program seeks to provide research opportunities, mentoring, summer internships, tutoring, assistance in the graduate admissions process, and so forth to participants from disadvantaged backgrounds. The program involved 156 institutions. Also, the Summer Research Opportunity Program (SROP) provides 8-10 weeks of summer research experiences for approximately 500 underrepresented students at 93 universities.

opportunities for African American, Latino/Latina, and Native American students. Starting its eighteenth year, the RBSI has helped talented minority students between their junior and senior years of college prepare for graduate school. The program emphasizes statistical analysis of data, research writing, and analytic skills and addresses career development issues (e.g., preparation for the Graduate Record Examination, meetings with leading scholars). The APSA partners with Duke University in the conduct of this Institute. Participants in the program typically pursue advanced degrees, with more than 50 percent continuing in graduate training in political science.

- The Sociology Department at Texas A&M University conducts a summer training program (Research Experiences for Undergraduates Summer Institute) that operates for eight weeks with ten students. The program offers formal coursework with academic credit, participation in a research project under the supervision of a faculty mentor, a professional socialization seminar, preparation for the Graduate Record Examination, a capstone research presentation at the conclusion of the Institute, and presentation of a paper the following spring (after subsequent work at the student's home site) at the Southwestern Sociological Society meeting. The program has institutional as well as individual ambitions in addition to the specific training selected students receive. Faculty members from Texas university affiliated campuses nominate students, with the home mentor committed to providing support during the subsequent academic year. This link to Texas-area regional campuses helps contribute to the training of students more generally at these home institutions. This initiative is also made possible through NSF's REU Program.

- Both the American Sociological Association and the American Psychological Association (APA) have offered national graduate fellowship training programs for underrepresented minorities with support from the National Institutes of Health and, in particular, the National Institute of Mental Health (NIMH). For more than 30 years, these Minority Fellowship Programs (MFPs) have provided a package of support, training, and the opportunity to work with a cohort of Fellows that has produced the leading scientists of color in both disciplines and has greatly benefited the disciplines themselves. For example, launched in 1974, the APA's Minority Fellowship Program has supported more than 1,000 trainees at more than 85 different institutions—of whom more than 600 have earned doctoral degrees. About three quarters of the current applicants to the APA's MFP Program are women. The program success rate is excellent: 75 percent of participants graduate within seven years and more than 90 percent graduate within ten years. Most MFP Fellows pursue research and teaching careers. The ASA's MFP Program reports similar results.

- As noted in the Undergraduate Education chapter, the Minority Opportunities Through School Transformation (MOST) Program of the American Sociological Association was an eight-year effort designed to achieve excellence and inclusiveness in education at the department level. Over this period, the program worked intensively with 11 departments (four of which were PhD-conferring and seven of which were BA-conferring) in order to produce intentional and sustainable change. MOST achieved dramatic results. For example, in 1993-1994, only about one quarter of the courses taught in MOST departments contained diversity content compared to more than 50 percent in 2000-2001. Overall, the percent of

graduating minority majors nearly doubled during the program. By 2000-2001, 33 percent of the graduating majors were minorities, with many advancing to graduate study. Departments reported similar results for minority faculty. Although MOST was located in departments of sociology, the goal of the project was to identify strategies, best practices, and approaches to addressing barriers that could be transportable to all SBE sciences and to other fields as well.

- The History of Science Society (HSS) is also directing attention to systemic change in educating students of color. HSS is the only scholarly society with a program of activities directed to change at Historically Black Colleges and Universities (HBCUs). Working since 2003 with six HBCUs (Howard University, Morgan State University, Bennett College, Morehouse College, Spelman College, Clark Atlanta University), the HSS emphasizes partnering with HBCU faculty and administrators on building curriculum modules for teaching history of science. A key goal is also to involve undergraduates and faculty in projects on the history of science. The HSS aims both to attract faculty and students at HBCUs to the history of science as a field of inquiry and to add to the limited body of knowledge about the history of science at HBCUs.

Components of an Action Plan

Prior chapters of this report offer facets of an action plan appropriate to challenges and opportunities at each educational level. They also emphasize outreach and the importance of attracting and retaining a diverse talent pool in the SBE sciences. This chapter highlights some additional ways to focus NSF strategies and intensify efforts to foster diversity in the SBE sciences.

Expanded SBE Access to and Support for Existing Diversity Programs

1. Special Attention to Inclusion of the SBE Sciences in Programs within the Division of Human Resource Development (HRD) should attract more students of color and promote the professional development of faculty in the SBE sciences:

- **The Louis Stokes Alliance for Minority Participation (LSAMP)** develops long-term, comprehensive strategies to strengthen the preparation of minority students and increase the number who successfully complete baccalaureates in STEM (science, technology, engineering, and mathematics) fields. The Program envisions partnerships that could capitalize on the experience of professional associations in the SBE sciences and draw on research and non-profit organizations as well as majority and minority serving academic institutions. With LSAMP emphasizing the progression of baccalaureate students through graduate careers, SBE proposals that create academic partnerships with other SBE organizations and institutions (including government agencies) could be extremely helpful in attracting students to SBE doctoral training.

- **Centers of Research Excellence in Science and Technology (CREST)** that focus on or explicitly include the SBE sciences should be nurtured and promoted by the Directorate for Education and Human Resources and the Directorate for Social, Behavioral and Economic Sciences. CREST provides substantial resources to upgrade the capabilities of the most

research-productive institutions that serve minorities. Awards that establish or improve SBE research centers at minority serving institutions (through, for example, laboratories, state of the art software and hardware, access to and training at such research or data centers as the Inter-university Consortium for Political and Social Research) should enhance research by scholars, encourage retention of strong scholar-teachers, and advance teaching and training at these institutions.

- **The Historically Black Colleges and Universities Undergraduate Program (HBCU-UP)** seeks to enhance the quality of undergraduate science, technology, engineering, and mathematics education at HBCUs. With an emphasis on instruction and curriculum, HBCU-UP aims to improve access to and retention in science. Similarly, **the Tribal Colleges and Universities Program (TCUP)** is designed to enhance the quality of science, technology, engineering, and mathematics education with emphasis on the leveraged use of information technologies at tribal colleges and universities, and at institutions that serve Alaskan Natives and Hawaiian Natives. Pathways to graduate training in the SBE sciences and the quality of SBE education at HBCUs and TCUs could be advanced if the SBE sciences were more fully integrated into these funding initiatives. As with other fields of science, SBE students and faculty in minority-serving institutions are an untapped talent pool for research and teaching.

- **The Alliances for Graduate Education and the Professorate (AGEP) Program** could also contribute to increasing the participation of underrepresented minorities in the SBE sciences. While there are some exemplary programs that emphasize quality mentoring and training, in the main, the SBE sciences would benefit from AGEP support, with its emphasis on innovative models of recruiting, mentoring, and retaining doctoral students and its innovative strategies for identifying and supporting underrepresented minorities. Such strategies could include coordination with LSAMP alliances and long-term collaboration on research and research training between doctoral programs and institutions that serve predominantly minority undergraduates. Explicit encouragement to institutions to include the SBE sciences in AGEP proposals and encouragement to the SBE science community to prepare AGEP proposals would strengthen the SBE sciences.

Expanded SBE participation in programs of the Human Resources Division in EHR is critical to widening and diversifying outreach in the SBE sciences. The rarity of the SBE sciences supported by these funding initiatives suggests the need for explicit language in solicitations that alerts applicants to the fact that the STEM sciences include the SBE sciences. It also suggests a need for dedicated or supplemental funding for competitive projects that develop SBE components as part of institution-wide initiatives. Program Directors in EHR and SBE are at the fore of communication with applicants and can exert effective leadership in making these possibilities known.

2. Programs Directed to Women and Girls need to include SBE Sciences. The larger proportion of women in the SBE sciences than in the STEM sciences generally does not diminish the need for initiatives to attract, train, and enable the career paths of SBE women scientists. As pointed out previously, there is considerable variation across SBE disciplines and within fields in the number of women scientists and in their roles. The HRD Program in Gender Diversity in

Science, Technology, Engineering, and Mathematics Education is ripe for projects, information dissemination, and research that focus on or include the SBE sciences. Such initiatives as MentorNet could usefully be extended to the social, behavioral, and economic sciences. More initiatives would be desirable like the University of Michigan's demonstration project on Girls Exploring Mathematics through Social Science, which strengthens middle school girls' interest in the social and behavioral sciences while simultaneously enhancing their mathematical skills. Also, NSF-wide programs such as the Advance Program should more intentionally include SBE women scientists in competitions for Fellows Awards, Leadership Awards, and Institutional Transformation Awards. More vigorous outreach, designated funds for a specific number of years to support SBE Fellows, and incentives to institutions that explicitly include the SBE sciences would yield more complete inclusion of these scientific fields.

3. The Research Experiences for Undergraduates (REU) Program has been a highly successful initiative to support projects aimed at attracting students of color to careers in the SBE sciences. Approximately 45 to 50 percent of supported students are underrepresented minorities. Many impressive REU awards have long histories of demonstrable success in realizing such gains. Allocating more resources to such programs and expanding their numbers to reach many SBE disciplines would be an effective way to increase the participation of historically underrepresented racial and ethnic minorities.[50] In economics, for example, as noted above, the undergraduate two-month summer program undertaken by AEA and supported in part with REU funds trains a substantial proportion of the students of color entering graduate programs each year. As with the AEA award, partnerships with minority-serving institutions could enhance the effectiveness and outreach of these initiatives.

4. The Integrative Graduate Education and Research Traineeship (IGERT) Program is now in its seventh year and is a potentially promising mechanism for the graduate training of underrepresented minorities in the SBE sciences. The IGERT emphasis on catalyzing cultural change in graduate education provides just the right framework for testing innovative strategies of training and mentoring for persons historically excluded from the educational system. IGERT's emphasis on interdisciplinary teams, attention to quality mentoring and building a sense of professional community, and focus on cross-cutting issues has generated engaging innovations in the SBE sciences. The explicit IGERT Program goal of training a more diverse and flexible talent pool of scientists makes it an apt means for ensuring that outreach and resources are directed to underrepresented minorities.

5. Expanded Funding for the SBE Minority Postdoctoral Research Fellowships and Support Program would help overcome the absence of a tradition of postdoctoral training in the SBE sciences. More generous funding is needed for this SBE initiative. Ten or fewer minority postdoctoral fellowships awarded each year are too few to affect the SBE disciplines. NSF may not be able to meet the full demand for postdoctoral training at the individual level, but,

[50] In some fields like education research where there is no pattern or tradition of undergraduate research training (i.e., research training occurs essentially at the doctoral level), REU-type support can make a major difference in attracting undergraduates of color and undergraduates more generally into these fields.

at the broader level of impact on the SBE sciences, an increase in the number of SBE Minority Postdoctoral Research Fellowships could provide the critical mass needed to help shape and influence these sciences.

New Opportunities and Initiatives

A great deal could be accomplished by ensuring that all existing NSF programs are open to applicants from the SBE sciences and are sufficiently funded to enhance diversity in SBE fields. In addition, new initiatives to foster diversity in the SBE sciences could further promote a more inclusive talent pool of SBE scientists. Examples include:

Collaboration of the SBE and EHR Directorates on an SBE Diversity Innovations Program. To keep pace with the diverse populations pursuing education and the challenging scientific questions being addressed, an initiative is needed to foster long-term sustainable change in how academic, degree-conferring departments, schools, or programs educate and train undergraduate and graduate students. This initiative should be open to degree granting SBE units at all colleges and universities interested in making systemic changes in educating the U.S. citizenry and workforce about the SBE sciences and in bringing more scientists into SBE fields. Proposals should aim to improve the lives of all students, but specific attention to innovations likely to meet the needs of underserved populations should be their primary focus. Summer institutes, enhanced research training, and other add-on activities could be included in any plan (and REU site or IGERT funding can be pursued), but proposals should emphasize the ways academic units would be transformed in their day-to-day operations. This program could be funded under the NSF Human and Social Dynamics Initiative. Scientific societies that seek to work with a group or cluster of departments should be eligible to apply. This initiative would complement the Systemic Reform of SBE Undergraduate Education initiative and the Graduate Education Reinvention Program proposed earlier in this report.

SBE Launch Awards Program (LAP) for Minority Scholars. The aim of this small grants initiative would be to provide underrepresented minorities with a "running" head start in doing research and building a viable research program. LAP would be directed to persons of color in order to enable their effective transition to a first project after completion of their degrees. The demands in particular on the time of junior faculty of color commend a LAP initiative. While such funding is desirable for all new faculty members, there is a critical need for the full participation of historically underrepresented minorities in SBE sciences. Heavy teaching loads, particularly at Historically Black Colleges and Universities and other minority-serving institutions, commend investments in research support. Scientists in SBE fields did not receive much funding through the former NSF *Research Planning Grants and Career Advancement Awards for Minority Scientists and Engineering.* The underlying rationale for these initiatives, however, remains compelling. For ten years, the National Institute of Mental Health has been supporting new investigators through B/START (Behavioral Science Track Award for Rapid Transition) awards at a maximum of $50,000. LAP is similar in goal.

Immediate Steps

- Ask the Committee on Equal Opportunities in Science and Engineering (CEOSE) to consider the recommendations in this report regarding diversity in the SBE sciences and the fuller inclusion of the SBE sciences in NSF programs addressed to diversity and to recommend further implementation steps, activities, and policies to advance the diversity components of this action plan.

- Clarify how NSF staff can consider the NSF goal of *Integrating Diversity into NSF Programs, Projects, and Activities* in making funding decisions. Division-wide discussion, program officer training, or guidance on how best to weigh such factors could help to further transform this NSF-stated goal from principle to practice.

- Develop an NSF incentive program that rewards academic departments, centers, and other units in the SBE sciences for achieving substantial increases in the number of underrepresented minority students, faculty, and researchers over given periods of time. Include in any such program, attention to academic units that partner across academic settings (e.g., initiatives between graduate programs and community colleges, 4-year colleges, and HBCUs).

- Fund the compilation of a *Manual of Best Practices for Recruiting and Retaining Minority Students in the Social, Behavioral, and Economic Sciences*. Identification of commonalities among effective programs in SBE disciplines and in diverse colleges and universities would be helpful in disseminating innovations to other academic units.

- Support research (following a call for proposals) on ways to achieve diversity in the SBE sciences via basic understanding of such issues as how minority and disadvantaged students decide whether to pursue post-secondary education, what affects their selection of majors and their experiences as undergraduates, and the determinants of entry and attrition in graduate school.

- Urge the American Association for the Advancement of Science (AAAS) to enhance the relevance and utility of its Minority Scientists Network to the SBE sciences. This collaboration between *Science* magazine's Next Wave Web Site and the AAAS Directorate for Education and Human Resources could have considerable value for students, scientists, faculty, and administrators in the SBE sciences.