

Science and Diversity: A Compelling National Interest

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Recent Supreme Court rulings and proposed legislative initiatives in opposition to affirmative action threaten to polarize and derail healthy discussions about the use of "group-sensitive" policies and practices to promote diversity, equal opportunity, and inclusion in education, employment, and advancement. In 1995, the Supreme Court ruled in a 5-to-4 decision that governments must demonstrate a compelling interest to warrant set-aside contract programs. That is, government must show exacting proof of past discrimination or have the remediating program struck down. In the aftermath of the Supreme Court decision in *Adarand Constructors, Inc. v. Peña*, No. 93-1841, President Clinton requested a review by all agencies and departments of the federal government of programs that contain race- and gender-conscious provisions (1). In 1995, Senator Robert Dole requested a compilation by the Congressional Research Service of any laws, regulations, or executive orders that appear to prefer or consider race, gender, or ethnicity as factors in federal employment or the allocation of federal contracts or grants (2). He later offered legislation (S. 1085) as a complement to a House bill (H.R. 2128) to end activities that relied on so-called preferential treatment in the aforementioned areas.

Because of special efforts that have been made to increase the participation of women and minorities in science and engineering, like it or not, these communities have been drawn into this debate. In the spirit of rational debate, we need to examine the social history that brought about the laws and regulations that are now under scrutiny and attack; to explore their intent and impact in science, engineering, and science-based fields; to assess the current status of the targeted groups; and to suggest future actions that compel a more diverse and inclusive science and engineering community.

Affirmative action has no clear and widely accepted definition. It has emerged as a piecemeal collection of laws and executive orders accumulated over a period of more than 50 years. Affirmative action was created as a way of responding to policies and practices that historically supported

discrimination, in order to remove structures that kept unequal access in place (2, 3). It included such practices as notifying women's and minority groups about job openings, advertising openings rather than relying on word of mouth, developing recruitment procedures, promoting a more open process aimed at women and minorities as well as other qualified applicants, and providing equal opportunities for advancement. Over the 1960s, presidential executive orders became more emphatic as the situation of women and minorities changed very little; these orders moved from encouraging inclusion to insisting on it for those who would do business with the federal government. The executive order by President Nixon required that an affirmative action plan that included numerical goals and timetables be developed. Affirmative action certainly never required the hiring of unqualified persons. Instead, it allowed race or gender (or both) to be considered when looking among candidates who were otherwise comparably qualified when judged by previously determined job-related criteria. (1, 4)

The process of goal setting began with an analysis of the potential applicant pool from which the employer could draw. The increasing number of women graduating with degrees in the sciences and engineering since the mid-1970s has swelled the pool of available candidates in many fields. Thus, for women in science the problem has largely been one of "letting us in" rather than a shortage of qualified candidates. For minority women, both sets of constraining forces have interacted.

The system of job search became fairer to everyone as a consequence of affirmative action. For example, in the mid-1960s it was typical for there to be only one or two pages of classified advertisements for job positions in *Science*. By the mid-1970s, there were two to three times as many personnel listings. *Science*, being widely read, provided a way for universities and businesses to reach more people and to satisfy affirmative action and equal employment opportunity requirements. The effect was positive for all job seekers and for the health of the scientific enterprise. Although it is also true that the overall number of faculty in science and engineering likely increased during this time because of the expansion of federal support for R&D

and increased numbers of students as the Baby Boom generation entered college, Rossiter (5) has documented the earlier use of "informal" recruitment mechanisms that for many years served to exclude women.

Minorities' access to the powerful institutions of society was limited by a lack of education and contacts that could only be addressed by ensuring those groups' access to quality education and to the most distinguished programs. But separate and unequal conditions made this difficult for many (6, 7). Jim Crow was not just a product of 1940s and 1950s America. As a student, I attended schools segregated by law. When I graduated from George Washington Carver High School in Birmingham, Alabama, in 1963, attendance at my state's flagship research university was not a viable option open to me.

Women's colleges and minority institutions have provided supportive environments for student participation in the sciences and engineering. Traditionally black institutions have historically made a disproportionate contribution to science degrees awarded to African American students. In 1991, 48% of bachelor's degrees in the physical sciences were awarded to African Americans by historically black colleges and universities (HBCUs). HBCUs awarded 46% of all degrees in mathematics, but only 28% of all bachelor's degrees to African American students (7).

In the case of science and engineering, special programs and targeted efforts were often developed to enhance educational opportunities and to introduce underparticipating groups to science and engineering careers and provide them with experiences to encourage and support involvement in fields where there was a weak history of participation (8). Industry led the effort to increase the participation of minorities in engineering education, driven initially by affirmative action requirements that applied to federal contractors. Building on grassroots efforts since the early 1970s, programs for precollege intervention, undergraduate retention and scholarships, and graduate education now work more or less seamlessly in a national engineering initiative. Businesses have continued to participate in these efforts and to promote efforts to bring women into engineering because they see that such activity is good for business (2).

The focus of the Professional Development Program (PDP) of the University of California at Berkeley, established in response to affirmative action requirements, extended from precollege education through faculty advancement concerns. Components emerging from the PDP experience, such as Uri Treisman's calculus program (9), have received wide acclaim as being effective in supporting minority student success. Not sur-

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prisingly, the strategies employed in PDP (smaller classes, focused group work, challenging assignments, tutoring assistance, and expectations of success) are found to work for majority students as well (10).

Those who were already well credentialed and well prepared needed different policy remedies that focused on participation and advancement, because for them there was a history of systematic exclusion and denial of opportunity. HBCUs offered the only opportunity for academic employment for black scientists for many years. In 1941, a survey of predominantly white colleges and universities revealed only two black faculty, both in nonteaching laboratory positions. With the exception of women's colleges and minority institutions, blacks and women continued to be underrepresented on the faculty of colleges and universities through the late 1980s (6).

Industry was not much better as an employer in pre-affirmative action America. Women were largely invisible in industrial science and technology. Where present, they were relegated to stereotypical roles with limited potential for upward mobility (11, 12). African Americans and women were not the only groups that faced discrimination and denial of opportunity within the sciences. American Indians and Latinos also faced barriers that denied them access to education, employment, and advancement.

It was conditions such as these that led to passage of laws (variously referred to as civil rights, equal employment opportunity, or anti-discrimination and affirmative action requirements) that seek to address the range of problems faced by groups attempting to join the mainstream of U.S. life and the U.S. economy. In covering educational institutions and employment generally, these laws do affect science and engineering. In addition, the Equal Opportunity in Science and Engineering Act of 1980 (Title 42 of U.S. Code § 1885-1885d) specifically directs the National Science Foundation (NSF) to undertake programs to increase participation by underrepresented groups and to promote the advancement by these

groups in science and engineering fields. Although NSF was given considerable latitude in developing programs to accomplish these goals, it must do so while balancing legislative intent and judicial decision, to design efforts that are effective in addressing the targeted groups and capable of withstanding tests of "strict scrutiny" and "narrow tailoring."

The policy changes, especially those of the past 25 years, have made a difference. New laws, court rulings, shifting attitudes, and special initiatives resulted in changes in the general and the scientific community. Women's participation in education and careers in science and engineering shot upward, although it did more in some fields (such as psychology) than in others (such as physics). Once the quotas setting the maximum numbers of women that medical school programs would accept were removed, these numbers also exploded (Fig. 1). Minorities also increased their participation in medicine, although the increases have been much more modest. However, research suggests that minority physicians make a disproportionate contribution to the health care of poor and minority populations (13). In view of the compelling national need to address the dire health conditions that afflict these groups (14), I would argue strongly that a targeted effort to increase participation is in all our best interests.

Doctorate attainment is increasing, but problems still exist. The science and engineering faculties of our major research universities remain overwhelmingly white and male; and women are overrepresented among the part-time, nontenure-track faculty and underrepresented among full professors. Our industries, universities, hospitals, law firms, and financial institutions still have glass ceilings—residual effects of our history of exclusion. When field, rank, sector of employment, and years of experience are held constant, women still earn less than their male counterparts (7). Minority doctoral attainment still remains below the levels needed in different sectors of society, as evidenced by the 949 Ph.D.'s awarded in

science and engineering in 1994 to African American, American Indian, and Latino citizens (7, 15). These numbers are hardly sufficient to meet the demands of higher education institutions in search of diverse faculty to serve their increasingly diverse student populations; of industry, which has come to recognize the marketplace value of diversity when competing in a global environment; of science, which must serve the needs of a pluralistic society; or of a country in a continual quest to realize its democratic ideals.

Critics of affirmative action and of special and targeted programs claim that these strategies have outlived their usefulness, or that they have done their job, or that they have been ineffective, depending on the situations and populations being discussed. Many individuals, although sympathetic to affirmative action, argue that actions to increase categorical participation are inappropriate in a time when so many individuals in science and engineering are unemployed or underemployed. Others complain that such programs discriminate, claiming that programs that address wrongs they themselves did not commit are unfair.

Individual court cases are replete with imperfectly developed program responses to the goals of affirmative action (4). Overly mechanistic and unnuanced responses have produced problems, for example, when women or minorities were added to the pool to "satisfy the numbers," when good faith was not employed, or when a "token" individual was brought on board. There has also been less than vigorous enforcement of laws and executive orders. I contend that failures in implementation are not to be confused with the worth and value of policy. The complex challenges that science and engineering face require that the full range of human resources, education, and literacy concerns be addressed. Special targeted programs need to remain a part of human resources policy for some time to come, as mainstream programs do not yet serve our aims of excellence and diversity (16). However, they must be coupled with strategies that lead to structural changes that make

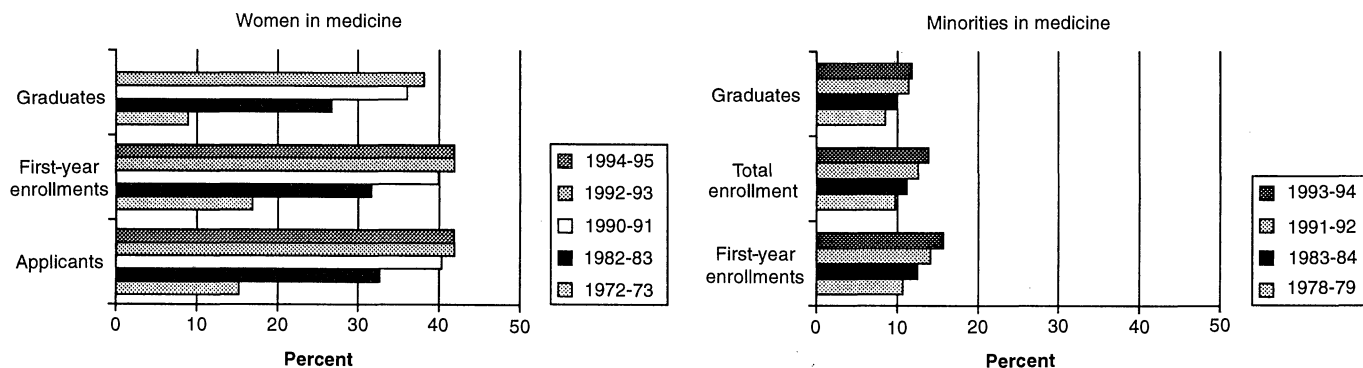


Fig. 1. Participation in medicine by women and minorities during the post-affirmative action decades (2).

targeting unnecessary rather than just unpopular or impolitic.

Structural change in higher education would involve such measures as stronger emphasis on improvement of introductory-level courses, promoting interactions with science and engineering professionals, promoting student success rather than student selection, addressing the needs of students for career advice and mentoring, and providing opportunities for students to do research as undergraduates and to see the connections between science and technology and the needs of their community and the larger society (17). Structural change would also entail better integration of research and education in our universities. Policy-makers can support such integration by including and using criteria that recognize the value of human resource development along with the quality of the ideas and researchers, especially in support of major research centers. An exciting program at the University of Maryland in Baltimore County described in an earlier special issue of *Science* (18) shows how thoughtful experimentation can lead to a program that supports excellence and diversity with a growth of overall institutional quality. We need more efforts by more institutions to show the various ways to support this compelling national interest (19).

As employers, universities and industries must be sensitive to the need to assist faculty and staff in addressing their personal as well as professional needs (such as childcare, elder care, relocation, and spouse employment, as well as lab space and access to equipment) (20). They need to be sensitive to the kind of workplace climate that is created, the types of activities that are rewarded as core contributions to the mission of the institution, and the extent to which the system of rewards is made clear to all who must live under it.

The mood of the Congress, state legislatures, and state boards makes us aware that challenges to special programs are immi-

nent. A struggle is currently under way in the University of California system to alter the rules governing the use of affirmative action in admissions and employment that will likely spread to other public institutions in other states. For program implementers a new urgency exists to reexamine what we are doing. We must revisit, review, and revise, when necessary, special programs to promote fairness and inclusion.

Some institutions, sensing the mood in the country, may choose to "preemptively close" their special programs. Some employers, unwilling to be honest with applicants about their capabilities and skills, will use affirmative action as a convenient excuse to explain hiring or promotion decisions. Other institutions, understanding history, looking toward the future, and possessing a commitment to realize science's uncommon values of openness, quality, and inclusion, will work toward building the kind of community that supports and affirms participation from the entire pool of talent. These institutions and their leaders will reexamine the incentives set out for their managers, executives, and faculty. They will seek to define and develop the range of skills and capabilities they need in their work force. They will look at their departments, programs, projects, and classrooms to see not only who is there but also who isn't. They will remove the psychological, physical, and policy barriers to participation. They will do this not for the benefit of any particular group, nor because of laws and policies that either require or forbid certain actions; but to ensure the future health of science and engineering in the United States.

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