Minorities at Majority Institutions

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The National Institutes of Health have pioneered support of minority undergraduate research experiences at minority institutions through the Minority Access to Research Careers (MARC) and Minority Biomedical Research Support (MBRS) programs. Since the inception of these programs in the early 1970s, many African American, Hispanic American, Native American, and Pacific Island students have gone on to graduate and professional programs in higher education. It is generally accepted that the NIH-supported MARC and MBRS programs have been a major factor in stimulating the research interest in these students and thus have provided a base for the small (but dwindling) pool of minority scientists. These programs as currently constructed, however, are not enough. Our nation must find innovative ways of reaching more minority students, at early ages, with better program continuity.

The underrepresentation of minorities in the sciences and engineering is well documented. We must now move to link discussion of a problem with programs that will encourage career choices in science. We need to expand the MARC and MBRS concept nationally, generally to stimulate minority students' interest in academic careers, and specifically to include a component at majority institutions to cultivate minority undergraduates' interest in research. We must also engender a broader commitment to mentoring minority students at majority institutions by expanding current and implementing new programs.

Data from a number of sources (*1–3*) show that blacks and other minorities are woefully underrepresented among the pool of U.S. doctoral degree holders in the biomedical sciences. Three-quarters of all doctorates earned by blacks are in education and the social sciences. James M. Jay has found that during the decade 1975 to 1984, only 612 Ph.D.'s were awarded to blacks in life, health, and medical sciences (*4*), while during the same decade, the total number of doctoral degrees awarded in these fields was well over 60,000. In 1985, blacks received only 21 life science doctoral degrees: 6 in biochemistry, 1 in cell biology, 5 in microbiology, 8 in pharmacology, and 1 in the neurosciences. Moreover, from 1978 to 1988, the total doctoral degrees in the United States increased 7.9% according to the American Council on Education. Over the same time course, the number of African American doctoral degrees declined 22.1%, with African American males experiencing an alarming 46.7% decline. By comparison, Hispanic American and Asian American doctoral degree holders increased 133.3 and 24.5%, respectively (*1*).

An Education Commission of the States report (*5*) highlights the lack of progress in establishing an educational pipeline for minorities in the scientific professions. Among the report's findings are the following compelling data. (i) The African, Hispanic, and Asian American populations are growing, and by the year 2025 are expected to make up 40% of the college-age population (18- to 24-year-olds). (ii) College participation rates among black college-age youth peaked between 1974 and 1976 and have since declined. (iii) The number of blacks in graduate school has dropped 19.2% between 1977 and 1985.

The Department of Education's Center for Statistics reports that black students made up 4.7% of graduate school enrollments in 1984, down from 6% in 1976. During that same period, the proportion of Hispanic American students rose from 1.8 to 2.2%, and the proportion of Asian American students went from 1.7 to 2.6%. Fifty-one percent of all doctoral degrees awarded to blacks were in education. The total number (805) of doctoral degrees awarded is significantly lower when compared to the 850 doctor of medicine degrees awarded to blacks (*6, 7*).

In 1985 the percentage of full-time black faculty in all fields was only 4.0%, down from 4.4% in 1977 (*8*). Further, half of all black faculty are at historically black colleges and universities (HBCUs). Given that fact, the percentage of black faculty in all fields, including education, at major doctoral granting research universities, is quite small. Moreover, the American Council on Education (*9*) reported that between 1977 and 1983, the number of black full-time faculty dropped from 19,674 to 18,827, whereas the number of white faculty increased 5% to 473,787.

The dynamics of graduate and professional education for minorities have as its most direct underpinning the counseling, guidance, and mentoring of minority undergraduates. For those minority students who do make it to undergraduate school, a major proportion of these individuals are somehow turned off to graduate education. One contributing factor is the lack of interest exhibited by many active Ph.D. researchers in the counseling, development, and long-term placement of these and other undergraduate science majors. Indeed, a recent 4-year study of biology undergraduate majors at Brown University indicated that less than 10% of these graduates matriculated into science graduate programs 1 year after

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graduation (*10*). Given the historic changes in minority student enrollment in majority institutions since the late 1950s and early 1960s, majority 4-year colleges and universities in the United States now enroll approximately 82% of all black undergraduates. HBCU graduates, however, represent 32% of all blacks earning science and engineering Ph.D.'s, 34% of physical science Ph.D.'s, 36% of math Ph.D.'s, and 33% of computer science Ph.D.'s (*11*). A greater proportion of the minority science majors at HBCUs tend to go on to graduate programs versus their counterparts at majority institutions. In searching for possible reasons for the apparent discrepancy, there are two differences that may contribute to the lower than expected graduate school matriculation of minority undergraduates at majority campuses relative to their HBCU counterparts.

In the early 1970s, the NIH instituted the MBRS program in the Division of Research Resources and later the MARC program in the National Institute of General Medical Sciences at HBCUs. More recently these programs have been successfully operating at campuses with large minority undergraduate student enrollment but where most of the faculty are not mentors from underrepresented groups. In the past 17 years, hundreds of minority students from these programs have gone on to graduate and professional schools. The second advantage of the program has been the mentoring relationship provided by faculty sponsors. These faculty members have developed mentor-student relationships that have encouraged students, assisted them in career choices, and been directly involved in their placement to top graduate and professional programs. For the most part, such extensive relationships are totally absent for minority students who are science majors or aspiring science majors at predominantly majority campuses.

Mentoring is an informal but crucial system that provides individuals with support and guidance during their graduate training and serves as an additional support source once they become academicians. Mentors often play a considerable role in career development. Long (*12*) has reported that individuals who had mentors are more productive in their careers, and Roche (*13*) observed that they are promoted more quickly. The importance of mentoring in promoting professional success has been clearly acknowledged (*14–16*). Indeed, some universities have attempted to formally institute protégé-mentoring relationships between junior and senior faculty (*6*). The lack of such a relationship can severely hamper professional development. Many black and other minority faculty have not experienced the advantage of true protégé-mentor relationship. Blackwell (*17, 18*) reported that only one in eight black Ph.D. recipients had the benefit of a true mentor during graduate school. Black doctoral recipients have had advisors at the dissertation stage, of course, but there have been relatively few opportunities to form protégé-mentor relationships with individuals well established in the academic community.

The crucial period for undergraduates interested in science are the freshmen and sophomore years. This is the time when career choices are made. Also, at this stage, the mentoring relationship is particularly important. Because the minority faculty pool in the sciences is woefully inadequate, we must do the following: (i) find methods to motivate minority student undergraduates at majority schools that have no network and mentoring environment from which they may broaden career options, particularly in the sciences; (ii) explore ways of involving nonminority scientists at majority institutions in mentoring minority science undergraduate majors; and (iii) train more minority students at the doctoral level in the sciences. The most likely solution is to create an extension to the current MARC and MBRS programs specifically for minority undergraduate research support (MURS) at majority colleges and universities. Such a program should receive additional budgetary appropriation and should not to be developed at the expense of the current MARC and MBRS programs at HBCUs. The goals of a new program would be the same as those of the current MARC and MBRS programs in seeking to stimulate research interest in minority undergraduates and encourage the development of better minority student-faculty mentoring relationships. One such small initiative has been established as a new program at the National Science Foundation called Research Careers for Minority Scholars (RCMS). Currently there is some $1.5 million budgeted for this program. We urge an expansion of this program in dollars and areas of academic support. The operational model can make use of existing MARC, MBRS, and RCMS student research programs.

We would suggest that the responsible program director for the proposed MURS program at majority institutions be the Dean of Arts and Sciences (or equivalent) in a division or school of the institution in which the natural and physical sciences are situated. The fields of undergraduate study would include biology, chemistry, physics, and mathematics. Mentors or investigators (minority and majority) for the program would submit for approval student research projects. Each funded program would have a coordinator who is a scientist and program investigator. Funding would be somewhat similar, but modified as currently set up for the MARC and MBRS programs. Each minority student approved through a divisional admissions committee would be assigned to a faculty sponsor or mentor and provided a stipend of $4200 per year, 25% of the college or university tuition (up to a maximum of $3000), a supply budget of $2000 allocated to the faculty mentor, and travel budget of $800. A small publication budget ($300) could be made available to, in part, defray student-related illustration and publication costs. We would also suggest a national indirect cost rate per institution of 65% to standardize institutional awards. To initiate such a program, it is estimated that $4 to $5 million in new start-up funds would be required. The initial phase of the program might target some 50 majority colleges and universities.

Before such a program is implemented, it is important to define specific areas that will be used to obtain data to evaluate the program. These data can also be used to gauge the impact on career choices and ultimately the pool of minority students who might go on to graduate and professional careers in science. The menu of questions for program evaluation are numerous. A short list of some of the most important parameters should focus on the following categories of information for undergraduate program participants: What is the student's race and undergraduate major? Did the student go on to an M.D., a Ph.D., or an M.D./Ph.D. program? What were the career choices before and after the program? What is the student's postbaccalaureate field of study? What was the role of the research advisor in career choices? What is the gender of the research advisor? How many male versus female students by institution go on to graduate education in the sciences? Is the institution research oriented or mainly liberal arts oriented? Were the research advisors mentored? What is the age of the mentor? Are the mentors heavily involved in teaching?

For the long term it will also be necessary to track these students beyond their choices of graduate or other careers. We would suggest follow-up studies to obtain information on postgraduate choice, job location, external funding success, promotion rate, and professional development.

A critical issue at majority institutions has been the lack of research training support for minority undergraduates. Minority students attending these institutions are an underdeveloped resource. Within the next 10 years large numbers of faculty at U.S. colleges and university will retire. Additional funds should be targeted at minority students attending majority institutions to increase the future pool of competitive scientists and engineers from which the underrepresented faculty pool will be attracted to our

nation's colleges and universities. At stake is the quality of science and engineering in the United States and our need to nurture and cultivate our diverse human resources for this country's future.

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