

Northeast Fisheries Science Center Reference Document 96-08

**Expanding Opportunities in Ocean Sciences:
Strengthening the Links
between HBMSCU Undergraduates
and Oceanic Graduate Studies**
*Proceedings of a Conference: 11-12 September 1995,
Hampton University, Hampton, Virginia*

compiled and edited by

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**U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Region
Northeast Fisheries Science Center
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Dedicated to

Ronald H. Brown

Secretary of the Department of Commerce

(1993 - 1996)

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FOREWORD

This *Report of Conference Proceedings* endeavors to provide a clear and objective account of the conference, *Expanding Opportunities in Ocean Sciences: A Conference to Strengthen the Links Between HBMSCU Undergraduates and Oceanic Graduate Studies*. The conference was held on the Hampton University campus in Hampton, Virginia September 11 and 12, 1995. The event was hosted by the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service and co-sponsored by the National Association of State Universities and Land Grant Colleges (NASULGC), the Southern Association of Marine Laboratories (SAML), the American Society of Limnology and Oceanography (ASLO), The Oceanographic Society (TOS), and the National Association of Marine Laboratories (NAML). This conference was a significant event, at least in part because of the degree of motivation of attendees, the cooperation of its sponsors, and the array of pragmatic recommendations generated. Eighty-six individuals from state and private, majority and minority colleges and universities, government agencies, and other Ocean Sciences institutions participated in the conference.

In commissioning this document, the Conference Steering Committee recognizes that there were many students and faculty interested in strengthening the links between historically black and minority serving colleges and universities (HBMSCUs) and Oceanic marine graduates studies who were not able to attend. It is understandable that they have a sincere interest in knowing the outcome of the conference.

This document may also serve as a resource for policy makers in education and employment, educators at all levels, historians, and other parties interested in the current situation of minorities in marine studies and the recommendations of this conference aimed at increasing minority graduate study and employment in such fields. Many of the issues and recommendations raised at the conference reflect the broader concerns of historically minority colleges and universities and their potential role in introducing students to non-traditional fields of employment. Thus there are applications for this document that extend beyond its reporting of this conference.

The participants generated substantive and far reaching discussions. While a detailed reporting and analysis of this discussion is presented in the body of this report, it is useful here to highlight the themes and concerns that were raised most frequently.

The Need for Communication

between majority and minority institution faculties, among students, faculty, administrators, and business leaders, on the Internet and through computer user groups, and most importantly, in one-to-one interactions.

The Need for Collaboration

among members of federal agencies, faculty at both HBMSCUs and majority institutions, students, and administrators and educators involved in minority support and Ocean Sciences.

The Need for Increasing the Visibility of the Ocean Sciences

particularly among minority populations, including K-12 teachers.

The Need for Support, Retention, and Follow-through

when encouraging minority students to choose Ocean Sciences.

The need for large research majority institutions to improve their success of educating and training underrepresented minority students by enlarging the pool of these students through more effective recruitment. Recruitment efforts can be improved by ensuring the quality of the “messenger” and of the “message.” Effective messengers can range from students to faculty to administrators but all need to be articulate speakers, well versed in the Ocean Sciences, convinced of the need to increase the number of underrepresented minorities completing graduate school, and willing to assume the responsibility needed to attract, support, and retain minority students.

The Need for Continuity and Sustainability

of efforts, e.g. subsequent conferences on a bi-annual basis.

The need to address what students can expect as they leave undergraduate departments to enter multi-disciplinary schools of marine science and oceanography. What can they expect once they acquire advance degrees? Will the early experiences of minority students prepare them for anticipated changes?

The need to communicate what experiences and knowledge will students need to bring to grad school and to the workplace. Therefore, what courses must they take in undergraduate and graduate school? Therefore, what courses and experiences should the HBMSCUs offer the prospective marine science scholar?

The need to address how the profession can reach out to the interested but uninformed student in the large private and state-supported majority institutions. The following narrative provides initial "new ways forward," based on retrospective evaluations of previous shortcomings in appropriate mentoring and training.

NANCY FOSTER
Deputy Assistant Administrator
for Fisheries

PREFACE

These proceedings of the conference held on the campus of Hampton University, Hampton, Virginia are emblematic of our continued efforts to increase minority involvement in the Ocean Sciences. The conference, *Expanding Opportunities in Ocean Sciences: Strengthening the Links between HBMSU Undergraduates and Oceanic Graduate Studies*, was the catalyst for bringing together for the first time government agencies from the National Oceanic and Atmospheric Administration, the National Science Foundation, the Environmental Protection Agency, and the Office of Naval Research, faculty, students, and administrators from historically black and minority serving colleges and universities and from graduate institutions with programs in the Ocean Sciences to share ideas on topics ranging from preparing students for graduate study to expanding interagency collaboration. This conference, with its emphasis on small working groups, allowed for a depth of discussion rarely possible and produced a list of constructive recommendations for all the participating parties. This is the first step to subsequent conferences, workshops and action to continue promoting diversity and equality in the workplace.

The issues addressed at the conference and the proposed recommendations are of importance to other employers, government agencies, colleges and universities, and to our society as a whole. We hope the dissemination of these proceedings will stimulate discussion, debate, and action. We also hope it will lead to progress in affirming human equality, valuing diversity, and creating an enriched world in which to live and work.

AMBROSE JEARLD, JR.
Acting Chief, Research
Planning and Coordination
Northeast Fisheries Science Center

ACKNOWLEDGEMENTS

This conference was conceived and planned under the auspices of the six organizations: the National Association of State Universities and Land Grant Colleges, the Southern Association of Marine Laboratories, the American Society of Limnology and Oceanography, The Oceanographic Society, the National Association of Marine Laboratories, and the National Marine Fisheries Service. It was hosted at Hampton University. The National Marine Fisheries Service funded the conference: its planning, costs incurred during the event, and the preparation and printing of the reports. Some participant travel costs were also supported directly by the National Marine Fisheries Service.

Conference Steering Committee

Ambrose Jearld, Jr., National Marine Fisheries Service (Chair)
Brian Bingham, Western Washington University
Susan B. Cook, Harbor Branch Oceanographic Institution, Inc.
Benjamin Cuker, Hampton University
John W. Farrington, Woods Hole Oceanographic Institution
Teri Frady, National Marine Fisheries Service
Natalie Huff, National Marine Fisheries Service
Darryl Keith, U.S. Environmental Protection Agency
Margaret Leinen, University of Rhode Island
Nancy H. Marcus, Florida State University
Livingston S. Marshall, University of Maryland Eastern Shore
Carlos Robles, California State University
Denise Stephenson-Hawk, Clark Atlanta University

Conference Chair

Ambrose Jearld, Jr., NOAA, National Marine Fisheries Service, Woods Hole, MA

We also thank many individuals for their contribution to the conference and this report. An especial thanks to Dr. Nancy Foster, National Marine Fisheries Service.

For her editing expertise, style, patience, and wit: Emily Miller.

This conference, beginning with the notion for and through this report, is the product of a cooperative undertaking. It began several years ago at a NOAA EEO conference. For their cheerful assistance beyond the call of duty: Drs. Carolyn Brown, George G. Grice, and John B. Pearce, Teri Frady, Natalie Huff, Evelyn Jones and Denise Peloquin, National Marine Fisheries Service; Dr. Ben Cuker, Hampton University; Dr. Melinda F. Davis, Fort Valley State College; Dr. Joan Mitchell, National Science Foundation; Emorcia Hill, New England Board of Higher Education; Dr. N. Joyce Payne, Public Black Colleges, NASULGC; Dr. Matt Gilligan, Savannah State College, GA.

Finally, for all of the panelists and working session chairs, and to the many, many more who go unnamed for your enduring inspiration.

I. CONFERENCE PLANNING

This conference was planned to continue discussion initiated at a previous NOAA Equal Employment Office (EEO) conference held in Rockville, Maryland in 1993. The discussion centered around the concern that there are still not minorities available for hiring in large numbers in the field of Ocean Sciences and as such the NMFS is faced with the dilemma of increasing its diversity at the same time it is faced with low numbers from which to recruit.

Ambrose Jearld, Jr., Chief of Research Planning and Evaluation at the NOAA Fisheries in Woods Hole agreed to consider this dilemma, research the issue, and report the findings. His findings on the access and opportunities for minorities in the field of Oceanography included the following:

In 1990, only about 3% of enrolled graduate students enrolled in oceanography were African, Hispanic, Native, or Asian Americans.

The National Research Council, in 1992, reported that the percentage of underrepresented ethnic groups was low in both the population of employed oceanographers (7.7%) and the Joint Oceanographic Institutions Incorporated (JOI) student population (2.5%).

At the graduate level, oceanography was still dominated by white American males.

Since the 1980s, there has been a steady increase in women entering graduate training in all areas of oceanography, including physical and chemical oceanography.

His findings indicated that progress has been made by these ethnic and gender groups but it appears uneven within and among them.

In suggesting that the oceanographic community has the resources to act upon the lack of minorities in the Ocean Sciences, Dr. Jearld noted that "historically, the combined oceanographic community has enjoyed rather powerful and substantial supporters in the private and federal sectors" and that this community has shown remarkable ingenuity in developing mechanisms to coordinate multi-institutional resources. He also noted the challenge laid before the NOAA in 1992 by the National Research Council, quoting from that report: "The National Oceanic and Atmospheric Administration has a wide range of responsibilities in ocean matters but is just beginning to develop significant research programs in many of its areas of responsibility. The future vitality of basic oceanographic research within academia may depend on its forging productive partnerships with NOAA. In general, the partnerships must extend beyond financial relationships to include the sharing of intellect, data, instrument development, facilities and labor."

Many of the JOI institutions achieved their current rank by virtue of strategic funding initiatives by the federal government intended to bolster the nation's capacity for ocean science research after World War II. The nation is now in a position to invest some of its resources to ensure a diverse workforce capable of ensuring the future economic and cultural sustainability of marine resources and communities. There are a number of HBMSCUs poised to make a quantum leap in this effort. In order to do so, however, there must be a fundamental change in the way the policy makers make funding available because it is clear that "special" one-time efforts may do more harm than good in terms of their sustained growth and productivity. In other words, unless the rules change, traditional efforts will produce traditional results and achieving a diverse workforce in Ocean Sciences will always be a goal rather than a reality.

While the NOAA Fisheries was deciding how to support the expansion of minorities in the Ocean Sciences, a critical conference was held in September 1994 jointly sponsored by the NOAA and a number of universities. The conference, *The NOAA/University Partnership Conference*, was held to improve the existing cooperation and constructive partnership between universities and NOAA. The participants addressed the major issues of concern in the NOAA-University relationship and proposed new and innovative mechanisms to resolve them. A specific plan of action and a timetable to accomplish the objectives of the conference was developed.

In the same month, the JOI produced a consortium, authorized for incorporation by Edward J. Freel, Secretary of State of Delaware, known as the *Consortium for Oceanographic Research and Education, Inc.* (CORE). The main purposes of this consortium are to advance knowledge in the science of oceanography and to disseminate such knowledge to the public and to the scientific community; to formulate policies and goals for educational and research programs and facilities in the marine sciences and related fields; to promote the exchange of information and knowledge, encouraging cooperative efforts among the members of the consortium; and to raise funds for the advancement of the study of the Ocean Sciences. While this consortium does not focus specifically on minority issues, it is concerned with meeting the same educational and research goals as the NOAA and its successful incorporation gave further impetus for a separate conference focusing on the NOAA's educational and outreach goals as they related to minorities and minority involvement in the Ocean Sciences.

Accordingly, on January 25, 1995, the NOAA's National Marine Fisheries Service (NMFS) approved the proposal to sponsor a conference, *Expanding Opportunities in Ocean Sciences* designed to assess the status of minorities in Ocean Sciences and to identify ways to increase their access to education at Joint Oceanographic Institutions. Dr. Ambrose Jearld then solicited representatives from oceanographic institutions, including the JOI, to serve as a steering committee. A list of the steering committee members is found in the Appendices. As the conference was planned, five organizations became co-sponsors: the National Association of State Universities and Land Grant Colleges (NASULGC), the Southern Association of Marine Laboratories (SAML), the American Society of Limnology and Oceanography (ASLO), The Oceanographic Society (TOS), and The National Association of Marine Laboratories (NAML), and the National Marine Fisheries Service (NMFS), the main sponsor.

The steering committee met twice, on February 7, 1995 and on April 12, 1995. At the first meeting, the steering committee members identified the target participants and established the goals and mission statement of the conference as follows:

The purpose of the conference is to form a partnership among government science agencies, and academia to develop strategies and an action plan to increase minority student enrollment in and successful completion of degree programs leading to employment in ocean science.

At the second meeting, the members discussed the types of networking that allowed for the most effective recruitment into the Ocean Sciences. This discussion determined the structure of the conference and its inclusion of panel discussion groups and smaller, single issue, work groups. As Dr. Jearld said, emphasizing the importance of time to meet and interact with people, "Many people in the majority institutions think you can make paper talk. If you want to recruit and retain minority candidates you have to find ways, in your travels, to take the time to stop and visit these institutions and meet the person head-on." Finally, the group determined that the conference would emphasize recommendations for constructive action.

Thus the conference was designed and set for September 1995, the beginning of the academic year.

II. OVERVIEW OF THE CONFERENCE PROGRAM

The *Expanding Opportunities in Ocean Sciences* conference was held at the McGrew Conference Center at Hampton University (HU), Hampton, Virginia on September 11 and 12, 1995. Eighty-six participants from state and private, majority and minority colleges and universities, government agencies and research laboratories attended this conference hosted by the National Marine Fisheries Service (NMFS). A complete list of those attending is provided in the Appendices. Faculty, students, researchers and administrators came with the expressed purpose of strengthening the links between historically black and minority-serving college and university (HBMSCU) undergraduates and institutions with oceanic graduate programs.

The participants were welcomed by Dr. William R. Harvey, President of Hampton University. The charge to the group was given by Dr. Nancy Foster, Deputy Administrator, National Marine Fisheries Service. A series of panel discussions followed on "Minorities at Work in the Ocean Sciences" chaired by Dr. Ambrose Jearld, NMFS; "Minority Student Matriculation" chaired by Dr. Benjamin Cuker, HU; and the "Student Perspective" chaired by Dr. Brian Bingham, Shannon Point Marine Center. Five working groups focused on the issues of minority recruitment, student-faculty relationships, bridging programs, faculty-faculty relationships, and retention. A sixth ad-hoc working group made up of federal representatives focused on the relationships among federal resources, oceanographic institutions, and HBMSCUs. Working lunch periods granted time for free discussion, networking, visiting classes in session at the Hampton University Marine Science Center and talking with students.

Hampton University was chosen as the site of the conference because it is one of the few HBMSCU schools to have a graduate program in marine sciences. As a venue, it proved to be an excellent choice. Participants thought highly of its ambiance and its students, and for many, while they were accustomed to black and minority groups convening at the participants' home institutions, this was their first visit to one of the 117 historically black campuses in the United States.

III. WELCOME: Dr. William R. Harvey, President, Hampton University

Dr. Robert Bonner, Dean, Pure and Applied Science at Hampton University, introduced the university president, Dr. William R. Harvey. Dr. Bonner reminded the audience that when Dr. Harvey first became president of Hampton University in 1978, he expressed, in his inaugural address, a vision for the development of a marine program at Hampton University. That vision became the current marine sciences program which now stands as one of HU's most recognized and commended programs.

Dr. Harvey welcomed those assembled to the campus. "On behalf of Hampton University, I am happy to welcome you to the Expanding Ocean Opportunities Conference. I express my thanks to NOAA's NMFS for sponsoring this conference and the Hampton University Department of Marine Sciences for helping to organize this very important event." He commended the participants who came from other colleges and universities as well as from the federal and private sectors for their interest in "promoting increased representation of minority students in the graduate programs of the major oceanographic schools. Hampton University has long been a leader in the design and implementation of programs designed to address the dearth of minority representation in the scientific professions. Our marine science program is but one such program and we consider it one of the most important."

Dr. Harvey concluded by stating "the ocean has been referred to by many as the last frontier whose mysteries and resources shall continue to be explored and unraveled most extensively in the 21st century and beyond. These initiatives shall require the preparation of professionals who can participate in these enterprises with expertise, dedication, and a sense of ethics, integrity, honesty, and discipline. It is a profession from which minority students must not be excluded. Thanks to the kind of planning, dialogue, and strategies that will arise from your deliberations during this conference, the opportunity for increased minority participation shall be greatly expanded. I applaud your commitment. I applaud your vision. And I applaud your foresight and wish for you a productive and enjoyable conference....Again, welcome to Hampton University."

IV. CHARGE: Dr. Nancy Foster, Deputy Administrator, NMFS

Dr. Ambrose Jearld of NOAA/NMFS introduced Dr. Nancy Foster, deputy administrator of the National Marine Fisheries Service. Dr. Foster also welcomed the participants, noting that the conference was a result of discussions that took place at the NOAA University/Partnership Conference. "When the folks who were busy convening this meeting actually put out the call for attendees, we were pleasantly surprised and really encouraged at the number of people that responded. In fact, we were only able to seat about 75% of the people who showed an interest in coming, because we wanted to keep the meeting small enough so that it could be a real working meeting."

In underscoring the necessity of this conference, Dr. Foster shared a few statistics. In 1990, in this country, only about 3% of the enrolled graduate students were minorities. The National Research Council reports that among the population of employed oceanographers, only 7.7% are minorities. The Joint Oceanographic Institutions, Inc. reports that of their associated universities only 2.5% of the student population are minorities. "Look closer to home in NOAA and in the National Marine Fisheries Service, since 1986, we've hired 436 employees under the job description Fishery Biologists and only 6.6% of those were minorities. Even worse than that, we've hired 1,607 of what we call Biological Science Technicians. These are folks without as much training as the Fisheries Biologists and only 8% of those were minorities. So we haven't been making great strides forward in this area."

She then gave the group its charge: "We view this meeting as a terrific opportunity," she said, "we have two days that we can spend trying to learn from each other....In my agency, the NMFS, we have experienced a new commitment to diversity. Dr. Foster emphasized the importance of capitalizing on personal contacts made at the meeting, "It's absolutely true that nothing in the world is more effective in making a change in the way we do business than the personal commitment of people who are in positions to make decisions about the way we do business....I hope that when we leave this conference we will be able to look back and say that this was one of those rare meetings that actually made a difference."

V. PANELS

The three panels, "Minorities at Work in Ocean Sciences," "Minority Student Matriculation: The Faculty View," and "The Student Perspective," were conceived as a way to structure the conference, allowing those with experience and knowledge to formally present their views. Such discussions also served as a precursor to the workgroups, allowing participants to become current with issues critical to the overall objectives of the conferences. Each member of a panel spoke briefly after which the floor was opened for questions, answers, and discussion with the audience.

A. Panel One: *Minorities at Work in Ocean Sciences: A View from Top Administrators*

Panel Members:

Dr. John Farrington, Senior Scientist and Dean, Woods Hole Oceanographic Institution
Ms. Emorcia Hill, Program Director, New England Board for Higher Education
Dr. Nathaniel Pitts, Director of Office of Science, National Science Foundation
Dr. Earl S. Richardson, President, Morgan State University
Dr. Kathryn Sullivan, Chief, NOAA Chief Scientist's Office

Dr. Ambrose Jearld, National Marine Fisheries Service, Chair

This panel identified issues key to lack of minority participation in Ocean Sciences.

Encouraging Students To Choose Science As A Career

Dr. Sullivan, NOAA's chief scientist, began the session, describing her interest in the conference as a means, not only to build bridges and relationships, but also to find direct ways for improvement. She pointed out that the meeting was an outgrowth of the NOAA-University Partnership meeting held in 1994, which NOAA hopes to make an annual event. "The Department of Commerce and NOAA," she said, "are both scientific and service organizations. Although not empowered as an educational institution -- there are things NOAA can do to empower, increase, and extend the ability of others to improve success for minorities in the academic pipeline."

Dr. Sullivan stressed the need to make science an option for students considering careers. "We need bachelor-trained technicians and scientists. We need young people to choose science as a career. In the early years, students may not be making decisions about going into science, but they may be making decisions that close off science as an option. That's what you have to avoid." She discussed what she perceives limits NOAA/NMFS' success in this field, and why partnerships between NOAA/NMFS and academic institutions are part of the answer. "We have some structural problems," she said, "an annoying one is that in this era of federal down-sizing, student employees count against federal agency personnel limits. One side effect of this is that students are one of the first groups affected -- exactly the people we want to attract into the sciences. We have not given up on turning it around. I mention it to all of you because you are constituents, and pressure from outside the agency can help this issue."

Finally, Dr. Sullivan pointed to a partnership with Clark Atlanta University and NOAA to develop an undergraduate program for meteorological studies as a model program in setting up networks and bridging. "They've done a good job setting up networks and bridging," she said. "They assure that four to five times through the early grades, students are given a good dose of exposure to science --to 'de-geek-ify' science." The program explicitly targets juniors and seniors in high school to get qualified students into undergraduate science programs and has had a tremendous success, placing 100% of their students.

The Status Of Degree Recipients Who Are Minorities

Dr. Earl S. Richardson, President of Morgan State University spoke next, addressing the issue of the status of minority degree recipients. "Early this year," he began, "there was a great deal of publicity surrounding release of statistics on Ph.D.s. The number of Ph.D.s awarded to Black Americans has increased. Since the news in the past has been the high proportion of foreign students receiving Ph.D.s, the increase of awards to

Black Americans was then news. Some said all the effort by leading Ph.D. granting universities was paying off. If you are out trying to hire recent Ph.D.s, you can be excused for not having noticed the “good” news. There are still relatively few black Ph.D.s in fields that are in demand.”

After two decades of trying to improve, Dr. Richardson notes, very little has actually changed. “Few would believe that the number of Ph.D.’s awarded to blacks was higher in 1977 than in any year since. In 1977, 1,116 African Americans received doctorates (4.3% of total). The figure for 1993 was 1,106 (4.2%).” It is true that the number of Ph.D.’s awarded to all U.S. citizens also declined in these two years. “However, blacks were badly underrepresented in 1977, and the extent of under representation is now the same or slightly worse, because there are more Black Americans in that age group.” In the mid-70s, black Ph.D. awards would have needed to double to be well represented, and now they should be tripled.

He continued with other statistics of interest, stating:

- More than half the Ph.D.s awarded to blacks were in education, and only 13% in sciences. Among all awards, regardless of race, 35% were in sciences. Among whites, 40% were in science; 66% among Asian Americans.
- 60% of all Ph.D.s awarded to blacks went to women, a flip since 1977. “For black males,” he said, “the past 15 years represent a significant reversal of progress -- a 36% decline in doctorates awarded, in spite of rapid growth in the black male population.”

Dr. Richardson also discussed improvements in high school graduation rates, and the persistent differential between the races in college attendance, bachelor’s degree, and advanced degree attainment. He concluded, “the current statistics say that blacks would have to double college graduates to close the gap, a gap that hasn’t narrowed in more than two decades.”

In trying to arrive at strategies for addressing this program, Dr. Richardson thought the group would benefit from examining some characteristics of family influences on educational success among young blacks:

- Parental Education. If at least one parent has a bachelor’s degree, the children are four times more likely to go to college than in a family where everyone has a high school diploma or less.
- Family Income. 49% of black families with children of college age earn less than \$20,000 annually. Thirteen percent of those families earn \$50,000. For white families, the figures are 20% and 37%, respectively.
- Preparation for College. As measured by standardized tests, this correlates to parental education and income. Even assuming that the scores underpredict success of students, few black students qualify for moderately selective educational institutions based on the scores.

The Role of Historically Black Colleges and Universities (HBCUs) in Education, Support, and Recruitment

Dr. Richardson continued, “I believe that in each of these instances, historically black colleges and universities can play an important role in improving the situation: improving retention in high school and preparation for science education; and improving preparation of undergraduates for advanced study in sciences. Students are coming in larger numbers than we can accommodate, and HBCUs continue to graduate a disproportionately higher number of undergraduates in the sciences.”

Dr. Richardson added that HBCUs are attractive to minorities for three main reasons: a tradition of enrollment by prominent minorities, a tradition of enrolling students from a wide range of backgrounds, and a high comfort level for minorities. Because HBCUs continue to be an excellent choice for a large and probably growing proportion of the minority population, it is crucial that they provide the most effective education possible. If they are to have the impact of which they are capable, HBCUs need additional resources and

programs. Federal agencies such as NOAA are in a position to address several problems of recruiting, training, and retaining minority students in the Ocean Sciences through the following means:

- **Provide Assistance to the Public Schools**
In many instances, HBCUs have a close relationship to the local public schools, particularly in urban settings. This places them in a good position to carry out much of the work that needs to be done to improve the preparation of elementary and secondary students for college work. Federal agencies can work in partnership with HBCUs to improve the education in public schools.
- **Create a Supportive and Stimulating Environment for Undergraduates**
HBCUs need to provide a wide variety of student services, such as career counseling programs, tutoring, and adequate financial aid. Beyond these, there is a need to identify and motivate undergraduates who have the potential for majoring in the sciences and pursuing advanced study. Federal agencies can develop and continue to support existing programs that enhance the educational experiences and support available to minority students in fields in which minority groups are underrepresented.
- **Support Graduate Programs at Selected Campuses**
Certain HBCUs are in a position to offer graduate programs in the sciences provided that external support is made available. This support should be a particular priority of NOAA and other federal agencies for three reasons: the quality of undergraduate education in the sciences will improve, the visibility of these graduate programs would encourage more undergraduates to pursue both undergraduate and graduate degrees in the sciences, and these campuses would become more attractive to both majority students and external funding.
- **Support Cooperation with Major Doctoral-Granting Research Institutions**
Faculty and basic infrastructure at HBCUs would be strengthened at all levels of study through substantive programs of collaboration. One existing collaboration is the National Minority Graduate Seeder Program sponsored by the NASULGC. This program supports a national data base of names of minority undergraduates in science-related fields which can be accessed by graduate and professional schools seeking minority candidates.

Finally, Dr. Richardson suggested that NOAA and other federal agencies create more scientists by getting students involved early; “they have to see us do it, they have to see the outward result of what happens when we are thinking creatively and investigating. It says to young people -- you can do this too.”

Early Recruitment And Exposure To Ocean/Marine Sciences

Dr. Pitts observed that ocean science has a particular problem in attracting students. Since it is interdisciplinary, marine science graduate programs do not look at students until they already have their undergraduate degrees. “If you haven’t already lined them up, it’s hard to attract them to graduate program in ocean science...It only takes one person in their path at school to say, ‘Hey, you ought to consider this.’ If you want to deal with minorities, you have to go where they are.”

Dr. Pitts continued by pointing to commercial industry as a good model for improving diversity in the workforce. “Everyone can look at the demographics,” he said, “they have not changed. The people that address them best now are the industries that are looking at long-term issues of productivity and economics.”

He also thought available electronic communication vehicles could be used more effectively to connect students to institutions, if individuals were willing to put in the required effort. “Think about the ability to hook up by computer now to anyone in the world, with video tele-conferencing...I run video conferences with people around the country...I put people in touch with students and sometimes that’s what it takes: personal time spent connecting people.”

Dr. Pitts ended by pointing out that students are weighing the likelihood of employment in their choice of advanced degrees, as well as the quality of the program. "The government may shut down...but the industry side is going to grow. There is discussion of broader training for graduate students...how do you make sure graduate education is in fact education, not just labor? And how do you make sure that this approach to education is innovative research and education, not entirely devoted to narrow problem-solving exercises."

Interventions In Progress: Experiencing Success

Dr. Farrington described the Minority Traineeship Program at WHOI, which has attracted 44 students. "We try to recruit early in the undergraduate's career, for two years, with emphasis on focus and mentoring." Although none of the student have returned to WHOI as faculty, Dr. Farrington said, "They have gone on to success in other areas and are now in positions at other universities where they can recommend others to us."

Confronting Inequality: How Can This Be Remedied?

Ms. Hill, Assistant Director of the New England Board for Higher Education (NEBHE), described NEBHE's Science and Engineering Academic Support Network aimed at encouraging students to enter and persist in science and engineering. The Network provides unique networking opportunities for students by linking them with mentors and advisors in their field of interest.

This program was developed in response to the difficulties that minority students experience in institutions of higher education. Most of these, Ms. Hill is convinced, must be attributed to structural inequalities within these systems. "We tend to talk about the under representation of minority students from the 'blame the victim' perspective, a philosophy that forces us into thinking we should be focusing on students. We have done that, and the numbers have not changed. This clearly points to another source--factors within the institutions themselves which are pervasive in undermining the success of minority students. At NEBHE, we have talked about 'good practice' *vis a vis* minority students on campus. For example, if you are in Maine, you do not recruit one minority person...you recruit at least two."

Ms. Hill concluded by saying that "at one point we believed that institutions wanted to change." Now, she believes that we must be more aggressive in our approach, joining forces to create a grassroots change, department by department.

The questions and answers that followed the panelists' talks focused on three areas: (1) defining the spectrum of Ocean Sciences; (2) comparing oceanic graduate studies with professional graduate studies in their attractiveness to minority students; and (3) recruiting students for oceanic studies programs.

B. Panel Two: *Minority Student Matriculation: The Faculty View*

Panel Members:

Dr. Matt Gilligan, Savannah State College
Dr. Nancy Marcus, Florida State University
Dr. Livingston Marshall, University of Maryland, Eastern Shore
Dr. Mark Ohman, Scripps Institution of Oceanography

Dr. Benjamin Cuker, Hampton University, Chair

This panel focused on issues related to the small numbers of people of color choosing ocean science, and specifically, to consider the barriers between undergraduate and graduate study.

Preparing Students To Enter The Fields Of Marine/Ocean Sciences

Dr. Cuker commented that even though things had improved for minorities in Ocean Sciences in the past 20 years, the numbers are still low. "If students have no experience on the water," he said, "their likelihood of choosing it as a career is smaller." Preparation for ocean science graduate study involves not only building strong math and science skills and getting good GRE scores, but also crossing cultural fences, allowing students positive ocean experience.

He also noted that there are graduate school expectations that have to be met, but said, "Many institutions do not prepare undergraduates for graduate school at all." He raised the question of student funding, saying, "Very few students enter graduate school with everything they need. Students should be funded for the work they have to do for their professors."

Impact Of Declining Institutional Resources On Student's Academic Preparation

Dr. Marshall identified the detrimental effects of declining institutional resources on the preparation of students at the undergraduate level, aggravated by the increasing number of students in these programs. "The courses that we offer and the quality of students that we get are improving," but he expressed concern about continuing to meet the needs of students in the current fiscal climate.

Incorporating The Student's Perspective In The Design Of Programs

Dr. Marcus thought much might be gleaned by pressing students more vigorously about how enrollment of minorities could be improved. "I am not the right person to ask about why there aren't more students in our programs. I have to ask the students." She indicated that her experience recruiting women into science might be used as a model for minority recruitment. "The women who have been most successful came from women's colleges. The same is probably true of historically black colleges and universities and other minority institutions."

She concluded that "students choose a place with proven success, a friendly atmosphere, and a place that takes an interest in them. The question is how do we build that?"

Evaluating Student's Aptitude For Success In The Sciences

Dr. Ohman discussed one successful program, SURSP -- Scripps Undergraduate Research Support Program. It is a competitive entry, summer research program with a specific focus and a required report at the end of the program. The program "helps individuals understand the process and helps us evaluate the individual's aptitude for research" he said. "It is a great indicator" of likely student success in a science degree program.

He also discussed the importance of improving K-12 science education. "The seeds of a science career are sown early on....Many of us can point back to a 'catalytic event'," that provided the motivation for entering the sciences. Dr. Ohman believes that if students are motivated early on they will successfully complete the coursework that underpins a science career.

Mentoring As A Key Element In Student's Success

In general, mentoring was identified as important in improving minority recruitment and retention. Dr. Ohman articulated "the mentoring function is critical....It calls for an individual commitment between and among people who can move students along. Support for faculty mentoring is also a key issue. Working with minority students and all students is time consuming: there's a trade-off between tenure activities and spending more time teaching and supporting students."

Attracting Cohorts versus Individuals

Dr. Gilligan's idea was that we must move from mentoring a single individual at a time. He proposed that it is most beneficial to attract a critical mass so that there is group support, saying: "An individual's expectation or measure of success at the end of the gauntlet has a lot to do with the encouragement they get to go into the pipeline, the placement of individuals along the line who will push them along, and very much with seeing people at the end who are successful and who are like them. It includes recruitment, retention, and linkage."

Dr. Gilligan made a few broad recommendations for getting cohort groups rather than individuals applying to graduate schools:

- Aggressively recruit students for Research Experiences for Undergraduates (REU) programs on the campuses.

- Create programs to increase the visibility of marine science as a career.
- Create institutional research linkage programs between minority and majority institutions such as stipend support for individuals to stay on the marine sciences career track.

The discussion and questions afterwards focused on (1) the importance of sending marine science representatives to undergraduate campuses, and (2) the necessity of having administrators understand that faculty involvement in recruitment should be rewarded during the tenure process.

C: Panel Three: *The Student Perspective: View from "The Bridge"*

Nancy Aguilar, Scripps Institution of Oceanography
 Maurice K. Crawford, North Carolina State University
 Scottie Yvette Henderson, University of Washington
 Dionne Hoskins, University of South Carolina
 James Stewart, Hampton University
 Dr. Isidro Bosch, State University of New York
 Dr. Gisèle Muller-Parker, Western Washington University

Dr. Brian Bingham, Shannon Point Marine Center, Chair

Prior to the conference, Dr. Bingham asked the panelists to identify the major challenges they face as students of color pursuing a science education and the factors that were helping them succeed. The panelists decided on the following three major issues which were posed as questions:

- 1) What cultural challenges do students of color face in a graduate institution? How important are they?
- 2) How important are mentors? What makes a good mentor?
- 3) What part do undergraduate research experiences play in preparing students for graduate school?

Defining Cultural Challenges: The Stereotyping Phenomena

Mr. Stewart discussed cultural challenges and indicated that they come from both inside and outside one's culture. "Before I started college, I was doing well in my physics class, and I was the only Black American in the class, but I didn't let this bother me. That year when I graduated, I had been accepted to Wesley and Hampton. I was excited and telling everyone about it. My peers said to me, 'You're going to be a garbage man, you're going to be cleaning my yard.' Can you imagine someone saying that after all we had been through together? I had to turn that negative into something positive. It made me more determined. No matter what happens, I am going to finish what I started."

Stereotypes are rampant throughout the educational system. Ms. Henderson talked about the negative impact of labeling which begins early on in the educational process. "In high school, Native Americans were thought of as drunks who weren't going anywhere....When I went to UC Santa Cruz, I was faced with a different problem. I was romanticized. I couldn't be me. I had to fit all the stereotypes."

Regarding appropriate disciplines/careers for minorities, Ms. Henderson mentioned that another attitude about Native Americans in sciences is that "I should be in social sciences or the arts. The American Indians in Science and Education Society (AISES) helped me get over that ostracism. AISES bridges the gap and provides support for those Native American students who are trying to find support from a Native community. The AISES group helps students find the connection between science and their Native values, thus using science as a positive tool for helping their Native community."

Cultural Assimilation

Ms. Hoskins commented that moving from a HBCU into a large majority university is comparable to the problem of assimilating into a foreign environment. "When you go to a new school as a graduate student you go with every label they've ever acquired about you. There are a lot of attitudes about HBCUs. You are sometimes considered a little package they have to work with. Some professors already have their ideas about you. Getting in is one thing. Getting accepted is another. You are not going to develop professionally or personally in a place where they don't think you belong to begin with. If you survive, often the only productive consequence is that the academic roughage builds strength in the student. But I don't feel this to be the optimal learning environment for any student."

Building Coping Mechanisms

On the issue of building confidence, Aguilar asked, "How do I deal with self-confidence as a minority student--the idea that I am taking a place away from a more qualified non-minority student. I have to keep a broad perspective. I keep in contact with mentors. One of the hardest things to do is to look at awkward comments and decide how they are meant."

Crawford stated, "It's the 'comfort factor' --being the only black person in your class. That is a common experience. There's no easy way around it. Get over it. That's the way it is. I like the tough love approach. Hopefully along the way you will have some good experiences. Make the situation work to your advantage."

Family Support

Students stated that a supportive family provided a sense of security and kept them focused on their goal. "My family was strong and was behind me all the way. I also had friends who were supportive. It is important to any student. There are days when you are struggling and some financial crises occurs and that's where family is important," Stewart noted. "As an undergraduate, my mother's entire income has gone to support my college. Fortunately, I have found programs that have supported my graduate work."

Respect from families is important according to Aguilar: "Many of our families expect us to go on to something better. My family respects that I travel a lot, that I am supporting myself. If they still don't understand what I do, they do respect what I do."

Pull From Families: Economic Demands

Usually families want students to pursue a more lucrative career. Dr. Bosch pointed out that "Many minority students are brought up in an environment where success is measured by financial gains, where students with strong potential are steered toward careers with the best financial rewards. Having immigrated to the U.S. for economic and political reasons, my father saw the best opportunities for me in the medical sciences and only encouraged me in that direction. The problem that we face is that we want to generate professionals from underrepresented groups, and that is a very competitive situation. Most of those candidates are on pre-med or a clinical track. Economics are playing a big part--medicine has a bright future. It is not enough to start recruiting students in the second or third year, because they are already going someplace else. The Ocean Sciences are recruiting largely from a pool of students already depleted by other career tracks. We have to get there earlier and I think the REU-type programs work."

Stewart concurs, "There are family members who think you should go another direction, who want you to go into business. I had an uncle who was like that. I was shocked. He made it sound like I wasn't accomplishing anything. So my determination came back. I had to make an argument that being an educator was important."

The Role of Mentors

All students believed that a good student-mentor relationship makes a big difference in the student's education. Mr. Crawford stated that there are three things a mentor can do: "Intellectually, they can keep you on the right track, advise you with their experience; physically, they can provide the technical support you need to do your work; mentally, when you feel like you can't go on,...they help you persevere." Ms. Hoskins gave this advice to mentors, "Programs, mentors, and persons assessing minority student potential must judge

based on that students surrounding, background, and so on. It takes time. You have to look past what's on paper....A good mentor has a keen sense of assessing strengths and weaknesses without a set formula. The diversity of students must be met with a diversity of approaches to guide them."

Research Experience for Undergraduates (REU): A Vital Path To Success Into The Marine Sciences

Ms. Aguilar said that the confidence others had in her kept her going along the educational ladder. "Someone gave me an application to Minorities in Marine Science Undergraduate Program (MIMSUP), Brian's program, which I am convinced gave me the confidence to go on for a Ph.D.. And all along the way, I had mentors telling me I was qualified."

Ms. Hoskins also mentioned, "I came through two (REUs) at the Virginia Institute of Marine Science (VIMS) and one at Purdue. It was indispensable. It gave me the opportunity to develop skills that I couldn't develop at Savannah State. It made me comfortable in a laboratory setting. It allows students to be fluent in the lab technique, language, and the community of science."

Mr. Crawford offered the comment, "In my junior year in college I was looking at a career and employment. Biology wasn't looking too good, so I started looking at nursing. I was about to do that when I got an application from one of my instructors for a co-op position in marine science. Ten years later, I am a co-op student again."

REUs: Ongoing Linkages

Dr. Bosch commented on the value of graduate institution programs that reach out to prospective applicants at the undergraduate level: "As an undergraduate, I had the opportunity to participate in the Minority Student Program at the Woods Hole Oceanographic Institution (WHOI). That helped me to understand where I wanted to go in marine science. It is not enough to start recruiting students in the second or third year, because they are already going someplace else by then.... We have to get there earlier. REU-type programs work to do this."

Dr. Bosch also spoke directly about retention. Once students are in a REU program, "What do we do to make sure students follow the track to graduate school, to post-doctoral studies, to a professional field?" He listed four time periods to focus on retention:

- The post REU experience: What happens after the student returns to their home institution when they are making decisions about future graduate studies?
- The first year of graduate school: Creating immediate ties with existing faculty and students, host families, and support group. Delaying research so these ties can be developed.
- The last year of graduate school: Don't abandon students during thesis writing.
- The first year of faculty: There's tremendous excitement in recruiting minorities but not much attention paid to retaining minority faculty. As a result there's a great deal of turn-over.

The Value of Learning to Teach

Dr. Muller-Parker spoke of better preparing students for careers by teaching them the value of learning to teach as well as conduct research. "In one sense we are approaching this backwards. We are saying let's assimilate students into the existing graduate culture. I think we should revise our culture and change it so that you are exposed to a whole culture of what it means to be a professional: teaching, service, and public responsibilities as well as learning and research."

"Our responsibility to education is far greater than our responsibility to publish a research paper....One way to do it is to involve more people in the preparation of graduate students. For minority students, most are

coming from smaller four-year schools and community colleges. We do not train students to teach in these types of institutions. We want these graduates to be able to go back and teach in something other than a research institution.”

The discussion and questions afterwards focused on three areas: (1) the competing relationship of identities as a minority and as a scientist, (2) the necessary involvement of minority families, and (3) the availability of work in marine sciences for those not desiring to complete a doctoral program.

VI: Working Groups

The five working groups were designed to allow conference participants an active role in determining the current status and needed improvements in specific areas relating to the successful recruitment and retaining of minority students in oceanic graduate studies. The conference participants received their working group assignments at registration. The working groups were chaired by Dr. Matthew Gilligan, Savannah State College; Dr. Nancy Marcus, Florida State University; Dr. Livingston S. Marshall, University of Maryland Eastern Shore; Dr. Margaret Leinen, University of Rhode Island; and Dr. Susan B. Cook, Harbor Branch Oceanographic Institution. Lists of the work group participants can be found in the appendices.

Consensus, Summary, and Recommendations from the Working Groups

A. Working Group 1 -- RECRUITMENT

Consensus: We urge the steering committee through NOAA Fisheries to provide a written response to these recommendations -- where action could be taken, where our recommendations need to be tailored more precisely, how our recommendations were implemented. We also advocate that for effective and successful recruitment, recommendations must target both the message -- convincing students that Ocean Sciences are exciting, necessary, meaningful and rewarding -- and the messengers -- all those groups who must assume responsibility for students' discovery of and matriculation in ocean science programs."

In each instance the personalization of all approaches and strong follow-up was seen as the key to success. Individuals must be identified at the seeking institution who will serve as role models, who are willing to get involved and spend the necessary time. Recruitment is time consuming and has to be recognized as a rewarding and rewarded activity.

Strategies to Improve the Message **Heighten Awareness About The Ocean/Marine Sciences**

Develop career/recruitment brochures, videos, posters, laser discs similar to the Southern Association of Marine Laboratories video and The Oceanography Society booklet, but with a more coastal-oriented perspective.

Ensure the material shows how a career in marine science is competitive with other career interests traditionally more attractive to minority students like pre-med and pre-law programs. Provide such materials to parents and guardians of prospective students.

Ensure that minority scientists are highlighted.

Make information on nontraditional careers in the aquatic sciences arena available and identify potential employers for all educational levels.

Develop a traveling exhibit on careers to display at smaller minority schools, meetings of minority professional societies, major professional meetings, diversity conferences, and similar meetings.

Expand Outreach Efforts By Adopting Broad-Based Recruiting Strategies

Enlarge the pool of people targeted. Extend efforts to include engineering programs and social sciences (e.g., economics, sociology, anthropology) as well as basic physical sciences, pre-med and pre-law programs.

Prepare K-12 Teachers For Active Participation In Recruitment Efforts

Target K-12 teachers in predominantly minority school districts. Provide concrete information about the opportunities that are available in these fields.

Strategies to Create Effective Messengers

Messengers:

Minority students, faculty and institutions

Graduate students

Majority faculty and institutions

Professional and Scientific Societies

Teachers and Educational Organizations

Federal Mission Agencies

State Mission Agencies

Establishing Partnerships, Linkages And Collaborations

Work with professional societies to enhance knowledge about careers, programs in Ocean Sciences (speakers bureau, conference participation, career booklets, posters, panels, videos, home pages).

Identify key people at HBMSCUs who are on the Internet and who are willing to disseminate information.

Identify key people in CORE and The National Association of Marine Laboratory institutions with marine science programs in support of partnership, linkage, and collaborative efforts.

Create A Speakers Bureau Featuring Representatives From A Wide Variety Of Backgrounds And Orientations

Develop a speaker program, perhaps jointly with professional societies/CORE institutions with support from agencies and foundations.

Use minority speakers/role models. Follow-up and return to campus on a regular basis.

Provide support and materials to the speakers in the form of good graphics, information on career opportunities, job and school requirements, enrichment activities (e.g. internships).

Provide complete financial support since many HBMSCUs face difficulties supporting outside guests even once on campus.

Recognize that most HBMSCUs need speakers who can give broad talks on the topics above, not just talks on a narrow range of research topics.

Work with the host to publicize the event (include posters to announce the talk, video blurbs on the speaker that can be run on the college cable channel, etc.).

Increase Opportunities For Experiential Learning

Support more internships and REU type programs. This gives a greater chance for students to discover programs and professional mentors who best suit their needs.

Strategies to Maximize Success

Intensify Use Of The Internet As A Vital Communication Medium

Ensure HBMSCU student access to the Internet and World Wide Web.

Create a marine science World Wide Web page with a mentor/protégé data base.

Establish an Internet directory for careers as well as for aquatic science programs at both majority and minority institutions.

Include information on summer course offerings, REU programs and other available internships, NMFS and other cruise schedules, curriculum modules, and the like.

Develop a list-serve for those wishing to communicate and/or willing to answer questions.

Offer Incentives And Rewards For Participation In Volunteer Activities

Give recognition and release time to researchers involved in recruitment/mentoring activities.

Consult With The End-User And Incorporate Their Perspectives In Program Development Activities

Listen to the faculty and students at HBMSCUs who have been through the programs. This is important as people from majority institutions, funding agencies and federal agencies may not recognize elements, that if lacking, prevent successful programs.

B. Working Group 2 -- STUDENT/FACULTY RELATIONSHIP

Consensus: The conference was of great value and it needs to be an on-going effort. We agree that one year is not enough time to fully evaluate the resulting efforts from the conference, thus we suggest the next conference be held in 1997. We also suggest that the planners anticipate publication and distribution costs for the full report.
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Increased Participation In Professional Development Activities

Prepare and expose students to meetings of professional societies by encouraging full participation prior to and during these meetings, (e.g. NSF/Hampton/ASLO Program).

Provide Access To The Internet And The World-Wide Web At HBMSCUs

Develop institutional collaboration and linkages to solve technological gaps. Lack of such components prevent students from connecting with other faculty and institutions and locating information about programs, courses, and undergraduate research opportunities at marine labs and oceanographic institutions.

Cultivate Relationships Between Students And Faculty Across Institutions

Establish linkages with science faculty at HBMSCUs to ensure continued matriculation at the graduate level. Students at HBMSCUs with or without marine programs can benefit from presentations about careers, training and opportunities in the marine sciences.

Incorporate Non-Traditional Approaches Into Graduate Education

Make the graduate experience more humane by "holistic" advising that recognizes the need for faculty cultural awareness/competence to mentor underrepresented minority students and for linking students with support systems.

Increase And Expand Programs That Offer Ocean Science Research Exposure And Experiences For Undergraduates

Encourage faculty to develop non-traditional, innovative efforts such as Savannah State College/Harbor Branch Oceanographic Institution (SSC/ HBOI) Bridge program and traditional programs such as NSF's REU Program.

Provide Support And Assistance To HBMSCUs To Introduce Or Expand Marine And Ocean Science Programs To Students.

Transfer surplus equipment, additional staffing through temporary assignment (memoranda of understanding or Intergovernmental Personnel Act (IPA)), small grants and contracts to hire or compensate students for participation in research at the HBMSCU or a collaborating institution, and assistance to increase grant awards to HBMSCUs.

C. Working Group 3 -- BRIDGING

Consensus: We advocate that NMFS/NOAA support annual meetings for HBMSCUs contacts, in varying sites, in conjunction with professional society meetings and that the information on this effort be distributed on the Internet.

Bridging efforts for the purposes of this workshop and conference are defined as activities specifically aimed at enhancing minority student participation in Ocean Sciences career development. A list of bridge programs is located in the appendices.

Evaluate And Assess Existing Programs

Determine the areas in which programs have experienced greatest successes and those where improvements are needed. Continue and enhance these programs.

Create Bridges At All Levels Of The Educational Pipeline And Across Institutions

The critical linkages include:

- high school to college
- majority to minority institutions and vice versa
- undergraduate to graduate
- 2 year to 4 year institutions
- degree program to job
- professional societies to minority institutions

Integrate Ocean Sciences In Federally-Funded Student Initiatives

Have an Ocean/Marine Science Institute as a component to Alliance for Minority Participation (AMP). AMP supports the establishment of comprehensive approaches to increase the quantity and quality of underrepresented minorities who successfully earn Science and Engineering baccalaureate degrees and to increase the number who go on for graduate study in these fields.

Expand Interagency Collaborations

Encourage and establish interagency initiatives to include federal agencies and/or professional societies and academic institutions.

Expand Funded Opportunities For Graduate Education

Provide more graduate funded traineeships and fellowships.

Provide Funds For Technological Advancement

Provide mini-grants in the range of \$200,000 to develop Internet capabilities. Funds should be used to purchase hardware and to create a marine science web page with access to a mentor/ protégé data base.

Intensify Use Of The Internet As A Vital Communication Medium

Establish an Internet directory which includes listings of: career options; aquatic science programs at both majority and minority institutions; summer course offerings; REU programs and other available internships; NMFS and other cruise schedules; curriculum modules, and the like.

Develop a list-serve for those wishing to communicate and/or willing to answer questions.

Create Opportunities For Faculty Development

Fund site visit exchanges for faculty to and from both minority and majority institutions.

Encourage Region-Wide Participation

Provide support for HBMSCU research fairs in four regions at rotating JOI/CORE institutions.

Private Sector Involvement

Bring private sector, business interests, and the like into existing mentoring programs.

Develop A Clearinghouse For Marine Science Programs

Maintain an updated list of contacts for marine science programs at HBMSCUs.

D. Working Group 4 -- FACULTY/FACULTY RELATIONSHIPS

Consensus: Efforts should be made to support extended visits by faculty from HBMSCUs to majority institutions with marine sciences programs to allow for the development of collaborative research efforts, especially those that can be continued at the minority institutions and that involve student participation.

Improving communication among faculty, researchers and administrators at minority and majority institutions will ultimately increase the numbers of minority students who pursue careers in the Ocean Sciences. Many of these efforts/ strategies are dependent on the availability of funds and the commitment to dedicate funds for successful implementation.

Expand Opportunities For Faculty Development

Fund informational visits of faculty from institutions with marine science programs to campuses without such programs.

Set up adjunct faculty appointments for HBMSCUs faculty at majority institutions.

Set up adjunct faculty appointments for majority institution faculty at HBMSCUs.

Support HBMSCU faculty participation in UNOLS cruises.

Fund HBMSCU faculty to do research in labs at majority institutions.

Fund collaborative research efforts especially those to be continued at minority institutions.

E. Working Group 5 -- RETENTION

Consensus: Continue the conference on a bi-annual basis with the same constituency at an accessible site and provide travel assistance to increase participation. We also advocate that teachers at all grade levels "teach to the top and give individualized help to the others" in order to retain high standards.

Issues related to retention are considered far more important at the undergraduate than graduate levels. Students at some institutions quietly disappear without asking for help. At other institutions, lack of motivation and lack of basic skills prevent student success. At the graduate level, recruitment is the real issue.

Provide A Sequence Of Experiential Learning Opportunities

Offer pre-REU experience in addition to at least 2 different REU programs before graduation. Internships and on-campus projects supervised by an advisor can substitute for one REU experience.

Expand Outreach Efforts By Graduate Programs

Develop strategies to cultivate an institution's own students in addition to establishing partnerships with historically minority colleges in area and community colleges.

Develop Model Programs In Conjunction With Other Organizations

Forge relationships with business and industry members who are committed to these issues.

Enhance Student's Skills In Key Areas

Support activities that bolster students' quantitative skills (computer access, graphing and math software acquisition and workshops).

Develop Systems Of Support For Students

Include mentoring and other one-one activities as an essential component of all programs. Follow the model George Burbanck has created at HU. He allows struggling students to list their complaints. These comments are given to students who are already achieving academic success who suggest solutions and respond to their colleagues.

F. Federal Partnership Work Group

Consensus: During this meeting, NSF and NMFS indicated that funds are presently available to begin the development of Option 2. Hope was expressed that in the near future the program will expand to include support from other federal agencies such as the ONR and the EPA.

During the conference, representatives from NSF, ONR, NOAA/NMFS and EPA met to discuss the federal resources available to achieve conference goals and how to integrate those resources to develop a federal partnership to complement and/or stimulate financially emerging partnerships between the oceanographic institutions and minority colleges and universities. The highest level of government representative was Dr. Nancy Foster, Deputy Assistant Administrator, NOAA/NMFS. Dr. Bradford Brown also represented NMFS (Science and Research Director, Southeast Fisheries Science Center). Representatives from the Program Manager level at ONR and NSF were Charles Luther and Joan Mitchell. Carol Daniels (USEPA, Gulf Ecology Division Gulf Breeze) and Darryl Keith (USEPA, Atlantic Ecology Division Narragansett) represented EPA at these discussions. Ambrose Jearld of the NOAA Fisheries chaired the workgroup.

Increasing the Pool of Minority Applicants: Two Options

Option 1: Link NSF sponsored Science and Technology (S&T) Centers at majority institutions with HBMSCUs and fund this linkage with NSF funds. Under this option, HBMSCUs and majority institutions would link to submit proposals to NSF to conduct joint research.

Option 2: Develop a national NSF-like Research Experience for Undergraduates (REU) program and fund this program with multiple agency funding which will be administered by NSF.

The goals of Option 2 are to increase the pool of minority applicants for graduate marine programs by providing talented undergraduate students with summer research opportunities and experience at academic and federal laboratories for a minimum of 3 summers (i.e. during their undergraduate career). An additional goal is to provide similar opportunities for faculty at HBMSCUs. Structurally, academic and federal laboratories would be arranged or "partnered" into four national groupings (Northwest, Southwest, South and Northeast-Mid Atlantic).

Academic/Federal Links

An example of a Federal/Academic arrangement of research laboratories in the Northwest include linking the University of Oregon, NMFS/NW Fisheries Center, EPA Newport and Corvallis laboratories, Oregon State University and Western Washington State with students and faculty from HBMSCUs. In New England, potential arrangements include NMFS/NE Fisheries Centers -- Narragansett and Woods Hole, WHOI, MBL, EPA-Narragansett, and GSO-URI. In the South, potential arrangements include NMFS/SW Fisheries Center, Miami, NOAA/ Atlantic Oceanographic and Meteorological Lab (AOML), Miami, EPA-Gulf Breeze, Texas A&M University, University of Miami, Duke University, University of North Carolina, University of Delaware, College of William and Mary, and University of Maryland. In the Southwest, potential arrangements include University of California's Scripps Institute of Oceanography (SIO), NMFS Southwest Fisheries Center, and San Diego State University.

Minority Summer Research Internships

It should be noted that several of the institutions named above have established minority summer research internships which have met with various levels of success. By placing these institutional efforts under a common banner with a possible pooling of resources, program effectiveness should increase (i.e. the number of participants should increase) through increased information sharing between programs and through students communicating their personal experiences among themselves. An example of this kind of effectiveness is found in the program at Shannon Point Marine Center at Western Washington University. Shannon Point Marine Center, located in Anacortes, WA (near the Washington/ British Columbia, Canada border) has had long standing relationships with HBMSCUs and annually draws minority students from well beyond their region for research internships.

VII. RECOMMENDATIONS

Targeted Recommendations

When the entire body reconvened some items were mentioned by all the groups. Communication on a continuing basis was part of each set of recommendations. Communication through the Internet and World Wide Web were cited by most of the groups as necessary to effect desired outcomes. However, perhaps surprisingly in this age of the information highway, communication on a face-to-face basis was a recurrent theme throughout the conference. Unanimously, each group felt that this conference or one similar should be reconvened on a bi-annual basis. It was suggested that other agencies might host it to represent their unique needs and perspectives. Other suggestions included having an annual meeting of HBMSCU contacts, perhaps in conjunction with professional meetings. Holding the proposed conferences at various locations would foster contacts between faculty, researchers and administrators from both majority and minority academic institutions and research laboratories. Each group also desired a written response to this conference. This document serves as a partial fulfillment of that request. NOAA/NMFS will report on the progress of recommendations, thus fulfilling the request of participants.

Another recurring theme was the advice to not reinvent programs but to use and expand successful ones while building connections between them. Just a few of the successful programs cited were NSF/Hampton/ASLO, NOAA/Clark-Atlanta University, NSF's REUs, MARC and MBRs.

The success of the recommendations was seen as dependent upon the commitment of funding from various sources, including NMFS/NOAA, as well as a commitment of time and key personnel at every institution involved. This brought up underlying concerns about such activities not being seen as important by the participants' home institutions. These concerns were expressed by professionals from every type of institution and reveal the second-class nature of student-oriented activities at many educational institutions as well as the persistent inability of many institutions, educational and otherwise, to deal with minority issues at every level.

The following are specific recommendations targeted to particular groups:

To the NOAA/NMFS

1. Make funds available to support a variety of activities, including:
 - conferences such as this
 - HBMSCU research fairs
 - annual meetings for HBMSCUs
2. Assist HBMSCUs in leveraging funds to support a variety of activities, including:
 - technological upgrades such as building internet and computer capabilities
 - site visits and exchanges between faculties of minority and majority schools
3. Provide employment and experiential learning opportunities, including:
 - internships
 - summer institutes for faculty
4. Utilize NOAA's staff to develop a speakers program
5. Support a nationwide, electronic recruitment system that creates a pipeline for students in the sciences between Ph.D. granting universities and institutions serving large numbers of minority students, such as the NASULGC's collaboration with the American Association of State Colleges and Universities.
6. Establish a national scholarship program for undergraduates and graduate students that is designed to encourage minorities to major in disciplines pertinent to Ocean Sciences.

7. Establish liaison positions at HBMSCUs. Liaison officers will be charged with the responsibility of providing technical assistance to create and sustain programs that support NOAA's mission.
8. Establish a NOAA/HBMSCU Task Force that will promote and enhance policies and programs designed to encourage collaborative programs, cooperative research and the institutionalization of NOAA programs at HBMSCUs.

To Federal Agencies

1. Funding agencies who support ocean science research and education should examine proposal and funding guidelines to ensure that the unique capabilities and characteristics of HBMSCUs can be reasonably accommodated.
2. Increase support for predominantly minority institutions that produce mathematics, engineering and science (both natural and social) graduates, particularly those with aquatic sciences programs.
3. NSF and other federal agencies should continue or begin to replace isolated and piecemeal opportunity efforts with more ambitious, coordinated, and coherent approaches that provide a systemic effort.
4. Effectively integrate government resources to develop a federal (multi-agency cost-share) partnership program to complement and/or stimulate (financially) emerging partnerships between the oceanographic institutions and HBMSCUs.
5. Link NSF-sponsored Science and Technology (S&T) Centers at majority institutions with HBMSCUs to encourage and support joint research and fund this linkage with NSF funds.
6. Develop a national NSF-like Research Experience for Undergraduates (REU).
7. Provide talented undergraduate students with summer research opportunities and experience for a minimum of three summers through a "partnering" of academic and federal laboratories and provide similar opportunities for faculty at HBMSCUs.
8. Expand program support to include other federal agencies such as the EPA.

To the Private Business Sector

1. Link up with existing mentor programs to increase students' experience in the business world of the Ocean Sciences (for example, summer internships in aquariums).
2. Continue to enhance existing and explore new opportunities for unique and productive partnerships with academia, especially small universities and colleges, and particularly HBCUs. Such partnerships should/could include: endowed chairs; research funding and support for equipment upgrade and purchase, facility construction; and access to corporate labs (faculty/student research experiences; IPA-like exchanges between business/ industry and universities).
3. Provide direct support to minority and majority institutions through financial or in-kind contributions, mentoring, research and employment opportunities for students.

4. Assist in persuading government agencies that increased funding for structural changes is crucial and must continue.

To Majority Institutions

1. Sponsor faculty exchanges between majority institutions with marine science programs and minority institutions to build connections between undergraduate and graduate institutions.
2. Work with minority institutions to increase joint funding for mutually beneficial programs.
3. Increase minority graduate enrollment by clusters not individuals.
4. Offer an increased number of fellowships/scholarships for students from HBMSCUs. Recognize the cultural differences between majority and minority institutions which may influence academic training for students in the respective types of institutions; utilize knowledge in this area to design and offer strong programs for all students. In all cases possible, research opportunities and funding should be pursued inclusive of smaller universities and colleges, particularly the HBMSCUs.
5. Intensify efforts to recruit and promote the development of minority students.
6. Improve minority faculty recruitment and retention.
7. Actively support mathematics and science-based choices by minority students.
8. Encourage minority students from a broad range of majors to consider the Ocean Sciences.
9. Involve the private sector.

To Minority Institutions

1. Recognize that graduates of HBMSCUs are considered strong candidates for graduate study and aggressively foster undergraduates for graduate studies in the Ocean Sciences.
2. Continue strengthening students' basic skills and providing opportunities for Ocean Sciences research experience.
3. Develop strong mentor programs.
4. Increase visibility and lobbying influence with your state and federal legislators (representatives); many of whom graduated from minority institutions or are associates of those who did.
5. Provide assistance to public schools to improve the preparation of elementary and secondary students for college work.
6. Create a supportive and stimulating environment for undergraduates.
7. Support graduate programs at selected HBMSCU campuses.
8. Support cooperation with major doctoral-granting research institutions.

9. Insist that any emerging program be developed with the end-users, underrepresented minority students, in mind. Demand that programs be tailored to their needs.

To the Students

1. Recognize that you are ultimately responsible for your own education, including:
 - using support systems
 - developing a strong mentor relationship
 - taking advantage of provided opportunities
2. Continue strengthening your academic record for graduate admission.
3. Continue to take advantage of opportunities (particularly research experiences and funding opportunities) available through federal agencies, academic institutions and business/industry network.
4. Use your experience to recruit and mentor less experienced individuals.

VIII. CONFERENCE REACTIONS: The Need for Further Discussion

There was an overwhelmingly strong positive reaction to the conference both from participants and those who did not attend but heard of the conference. After a short article describing the conference was in the NOAA Report, the ASLO Bulletin, and other newsletters, a number of students, faculty, and administrators have written requesting further information. Most people are particularly interested in the recommendations that were produced and are looking to implement them in their home institutions. Conference participants strongly suggested that NOAA follow the implementation of the conference's recommendations and report, in writing, on their progress and effectiveness.

Conference participants, during the question and answer periods, suggested several areas that needed further discussion. These areas are the following:

1. What will life be like for students once they graduate? This question goes beyond the basic discussions about whether there will or will not be jobs available for the future. For instance, we need to think about whether a new minority faculty appointee gets placed on an excessive number of committees. While the intent to present a diverse image is honorable, this committee work, in the present system, will count only minimally towards tenure.
2. Into which fields of Ocean Sciences will these students be going? Oceanography is a diverse field encompassing essentially all the basic sciences: Physics, Chemistry, Biology, Geology, Climatology, etc. In addition, as was mentioned on numerous occasion during the meeting, it is really the only field of science that, for graduate degrees, draws upon groups of individuals with training outside Oceanography for advanced degrees. However, what must also be noted is that most of the HBMSCUs do not have as diverse programs in the sciences, particularly at the undergraduate level. This suggests that most of the students oceanic graduate studies will attract will be in a few basic fields of marine sciences, particularly, marine biology and marine chemistry.
3. Although most minority students attend HBMSCUs, many do not and recruitment needs to reach out to them as well. We need to keep contact with a diverse body of organizations to ensure that all minority students have the possibility to be involved in all aspects of oceanography.
4. N'e. Muoneke asked that the field of Ocean Sciences be more clearly defined and articulated. Ocean Sciences is a diverse field. Strong definitions of both Ocean Sciences as a whole and the elements that make it up will provide a clear message for representatives to share.
5. Russell Cuhel raised the question, "Why do students need advanced degrees to work in Ocean Sciences?" Dr. Sullivan discussed the need for science technicians trained at the bachelor's level as well as those scientists with advanced degrees. HBMSCUs and Ocean Science institutions must work towards demonstrating this need even before students choose majors.

Participants also suggested ways to improve the format of the conference for following years:

1. Include more informal sessions with students.
2. Develop and present a case study on successful minorities in the Ocean Sciences.
3. Provide a panel on cultural differences.
4. Add other constituents when possible, perhaps inviting a new group each conference year. Possible groups: community colleges, school system leaders, and innovative program providers.

IX. APPENDICES

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Appendix C: Program Guide

September 11, 1995

- 8:00-8:30 **Registration**
- 8:30-8:45 **Welcome:** Dr. William R. Harvey, President, Hampton University
- 8:45-9:00 **Charge to the Group:** Dr. Nancy Foster, Deputy Administrator, National Marine Fisheries Service
- 9:00-10:30 **Panel 1: Minorities at Work in Ocean Sciences**
View from top administrators

Chair: Dr. Ambrose Jearld, NMFS/NEFSC

Panel members: Dr. John Farrington, WHOI; Ms. Emorcia Hill, New England Board of Higher Education; Dr. Nathaniel Pitts, NSF; Dr. Earl S. Richardson, President, Morgan State University; Dr. Kathryn D. Sullivan, NOAA Chief Scientist's Office

10:30-11:00 **Coffee Break**

11:00-12:00 **Panel 2: Minority Student Matriculation**
The faculty view

Chair: Dr. Ben Cuker, Hampton University

Panel members: Dr. Matthew Gilligan, Savannah State College; Dr. Livingston S. Marshall, University of Maryland Eastern Shore; Dr. Nancy Marcus, Florida State University; Dr. Mark Ohman, Scripps Institution of Oceanography

Noon-1:00 **Lunch** (catered)

1:00-2:30 **Panel 3--The Student Perspective**
View from "The Bridge"

Chair: Dr. Brian Bingham, Shannon Point Marine Center

Panel members: Ms. Nancy Aguilar, Scripps Institution of Oceanography; Dr. Isidro Bosch, State University of New York; Mr. Maurice Crawford, North Carolina State University; Ms. Scottie Yvette Henderson, University of Washington; Ms. Dionne Hoskins, University of South Carolina; Dr. Gisèle Muller-Parker, Western Washington University; Mr. James Stewart, Hampton University

2:30-2:45 **Soda break**

2:45-5:00 **Working Groups**

You will receive your assignments at registration. Working group chairs include Dr. Matthew Gilligan, Savannah State College; Dr. Nancy Marcus, Florida State University; Dr. Livingston S. Marshall, University of Maryland Eastern Shore; Dr. Margaret Leinen, University of Rhode Island; and Dr. Susan B. Cook, Harbor Branch Oceanographic Institution

5:00 **Walking tour of campus**

6:00 **Reception, Hampton University Museum**
Hosted by the Steering Committee

September 12, 1995

8:00-Noon **Finish working sessions**

Noon-1:00 **Lunch** (catered) Committee chairs and recorders collate reports and prepare for afternoon session

1:00-3:00 **Presentation of results**

3:30-5:00 **Afternoon tea, network opportunity**

The shuttle to the McGrew Center will leave the Radisson and the Courtyard by Marriott at 7:45 AM on the 11th and 12th.

Appendix D: Work Group Assignments

(This information was compiled from participants who had registered by September 8, 1995. Participants who were not assigned to a work group were encouraged to join any group.)

Work Group #1	Work Group #2	Work Group #3
Margaret Leinen, Chair	L. Marshall, Chair	S. Cook, Chair
Henry Aceto Robert Bonner Isidro Bosch Bradford Brown George Burbank Maurice Crawford Ben Cuker John Farrington Natalie Huff Robert Jordan John Milliman N'e. Muoneke Earl Richardson Roy Watlington	Essie Coleman-Duffie Russell Cuhel Carol Daniels Peggy Delaney Fred Dobbs Dionne Hoskins John J. Kelley Joan Mitchell Marvin K. Moss Gisèle Muller-Parker Carlos Robles Barbara Weeks-Huntington Herbert Windom	Nancy Aquilar James Battey Charles Epifanio Frank Hall William Harvey Emorcia Hill Linda Hayden Earl Rhoden Linda Schaffer Ed Shaar Sheila Stiles Joseph Ramus Judith Vergun Ken Webb Dorothy White
Work Group #4	Work Group #5	Ad-Hoc Federal Work Group
Matt Gilligan, Chair	Nancy Marcus, Chair	Ambrose Jearl, Jr., Chair
Clarence Coleman Judith Connor Loveday Conquest Greg Cutter Melinda Davis Irma Delson Scottie Yvette Henderson Ambrose Jearl Evelyn Jones Darryl Keith Tom Malone Kathryn Sullivan Ken Tenore William Willis	Kerry Bolognese Chris D'Elia Nancy Foster Doretha B. Foushee Judith Grassle Mark Ohman Nathaniel Pitts DeLois Powell Joseph Richardson Richard Rosenblatt Larry Shannon Denise Stephenson-Hawk James Stewart Brian Bingham	Bradford Brown, NOAA Carol Daniels, USEPA Nancy Foster, NOAA Darryl Keith, USEPA Charles Luther, ONR Joan Mitchell, NSF

Appendix E: Evaluations

Summary

The overwhelming majority of participants rated the conference as “very well organized” as “fully meeting their expectations” and as being “very useful and informative.” There was a variety of responses to the three short-answer questions asking about the major strengths and weaknesses of the conference as well as the single most important improvement that could be made to the conference. Most participants said that the greatest strength was the limited number of people and the form of the conference, panel discussions followed by workgroups, that allowed for networking, collaboration, and discussion. Most also listed the need for follow-up to the conference’s recommendations and proposals as the single most important way to improve the conference. There was not a similar consensus on the greatest weakness of the conference with comments ranging from requests for the conference to be extended to more frequent coffee breaks.

Tally

Thirty (30) evaluations were collected. There were six questions on the evaluation form. Questions 1, 2, and 6 asked for a response on a numerical scale from 1 - 6 in which 6 equaled the most positive response. The answer with the greatest number of responses in bold type. Questions 3, 4, and 5 asked for short-answer responses. Responses suggested by more than one respondent are listed in bold type.

1. How well was the conference organized? from 1 (not every well) to 6 (very well)

Scale	1	2	3	4	5	6
Number	0	0	0	4	16	10
Percent (of Respondents)	0	0	0	13%	54%	33%

2. How well did the conference meet your expectations? *from 1 (not very well) to 6 (very well)*

Scale	1	2	3	4	5	6
Number	0	0	0	2	16	12
Percent (of Respondents)	0	0	0	7%	53%	40%

6. What is your overall estimate of the conference’s quality and usefulness? *from 1 (not very useful and informative) to 6 (very useful and informative)*

Scale	1	2	3	4	5	6
Number	0	0	0	1	14	15
Percent (of Respondents)	0	0	0	3%	47	50%

3. List major strengths of the conference.

A small number of participants facilitated good dialogue.
Opportunity to network with other professionals.
Opportunity to contribute in working groups.
The recommendations that will be acted upon.
Willingness of conference participants to openly communicate.
Holding the conference at a HBMSCU.
The broad spectrum of ways to expand awareness of the Ocean Science career options.
Panels followed by workgroups.
The diversity of participants.

4. List major weaknesses of the conference.

Need more time for panel discussions.
Need to provide a list of HBMSCUs with Ocean Science programs for participants.
Need to provide computer demonstrations of Internet capabilities.
Not enough students in panels.
Too many presenters on the panels.
The recommendations that will not be acted upon.
Information for the conference was late in arriving.
Cramped seating for general sessions.
Open to students at open sessions.
Sessions overly structured without enough time for one-on-one conversations.
Purpose of producing recommendations not always clear.

5. What, if any, is the one most important thing that should be done to improve this conference?

Extend the conference to a minimum of three days to accommodate more discussion.
Have a follow-up conference.
Invite a few representatives from minority parent groups and organizations to provide input regarding cultural understanding.
Invite Dr. Michael Howell from South Carolina, as a representative of AMP, to the next meeting.
Coordination with other national programs.
More student participation.
Include more representatives from HBMSCUs that do not have Ocean Science programs.
Send agenda and conference participant list to participants earlier.
Produce a time line of specific outcomes from recommendations.
Ask participants to focus their attention on a specific task.

Appendix F: Bridge Program and Computer Database Information

Bridge Program Information

ASLO-Hampton University. Dr. Ben Cuker, Marine and Environmental Science, Hampton University, Hampton, VA 23668; (804)727-5884; FAX 727-5084

BUMP (Boston University Marine Program) REU Program. WBLMER, BUMP-MBL, Woods Hole, MA 02543

California Academy of Math and Science

Committee on Underrepresented Minorities in Limnology and Oceanography (CURMLO)

Duke University, Minority Training Program in the Marine Sciences.

Duke University, School of the Environment, Marine Laboratory, Beaufort, NC 28516-9721; (919)728-2111

ECO - The Environmental Careers Organization. John Cook, National President; Dee Rollins, Regional Director; 286 Congress St., Third Floor, Boston, MA 02210; (617)426-4375; FAX (617)423-0998. Florida and Southeast, Robin Boland, Regional Director, 4902 Eisenhower Blvd., Suite 217, Tampa, FL 33634; (813)886-4330; FAX (813)882-0589; Great Lakes, 50 Public Square, Suite 628, Cleveland, OH 44113; (216)861-4545; FAX (216)861-6727.

Estaurine Research Foundation (ERF) sponsored by Gulf Estaurine Research Society

Federal Sector Bridges Internships, co-ops, workstudies available at both the high school and college level

The Jason Project (private funding)

Ronald E. McNair Program U.S. Department of Education, Division of Student Services, 600 Independent Avenue, SW Portal Suite 600-D, Washington, DC 20202-5249

Minority Summer Fellowships in Marine Science at the Baruch Institute.

Anne B. Miller, Coordinator, Baruch Institute Minority Program, University of South Carolina, Columbia, SC 29208

NOAA Cruise Participation. Mrs. Gladys Reese, NOAA/NMFS/SEFSC, Mississippi Labs, P.O. Drawer 1207, Pascagoula, MS 39568-1207; (601)762-4591; Dr. Ambrose Jearld, NOAA/NMFS, Woods Hole Laboratory, Woods Hole, MA 02543; (508)548-5123

Oak Ridge Institute for Science and Education (ORISE). Oak Ridge Institute for Science and Education, P.O. Box 117, Oak Ridge, TN 37831-0117. ATTN: Angie Palmer

Research Careers for Minority Scholars (RCMS), Minority Biomedical Research Support (MBRS), Minority Access to Research Careers (MARC)

Research Opportunity Award (ROA) Awards of about 15K which allow academics from a non-research organization to link with NSF funded scientists to participate in research at a majority research institute.

Savannah State College & Harbor Branch Oceanographic Institution Minority Undergraduate Marine Science Summer Program (NSF Ocean Sciences) contacts: Matthew Gilligan (SSC) and Susan Cook (HBOI)

Scripps Undergraduate Research Fellowship Program (SURF). David McDonald, Director, Graduate Affirmative Action Programs, Office of Graduate Studies and Research, 9500 Filman Dr., Dept. 0003, La Jolla, CA 92093-0003; (619)534-3553

Shannon Point Marine Center, Summer REU Program. Dr. Gisèle Muller-Parker, Western Washington University, 1900 Shannon Point Rd., Anacortes, WA 98221; (206)293-2188; OMNET Shannon.Point

South Carolina Department of Natural Resources Minority Training Program. Donna Richardson, Department of Natural Resources, Marine Resource Division, P.O. Box 12559, Charleston, SC 29422-2559; (803)795-6350 ext. 2233

Summer Research Intern Program, Beaufort Laboratory, NOAA-NMFS. John Govoni, NMFS, Beaufort, NC 28516; (919)728-3376

Tennessee Technological University. U.S. Fish and Wildlife Service, Dept. of Biology, Box 5063, Cookeville, TN 38505

Texas A&M University, REU Program. Dr. Gilbert Rowe, College of Oceanography, Texas A&M University, College Station, TX 77843-3146; (409)845-4092

Traineeships in Oceanography for Minority Group Undergraduates, Woods Hole Oceanographic. The Fellowship Committee, Education Office, WHOI, Woods Hole, MA 02543; (508)457-2000, ext. 2200

University of North Carolina Program (NSF) Undergraduate Program (NCA&T, Pembroke, Elizabeth City State) and NOAA Southeast Fisheries Center (pays for ship time)

University of Texas, Institute of Marine Science, Port Aransas, REU Program with a Minority Focus. Summer Intern Coordinator, Marine Science Institute, The University of Texas, P.O. Box 1267, Port Aransas, TX 78373-1267; (512)749-6721; FAX (512)749-6777

Upward Bound

Western Washington University, Minorities in Marine Science Undergraduate Program (MIMSUP). Dr. Brian Bingham, Shannon Point Marine Center, 1900 Shannon Point Rd., Anacortes, WA 98221; (206)293-2188; OMNET Shannon.Point;
E-mail address: bingham@henson.cc.wvu.edu

Computer Database Information

FEDIX Federal Information Exchange. The on-line database retrieval service of government information for colleges, universities, and other organizations. Internet: World Wide Web URL: <http://web.fie.com/> Telnet or FTP address: fedix.fie.com Gopher address: gopher.fie.com Modem Access: Dataline 1-301-258-0953 Toll-free: 1-800-783-3349 (800 line available to minority institutions only)

MOLIS Minority On-Line Information System. An on-line service providing information about institutional capabilities of Historically Black Colleges and Universities and Hispanic-Serving Institutions. Internet: World Wide Web URL: <http://web.fie.com/> Telnet or FTP address: fedix.fie.com Gopher address: gopher.fie.com Modem Access: Dataline 1-301-258-0953 Toll-free: 1-800-783-3349 (800 line available to minority institutions only)

**Appendix G: A Listing of Historically Black and Minority Serving
Colleges and Universities**

Historically Black Institutions, listed by state

Alabama

Alabama A & M University	Huntsville, AL 35762
Alabama State University	Montgomery, AL 36195
Bishop State Jr. College	Mobile, AL 36990
Concordia College	Selma, AL 36701
Fredd State Technical College	Tuscaloosa, AL 34501
Lawson State Community College	Birmingham, AL 35211
Miles College	Birmingham, AL 35208
Oakwood College	Huntsville, AL 35896
Selma University	Selma, AL 36701
J.F. Drake Technical College	Huntsville, AL 35811
Stillman College	Tuscaloosa, AL 35401
Talladega College	Talladega, AL 35160
Trenholm State Technical College	Montgomery, AL 36108
Tuskegee University	Tuskegee, AL 36088

Arkansas

Arkansas Baptist College	Little Rock, AR 72202
Philander Smith College	North Little Rock, AR 72202
Shorter College	North Little Rock, AR 72114
University of Arkansas at Pine Bluff	Pine Bluff, AR 71601

Delaware

Delaware State University	Dover, DE 19901
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District of Columbia

Howard University	Washington, DC 20059
University of the District of Columbia	Washington, DC 20008

Florida

Bethune Cookman College	Daytona Beach, FL 32015
Edward Waters College	Jacksonville, FL 32209
Florida A&M University	Tallahassee, FL 32307
Florida Memorial College	Miami, FL 33054

Georgia

Albany State College	Albany, GA 31705
Clark Atlanta University	Atlanta, GA 30314
Fort Valley State College	Fort Valley, GA 31030
Interdenominational Theological Center	Atlanta, GA 30314
Morehouse College	Atlanta, GA 30314
Morehouse School of Medicine	Atlanta, GA 30310
Morris Brown College	Atlanta, GA 30314
Paine College	Augusta, GA 30910
Savannah State College	Savannah GA 31404
Spelman College	Atlanta, GA 30314

Kentucky

Kentucky State University

Frankfort, KY 40601

Louisiana

Dillard University

New Orleans, LA 70122

Grambling State University

Grambling, LA 71245

Southern University System

Baton Rouge, LA 70813

Southern University A&M College

Baton Rouge, LA 70813

Southern University at New Orleans

New Orleans, LA 70126

Southern University at Shreveport

Shreveport, LA 71107

Xavier University

New Orleans, LA 70125

Maryland

Bowie State University

Bowie, MD 20715

Coppin State College

Baltimore, MD 21239

Morgan State University

Baltimore, MD 21239

University of Maryland, Eastern Shore

Princess Anne, MD 21853

Michigan

Lewis College of Business

Detroit, MI 48235

Mississippi

Alcorn State University

Lorman, MS 39096

Coahoma Community College

Clarksdale, MS 38614

Hinda Community College

Utica, MS 39175

Jackson State University

Jackson, MS 39217

Mary Holmes College

West Point, MS 39773

Mississippi Valley State University

Itta Bena, MS 38941

Rust College

Holly Springs, MS 39174

Tougaloo College

Tougaloo, MS 39174

Missouri

Harris-Stowe State College

St. Louis, MO 63103

Lincoln University

Jefferson City, MO 63013

North Carolina

Barber-Scotia College

Concord, NC 28025

Bennett College

Greensboro, NC 27401

Elizabeth City State University

Elizabeth City, NC 27909

Fayetteville State University

Fayetteville, NC 28301

Johnson C. Smith University

Charlotte, NC 28216

Livingstone College

Salisbury, NC 28144

North Carolina A&T State University

Greensboro, NC 27411

North Carolina Central University

Durham, NC 27707

St. Augustine's College

Raleigh, NC 27610-2298

Shaw University

Raleigh, NC 27611

Winston-Salem State University

Winston Salem, NC 27110

Ohio

Central State University

Wilberforce, OH 45384

Wilberforce University

Wilberforce, OH 45384

Oklahoma

Langston University

Langston, OK 73050

Pennsylvania

Cheyney State University

Cheyney, PA 19319

Lincoln University

Lincoln, PA 19352

South Carolina

Allen University

Columbia, SC 29204

Benedict College

Columbia, SC 29204

Claflin College

Orangeburg, SC 29115

Clinton Junior College

Rock Hill, SC 29731

Denmark Technical College

Denmark, SC 29042

Morris College

Sumter, SC 29150

South Carolina State University

Orangeburg, SC 29117

Voorhees College

Denmark, SC 29042

Tennessee

Fisk University

Nashville, TN 37208

Knoxville College

Knoxville, TN 37921

Lane College

Jackson, TN 38301

Lemoyne-Owen College

Memphis, TN 38126

Meharry Medical College

Nashville, TN 37203

Tennessee State University

Nashville, TN 37209

Texas

Huston-Tillotson College

Austin, TX 78702

Jarvis Christian College

Hawkins, TX 75765

Paul Quinn College

Dallas, TX 75241

Prairie View A&M University

Prairie View, TX 77446

Saint Phillip's College

San Antonio, TX 75160

Southwestern Christian College

Terrell, TX 75160

Texas College

Tyler, TX 75702

Texas Southern University

Houston, TX 77004

Wiley College

Marshall, TX 75670

Virginia

Hampton University

Hampton, VA 23668

Norfolk State University

Norfolk, VA 23504

Saint Paul's College

Lawrenceville, VA 23868

Virginia State University

Petersburg, VA 23806

Virginia Union University

Richmond, VA 23220

West Virginia

Bluefield State College

Bluefield, WV 24701

West Virginia State University

Institute, WV 25112

U.S. Virgin Islands

University of the Virgin Islands

St. Thomas, USVI 00802

Other Equal Opportunity Educational Colleges and Universities

Atlanta Junior College
Chicago State University
Compton Community College
Cuyahoga Community College
Charles R. Drew University
of Medicine and Science
Highland Park Community College
Kennedy-King College
Medgar Evers College
Roxbury Community College
Sojourner-Douglass College
Wayne County Community College

Atlanta, GA 30310
Chicago, IL 60628
Compton, CA 90221
Cleveland, OH 44115

Los Angeles, CA 90059
Highland Park, MI 48209
Chicago, IL 60621
Brooklyn, NY 11225
Boston, MA 02115
Baltimore, MD 21206
Detroit, MI 48226

Southeast Asian Studies Programs/Southeast Asian Resource Centers at Colleges and Universities

Southeast Asia Program
Cornell University
Ithaca, NY 14853

University of Wisconsin Center for Southeast Asian Studies
Madison, WI 53706

Hispanic Association of Colleges and Universities (HACU)

Hispanic Serving Institutions

Arizona

Arizona Western College
South Mountain Community College*

California

California State University
 Bakersfield
 Fresno
 Los Angeles
Cerritos College
College of the Sequoias
Compton Community College
Don Bosco Technical Institute
East Los Angeles College
Gavilan College
Hartnell College
Imperial Valley College
Kings River Community College
Los Angeles City College
Los Angeles Harbor College
Los Angeles Mission College
Los Angeles Trade-Tech College
Mount Saint Mary's College
Mount San Antonio College
Oxnard College
Palo Verde College
Rancho Santiago Community College
Rio Hondo College
Saint John's Seminary College
San Bernardino Valley College
San Diego State University
 Imperial Valley Campus
Southwestern College
West Hills Community College

Colorado

Community College of Denver
Otero Junior College
Pueblo Community College
Trinidad State Junior College

Florida

Barry University
Florida International University
Miami-Dade Community College
 Homestead Campus
 Kendall Campus
 Medical Center Campus
 North Campus
 Wolfson Campus
Saint John Visnney College Seminary
St. Thomas University

St. Vincent de Paul
Regional Seminary

Illinois

Harry S. Truman College
MacCormac Junior College
Richard J. Daley College
Robert Morris College
St. Augustine College

New Jersey

Hudson County Community College
Passaic County Community College

New Mexico

Albuquerque Tech-Voc. Inst.
College of Santa Fe
Dona Ana Branch Community College
Eastern New Mexico University-
 Roswell
Luna Vocational Tech. Institute
New Mexico Highlands University
New Mexico State University-
 Grants Campus
 Main Campus
Northern New Mexico
 Community College
Sante Fe Community College
University of New Mexico
University of New Mexico-
 Valencia Campus
Western New Mexico University

New York

Boricua College
Borough of Manhattan Community
 College of the City University of NY
Bronx Community College
City Univ. of New York-City College
College of Aeronautics
Herbert H. Lehman College
 The City University of New York
Hostos Community College
John Jay Coll. of Criminal Justice
LaGuardia Community College
Mercy College

Texas

Alamo Community College
District
Bee County College
Del Mar College

El Paso Community. College District
Incarnate Word College
Laredo Community College
Our Lady of the Lake University
Palo Alto College
Saint Mary's University
San Antonio College
Southwest Texas Junior College
St. Edward's University
St. Philip's College
Sul Ross State University
Texas A&M International University
Texas A&M University- Kingsville
Corpus Christi
Texas State Tech. Coll.-Harlingen
Univ. of Texas at Brownsville in Partnership
w/Texas Southmost College
University of Houston-Downtown
University of Texas-Pan American
University of Texas at El Paso
at San Antonio

Puerto Rico

American University of Puerto Rico
Antillian Adventist University
Bayamon Central University
Caribbean Center for Advanced Studies
Caribbean University College
Pontifical Catholic University
of Puerto Rico
Center for Advanced Studies on
Puerto Rico and the Caribbean
Colegio Universitario del Este
Conservatory of Music of Puerto Rico
InterAmerican University of Puerto Rico
Aguadilla Campus
Aracibo University College
Barranquitas Campus
Bayamon Campus
Central Administration
Fajardo Campus
Guayama Campus
Metropolitan Campus
Ponce Regional College
San German Campus
Technological College of the
Municipality of San Juan
Universidad Metropolitana
Universidad Politecnica
de Puerto Rico
Universidad del Turabo
University of Puerto Rico
Aguadilla Regional College
Aracibo Technological
University College
Bayamon Technological
University College

Carolina Regional College
Cayey University College
Central Administration Office
Humacao Univ. College
La Montana Regional College
Mayaguez Campus
Medical Sciences Campus
Ponce Technological
University College
Rio Piedras Campus
University of the Sacred Heart

Member of HACU Systems

TOTAL: 132

HACU Associates

Arizona

Arizona State University
University of Arizona

California

California State Polytechnic
University-Pomona
California State University-
Dominquez Hills
Hayward
Long Beach
Northridge
Sacramento
San Marcos
Crafton Hills College
Long Beach Community College District
San Francisco State University
Santa Barbara City College
University of California-
Irvine
Los Angeles
San Diego

Colorado

Adams State College
Metropolitan State College of Denver

Florida

University of Florida

Illinois

Chicago State University
City Colleges of Chicago
Elgin Community College
Harold Washington College
Northeastern Illinois University
University of Illinois at Chicago

New Jersey

Jersey City State College
Kean College of New Jersey

New Mexico

Clovis Community College
Eastern New Mexico University
New Mexico Institute of Mining &
Technology
New Mexico State University-
Alamogordo

New York

Brooklyn College
New York City Technical
College CUNY
Pace College
New York Campus

Pennsylvania

Pennsylvania State University-
Main Campus

Texas

East Texas State University
Texas A&M University
Texas Lutheran College
University of Houston-
University Park
University of Texas
at Austin
at Dallas
Health Science Center
at San Antonio
of the Permian Basin

Washington

Heritage College

Wisconsin

University of Wisconsin System
Office

TOTAL: 45

Colleges for Women Only

Alabama

Judson College

California

Mills College
Mount St. Mary's College
Scripps College

Connecticut

St. Joseph College

District Of Columbia

Mount Vernon College
Trinity College

Georgia

Agnes Scott College
Brenau University
Spelman College
Wesleyan College

Illinois

Lexington Institute of Hospitality Careers

Indiana

St. Mary-of-the-Woods College
St. Mary's College

Kentucky

Midway College

Maryland

College of Notre Dame of Maryland
Hood College

Massachusetts

Aquinas College at Milton
Aquinas College at Newton
Bay Path College
Elms College
Emmanuel College
Endicott College
Fisher College
Lasell College
Lesley College
Mount Holyoke College
Pine Manor College
Regis College
Simmons College
Smith College
Wellesley College

Minnesota

College of St. Benedict
College of St. Catherine St. Catherine Campus

Missouri

Cottey College
Stephens College
William Woods College

Nebraska

College of St. Mary

New Jersey

Assumption College for Sisters
College of St. Elizabeth
Georgian Court College
Rutgers-The State University of New Jersey:
Douglas College

New York

Barnard College
College of New Rochelle
Russell Sage College
Wells College
William Smith College

North Carolina

Bennett College
Meredith College
Peace College
St. Mary's College
Salem College

Ohio

Notre Dame College of Ohio
Ursuline College

Pennsylvania

Bryn Mawr College
Carlow College
Cedar Crest College
Chatham College
Chestnut Hill College
Harcum Junior College
Immaculate College
Moore College of Art & Design
Rosemont College
Seton Hill College
Wilson College

South Carolina

Columbia College
Converse College

Vermont

Trinity College of Vermont

Virginia

Hollins College
Mary Baldwin College
Randolph-Macon Woman's College
Southern Virginia College for Women
Sweet Briar College

Wisconsin

Alverno College
Mount Mary College

Appendix H: Joint Oceanographic Institutions Incorporated (JOI) Members

The Institute of Geophysics
The University of Texas at Austin

The Lamont-Doherty Geological Observatory
Columbia University

The Rosentiel School of Marine and Atmospheric Science
University of Miami

The College of Oceanography
Oregon State University

The Graduate School of Oceanography
University of Rhode Island

The College of Geosciences and Maritime Studies
Texas A & M University

The School of Ocean and Earth Science and Technology
University of Hawaii

The Woods Hole Oceanographic Institution

The Scripps Institution of Oceanography
University of California, San Diego

Appendix I: Members of the Consortium for Oceanographic Research and Education, Inc.

Institutions of the Board of Governors

University of Alaska
University of California, San Diego
University of California Consortium
Irvine
Los Angeles
Santa Barbara
Santa Cruz
Columbia University
University of Delaware
Harbor Branch Oceanographic Institution
University of Hawaii
University of Maryland
University of Miami
North Carolina State University
University of North Carolina at Wilmington
Oregon State University
University of Rhode Island
The University of Texas at Austin
Texas A & M University
University of Washington
The Woods Hole Oceanographic Institution

Other Institutions

Bigelow Laboratory for Ocean Sciences
University of Connecticut
University of Michigan
Monterey Bay Aquarium Research Institute
Moss Landing Marine Laboratories
Old Dominion University
College of William and Mary

Appendix J: Members of the National Association of Marine Laboratories

Dr. Kenneth Able (NEAMGLL)

Inst. Marine & Coastal Sciences
Rutgers Univ., Marine Field Station
800 Great Bay Blvd.
Tuckerton, NJ 08087
(609) 296-5260; -1024
able@arctic.rutgers.edu

Dr. James J. Alberts (SAML)

Univ. of Georgia, Marine Institute
Sapelo Island, GE 31327
(912) 485-2221; FAX: 485-2133
jalberts@uga.cc.uga.edu

Dr. Robert van Aller (Bill Walker)

Gulf Coast Research Laboratory
703 East Beach Dr.
P.O. Box 7000
Ocean Springs, MS 39566-7000
(601) 872-4211; FAX: 872-4204, -4279

Dr. Larry Atkinson (SAML)

Coastal Physics & Oceanography
Old Dominion University
Norfolk, VA 23529/0276
(804) 683-4285/-4926; FAX: 683-5550
atkinson@ccpo.odu.edu

Dr. Daniel Baden (SAML)

Rosenstiel School, Mar. Atmos. Sci.
University of Miami
4600 Rickenbacker Causeway
Miami, FL 33149/1098
(305) 361-4738; FAX: 361-4001
dbaden@rsmas.miami.edu

Dr. Howard S. Barnes (SAML)

Smithsonian Tropical Res. Inst.
Panama, Unit 0948
APO AA 34002-0948, USA
(507) 227-5211; FAX: 232-6197
stri.tivoli.forda@ic.si.edu
(Ana Maria Ford, Adm. Asst.)

Dr. David Bechler (SAML)

Center, Coastal & Marine Studies.
Lamar University
P.O. Box 10037
Beaumont, TX 77710-0037
(409) 880-8253; FAX: 880-8007
dlbechler@lub001.lamar.edu

Dr. Richard L. Benefield (SAML)

Seabrook Marine Laboratory
P.O. Box 8
Seabrook, TX 77586
(713) 474-2881; FAX: 474-2812

Dr. Peter R. Betzer (SAML)

Department of Marine Sciences
University of South Florida
140 Seventh Ave., South
St. Petersburg, FL 33701
(813) 893-9130; FAX: 893-9189

Dr. Paul Bienfang (WAML)

Center for Applied Aquaculture
Oceanic Institute
P.O. Box 25280
Honolulu, HI 96825
(808) 259-7951; FAX: 259-5971
74763.2226@compuserve.com

Dr. Stephen B. Brandt (NEAMGLL)

Great Lakes Center
SUNY College at Buffalo
1300 Elmwood Avenue
Buffalo, NY 14222
(716) 878-4329; FAX: 878-4009
brandtsb@snybufaa.cs.snybuf.edu

Dr. Peter Brewer (WAML)

Monterey Bay Aquarium Res. Inst.
160 Central Avenue
Monterey, CA 93940
(408) 647-3700
brpe@mbari.org

Dr. Charles J. Brokaw (WAML)

Kerckhoff Marine Laboratory
California Institute of Technology
101 Dahlia Street
Corona Del Mar, CA 92625
(818) 395-6294; FAX: (714) 675-1837

Dr. Arthur Brooks (NEAMGLL)

Center, Great Lakes Studies
University of Wisconsin
600 E. Greenfield Ave., Box 413
Milwaukee, WI 53204
(414) 382-1704; FAX: 382-1705
abrooks@csd.uwm.edu

Dr. Richard Brusca (SAML)
Grice Marine Biological Lab
College/Univ. of Charleston
205 Fort Johnson
Charleston, SC 29412-6412
(803) 762-5550; FAX: 762-5555
bruscar@cofc.edu

Dr. Lou Burnett
Department of Biology
College of Charleston
Charleston, SC
burnettl@cofc.edu

Dr. John E. Burris (NEAMGLL)
Marine Biological Laboratory
Woods Hole, MA 02543
(508) 289-7405; FAX: 457-1924
jburris@mbl.edu

Dr. James S. Clegg (WAML)
Bodega Marine Laboratory
P.O. Box 247
Bodega Bay, CA 94923
(707) 875-2211; FAX: 875-2009
jsclegg@ucdavis.edu

Dr. Kirk Cochran (NEAMGLL)
(Dr. William Wise)
Marine Sciences Research Center
State University of New York
Stony Brook, NY 11794
(516) 632-8700; FAX: 632-8820
kcochran@ccmail.sunysb.edu

Dr. Patrick Colin (WAML)
Coral Reef Research Foundation
Chuuk Atoll Research Laboratory
P.O. Box 70
Weno, Chuuk State
Federated States of Micronesia
FAX: 011(691) 330-4413

Dr. David Correll (SAML)
Smithsonian Environ. Research Cntr.
647 Contees Wharf Rd.; P.O. Box 28
Edgewater, MD 21037-0028
(301) 261-4190; FAX: 261-7954
correll@serc.si.edu

Dr. Benjamin Cuker (SAML)
Hampton University
School of Marine & Environ. Studies
Hampton, VA 23668
(804) 727-5884; FAX: 727-5832

Dr. Michael Dagg (SAML)
Louisiana Universities
Marine Consortium (LUMCON)
8124 Highway 56
Chauvin, LA 70344
(504) 851-2800;
FAX: 851-2874mdagg@coco.lumcon.edu

Dr. Randall Davis (SAML)
Texas A&M University - Galveston
Mitchell Campus
P.O. Box 1675
Galveston, TX 77553/1675
(409) 740-4528; FAX: 740-5001

Dr. Kevin Eckelbarger (NEAMGLL)
Darling Marine Center
University of Maine
Walpole, ME 04573
(207) 563-3146; FAX: 563-3119
kevine@maine.maine.edu

Dr. Charles Epifanio (NEAMGLL)
Graduate College of Marine Studies
University of Delaware
Lewes, DE 19958
(302) 645-4262; FAX: 645-4007
epi@udel.edu

Dr. John Farrington (NEAMGLL)
Woods Hole Oceanographic Institution
Woods Hole, MA 02543
(508) 289-2200, 2219; FAX: 289-2188
jfarrington@cliff.whio.edu

Dr. Madilyn Fletcher (SAML)
Center for Marine Biotechnology
Univ. of Maryland; Columbus Cntr.
701 E. Pratt St.
Baltimore, MD 21202
(410) 234-8800; FAX: 234-8896
fletcher@umbi.umd.edu

Dr. Edward Frieman (WAML)
Scripps Institute of Oceanography
Univ. California, San Diego
9500 Gilman Dr.
La Jolla, CA 92093
(619)534-2826; FAX: 534-5306

Dr. Chris Garside (NEAMGLL)
Bigelow Lab for Ocean Sci.
McKown Point; P.O. Box 475
West Boothbay Harbor, ME 04575
(207) 633-9600; FAX: 633-9641
garside@bigelow.org

Dr. Matthew R. Gilligan (SAML)
Marine Biology Program
Dept. of Biology & Life Sciences
Savannah State College
Savannah, GE 31404
(912) 356-2250; FAX: 356-2996

Dr. Frederick J. Grassle (NEAMGL)
Haskin Shellfish Research Lab.
Rutgers University
Marine Field Station
New Brunswick, NJ 08903/0231
(908) 932-6555 x509; FAX: 932-8578
grassle@ahab.rutgers.edu

Dr. Michael J. Greenberg (SAML)
The Whitney Laboratory
University of Florida
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Appendix K: Bibliography of Suggested Readings

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Appendix L: Notes and Statistical Tables

One of the primary concerns of this conference was to address the national deficit of minorities in the sciences in the U.S. The term "deficit," is more than appropriate for two reasons:

(1) African Americans, Hispanics, and Native Americans received two percent or less of the 1994 doctorates earned in mathematics, environmental sciences, and engineering and no African American, Hispanics or Native Americans received doctorates in oceanography and marine sciences. (See the following Tables)

Mathematics	African American		Asian		Caucasian		Hispanic		Native American	
	Count	Percentage	Count	Percentage	Count	Percentage	Count	Percentage	Count	Percentage
Applied Mathematics	1	1%	28	21%	99	76%	2	2%	0	—
Algebra	2	4%	2	4%	46	88%	0	—	0	—
Analysis and Functional Analysis	1	2%	11	19%	46	79%	0	—	0	—
Geometry	1	4%	7	30%	13	57%	2	9%	0	—
Logic	2	10%	0	—	17	85%	1	5%	0	—
Number Theory	0	—	4	16%	19	76%	2	8%	0	—
Mathematical Statistics	2	2%	36	32%	72	63%	1	1%	1	1%
Topology	0	—	6	24%	16	64%	1	4%	1	4%
Computing Theory and Practice	0	—	3	38%	5	63%	0	—	0	—
Operations Research	0	—	6	33%	10	56%	1	6%	0	—
Mathematics, General	2	2%	30	25%	85	70%	3	2%	0	—
Mathematics, Other	0	—	8	16%	43	84%	0	—	0	—
* TOTAL	11	2%	141	22%	471	73%	13	2%	2	.3%

Summary Report 1994 Doctorate Recipients from United States Universities (1995), Office of Scientific and Engineering Personnel, National Research Council (NRC). National Academy Press, Washington, DC.

* Percentages may not equal 100%, due to rounding.

Physics and Astronomy	African American		Asian		Caucasian		Hispanic		Native American	
	Count	%	Count	%	Count	%	Count	%	Count	%
Astronomy	0	—	5	10%	42	82%	1	2%	0	—
Astrophysics	0	—	5	8%	54	90%	1	2%	0	—
Acoustics	0	—	3	20%	12	80%	0	—	0	—
Chemical and Atomic/Molecular	1	1%	23	23%	73	72%	5	5%	0	—
Elementary Particles	1	1%	13	12%	92	84%	3	3%	0	—
Fluids	0	—	1	10%	9	90%	0	—	0	—
Nuclear	0	—	15	20%	60	79%	1	1%	0	—
Optics	1	1%	21	25%	58	70%	3	4%	0	—
Plasma and High-Temperature	1	2%	13	22%	44	73%	1	2%	1	2%
Polymer	1	6%	4	25%	9	56%	2	13%	0	—
Solid State and Low-Temperature	3	1%	84	33%	156	62%	7	3%	0	—
Physics, General	2	1%	50	25%	140	69%	4	2%	0	—
Physics, Other	1	1%	28	24%	83	70%	3	3%	1	1%
* TOTAL	11	1%	265	23%	832	72%	31	3%	2	.2%

Summary Report 1994 Doctorate Recipients from United States Universities (1995)
Office of Scientific and Engineering Personnel, National Research Council (NRC).
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* Percentages may not equal 100%, due to rounding.

Table 6: 1994 Doctorates To U.S. Citizens By Race/Ethnicity - Engineering										
Engineering	African American		Asian		Caucasian		Hispanic		Native American	
	Aerospace, Aeronautic, Astronautic	1	1%	23	18%	100	77%	3	2%	1
Agricultural	0	—	9	22%	28	68%	2	5%	1	2%
Bioengineering and Biomedical	0	—	22	17%	98	78%	3	2%	1	1%
Ceramic Sciences	0	—	3	14%	17	81%	0	—	0	—
Chemical	8	2%	79	24%	234	70%	5	1%	1	.3%
Civil	6	3%	57	24%	161	68%	12	5%	0	—
Communications	0	—	7	41%	8	47%	2	12%	0	—
Computer	1	1%	36	38%	58	60%	1	1%	0	—
Electrical, Electronics	16	2%	262	33%	481	61%	18	2%	1	.1%
Engineering Mechanics	0	—	26	41%	38	59%	0	—	0	—
Engineering Physics	0	—	3	25%	9	75%	0	—	0	—
Engineering Science	0	—	8	31%	17	65%	1	4%	0	—
Environmental Health Engineering	2	4%	12	22%	38	70%	2	4%	0	—
Industrial Manufacturing	6	5%	29	24%	83	70%	1	1%	0	—

* Percentages may not equal 100%, due to rounding.

Engineering	African American		Asian		Caucasian		Hispanic		Native American	
Industrial Manufacturing	6	5%	29	24%	83	70%	1	1%	0	—
Materials Science	2	1%	71	29%	161	67%	4	2%	1	.4%
Mechanical	7	1%	153	32%	296	63%	8	2%	0	—
Metallurgical	1	3%	8	23%	24	69%	0	—	0	—
Mining and Mineral	1	8%	6	46%	6	46%	0	—	0	—
Nuclear	0	—	8	19%	32	76%	1	2%	0	—
Ocean	0	—	4	36%	6	55%	0	—	0	—
Operations Research	2	8%	4	17%	18	75%	0	—	0	—
Petroleum	0	—	8	44%	9	50%	1	6%	0	—
Polymer/Plastics	0	—	9	33%	16	59%	1	4%	0	—
Systems	0	—	7	23%	23	74%	1	3%	0	—
Engineering, General	0	—	6	32%	12	63%	0	—	0	—
Engineering, Other	1	2%	8	15%	43	81%	0	—	0	—
* TOTAL	32	2%	535	29%	1249	68%	1	.1%	5	.3%

Summary Report 1994 Doctorate Recipients from United States Universities (1995),
Office of Scientific and Engineering Personnel, National Research Council (NRC).
National Academy Press, Washington, DC.

* Percentages may not equal 100%, due to rounding.

(2) A sizable percentage of Ph.D.s in the sciences were awarded to non-U.S. citizens.

Notes

It is important to note that unprecedented shifts in federal policy and appropriations for graduate programs over the last five years forced higher education and states to take on greater fiscal responsibilities for graduate programs and student assistance. While Congress continues to cut financial aid for graduate studies, tuition has accelerated at more than twice the rate of inflation for the last fifteen years. Although President Clinton has proposed an increase for the Graduate Assistance in Areas of National Need (GAANN) program, Harris, Javits and faculty development fellowships are targeted for elimination in FY'97. In the face of severe budget cuts at the national and state level, prospects become even dimmer for minorities and particularly minorities in the sciences. In 1994 the Department of Education allocated \$65.1 million in graduate education. In 1996, the request was reduced substantially to \$31 million.

The Bureau of the Census projects, "...by 2012 more blacks than non-Hispanic whites would be added to the population each year." "Around 2030 the total elementary school-aged cohort of the U.S. would be about equally divided between non-Hispanic whites and all other racial/ethnic groups combined." (NSF. Women, Minorities, and Persons with Disabilities in Science and Engineering: 1994, p. 11. Arl. VA, 1994. (NSF 94-333). These demographic changes during the next century demand a major national commitment to diversify the small group of U.S. citizens who combine creativity and scientific training to:

- Determine national scientific policy and research priorities
- Develop new products and solutions
- Conduct research to improve the quality of life
- Become faculty members to prepare future leaders in all fields and
- Influence students as role models to advance scientific literacy

Appendix M: Glossary of Acronyms

AISES	American Indians in Science and Education Society
AMP	Alliances for Minority Participation
ASLO	American Society of Limnology and Oceanography
CORE	Consortium for Oceanographic Research and Education
DOC	Department of Commerce
EEO	Equal Employment Office
EPA	Environmental Protection Agency
ERF	Estaurine Research Foundation
HACU	Hispanic Association of Colleges and Universities
HBCUs	Historically Black Colleges and Universities
HBMSCU	Historically Black or Minority Serving College and University
HBMSCUs	Historically Black or Minority Serving Colleges and Universities
HBOI	Harbor Branch Oceanographic Institution
HU	Hampton University
IPA	Intergovernmental Personnel Act of 1970
JOI	Joint Oceanographic Institutions Incorporated
MARC	Minority Access to Research Careers Program
MBL	Marine Biological Laboratory, Woods Hole, MA
MBRS	Minority Biomedical Research Support Program
MIMSUP	Minorities in Marine Sciences Undergraduate Program
MOLIS	Minority On-line Information Service
NAML	National Association of Marine Laboratories
NASULGC	National Association of State Universities and Land Grant Colleges
NCA&T	North Carolina Agricultural and Technical State University
NEAMGLL	Northeast Association of Marine and Great Lake Laboratories
NEBHE	New England Board of Higher Education
NIH	National Institutes for Health
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRC	National Research Council
NSF	National Science Foundation
ONR	Office of Naval Research
RCMS	Research Careers for Minority Scholars Program
REU	Research Experience for Undergraduates
ROA	Research Opportunity Award
SAML	Southern Association of Marine Laboratories
SEFSC	Southeastern Fisheries Science Center
SSC	Savannah State College
SIO	Scripps Institute of Oceanography
SURSP	Scripps Undergraduate Research Support Program
TOS	The Oceanography Society
UC	University of California
UNC	University of North Carolina
UNOLS	University-National Oceanographic Laboratory System
URI	University of Rhode Island
VIMS	Virginia Institute of Marine Science
WAML	Western Association of Marine Laboratories
WHOI	Woods Hole Oceanographic Institution

Appendix N: Additional Information

Conference Highlights

Expanding Opportunities in Ocean Sciences

*A Conference to Strengthen the Links Between
HBMSU Undergraduates and Oceanic Graduate Studies*

September 11 & 12, 1995
Hampton University
Hampton, Virginia

June 1996

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CONFERENCE HIGHLIGHTS

Expanding Opportunities in Ocean Sciences

This document provides a summary account of the conference as well as recommendations to be considered and implemented by institutions concerned with increased participation of underrepresented minorities in higher education, in general, and the Ocean Sciences, in particular.

Purpose of the Conference

The Conference: **Expanding Opportunities in Ocean Sciences** was held on the Hampton University campus in Hampton, Virginia September 11 and 12, 1995. Faculty, students, researchers and administrators came with the expressed purpose of strengthening the links between historically black and minority serving colleges and universities (HBMSCUs) undergraduates and graduate studies in the Ocean Sciences. Eighty-six individuals from state and private, majority and minority college and universities, government agencies, and other Ocean Sciences institutions participated in the conference hosted by the National Marine Fisheries Service (NMFS).

Overview of the Conference Program

Dr. William R. Harvey, President of Hampton University, who was introduced by Dr. Robert Bonner, Dean, Pure and Applied Science at Hampton University, offered a warm and gracious welcome to the campus, on behalf of Hampton University.

The charge to the group was given by Dr. Nancy Foster, Deputy Administrator, National Marine Fisheries Service, who was introduced by Dr. Ambrose Jearld, Chairman, Conference Steering Committee. "We view this meeting as a terrific opportunity," she said, "we have two days that we can spend trying to learn from each other....I hope that when we leave this conference we will be able to look back and say that this was one of those rare meetings that actually made a difference."

In underscoring the necessity of this conference, Dr. Foster shared a few statistics. In 1990, in this country, only about 3% of the enrolled graduate students were minorities. Among the population of employed oceanographers, only 7.7% are minorities (NRC). Only 2.5% of the student population are minorities at JOI, Inc. "Look closer to home in NOAA and in the National Marine Fisheries Service. Since 1986, we've hired 436 employees under the job description Fishery Biologists and only 6.6% of those were minorities. We've hired 1,607 of what we call Biological Science Technicians and only 8% of those were minorities. So we haven't been making great strides forward in this area."

With this jolting reminder of the extent to which minorities are underrepresented in the marine/Ocean Sciences, in both the educational and occupational markets, the conference began. A series of panel discussions followed. Afterwards, the participants broke into five working groups. The five groups dealt with the issues of minority recruitment, student-faculty relationships, bridging programs, faculty-faculty relationships and retention respectively. A sixth working group was composed of federal representatives who discussed federal responsibility.

The Consensus of Discussion Raised During the Conference

- **The Need for Communication**
between majority and minority institution faculties, among students, faculty, administrators, and business leaders, on the Internet and through computer user groups, and most importantly, in one-to-one interactions.
- **The Need for Collaboration**
among members of federal agencies, faculty at both HBMSCUs and majority institutions, students, and administrators and educators involved in minority support and Ocean Sciences.
- **The Need for Increasing the Visibility of the Ocean Sciences**
particularly among minority populations, including K-12 teachers.
- **The Need for Support, Retention, and Follow-through**
when encouraging minority students to choose Ocean Science
- The need for large research majority institutions to improve their success of educating and training underrepresented minority students by enlarging the pool of these students through more effective recruitment. Recruitment efforts can be improved by ensuring the quality of the “messenger” and of the “message.” Effective messengers can range from students to faculty to administrators but all need to articulate speakers, well versed in the Ocean Sciences, convinced of the need to increase the number of underrepresented minorities completing graduate school, and willing to assume the responsibility needed to attract, support, and retain minority students.
- **The Need for Continuity and Sustainability**
of efforts, e.g., subsequent conferences on a bi-annual basis.
- The need to address what students can expect as they leave undergraduate departments to enter multi-disciplinary schools of marine science and oceanography. What can they expect once they acquire advance degrees? Will the early experiences of minority students prepare them for anticipated changes?
- The need to communicate what experiences and knowledge will students need to bring to grad school and to the workplace. Therefore, what courses must they take in undergraduate and graduate school? Therefore, what courses and experiences should the HBMSCUs offer the prospective marine science scholar?
- The need to address how the profession can reach out to the interested but uninformed student in the large private and state-supported majority institutions. The following narrative provides initial “new ways forward,” based on retrospective evaluations of previous shortcomings in appropriate mentoring and training.

An Overview of the Panels

The three panels, "Minorities at Work in Ocean Sciences," "Minority Student Matriculation: The Faculty View," and "The Student Perspective," were conceived as a way to structure the conference, allowing those with experience and knowledge to formally present their views. Such discussions also served as a precursor to the workgroups, allowing participants to become current with issues critical to the overall objectives of the conferences. Each member of a panel spoke briefly after which the floor was opened for questions, answers, and discussion with the audience.

Panel One: *Minorities at Work in Ocean Sciences: A View from Top Administrators*

Dr. Ambrose Jearld, National Marine Fisheries Service, Chair

This panel identified issues key to lack of minority participation in Ocean Sciences.

Encouraging Students To Choose Science As A Career

Dr. Sullivan stressed the need to make science an option for students considering careers. "We need bachelor-trained technicians and scientists. We need young people to choose science as a career. In the early years, students may not be making decisions about going into science, but they may be making decisions that close off science as an option. That's what you have to avoid."

Dr. Sullivan pointed to a partnership with Clark Atlanta University and NOAA to develop an undergraduate program for meteorological studies as a model program in setting up networks and bridging. "They've done a good job setting up networks and bridging," she said. "They assure that four to five times through the early grades, students are given a good dose of exposure to science --to 'de-geek-ify' science." The program explicitly targets juniors and seniors in high school to get qualified students into undergraduate science programs and has had a tremendous success, placing 100% of their students.

The Status Of Degree Recipients Who Are Minorities

Dr. Earl S. Richardson, President of Morgan State University addressed the issue of the status of minority degree recipients. "There are still relatively few black Ph.D.s in fields that are in demand." After two decades of trying to improve, Dr. Richardson notes, very little has actually changed. "Few would believe that the number of Ph.D.'s awarded to Blacks was higher in 1977 than in any year since. In 1977, 1,116 African Americans received doctorates (4.3% of total). The figure for 1993 was 1,106 (4.2%)." Only 13% of those Ph.D.s granted were in sciences.

The Role of Historically Black Colleges and Universities (HBCUs) in Education, Support, and Recruitment

Dr. Richardson added that HBCUs are attractive to minorities for three main reasons: a tradition of enrollment by prominent minorities, a tradition of enrolling students from a wide range of backgrounds, and a high comfort level for minorities. Because HBCUs continue to an excellent choice for a large and probably growing proportion of the minority population, it is crucial that they provide the most effective education

possible. If they are to have the impact of which they are capable, HBCUs need additional resources and programs. Federal agencies such as NOAA are in a position to address several problems of recruiting, training, and retaining minority students in the Ocean Sciences through providing assistance to public schools, create a supportive and stimulating environment for undergraduates, support graduate programs at selected campuses, and support cooperation with major doctoral-granting research institutions.

Early Recruitment And Exposure To Ocean/Marine Sciences

Dr. Pitts observed that Ocean Science has a particular problem in attracting students. Since it is interdisciplinary, marine science graduate programs do not look at students until they already have their undergraduate degrees. “If you haven’t already lined them up, it’s hard to attract them to graduate program in Ocean Science...It only takes one person in their path at school to say, ‘Hey, you ought to consider this.’”

Interventions In Progress: Experiencing Success

Dr. Farrington described the Minority Traineeship Program at WHOI, which has attracted 44 students. “We try to recruit early in the undergraduate’s career, for two years, with emphasis on focus and mentoring.” Although none of the student have returned to WHOI as faculty, Dr. Farrington said, “They have gone on to success in other areas and are now in positions at other universities where they can recommend others to us.”

Confronting Inequality: How Can This Be Remedied?

Ms. Hill, Assistant Director of the New England Board for Higher Education (NEBHE), described NEBHE’s Science and Engineering Academic Support Network aimed at encouraging students to enter and persist in science and engineering. The Network provides unique networking opportunities for students by linking them with mentors and advisors in their field of interest.

This program was developed in response to the difficulties that minority students experience in institutions of higher education.

Panel Two: *Minority Student Matriculation: The Faculty View*

Dr. Benjamin Cuker, Hampton University, Chair

This panel focused on issues related to the small numbers of people of color choosing Ocean Science, and specifically, to consider the barriers between undergraduate and graduate study.

Preparing Students To Enter The Fields Of Marine/Ocean Sciences

Dr. Cuker commented that even though things had improved for minorities in Ocean Sciences in the past 20 years, the numbers are still low. “If students have no experience on the water,” he said, “their likelihood of choosing it as a career is smaller.” Preparation for Ocean Science graduate study involves not only building strong math and science skills and getting good GRE scores, but also crossing cultural fences, allowing students positive ocean experience.

Impact Of Declining Institutional Resources On Student's Academic Preparation

Dr. Marshall identified the detrimental effects of declining institutional resources on the preparation of students at the undergraduate level, aggravated by the increasing number of students in these programs. "The courses that we offer and the quality of students that we get are improving," but he expressed concern about continuing to meet the needs of students in the current fiscal climate.

Incorporating The Student's Perspective In The Design Of Programs

Dr. Marcus indicated that her experience recruiting women into science might be used as a model for minority recruitment. "Successful women graduate students came from women's colleges. The same is probably true of historically black colleges and universities and other minority institutions." She concluded that "students choose a place with proven success, a friendly atmosphere, and a place that takes an interest in them. The question is how do we build that?"

Evaluating Student's Aptitude For Success In The Sciences

Dr. Ohman discussed one successful program, SURSP -- Scripps Undergraduate Research Support Program. It is a competitive entry, summer research program with a specific focus and a required report at the end of the program. The program "helps individuals understand the process and helps us evaluate the individual's aptitude for research" he said. "It is a great indicator" of likely student success in a science degree program.

He also discussed the importance of improving K-12 science education. "The seeds of a science career are sown early on....Many of us can point back to a 'catalytic event'," that provided the motivation for entering the sciences. Dr. Ohman believes that if students are motivated early on they will successfully complete the coursework that underpins a science career.

Mentoring As A Key Element In Student's Success

In general, mentoring was identified as important in improving minority recruitment and retention. Dr. Ohman articulated "the mentoring function is critical....It calls for an individual commitment between and among people who can move students along. Support for faculty mentoring is also a key issue. Working with minority students and all students is time consuming: there's a trade-off between tenure activities and spending more time teaching and supporting students."

Attracting Cohorts versus Individuals

Dr. Gilligan's idea was that we must move from mentoring a single individual at a time. He proposed that it is most beneficial to attract a critical mass so that there is group support, recommending that schools do three things: 1) aggressively recruit students for Research Experiences for Undergraduates (REU) programs on the campuses, 2) create programs to increase the visibility of marine science as a career, and 3) create institutional research linkage programs between minority and majority institutions such as stipend support for individuals to stay on the marine sciences career track.

Panel Three: *The Student Perspective: View from "The Bridge"*

Dr. Brian Bingham, Shannon Point Marine Center, Chair

Prior to the conference, Dr. Bingham asked the panelists to identify the major challenges they face as students of color pursuing a science education and the factors that were helping them succeed. The panelists decided on the following three major issues which were posed as questions:

- 1) What cultural challenges do students of color face in a graduate institution?
- 2) How important are mentors? What makes a good mentor?
- 3) What part do undergraduate research experiences play in preparing students for graduate school?

Defining Cultural Challenges: The Stereotyping Phenomena

Mr. Stewart discussed cultural challenges and indicated that they come from both inside and outside one's culture. "Before I started college, I was doing well in my physics class, and I was the only Black American in the class, but I didn't let this bother me. That year when I graduated, I had been accepted to Wesley and Hampton. I was excited and telling everyone about it. My peers said to me, 'You're going to be a garbage man, you're going to be cleaning my yard.' Can you imagine someone saying that after all we had been through together? I had to turn that negative into something positive. It made me more determined. No matter what happens, I am going to finish what I started."

Stereotypes are rampant throughout the educational system. Ms. Henderson talked about the negative impact of labeling which begins early on in the educational process. "In high school, Native Americans were thought of as drunks who weren't going anywhere....When I went to UC Santa Cruz, I was faced with a different problem. I was romanticized. I couldn't be me. I had to fit all the stereotypes."

Cultural Assimilation

Ms. Hoskins commented that moving from a HBCU into a large majority university is comparable to the problem of assimilating into a foreign environment. "When you go to a new school as a graduate student you go with every label they've ever acquired about you. There are a lot of attitudes about HBCUs. You are sometimes considered a little package they have to work with. Some professors already have their ideas about you. Getting in is one thing. Getting accepted is another....I don't feel this to be the optimal learning environment for any student."

Building Coping Mechanisms:

On the issue of building confidence, Aguilar asked, "How do I deal with self-confidence as a minority student--the idea that I am taking a place away from a more qualified non-minority student? I have to keep a broad perspective. I keep in contact with mentors."

Crawford stated, "It's the 'comfort factor' --being the only black person in your class. That is a common experience. There's no easy way around it. Make the situation work to your advantage."

Family Support

Students stated that a supportive family provided a sense of security and kept them focused on their goal. "My family was strong and was behind me all the way. I also had friends who were supportive. It is important to any student. There are days when you are struggling and some financial crises occurs and that's where family is important," Stewart noted. "As an undergraduate, my mother's entire income has gone to support my college. Fortunately, I have found programs that have supported my graduate work.

Pull From Families: Economic Demands

Usually families want students to pursue a more lucrative career. Dr. Bosch pointed out that "Many minority students are brought up in an environment where success is measured by financial gains, where students with strong potential are steered toward careers with the best financial rewards. The problem that we face is that we want to generate professionals from underrepresented groups, and that is a very competitive situation. Most of those candidates are on pre-med or a clinical track. It is not enough to start recruiting students in the second or third year, because they are already going someplace else."

The Role of Mentors

All students believed that a good student-mentor relationship makes a big difference in the student's education. Mr. Crawford stated that there are three things a mentor can do: "Intellectually, they can keep you on the right track, advise you with their experience; physically, they can provide the technical support you need to do your work; mentally, when you feel like you can't go on,...they help you persevere." Ms. Hoskins gave this advice to mentors, "A good mentor has a keen sense of assessing strengths and weaknesses without a set formula. The diversity of students must be met with a diversity of approaches to guide them."

Research Experience for Undergraduates (REU): A Vital Path To Success Into The Marine Sciences

Ms. Hoskins said, "I came through two (REUs) at the Virginia Institute of Marine Science (VIMS) and one at Purdue. It was indispensable. It gave me the opportunity to develop skills that I couldn't develop at Savannah State. It made me comfortable in a laboratory setting. It allows students to be fluent in the lab technique, language, and the community of science."

REUs: Ongoing Linkages

Dr. Bosch commented on the value of graduate institution programs that reach out to prospective applicants at the undergraduate level: "It is not enough to start recruiting students in the second or third year, because they are already going someplace else by then....We have to get there earlier. REU-type programs work to do this."

Dr. Bosch also spoke directly about retention. Once students are in a REU program, "What do we do to make sure students follow the track to graduate school, to post-doctoral studies, to a professional field?" He listed four time periods to focus on retention:

- The post REU experience: What happens after the student returns to their home institution when they are making decisions about future graduate studies?

- The first year of graduate school: Creating immediate ties with existing faculty and students, host families, and support group. Delaying research so these ties can be developed.
- The last year of graduate school: Don't abandon students during thesis writing.
- The first year of faculty: There's tremendous excitement in recruiting minorities but not much attention paid to retaining minority faculty. As a result there's a great deal of turn-over.

The Value of Learning to Teach

Dr. Muller-Parker spoke of better preparing students for careers by teaching them the value of learning to teach as well as conduct research. "Our responsibility to education is far greater than our responsibility to publish a research paper....One way to do it is to involve more people in the preparation of graduate students. For minority students, most are coming from smaller four-year schools and community colleges. We do not train students to teach in these types of institutions. We want these graduates to be able to go back and teach in something other than a research institution."

An Overview of the Working Groups

The five working groups were designed to allow conference participants an active role in determining the current status and needed improvements in specific areas relating to the successful recruitment and retaining of minority students in oceanic graduate studies.

Working Group 1 -- RECRUITMENT

Consensus: We urge the steering committee through the NOAA Fisheries to provide a written response to these recommendations -- where action could be taken, where our recommendations need to be tailored more precisely, how our recommendations were implemented. We also advocate that for effective and successful recruitment, recommendations must target both the message -- convincing students that Ocean Sciences are exciting, necessary, meaningful and rewarding -- and the messengers -- all those groups who must assume responsibility for students' discovery of and matriculation in Ocean Science programs."

In each instance the personalization of all approaches and strong follow-up was seen as the key to success. Individuals must be identified at the seeking institution who will serve as role models, who are willing to get involved and spend the necessary time. Recruitment is time consuming and has to be recognized as a rewarding and rewarded activity.

Strategies to Improve the Message

Heighten Awareness About The Ocean/Marine Sciences

- Develop career/recruitment brochures, videos, posters, laser discs.
- Ensure the material shows how a career in marine science is competitive with other career interests traditionally more attractive to minority students like pre-med and pre-law programs. Provide such materials to parents and guardians of prospective students.
- Ensure that minority scientists are highlighted.
- Make information on nontraditional careers in the aquatic sciences arena available and identify potential employers for all educational levels.
- Develop a traveling exhibit on careers to display at smaller minority schools, meetings of minority professional societies, major professional meetings, diversity conferences, and similar meetings.

Expand Outreach Efforts By Adopting Broad-Based Recruiting Strategies

- Enlarge the pool of people targeted. Extend efforts to include engineering programs as well as basic physical sciences, pre-med and pre-law programs.

Prepare K-12 Teachers For Active Participation In Recruitment Efforts

- Target K-12 teachers in predominantly minority school districts. Provide concrete information about the opportunities that are available in these fields.

Strategies to Create Effective Messengers

Messengers:

Minority students, faculty and institutions
Graduate students
Majority faculty and institutions
Professional and Scientific Societies
Teachers and Educational Organizations
Federal Mission Agencies
States Mission Agencies

Establishing Partnerships, Linkages And Collaborations

- Work with professional societies to enhance knowledge about careers, programs in Ocean Sciences (speakers bureau, conference participation, career booklets, posters, panels, videos, home pages).
- Identify key people at HBMSUCs who are on the Internet and who are willing to disseminate information.
- Identify key people in CORE and The National Association of Marine Laboratory institutions with marine science programs in support of partnership, linkage, and collaborative efforts.

Create A Speakers Bureau Featuring Representatives From A Wide Variety Of Backgrounds And Orientations

- Develop a speaker program, perhaps jointly with professional societies/CORE institutions with support from agencies and foundations.
- Use minority speakers/role models. Follow-up and return to campus on a regular basis.
- Provide support and materials to the speakers in the form of good graphics, information on career opportunities, job and school requirements, enrichment activities (e.g. internships).
- Provide complete financial support since many HBMSUCs face difficulties supporting outside guests even once on campus.

- Recognize that most HBMSCUs need speakers who can give broad talks on the topics above, not just talks on a narrow range of research topics.
- Work with the host to publicize the event (include posters to announce the talk, video blurbs on the speaker that can be run on the college cable channel, etc.).

Increase Opportunities For Experiential Learning

- Support more internships and REU type programs. This gives a greater chance for students to discover programs and professional mentors who best suit their needs.

Strategies to Maximize Success

Intensify Use Of The Internet As A Vital Communication Medium

- Ensure HBMSCU student access to the Internet and World Wide Web.
- Create a marine science World Wide Web page with a mentor/protégé data base.
- Establish an Internet directory for careers as well as for aquatic science programs at both majority and minority institutions.
- Include information on summer course offerings, REU programs and other available internships, NMFS and other cruise schedules, curriculum modules, and the like.
- Develop a list-serve for those wishing to communicate and/or willing to answer questions.

Offer Incentives And Rewards For Participation In Volunteer Activities

- Give recognition and release time to researchers involved in recruitment/mentoring activities.

Consult With The End-User And Incorporate Their Perspectives In Program Development Activities

- Listen to the faculty and students at HBMSCUs who have been through the programs. This is important as people from majority institutions, funding agencies and federal agencies may not recognize elements, that if lacking, prevent successful programs.

B. Working Group 2 -- STUDENT/FACULTY RELATIONSHIP

Consensus: The conference was of great value and it needs to be an on-going effort. We agree that one year is not enough time to fully evaluate the resulting efforts from the conference, thus we suggest the next conference be held in 1997. We also suggest that the planners anticipate publication and distribution costs for the full report.

Increased Participation In Professional Development Activities

- Prepare and expose students to meetings of professional societies by encouraging full participation prior to and during these meetings, (e.g. Hampton/ASLO Program).

Provide Access To The Internet And The World-Wide Web At HBMSCUs

- Develop institutional collaboration and links to solve technological gaps. Lack of such components prevent students from connecting with other faculty and institutions and locating information about programs, courses, and undergraduate research opportunities at marine labs and oceanographic institutions.

Cultivate Relationships Between Students And Faculty Across Institutions

- Establish linkages with science faculty at HBMSCUs to ensure continued matriculation at the graduate level. Students at HBMSCUs with or without marine programs can benefit from presentations about careers, training and opportunities in the marine sciences.

Incorporate Non-Traditional Approaches Into Graduate Education

- Make the graduate experience more humane by “holistic” advising that recognizes the need for faculty cultural awareness/competence to mentor underrepresented minority students and for linking students with support systems.

Increase And Expand Programs That Offer Ocean Science Research Exposure And Experiences For Undergraduates

- Encourage faculty to develop non-traditional, innovative efforts such as Savannah State College/Harbor Branch Oceanographic Institution (SSC/ HBOI) Bridge program and traditional programs such as NSF's REU Program.

Provide Support And Assistance To HBMSCUs To Introduce Or Expand Marine And Ocean Science Programs To Students.

- Transfer surplus equipment, additional staffing through temporary assignment (memoranda of

understanding or Intergovernmental Personnel Act (IPA)), small grants and contracts to hire or compensate students for participation in research at the HBMSCU or a collaborating institution, and assistance to increase grant awards to HBMSCUs.

Working Group 3 -- BRIDGING

Consensus: We advocate that NMFS/NOAA support bi-annual meetings for HBMSCUs contacts, in varying sites, in conjunction with professional society meetings and that the information on this effort be distributed on the Internet.

Bridging efforts for the purposes of this workshop and conference are defined as activities specifically aimed at enhancing minority student participation in Ocean Sciences career development. A list of bridge programs is located in the appendices.

Evaluate And Assess Existing Programs

- Determine the areas in which programs have experienced greatest successes and those where improvements are needed. Continue and enhance these programs.

Create Bridges At All Levels Of The Educational Pipeline And Across Institutions

Integrate Ocean Sciences In Federally-Funded Student Initiatives

- Have an Ocean/Marine Science Institute as a component to Alliance for Minority Participation (AMP). AMP supports the establishment of comprehensive approaches to increase the quantity and quality of underrepresented minorities who successfully earn Science and Engineering baccalaureate degrees and to increase the number who go on for graduate study in these fields.

Expand Interagency Collaborations

- Encourage and establish interagency initiatives to include federal agencies and/or professional societies and academic institutions.

Expand Funded Opportunities For Graduate Education

Provide Funds For Technological Advancement

- Provide mini-grants in the range of \$200,000 to develop Internet capabilities. Funds should be used to purchase hardware and to create a marine science web page with access to a mentor/ protégé data base.

Intensify Use Of The Internet As A Vital Communication Medium

- Establish an Internet directory which includes listings of: career options; aquatic science programs at both majority and minority institutions; summer course offerings; REU programs and other available internships; NMFS and other cruise schedules; curriculum modules, and the like.
- Develop a list-serve for those wishing to communicate and/or willing to answer questions.

Create Opportunities For Faculty Development

- Fund site visit exchanges for faculty to and from both minority and majority institutions.

Encourage Region-Wide Participation

- Provide support for HBMSCU research fairs in four regions at rotating JOI/CORE institutions.

Private Sector Involvement

- Bring private sector, business interests, and the like into existing mentoring programs.

Develop A Clearinghouse For Marine Science Programs

- Maintain an updated list of contacts for marine science programs at HBMSCUs.

Working Group 4 -- FACULTY/FACULTY RELATIONSHIPS

Consensus: Efforts should be made to support extended visits by faculty from HBMSCUs to majority institutions with marine sciences programs to allow for the development of collaborative research efforts, especially those that can be continued at the minority institutions and that involve student participation.

Improving communication among faculty, researchers and administrators at minority and majority institutions will ultimately increase the numbers of minority students who pursue careers in the Ocean Sciences. Many of these efforts/ strategies are dependent on the availability of funds for successful implementation.

Expand Opportunities For Faculty Development

- Fund informational visits of faculty from institutions with marine science programs to campuses without such programs.
- Set up adjunct faculty appointments for HBMSCUs faculty at majority institutions.
- Set up adjunct faculty appointments for majority institution faculty at HBMSCUs.
- Support HBMSCU faculty participation in UNOLS cruises.
- Fund HBMSCU faculty to do research in labs at majority institutions.
- Fund collaborative research efforts especially those to be continued at minority institutions.

Working Group 5 -- RETENTION

Consensus: Continue the conference on an bi-annual basis with the same constituency at an accessible site and provide travel assistance to increase participation. We also advocate that teachers at all grade levels “teach to the top and give individualized help to the others” in order to retain high standards.

Issues related to retention are considered far more important at the undergraduate than graduate levels. Students at some institutions quietly disappear without asking for help. At other institutions, lack of motivation and lack of basic skills prevent student success. At the graduate level, recruitment is the real issue.

Provide A Sequence Of Experiential Learning Opportunities

- Offer pre-REU experience in addition to at least 2 different REU programs before graduation. Internships and on-campus projects supervised by an advisor can substitute for one REU experience.

Expand Outreach Efforts By Graduate Programs

- Develop strategies to cultivate an institution’s own students in addition to establishing partnerships with historically minority colleges in area and community colleges.

Develop Model Programs In Conjunction With Other Organizations

- Forge relationships with business and industry members who are committed to these issues.

Enhance Student’s Skills In Key Areas

- Support activities that bolster students’ quantitative skills (computer access, graphing and math software acquisition and workshops).

Develop Systems Of Support For Students

- Include mentoring and other one-one activities as an essential component of all programs. Follow the model George Burbanck has created at HU. He allows struggling students to list their complaints. These comments are given to students who are already achieving academic success who suggest solutions and respond to their colleagues.

F. Federal Partnership Work Group

Consensus: During this meeting, NSF and NMFS indicated that funds are presently available to begin the development of Option 2. Hope was expressed that in the near future the program will expand to include support from other federal agencies such as the ONR and the EPA.

During the conference, representatives from NSF, ONR, NOAA/NMFS and EPA met to discuss the federal resources available to achieve conference goals and how to integrate those resources to develop a federal partnership to complement and/or stimulate financially emerging partnerships between the oceanographic institutions and minority colleges and universities.

Increasing the Pool of Minority Applicants: Two Options

Option 1: Link NSF sponsored Science and Technology (S&T) Centers at majority institutions with HBMSCUs and fund this linkage with NSF funds. Under this option, HBMSCUs and majority institutions would link to submit proposals to NSF to conduct joint research.

Option 2: Develop a national NSF-like Research Experience for Undergraduates (REU) program and fund this program with multiple agency funding which will be administered by NSF in order to increase the pool of minority applicants for graduate marine programs by providing talented undergraduate students with summer research opportunities and experience at academic and federal laboratories.

An Overview of Proposed Recommendations

When the entire body reconvened some items were mentioned by all the groups. Communication on a continuing basis was part of each set of recommendations. Communication through the Internet and World Wide Web were cited by most of the groups as necessary to effect desired outcomes. However, perhaps surprisingly in this age of the information highway, communication on a face-to-face basis was a recurrent theme throughout the conference. Unanimously, each group felt that this conference or one similar should be reconvened on an annual basis. Another recurring theme was the advice to not reinvent programs but to use and expand successful ones while building connections between them.

The success of the recommendations was seen as dependent upon the commitment of funding from various sources, including NMFS/NOAA, as well as a commitment of time and key personnel at every institution involved. This brought up underlying concerns about such activities not being seen as important by the participants' home institutions. These concerns were expressed by professionals from every type of institution and reveal the second-class nature of student-oriented activities at many educational institutions as well as the persistent inability of many institutions, educational and otherwise, to deal with minority issues at every level.

Targeted Recommendations

To the NOAA/NMFS

1. Make funds available to support a variety of activities, including:
 - conferences such as this
 - HBMSCU research fairs
 - annual meetings for HBMSCU
2. Assist HBMSCU in leveraging funds to support a variety of activities, including:
 - technological upgrades such as building internet and computer capabilities
 - site visits and exchanges between faculties of minority and majority schools
3. Provide employment and experiential learning opportunities, including:
 - internships
 - summer institutes for faculty
4. Utilize NOAA's staff to develop a speakers program
5. Support a nationwide, electronic recruitment system that creates a pipeline for students in the sciences between Ph.D. granting universities and institutions serving large numbers of minority students, such as the NASULGC's collaboration with the American Association of State Colleges and Universities.
6. Establish a national scholarship program for undergraduates and graduate students that is designed to encourage minorities to major in disciplines pertinent to Ocean Sciences.
7. Establish liaison positions at HBMSCUs. Liaison officers will be charged with the responsibility of providing technical assistance to create and sustain programs that support NOAA's mission.
8. Establish a NOAA/HBMSCU Task Force that will promote and enhance policies and programs designed to encourage collaborative programs, cooperative research and the institutionalization of NOAA programs at HBMSCUs.

To Federal Agencies

1. Funding agencies who support Ocean Science research and education should examine proposal and funding guidelines to ensure that the unique capabilities and characteristics of HBMSCUs can be reasonably accommodated.
2. Increase support for predominantly minority institutions that produce mathematics, engineering and science (both natural and social) graduates, particularly those with aquatic sciences programs.
3. NSF and other federal agencies should continue or begin to replace isolated and piecemeal opportunity efforts with more ambitious, coordinated, and coherent approaches that provide a systemic effort.

4. Effectively integrate government resources to develop a federal (multi-agency cost-share) partnership program to complement and/or stimulate (financially) emerging partnerships between the oceanographic institutions and HBMSCUs.
5. Link NSF-sponsored Science and Technology (S&T) Centers at majority institutions with HBMSCUs to encourage and support joint research and fund this linkage with NSF funds.
6. Develop a national NSF-like Research Experience for Undergraduates (REU).
7. Provide talented undergraduate students with summer research opportunities and experience for a minimum of three summers through a “partnering” of academic and federal laboratories and provide similar opportunities for faculty at HBMSCUs.
8. Expand program support to include other federal agencies such as the EPA.

To the Private Business Sector

1. Link up with existing mentor programs to increase students’ experience in the business world of the Ocean Sciences
2. Continue to enhance existing and explore new opportunities for unique and productive partnerships with academia, especially small universities and colleges, and particularly HBCUs. Such partnerships should/could include: endowed chairs; research funding and support for equipment upgrade and purchase, facility construction; and access to corporate labs (faculty/student research experiences; IPA-like exchanges between business/ industry and universities).
3. Provide direct support to minority and majority institutions through financial or in-kind contributions, mentoring, research and employment opportunities for students.
4. Assist in persuading government agencies that increased funding for structural changes is crucial and must continue.

To Majority Institutions

1. Sponsor faculty exchanges between majority institutions with marine science programs and minority institutions to build connections between undergraduate and graduate institutions.
2. Work with minority institutions to increase joint funding for mutually beneficial programs.
3. Increase minority graduate enrollment by clusters not individuals.
4. Offer an increased number of fellowships/scholarships for students from HBMSCUs. Recognize the cultural differences between majority and minority institutions which may influence academic training for students in the respective types of institutions; utilize knowledge in this area to design

and offer strong programs for all students. In all cases possible, research opportunities and funding should be pursued inclusive of smaller universities and colleges, particularly the HBMSCUs.

5. Intensify efforts to recruit and promote the development of minority students.
6. Improve minority faculty recruitment and retention.
7. Actively support mathematics and science-based choices by minority students.
8. Encourage minority students from a broad range of majors to consider the Ocean Sciences.
9. Involve the private sector.

To Minority Institutions

1. Recognize that graduates of HBMSCUs are considered strong candidates for graduate study and aggressively foster undergraduates for graduate studies in the Ocean Sciences.
2. Continue strengthening students' basic skills and providing opportunities for Ocean Sciences research experience.
3. Develop strong mentor programs.
4. Increase visibility and lobbying influence with your state and federal legislator (representatives); many of whom graduated from minority institutions or are associates of those who did.
5. Provide assistance to public schools to improve the preparation of elementary and secondary students for college work.
6. Create a supportive and stimulating environment for undergraduates.
7. Support graduate programs at selected HBMSCU campuses.
8. Support cooperation with major doctoral-granting research institutions.
9. Insist that any emerging program be developed with the end-users, underrepresented minority students, in mind. Demand that programs be tailored to their needs.

To the Students

1. Recognize that you are ultimately responsible for your own education, including:
 - using support systems
 - developing a strong mentor relationship
 - taking advantage of provided opportunities
2. Continue strengthening your academic record for graduate admission.

3. Continue to take advantage of opportunities (particularly research experiences and funding opportunities) available through federal agencies, academic institutions and business/industry network.
4. Use your experience to recruit and mentor less experienced individuals.

Conference Reactions: The Need for Further Discussion

Conference participants, during the question and answer periods, suggested several areas that needed further discussion.

(1) **What will life be like for students once they graduate?** This question goes beyond the basic discussions about whether there will or will not be jobs available for the future. For instance, we need to think about whether a new minority faculty appointee gets placed on an excessive number of committees. While the intent to present a diverse image is honorable, this committee work, in the present system, will count only minimally towards tenure.

(2) **Into which fields of Ocean Sciences will these students be going?** Oceanography is a diverse field encompassing essentially all the basic sciences: Physics, Chemistry, Biology, Geology, Climatology, etc. In addition, as was mentioned on numerous occasion during the meeting, it is really the only field of science that, for graduate degrees, draws upon groups of individuals with training outside Oceanography for advanced degrees. However, what must also be noted is that most of the HBMSCUs do not have as diverse programs in the sciences, particularly at the undergraduate level. This suggests that most of the students oceanic graduate studies will attract will be in a few basic fields of marine sciences, particularly, marine biology and marine chemistry.

(3) **How can the profession reach out to interested but uninformed students?** Although most minority students attend HBMSCUs, many do not and recruitment needs to reach out to them as well. We need to keep contact with a diverse body of organizations to ensure that all minority students have the possibility to be involved in all aspects of oceanography.

(4) **What constitutes the Ocean Sciences?** Strong definitions of both Ocean Sciences as a whole and the elements that make it up will provide a clear message for representatives to share.

(5) **Why do students need advanced degrees to work in Ocean Sciences?** There is a need for science technicians trained at the bachelor's level as well as those scientists with advanced degrees. HBMSCUs and Ocean Science institutions must work towards demonstrating this need even before students choose majors.

Participants also suggested ways to improve the format of the conference for following years:

- (1) Include more informal sessions with students.
- (2) Develop and present a case study on successful minorities in the Ocean Sciences.
- (3) Provide a panel on cultural differences.
- (4) Add other constituents when possible, perhaps inviting a new group each conference year. Possible groups: community colleges, school system leaders, and innovative program providers.

***Expanding the
African-American Talent Pool
at All Levels of Education:
An Essential Step in
Increasing the Number of
Minority Scientists and Engineers
Holding Graduate Degrees***

***Presented by
Dr. Earl S. Richardson
President
Morgan State University***

***Hampton University
Hampton, Virginia
September 11, 1995***

Earlier this year, there was a good deal of publicity surrounding the release of the statistics on new doctoral recipients. The major news was that number of doctorates awarded to African-Americans had risen over the prior year. Because the primary interest in the release of this information in recent years has been the high proportion of foreign students obtaining doctorates from U.S. Universities, the increase in doctorates awarded to black U.S. citizens was treated as good news. Some said that all the hard work by our leading doctoral-granting research institutions was finally paying off.

Any organization that has been out trying to hire recent doctoral recipients can be excused for not having noticed this good news. There are very few African-Americans holding doctoral degrees in fields that are in demand. In Oceanography and Marine Sciences, for example, no doctorates were even awarded to blacks. Even a cursory look at the details beyond the press releases reinforces the notion that there is very little to cheer about. The fact of the matter is that despite two decades of a great deal of rhetoric about the issue of improving access to higher education for minorities, large sums of money being spent on programs at some universities, and the development of an entire vocabulary designed to promote sensitivity to an increasingly diverse young population, very little has been accomplished. I would argue that we have diverted attention from our lack of significant progress in this area and in doing so have avoided dealing with the problem of black under-representation in an effective manner.

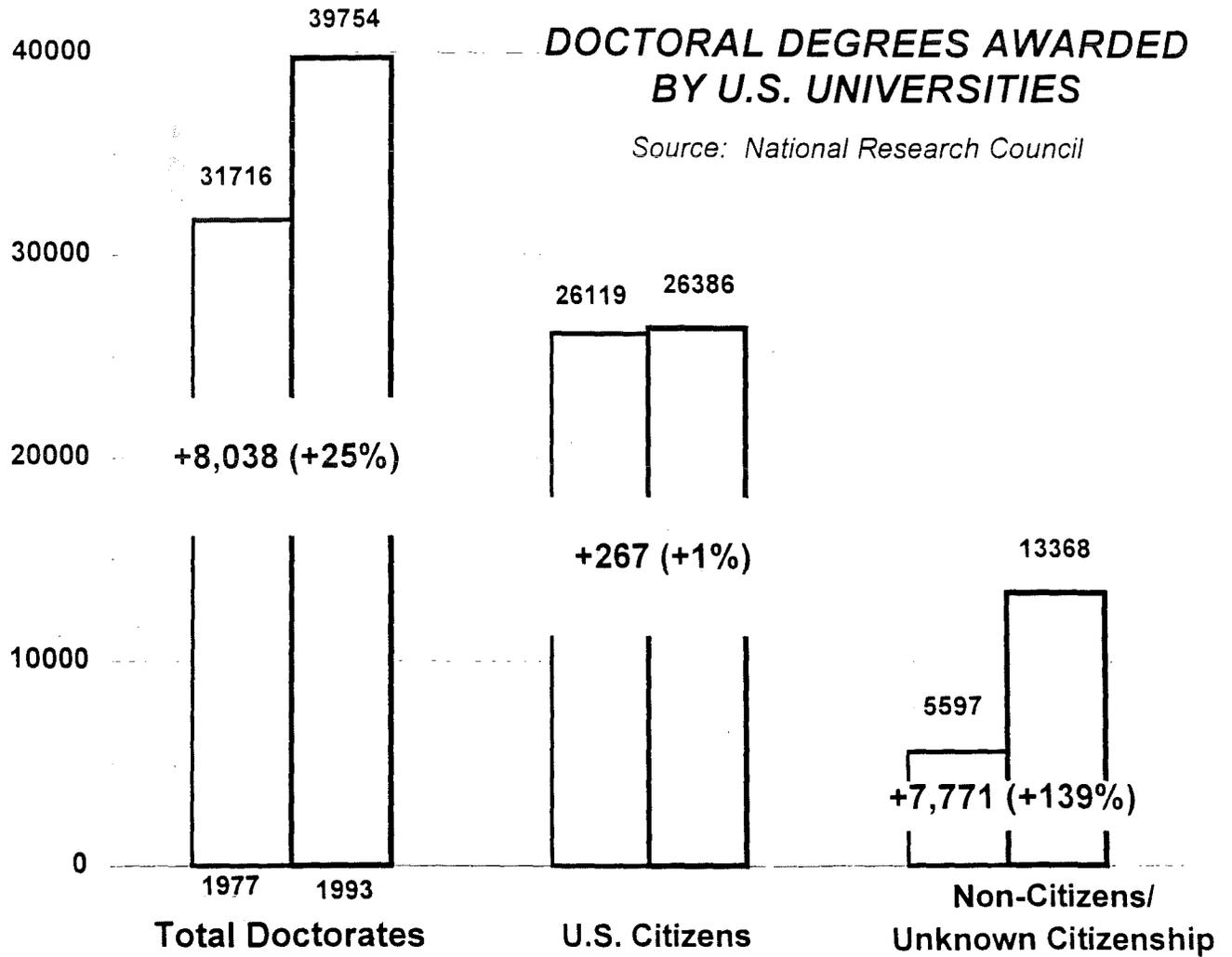
It is first useful to consider the long-term perspective. Few probably would believe that the number of doctorates awarded to blacks was higher in 1977 than in any year since. But, that is a fact. Sixteen years ago was the highest year on record for the number of doctorates awarded to African-Americans despite the fact that the young black population was much smaller then than now. In 1977, 1,116 African-Americans received doctorates, 4.3% of the total awarded to U.S. citizens. The figure for 1993 was slightly lower, with 1,106 awards going to blacks, 4.2% of the total.

One could argue, that the number of doctorates awarded to U.S. citizens of all races also was about the same in 1993 as in 1977. This is true - the figure for 1977 was 26,119 versus 26,386 in 1993. However, blacks were badly under-represented among doctoral degree recipients in 1977 and their extent of under-representation has worsened despite the increased visibility of the issue of education under-representation among minorities. During the period between the mid-1970s and now, the number of black U.S. Citizens in the 25-34 age group, the bracket in which most doctoral recipients are concentrated, increased by over 75%. Blacks went from making up only 10.6% of this age group to 13%. Hence, in the mid-1970's, before the advent of all of our current high profile efforts, we would have had to have more than doubled the number of new black doctoral degree recipients for blacks to be represented in this group at the same rate as they were represented in the young adult population. Now, we would have to more than triple the number to achieve this same goal!

It also is useful to examine other patterns in the data. First of all, nearly half - 46% of doctorates awarded to blacks were in education. The comparable figure for all

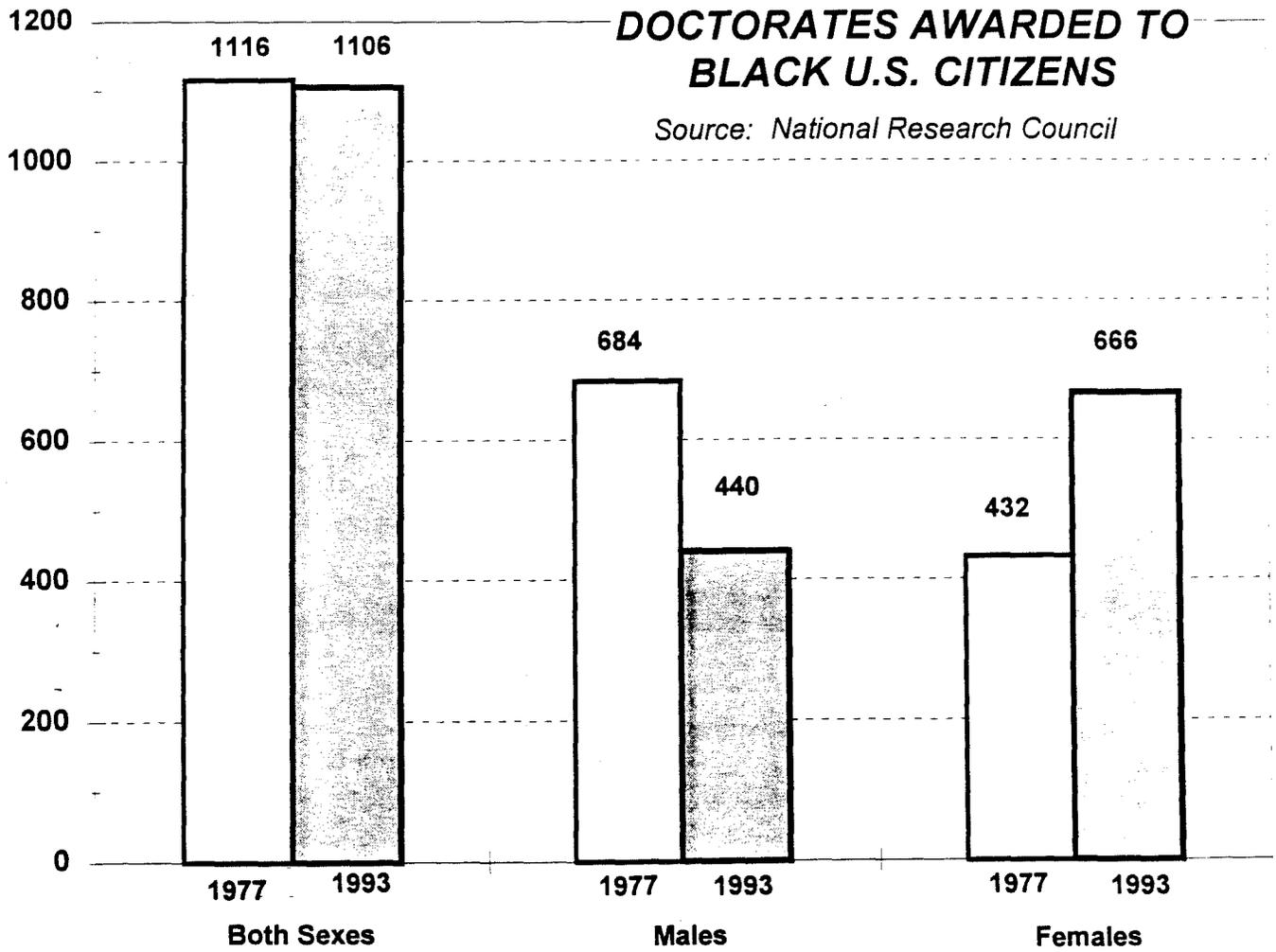
DOCTORAL DEGREES AWARDED BY U.S. UNIVERSITIES

Source: National Research Council



DOCTORATES AWARDED TO BLACK U.S. CITIZENS

Source: National Research Council



U.S. citizens was only 22%. Only 145 doctorates were awarded to blacks in the physical, mathematical, computer, and biological sciences and engineering, accounting for only 13% of all doctorates awarded to blacks. Meanwhile, among all doctoral recipients, 35% of all awards were in these fields. Among whites, 40% of doctorates were awarded in these fields while among Asian-Americans the figure was 66%. As low as the proportion of awards to blacks in the sciences is, to get a true picture one has to remember that this is on top of the low number of awards to blacks, regardless of field.

It also is worth noting that 60% of doctorates awarded to blacks are awarded to women. This is a dramatic reversal from 1977 when 61% of doctorates awarded to black U.S. citizens went to men. The change reflects a good deal of progress by women, although still less growth than that in the black female population. For males, the past fifteen years represent a significant reversal of earlier progress. Fifteen years ago, black men received 684 doctorates. In 1993, only 440 were awarded. The 1993 level, represents a 36% decline since 1977, a period in which the black male population grew rapidly.

ATTRITION THROUGHOUT THE EDUCATIONAL SYSTEM

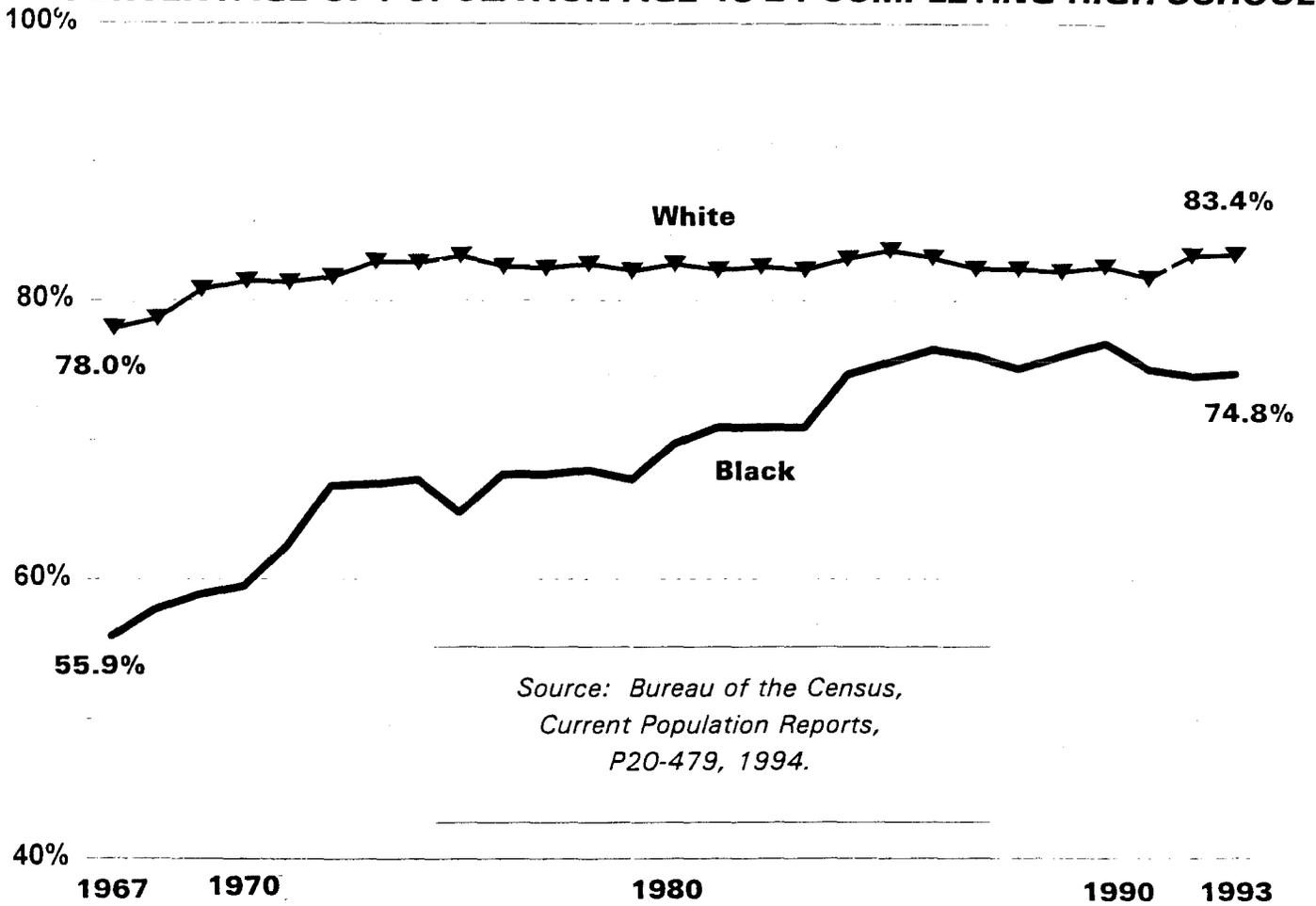
The problem of black under-representation exists throughout the educational pipeline. Production of doctoral degrees, therefore, reflects not only what is going on in graduate school but also the accumulation of developments prior to that point.

It is useful to begin by looking at high school graduation rates. Over the long term, the gap between high school graduation rates for the young black and white population has narrowed substantially. However, in recent years, there has essentially been stability, with the black graduation rate remaining about eight percentage points below the white rate. (In 1993, 83% of whites and 75% of blacks in the 18-24 age group had graduated from college).

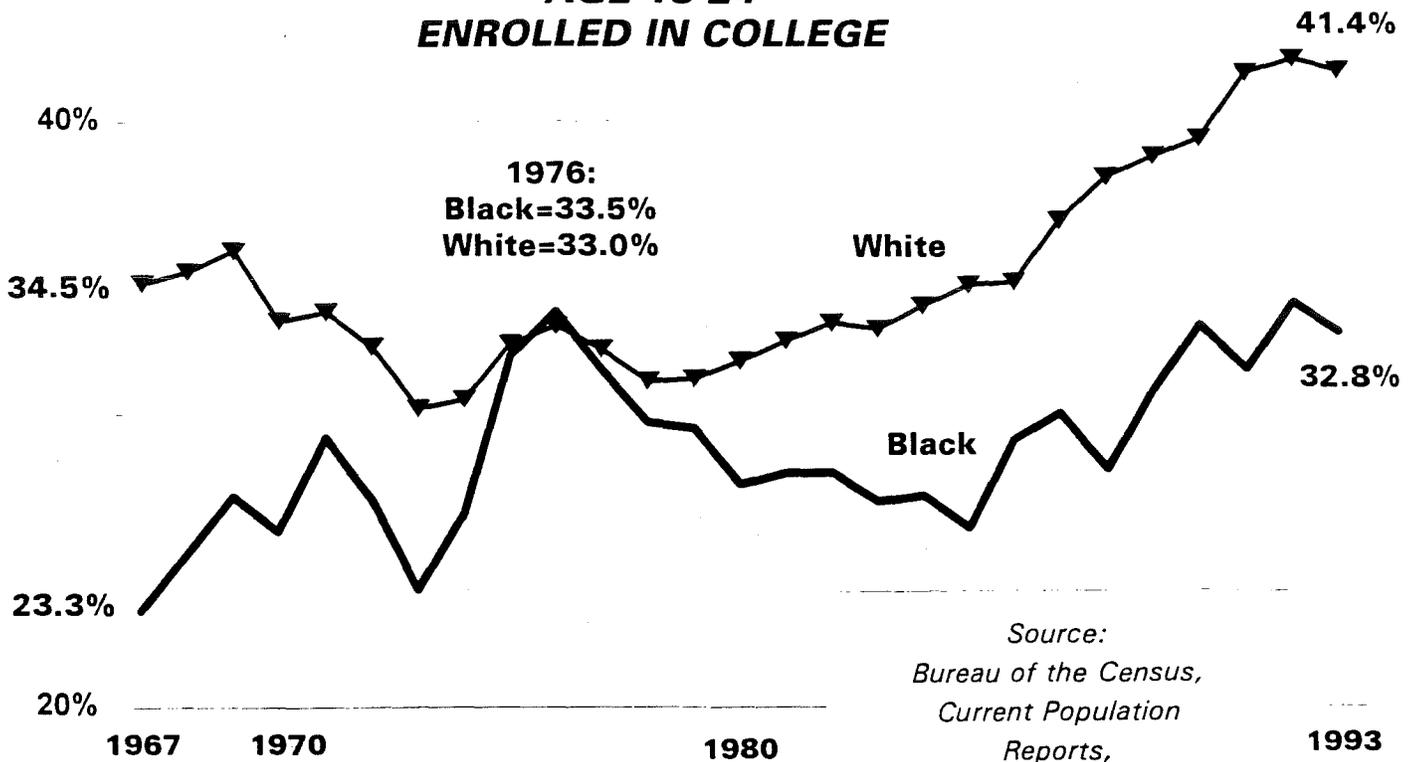
Among those graduating from high school, the college-going rate is considerably higher for whites than blacks (41% vs. 33%). This difference is not much different than a quarter of a century ago, although at that time a much smaller percentage of black high school students graduated from high school than at present. The higher black dropout rate in high school combined with a lower college-going rate for graduates results in a gap of about ten percentage points (currently 35% vs. 25%) by race in the percentage of the 18-24 population enrolled in college.

Because average college retention rates for black students are below the average for all students, the gap widens slightly more in terms of college degree attainment. Among the population ages 25-29, 25% of whites but only 13% of blacks hold a bachelor's degree or higher. While the percentages may not appear large, the current difference means that the production of bachelor's degrees to black students would have to double immediately for black and white representation be equal among new degree recipients. What is particularly problematic is the fact that this gap has not narrowed in almost two decades.

PERCENTAGE OF POPULATION AGE 18-24 COMPLETING HIGH SCHOOL



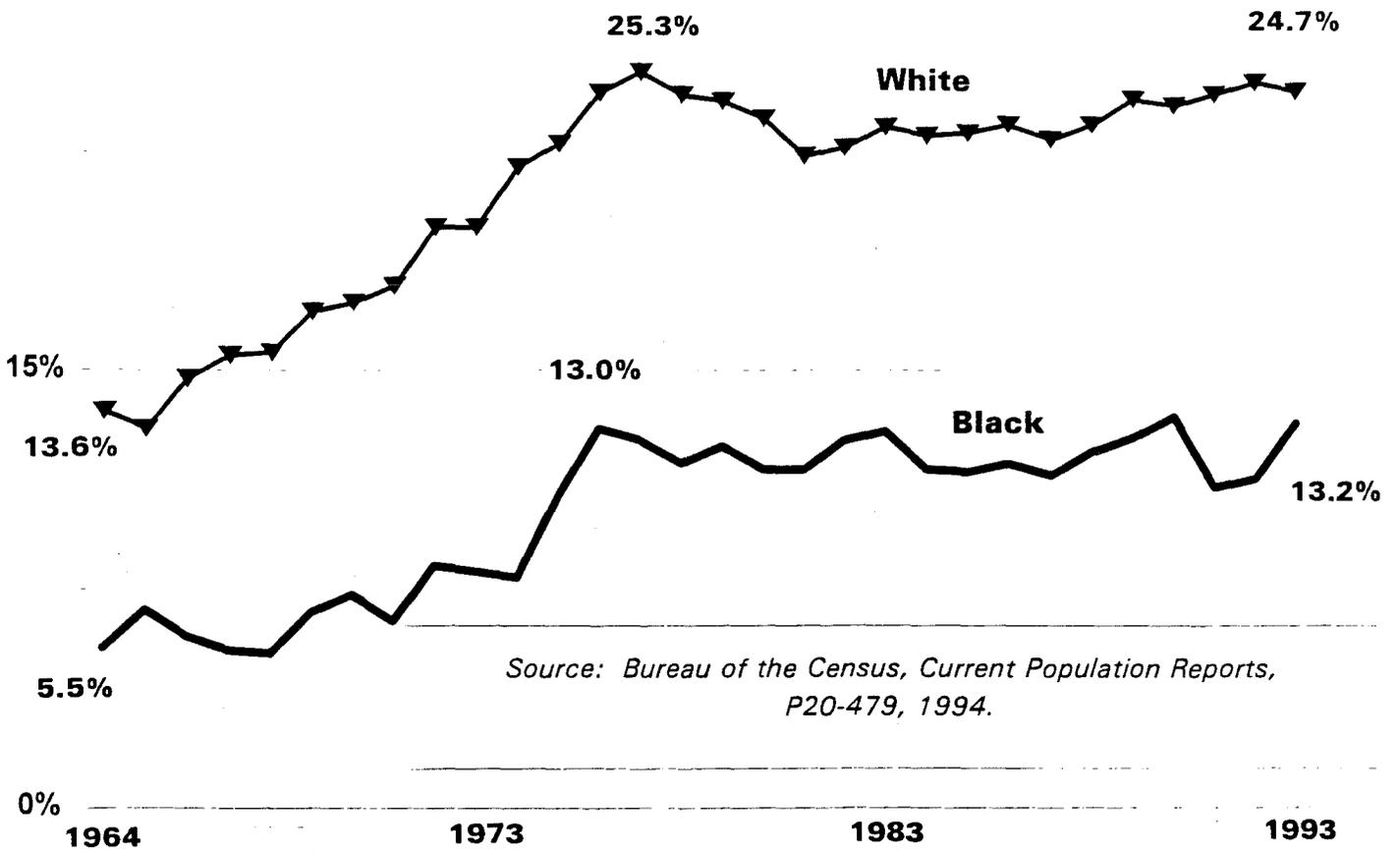
**PERCENTAGE OF
HIGH SCHOOL GRADUATES
AGE 18-24
ENROLLED IN COLLEGE**



*Source:
Bureau of the Census,
Current Population
Reports,
P20-479, 1994*

**PERCENT OF POPULATION AGE 25-29
WITH COLLEGE DEGREES**

30%



Source: Bureau of the Census, Current Population Reports,
P20-479, 1994.

Without a continuing increase in the educational attainment of the young population, the overall educational attainment of the general adult population will stagnate. Hence, for the entire adult population age 25 and over, the difference in college degree attainment between the races has been growing. Thirty years ago, before equal educational opportunity in higher education was a highly visible issue, there was a difference of only six percentage points in the percentages of black and white adults holding college degrees (10% vs. 4%). Currently the difference is 11 points (23% vs. 12%).

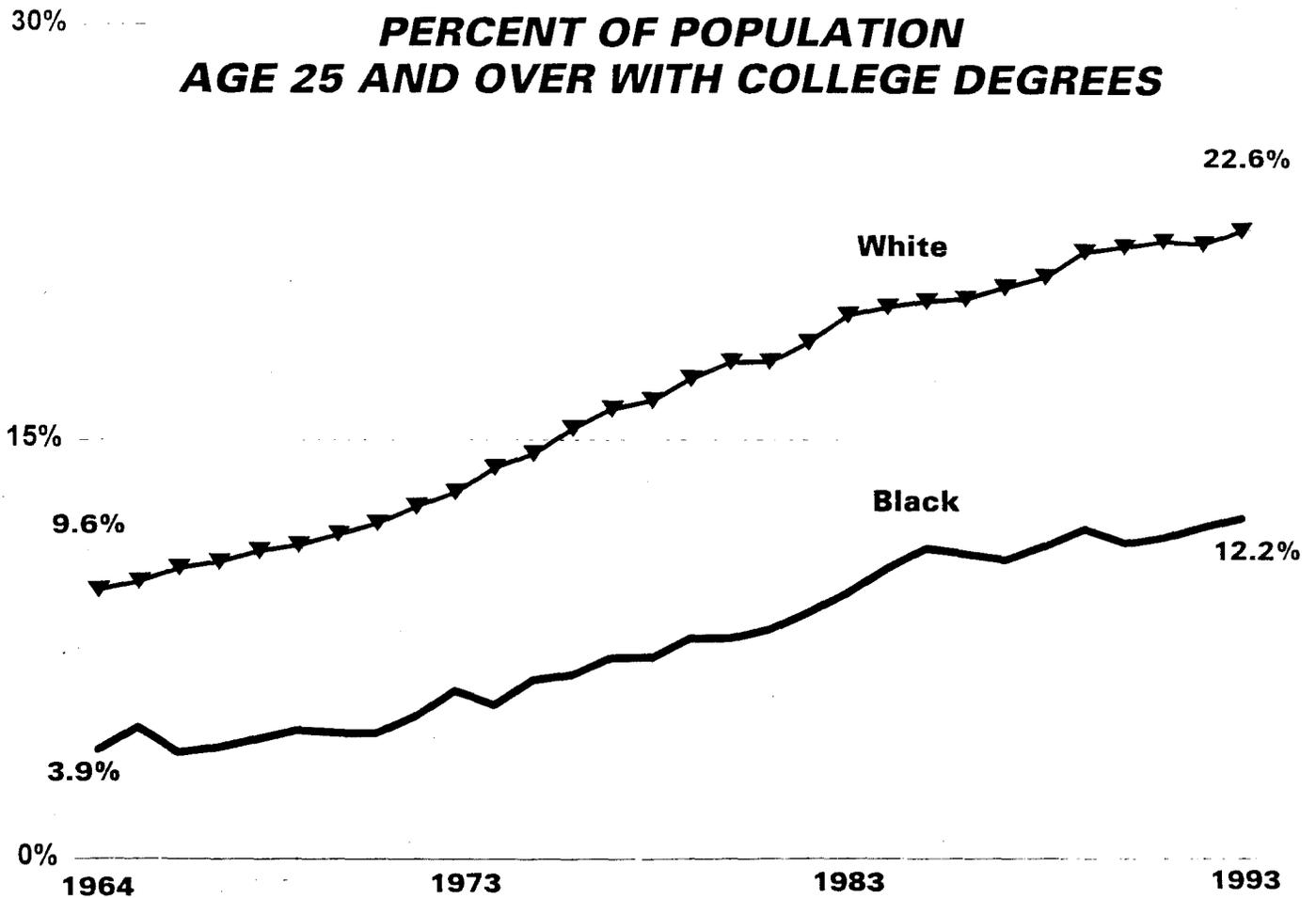
The differences in educational attainment among the young adults, of course, translate into differences in advanced degrees in the entire adult population. Currently, 9% of white adults age 25 and over hold a degree beyond the baccalaureate. The figure for black is only 4%.

CHARACTERISTICS OF THE YOUNG BLACK POPULATION

In formulating strategies for dealing with what is by any definition a large a growing problem, it is useful to examine some of the characteristics of the young African-American population.

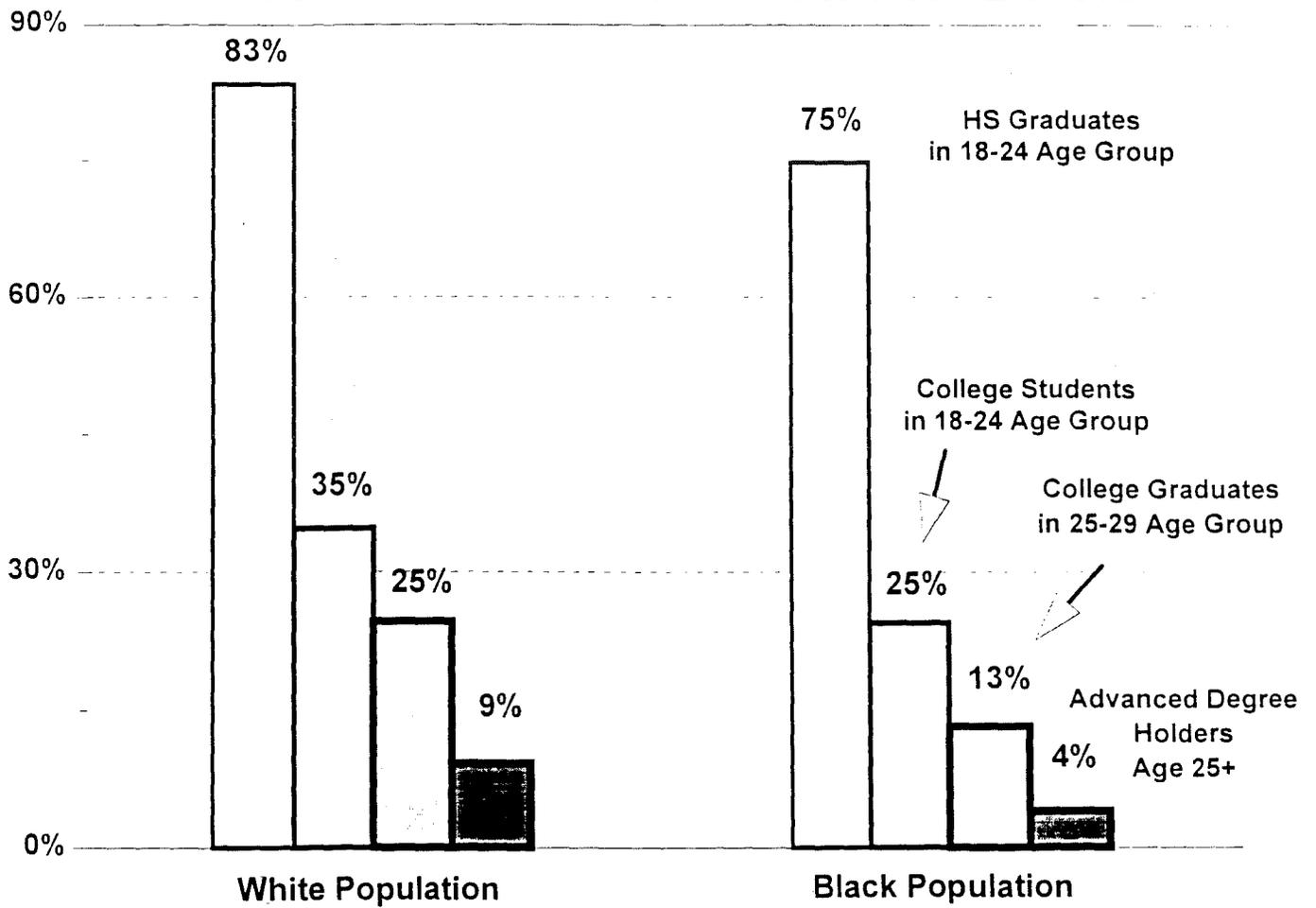
- **Parental Educational Attainment.** There is a close relationship between parental education and the tendency of children to attend college. Regardless of race, Individuals of college age from families in which at least one parent has a bachelor's degree are about four times as likely to enroll in college as individuals from families in which the best educated parent has not completed high school. Only 12% of black college-age children are from families in which a parent has a college degree while 30% are from families in which no parent has even completed high school. The comparable figures for whites of college age are almost the reverse, 26% and 17%, respectively.
- **Family Income.** Closely related to relatively low educational attainment among black families with college-age children is low average family income. Fully 49% of black families with children of college age earn less than \$20,000 annually, and only 13% earn over \$50,000. The comparable figures for white families are 20% and 37%, respectively. According to the Bureau of the Census, the average income of black families has been declining in comparison to that of white families as the percentage of black families headed by a single parent has increased to almost triple that for white families. By contrast, for families headed by married couples, the income of blacks relative to whites has been improving. Hence, among the young, there is a great deal of educational and economic diversity within the black population and it is growing. In addressing the issue of black under-representation, it is important to know which segments of this diverse population we are targeting and which we need to better address.
- **Preparation for College.** Closely related to family income and educational attainment as well as to other factors such as school quality is the extent of preparation for college, at least as measured by standardized tests such as the SAT.

PERCENT OF POPULATION AGE 25 AND OVER WITH COLLEGE DEGREES



SOURCE: "Educational Attainment in the United States: March 1993 and 1992,"
U.S. Bureau of the Census, Current Population Reports, P20-476, 1994.

PROGRESSION THROUGH THE EDUCATIONAL SYSTEM

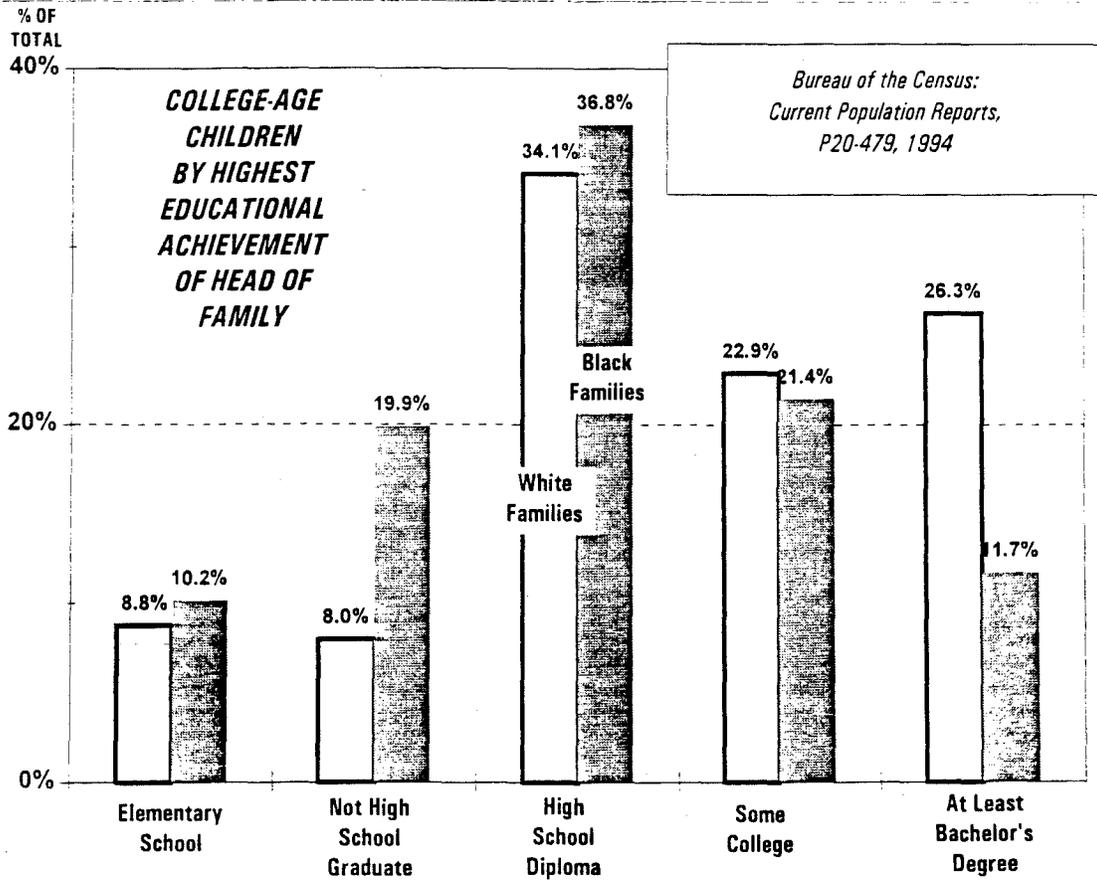


Number of Dependent Children Ages 18-24 by Highest Educational Attainment of Head of Family

	<u>White</u> <u>Number</u>	<u>Percent</u>	<u>Black</u> <u>Number</u>	<u>Percent</u>
Total Children	10,697,000	100.0%	2,291,000	100.0%

Educational Attainment of Head of Family

Elementary Education	938,000	8.8%	233,000	10.2%
Less Than High School	854,000	8.0%	455,000	19.9%
High School Diploma	3,648,000	34.1%	844,000	36.8%
Less than Baccalaureate	2,447,000	22.9%	491,000	21.4%
Bachelor's or Higher	2,810,000	26.3%	268,000	11.7%



College Enrollment for Children Ages 18-24 by Highest Educational Attainment of Head of Family

	<u>White</u>		<u>Black</u>	
	<u>Total Number</u>	<u>Number Enrolled</u>	<u>Total Number</u>	<u>Number Enrolled</u>
<u>Enrolled in Any Type of College Full-Time or Part-time</u>				
Numbers (thousands)				
Elementary Education	938	206	233	33
Less Than High School	854	189	455	74
High School Diploma	3648	1276	844	247
Less than Baccalaureate	2447	1287	491	192
Bachelor's or Higher	2810	2018	268	164
Total	10697	4976	2291	710

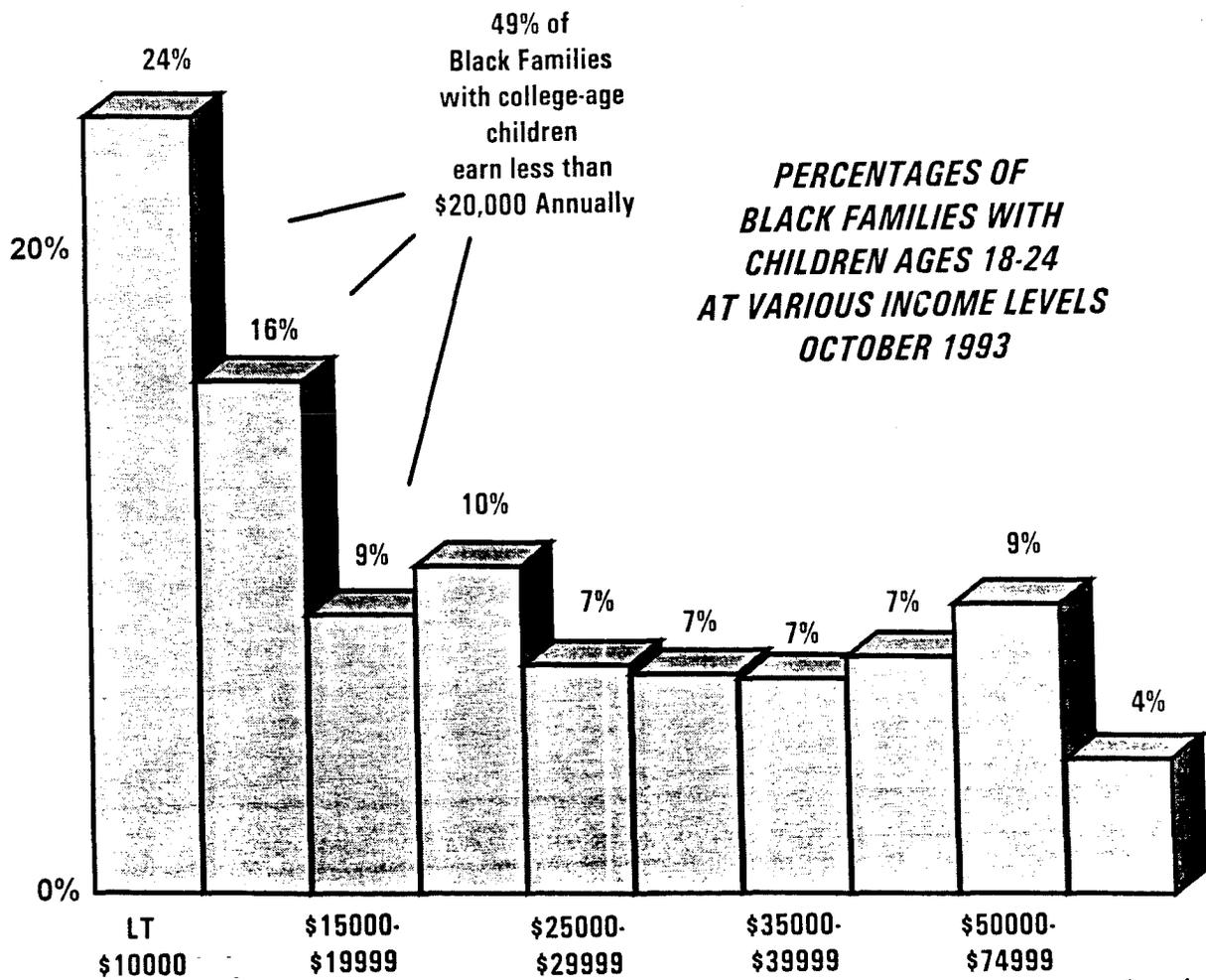
Enrollment Rates		
Elementary Education	22.0%	14.2%
Less Than High School	22.1%	16.3%
High School Diploma	35.0%	29.3%
Less than Baccalaureate	52.6%	39.1%
Bachelor's or Higher	71.8%	61.2%
Total	46.5%	31.0%

Enrolled in College Full-Time

Numbers (thousands)				
Elementary Education	938	139	233	22
Less Than High School	854	139	455	62
High School Diploma	3648	1085	844	208
Less than Baccalaureate	2447	1098	491	163
Bachelor's or Higher	2810	1834	268	152
Total	10697	4295	2291	607

Enrollment Rates		
Elementary Education	14.8%	9.4%
Less Than High School	16.3%	13.6%
High School Diploma	29.7%	24.6%
Less than Baccalaureate	44.9%	33.2%
Bachelor's or Higher	65.3%	56.7%
Total	40.2%	26.5%

Source: Bureau of the Census, Current Population Reports, P20-479, 1994.



SOURCE: "School Enrollment - Social and Economic Characteristics of Students: October 1993," Bureau of the Census Current Population Reports, Issued October 1994.

As shown by data college from the College Board, there is a strong relationship between parental education, family income, and student scores on the SAT. On the average, black college-bound students obtained an average score of 740 compared to 902 for all students taking the exam in 1994. To illustrate how large these differences are, it is useful to translate these scores into percentile ranks. On both the SAT-verbal and SAT-math, only about 16% of black students taking the test scored above the average obtained by white students. Hence, a black student obtaining what would be only an average score for a white student, would score higher than 84% of all African-Americans taking the test. Even assuming that the SAT under-predicts black student performance in college, there are relatively few black students qualified for entrance into even moderately selective institutions on the basis on traditional predictors of student success.

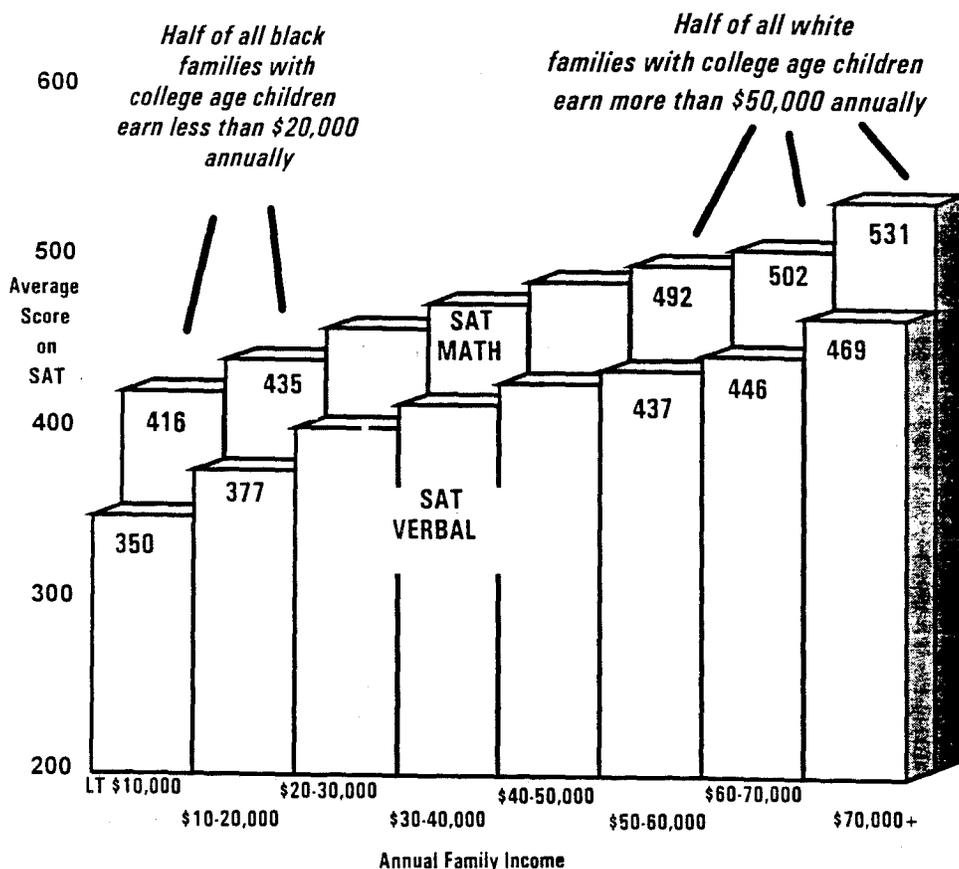
The net result of these three factors alone places the vast majority of the young black population at risk for not completing a college degree.

SOME IMPLICATIONS OF ATTEMPTING TO IMPROVE AFRICAN-AMERICAN EDUCATIONAL ATTAINMENT

It should be clear that doctoral education is not the main problem we as a society face in attempting to increase the educational attainment of the black population or their participation in the social and economic mainstream of this nation. This is not to suggest that that increasing the number of minorities receiving doctorates is not a worthy goal or that it should not be an issue of continuing concern. It should be. However, it is only a small part of a much larger problem. While it is necessary to develop strategies to deal with this issue, the extent to which we deal with the broader problem ultimately will impact on our success at advanced degree levels.

That much larger problem, and one that is growing, involves those young African-American adults who do not graduate from high school as well as those who graduate but are not likely to complete an undergraduate degree. Unfortunately, this represents the vast majority of the young black population. This group has characteristics which, without intervention, suggest a below-average probability of enrolling in college and completing a degree. Yet these are the students with whom we must achieve success if there is going to be a real change in the educational profile of the overall black population. There simply are not enough black young people with characteristics that give them a strong likelihood of success to have an impact on the overall numbers if they are the only group we target. Unfortunately, educating the typical African-American student competes with other priorities at most campuses, a situation that is likely to get worse as the college-age population begins to grow again and funding available to higher education remains tight. Yet, if we do not meet with more success quickly throughout our educational system, there is no chance that we will be able to address the resulting social and economic problems. And, we will not broaden the pool from which scientists and candidates for advanced degrees are drawn.

SAT SCORES AND FAMILY INCOME



Scores on the SAT, as on other standardized tests, are closely related to family income and other measures of socio-economic status.

The family income profile of the black student population taking the SAT is very much different than that of the white student population taking the exam. These differences are reflected in average SAT scores for black students that are considerably lower than average scores for white students.

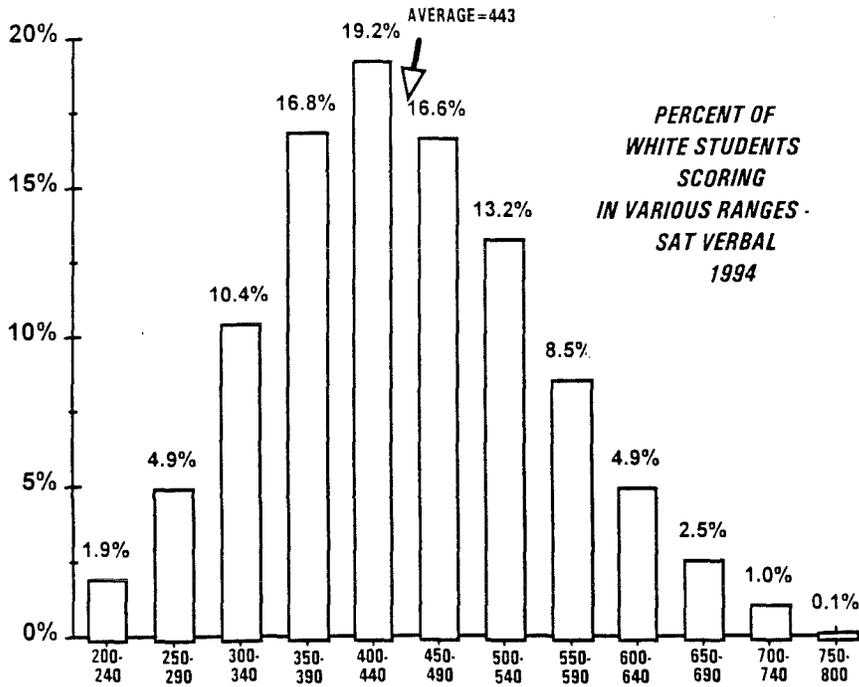
<u>AVERAGE SCORES</u>	<u>BLACK STUDENTS</u>	<u>WHITE STUDENTS</u>
VERBAL	352	443
MATHEMATICS	388	495
COMBINED	740	938

Sources:

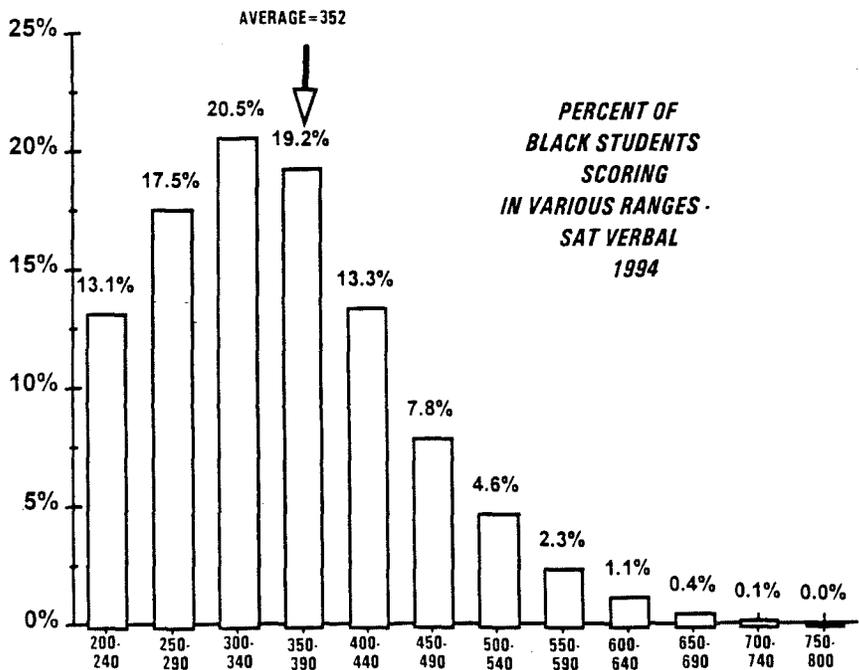
SAT Scores - "1994 Profile of SAT and Achievement Test Takers: National Report," The College Board, 1994'

Family Income Data - "School Enrollment - Social and Economic Characteristics of Students: October 1993," Bureau of the Census Current Population Reports, October 1994.

SAT VERBAL SCORES BY RACE



The average score for black students on the verbal portion of the SAT is 91 points lower than that for white students

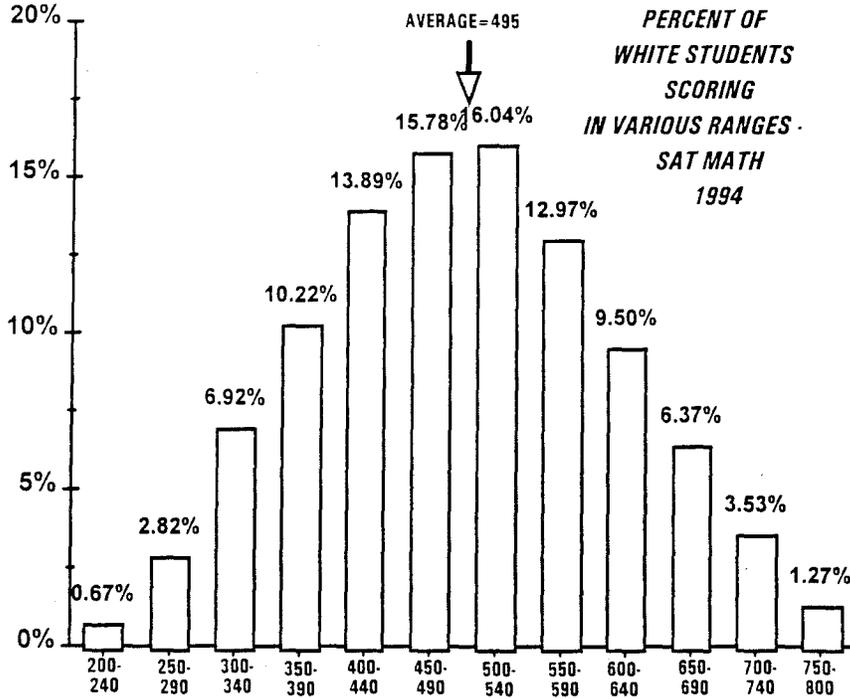


Half of all black students but only 17% of white students score below 350.

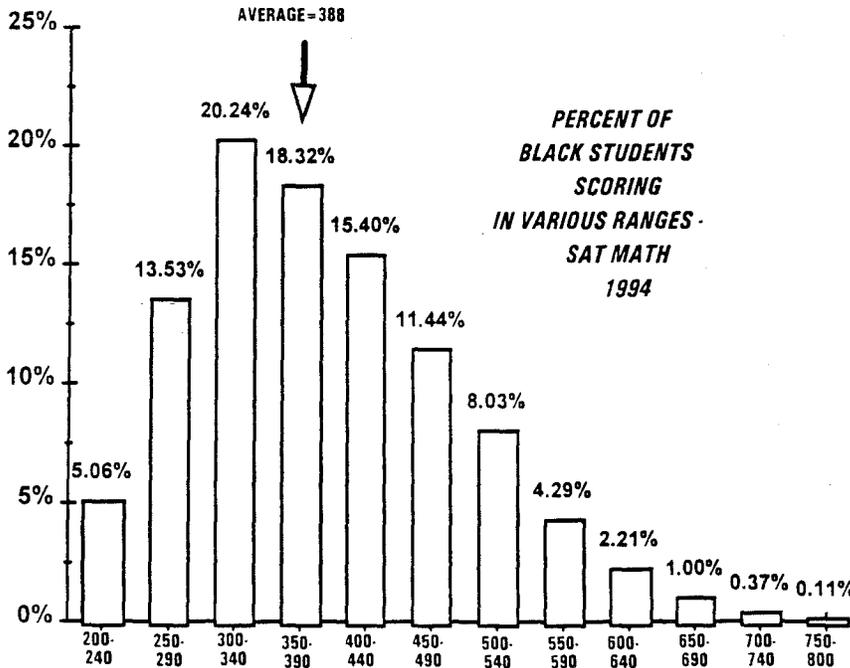
Thirty percent of white students but only 8% of black students score over 500.

Source: The College Board

SAT MATH SCORES BY RACE



The average score for black students on the mathematics portion of the SAT is 107 points lower than that for white students.



Thirty-nine percent of black students but only 10% of white students score below 350.

Half of white students but only 16% of black students score over 500.

Source: The College Board

SOME STRATEGIES

There is little question that we need to take a broad-based approach to improving the education of our black population younger than college age and that this preparation has to begin as early as possible. We need to address more than the academic questions, however. We also need to deal with motivation and aspirations. We need to work outside of the schools as well as within them. We also need to work with teachers. Their jobs not only are the most challenging, but they also often have difficulty seeing the big picture due to the variety of specialized and short-term programs that seem to be the typical way in which outsiders aid the schools. They need to be updated professionally on a regular basis and supported in raising academic standards. Their classroom instruction has to be supplemented by support outside the classroom, a major problem for schools with large numbers of families with modest education and income. It is obvious that this is well beyond the scope of the typical demonstration project or esoteric effort that is all-too-typical of the way in which the academic community becomes involved in the schools. The segments of the academic community that can provide substantive help over a long period of time are those most likely to have strong local ties and a local public service orientation.

To educate a broader segment of the African-American community through the bachelor's degree level, institutions with such a commitment will have to take a comprehensive approach to assisting in the transition between high school and college and in improving the performance of students in their programs of study. Obviously, the ability to devote this much attention to minority retention is a function of campus mission and resource availability. It is important to recognize the diversity within the young black population in discussing college performance. More selective campuses have higher retention and graduation rates than less selective ones, regardless of the race of the students. However, because of the relatively lower average levels of college preparation among young black students, these more selective campuses, with few exceptions, have a relatively low percentage of blacks among their enrollees and their graduates. They tend to enroll those from middle income families and above, as reflected by their test scores. It is probably going to be difficult for these campuses to broaden the segment of the black population they serve due to enrollment pressures and fiscal limitations. Other campuses, however, will have to take on additional responsibilities if we are to make progress. While some have suggested that a higher proportion of black students be channeled into community colleges as a cost-effective method of increasing black student access, the fact is that black enrollment at these institutions already is high but transfer rates to four-year campuses are relatively low. Research consistently shows that black student baccalaureate completion is positively related to beginning college at a baccalaureate-granting campus. This is not surprising in that the mission of a community college is a complex one. Black student success in college also is associated with living one campus and being involved in campus affairs, experiences available primarily at baccalaureate-granting campuses.

At advanced degree levels, we will make progress on many of the problems of minority representation if we make progress at the elementary, secondary, and

undergraduate levels. While there still may be the need for special support activities, most of the payoff is likely to come from identifying undergraduates who are talented enough to undertake advanced degree programs and encouraging them to engage in undergraduate enrichment activities that will prepare and motivate them for advanced study.

THE ROLE OF HISTORICALLY BLACK CAMPUSES

There are 117 historically black institutions of higher education nationwide. All but a few are concentrated in the south, the residence of over one-third of the nation's black population. Most are relatively small and have a rather narrow range of program offerings. Few are well known outside the African-American community. However, they traditionally have played a very important role in increasing the educational credentials of the black population. If enrollments are any indication, their importance is increasing, instead of declining, as some had predicted when integration of higher became an issue of increased visibility more than twenty years ago. These campuses produce black graduates and leaders far beyond the scale one would predict from their size or visibility. For example, according to the federal government, HBCUs enroll 18% of all black college students and award 40% of the bachelor's degrees received by black students nationwide. Their graduates account for 85% of black physicians, 80% of black federal judges, 75% of black lawyers and black military officers, 50% of black elected officials, and 50% of black business executives. Of particular interest is the fact that black HBCU bachelor's degree recipients account for 75% of black Americans with Ph.D. degrees.

It is worth emphasizing the role that HBCUs play in preparing black students for graduate study, as that is an area of particular interest to the scientific community. The most recent report of new doctorate degree production tabulates the baccalaureate institutions of new doctoral recipients. Nine of the top ten campuses and 17 of the top twenty-one whose black baccalaureate recipients subsequently receive doctoral degrees are HBCUs. It is noteworthy that only three of the top twenty campuses awarding doctorates to blacks are HBCUs, indicating a good record by HBCUs in preparing their students for study at major doctoral-granting campuses. HBCUs are also important undergraduate sources of black students obtaining doctorates in the sciences. Considering the physical and biological sciences, mathematics, computer science, and engineering, nine of the top eleven undergraduate campuses of doctoral recipients are HBCUs.

With legalized school segregation more than forty years in our past and much higher enrollment rates at all levels of education by blacks since that time, it may be surprising to many that our historically black campuses continue to make such a large contribution. In fact, most have been growing rapidly during the past decade, when undergraduate enrollments nationwide were relatively stable. Hence, the relative magnitude of their contributions can be expected to continue to increase. There are at least three reasons for this, all inter-related.

**Leading Undergraduate Campuses
of African-Americans
Who Received Doctorates
between 1989 and 1993 in
ALL DISCIPLINES**

*Howard University (123)**
*Hampton University (67)**
*Spelman College (67)**
*North Carolina A&T (63)**
*Tuskegee University (60)**
Wayne State University (57)
*Southern University (53)**
*North Carolina Central University (49)**
*South Carolina State University (48)**
*Fisk University (46)**
*Florida A&M University (44)**
*Texas Southern University (44)**
*Morgan State University (43)**
*Tennessee State University (43)**
Chicago State University (42)
*Jackson State University (42)**
*Virginia State University (41)**
*University of the District of Columbia (36)**
University of Michigan (35)
University of Maryland - College Park (33)
*Clark Atlanta University (33)**

Total Campuses = 21

***Historically Black Campuses = 17**

Source: Thurgood, D.H. and J.E. Clarke. 1995. "Summary Report 1993: Doctorate Recipients from United States Universities. Washington, D.C.: National Academy Press. (This report gives the results of data collected in the "Survey of Earned Doctorates," sponsored by five federal agencies: NSF, NIH, NEH, U.S. Dept. of Ed., and USDA, and conducted by the NRC.)

**Leading Undergraduate Campuses
of African-Americans
Who Received Doctorates
between 1985 and 1990 in
ENGINEERING AND THE SCIENCES**

Tuskegee University (18)*
Howard University (14)*
Jackson State University (13)*
Massachusetts Institute of Technology (13)
Southern University (10)*
Tennessee State University (9)*
Morehouse College (8)*
Spelman College (8)*
North Carolina A&T State University (8)*
CUNY (7)
Fisk University (7)*

Total Campuses=11
***Historically Black Campuses=9**

Note: Science fields included are physical sciences, mathematics, computer science, agricultural science, and biological sciences.

Source: National Science Foundation, "Undergraduate Origins of Recent Science and Engineering Doctorate Recipients," NSF 92-332, Special Report, (Washington, D.C., 1992).

- **A tradition of enrollment by prominent blacks.** Most successful blacks in our society have received at least their undergraduate education from an HBCU. These leaders of the black community typically have a great deal of loyalty to their undergraduate campuses and frequently encourage their own children and the children of relatives and acquaintances to attend an HBCU.
- **A tradition of enrolling students from a wide range of backgrounds.** HBCUs, as one of the few educational institutions historically available to black students, have had to enroll students with a wide range of academic and socio-economic backgrounds. This is a tradition most have continued. This means that they have to challenge the exceptionally well-prepared student while at the same time providing support for those whose pre-college preparation results in their being considered "at risk". The continuation of this tradition is reflected by the fact that few HBCUs have attempted to cultivate the elitist image prevalent among an increasing number of majority institutions.
- **A high comfort level for black students.** While difficult to quantify, black students often simply attend an HBCU because they feel comfortable there. While we cannot claim to provide better facilities or other amenities for students, there is comfort in numbers, in the feeling that they are as likely to encounter understanding as competition from other students, and that faculty and staff will be sympathetic to their needs and concerns.

Because HBCUs continue to be attractive to a large and probably growing proportion of our young black population, it is important that they provide the most effective education possible. While they undoubtedly will continue to enroll many of the most capable black students, this is something other campuses do as well. The real importance of their role is that, in addition, they educate students from the broad range of the black population that is considered "typical" in terms of academic preparation and socio-economic characteristics. These are the students whose potential must be realized to a much greater extent than at present if we are to have a real impact on the overall educational attainment of the black population.

While their mission is an appropriate one to capitalize on the trends in the student market that need to be addressed, HBCUs generally are in need of additional resources and programs if they are to have the impact of which they are capable. Federal agencies such as NOAA are in a position to have an impact on the problem of minority under-representation by addressing several problems through support of HBCUs and through support of cooperative arrangements between HBCUs and other campuses.

- **Assistance to the Public Schools.** In many instances, HBCUs have a close relationship to local public schools, particularly in urban settings. This places them in a good position to carry out much of the work that needs to be done to improve the preparation of elementary and secondary students for college work. While programs of service typically will require additional resources to improve their effectiveness, HBCUs have the tradition, the mission orientation, and the identification that positions them well to be effective. As an added benefit, the

visibility of this role should help increase their overall level of public support, a critical factor in ensuring their long-term viability and continued development. A good example of a federal program that would appear to have potential for improving education in the public schools is the National Science Foundation's Urban System Initiative. NSF has made major multi-year awards to Baltimore as well as to other cities whose school systems have developed plans for working with local colleges and other institutions that can help enhance mathematics and science education. The program is comprehensive in that it involves students at all grade levels and focuses on preparation for careers as well as for college. There is no reason that this program could not be supplemented by other agencies sharing the same vision or extended to other areas.

- **Creating a Supportive and Stimulating Environment for Undergraduates.** In order to be most effective with the clientele they enroll, HBCUs need to provide personal attention to students and to have a range of support programs that promote student success. HBCUs require below-average student-faculty ratios and class sizes, strong advisement and counseling programs, out-of-class tutoring, a significant amount of on-campus housing, and adequate financial aid. This latter category needs to include enough financial aid to reduce or eliminate the need for students to work significant numbers of hours at off-campus employment. Beyond this, there is a major need to identify and motivate undergraduates who have the potential for majoring in the sciences and/or pursuing advanced study. Successful programs designed to accomplish their goals typically offer opportunities for working closely with faculty members, assisting in research projects, special classes, and financial assistance. A number of federal agencies, private sector organizations, and foundations have programs that enhance the educational experiences and the support available to minority students in fields in which minority groups are under-represented.
- **Graduate Programs at Selected Campuses.** Certain HBCUs are in a position to offer a wider array of graduate programs in the sciences, if sufficient external support is made available. HBCUs have a very strong record of preparing undergraduates for advanced study, primarily at majority campuses. Selected HBCUs could make an additional contribution at the graduate level with adequately supported programs. Because of the potential contributions of graduate programs at HBCUs, it is important that they be as strong as possible. This should be a particular priority of NOAA and other federal agencies as the payoff is likely to be evident more quickly than other longer-term efforts. At least three other desirable outcomes would also likely result from the development of more graduate programs at HBCUs. First, the quality of undergraduate education in the sciences would probably increase at campuses offering graduate degrees. Second, the visibility that graduate programs would provide would be likely to encourage more undergraduates to pursue baccalaureate programs in the sciences. Third, campuses would become more attractive to majority students and external funding as a result of their increased visibility.
- **Cooperation with Major Doctoral-Granting Research Institutions.** There is a great deal of potential for cooperation between many historically black institutions

and campuses with prominent graduate and research programs. For one, faculty and basic infrastructure at HBCUs would be strengthened at all levels of study and across many fields through substantive programs of collaboration. Such programs might include joint-research, sharing of facilities and equipment, and faculty exchanges. One project having national potential that already is in operation is the National Minority Graduate Seeder Program sponsored by the National Association of State Universities and Land-Grant Colleges. This program supports a national data base of names of minority undergraduates in science-related fields. The data base is accessed by graduate and professional schools seeking minority candidates.

Collaboration would strengthen the quality of undergraduate education at HBCUs. Such arrangements also would provide major doctoral-granting institutions with a pool of potential graduate students whose preparation they will have helped to influence. In addition, where HBCUs offer or develop graduate programs, these would be strengthened if assistance was provided by major research campuses. Finally, both types of campuses have much to contribute to the upgrading of public elementary and secondary education. Major campuses typically have a broad range of expertise that theoretically can be brought to bear on the problems of our urban schools. HBCUs usually have close connections with local public schools and, even more importantly, the community they serve and with the institutions and groups that are part of this community. In the long run, our success in producing minority doctorates in the sciences is going to depend on how much we expand the pool of well qualified minority students at the elementary and secondary school level, a pool whose potential barely being tapped at the present time.