ANNUAL REPORT 1994-1995

# THE HISTORICALLY BLACK COLLEGES AND UNIVERSITIES/MINORITY INSTITUTIONS ENVIRONMENTAL TECHNOLOGY CONSORTIUM

## CONSORTIUM MEMBER INSTITUTIONS

Alabama Agricultural and Mechanical University
Clark Atlanta University
Florida Agricultural and Mechanical University
Florida International University
Hampton University
Howard University
Jackson State University
New Mexico Highlands University
North Carolina Agricultural and Technical State University
Northern Arizona University
Prairie View Agricultural and Mechanical University
Southern University and Agricultural and Mechanical College -- Baton Rouge
Texas Agricultural and Mechanical University -- Kingsville
Texas Southern University
Tuskegee University
University of Texas -- El Paso
Xavier University -- New Orleans

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DOE/AL/66158--T5

# Preface

For over forty (40) years the United States Department of Energy (US DOE) designed, developed, manufactured and tested nuclear weapons for national defense purposes. This weapons complex generated very large quantities of hazardous, toxic and radioactive waste. The US DOE, like most manufacturers, before there was any sense of environmental stewardship, contaminated both soils and groundwater on and near its facilities. Recognizing this environmental problem the US DOE has set a goal to clean up the weapons complex and bring all of its sites and facilities into compliance with all applicable environmental regulations. The Department set a thirty year goal for waste management and clean-up of more than 100 contaminated installations in 36 states and territories that include 3,700 sites: over 26,000 acres, with hazardous or radioactive contaminated surface or ground water, soil or structures; over 26,000 acres requiring remediation and environmental restoration. A number of growing new sites have been identified; 500 surplus facilities are awaiting decontamination and decommissioning and approximately 5,000 peripheral properties have soil contamination with uranium tailings.

To successfully meet this environmental clean-up challenge the Department of Energy's Office of Technology Integration and Environmental Education and Development (EM-52) within the Office of the Assistant Secretary for Technology Development (EM-50) in the DOE Office of Environmental Management (EM) supported DOE's needs and goals to ensure a skilled, knowledgeable workforce to meet its 30-year clean-up goals. There was a projected shortfall of trained environmental management personnel. To meet this human resource need for technically trained personnel EM-50 initiated several collaborative partnerships with universities.

In 1990, the Historically Black Colleges and Universities/Minority Institutions (HBCU/MI) Environmental Technology Consortium was funded. With this unique consortium, the Department reached out to historically underutilized and underrepresented groups to provide them access to environmental education and the environmental industry. Under a cooperative agreement, environmental issues were infused into traditional courses and new courses, curricula and degree programs were developed.

These curriculum and faculty development activities of the Consortium provides a major resource for both trained minority personnel and environmental education and training programs. Additionally, new technologies for environmental remediation and restoration are being developed.

In 1995, the new challenge for EM and its Office of Training and Education (EM-13) is in curriculum design for the Technical Qualifications Program (TQP) mandated by the DOE Defense Nuclear Facilities Safety Board (DNFSB). Under this program, Learning Activity Design Specifications (LADSs) will guide the development and delivery of an EM Education and Training program for DOE employees to meet the mandates of the DNFSB. The academic partners of EM will build upon prior curriculum development activities to develop and deliver traditional courses, Computer-Based Training (CBT) and distance learning courses through Interactive Television. Additionally, short-term courses for career development would be available.

The Council of Presidents and the Steering Committee of the Consortium acknowledges with thanks the Department of Energy's support and commitment, especially, the Office of the Assistant Secretary for Environmental Management (EM-1); the Office of the Deputy Assistant Secretary for Management and Evaluation (EM-10); and the Office of Training and Education (EM-13).

Frederick H. Humphries
Chair
Council of Presidents

Kofi B. Bota
Director

August O. Curley
Program Manager

## DISCLAIMER

# EXECUTIVE SUMMARY

The HBCU/MI ET Consortium was established in January 1990, through a Memorandum of Understanding (MOU) among its member institutions. This group of research oriented Historically Black Colleges and Universities and Minority Institutions (HBCU/MIs) agreed to work together to initiate or revise education programs, develop research partnerships with public and private sector organizations, and promote technology development to address the nation's critical environmental contamination problems. The Consortium's Research, Education and Technology Transfer (RETT) Plan became the working agenda. The Consortium is a resource for collaboration among the member institutions and with federal and state agencies, national and federal laboratories, industries, (including small businesses), majority universities, and two and four-year technical colleges. As a group of 17 institutions geographically located in the southern United States, the Consortium is well positioned to reach a diverse group of women and minority populations of African Americans, Hispanics and American Indians.

This Report provides a status update on activities and achievements in environmental curriculum development, outreach at the K-12 level, undergraduate and graduate education, research and development, and technology transfer.

# INTRODUCTION

The United States is moving into the 21st century with serious energy and environmental problems. There are problems not only in dwindling natural resources, but also that of confronting past decisions that have created pollution because of our energy, defense and commercial activities. Several laws, principal among them the Solid Waste Disposal Act (SWDA), as amended by the Resource Conservation and Recovery Act (RCRA), 1976 and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA), 1986, commonly known as Superfund, target wastes and hazardous substances so that there is now a clear national mandate to find safer, faster and cost-effective solutions for waste elimination and reduction, treatment, storage and disposal, as well as clean-up of contaminated environments.

The greater the need for creating new environmental technologies and new solutions, the greater the need for a technologically and scientifically trained workforce. Unfortunately, our educational system has lagged in producing the scientists and engineers needed to solve these environmental problems.

Numerous studies have painted a bleak picture of our dilemma. The December 1989 report of the Task Force on Women, Minorities and the Handicapped estimates that by the year 2010, the nation will be dangerously short of scientists and engineers. A recent EPA study estimates that we would require 9,000 Ph.D.'s a year to meet projected needs while universities are producing only 2,000 per year.

This report, *Changing America: The New Face of Science and Engineering*, extended the warning, stating that, "The education pipeline -- from kindergarten through the Ph.D. -- is failing to produce the workers needed to meet future demands. Indeed, unless... (everyone)... acts in concert, our national science and engineering workforce will continue to erode and the prospects for maintaining an advanced industrial society will diminish."

Our competitiveness in the global marketplace depends upon our taking corrective action to reverse existing downward trends in the number and availability of skilled technical manpower. The United States has to improve its approximately seven-year lag between formulating new ideas and commercial concepts and bringing them to market. We can no longer continue to segregate academia and industry in our research and development (R&D) efforts. Technological innovations are so rapid that it is almost impossible for academia to keep up without effective interactions with industry. To the extent faculty lags, so too will the advent of new courses and curricula. Ultimately, graduates come into an industrial culture that may be five to seven years ahead of them. Industry cannot expect this novice staff to immediately begin solving technological problems.

To address this lack of effective technology development and transfer mechanism, government, academia and industry must foster alliances by building collaborative research efforts and teaching students research skills and the ways of their future profession before they leave the academe. Besides bolstering science and mathematics instruction for students and teachers in the pre-college environment, educators also must promote the attitude of and opportunities for lifelong learning. Technology changes so quickly -- a generation of computer hardware barely lasts five years -- that our educational institutions must teach problem solving and learning skills more than knowledge that quickly becomes obsolete. Adults will have multiple careers in the coming decades, and the requirements for change require continuing education for the workforce.

In August 1989, The Department of Energy (DOE) released its Environmental Technology Five-Year Plan, which included support of strong educational programs at all levels. A few months later, in October 1989, the Secretary of Energy and the Chairman of the Lawrence Hall of Science convened a Mathematics and Science Education Conference in Berkeley, California. One of the recommendations of this conference was to "increase participation of female, minority, disabled and disadvantaged students in mathematics and science." Targeting minority groups makes sense: there is a large pool of talent; these groups have been underrepresented despite our nation's commitment to equal opportunity and, furthermore, minority populations are becoming a larger percentage of our nation's population.

# INTRODUCTION

Hispanics, American Indians, Native Alaskans and African Americans are projected to constitute more than one-third of the nation's population by the early 21st century, although they have low enrollments in our colleges and universities. Rawls, in "Minorities in Science" in Chemical and Engineering News (April 15, 1991), reports that 42% of the new entrants into the U.S. labor force will be women and minorities by the first decade of the 21st century. In spite of this fact, minorities currently represent only four percent of the natural scientists and engineers. A greater scientific literacy must be promoted nationally and particularly among minority populations since therein lies the greatest potential of untapped human resources.

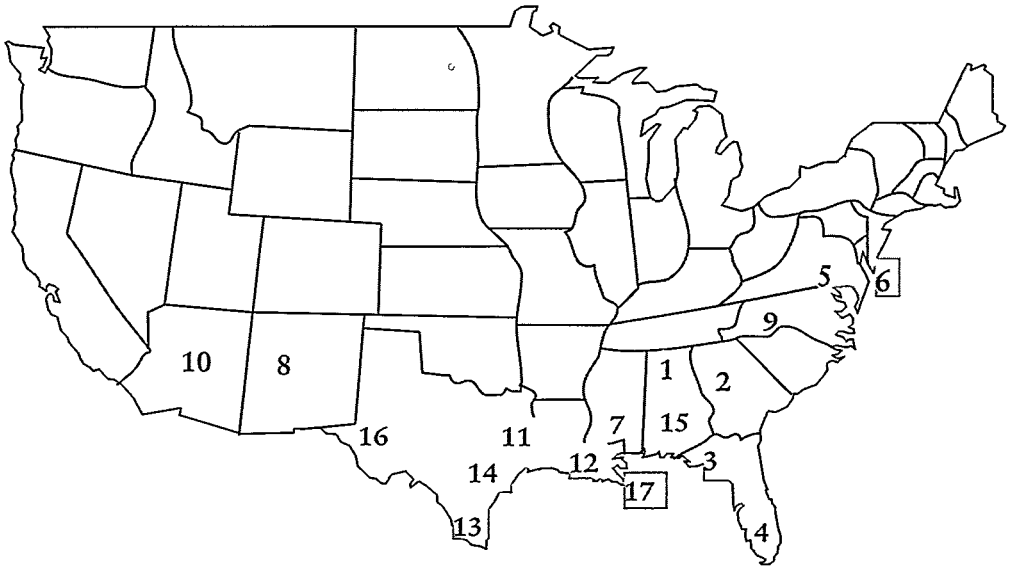
In January 1990, a group of African American, Hispanic and Native American Indian serving institutions formed the Historically Black Colleges and Universities (HBCUs) and Minority Institutions (MIs) Environmental Technology Consortium (Consortium). The seventeen institutions of the Consortium are well-known for their significant role in training the nation's minority technical workforce. Twelve of the institutions are Historically Black Colleges and Universities, four are predominantly Hispanic and two have a sizable population of Native American Indians. Figure 1 shows the location of these institutions spanning almost from coast-to-coast.

While approximately 80% of African American students attend majority institutions, HBCUs graduate more than half of those who receive bachelor's degrees. The top five higher education institutions producing minority B.S. engineering graduates are members of this Consortium, as are the top two producers of minority Ph.D.s in pharmacy. Two member institutions produce 16 percent of this B.S. Engineering Technology degrees awarded to African Americans, while two institutions produce 7 percent of the B.S. engineering degrees conferred on Hispanics.

With this track record and its existing programs for K-12 educational reforms in science and mathematics, the Consortium is uniquely qualified to develop environmental technology programs to fill the workforce gap for the next several years. HBCUs/MIs provide the role models and nurturing atmosphere to produce minority engineers and scientists and are the best situated resource to make a significant impact on the number of minorities entering the workforce.

While planning for the Consortium's program was underway, DOE ran a Notice of Program Interest in the April 1990 Federal Register requesting proposals from academic organizations which wanted leadership roles in academic partnerships for environmental education and technology development. The program's focus was environmental technology development with the concomitant goal of increasing the number of scientists, engineers and other professionals (e.g., technicians) in these fast-growing career areas. Thirteen proposals were received in the competition by the DOE. In September 1990, the Secretary of Energy announced that the HBCU/MI Environmental Consortium won the competition. A cooperative agreement between DOE and the Consortium was signed in October 1990.

## Geographic Location of Member Institutions




| Location | University | Minority Population Served |
|---|---|---|
| 1 | Alabama A&M University | African American |
| 2 | Clark Atlanta University | African American |
| 3 | Florida A&M University | African American |
| 4 | Florida International University | Hispanic, African American |
| 5 | Hampton University | African American |
| 6 | Howard University | African American |
| 7 | Jackson State University | African American |
| 8 | New Mexico Highlands University | Hispanic, Native American Indian |
| 9 | North Carolina A&T State University | African American |
| 10 | Northern Arizona University, Hispanic | Native American Indian |
| 11 | Prairie View A&M University | African American |
| 12 | Southern University at Baton Rouge | African American |
| 13 | Texas A&M University - Kingsville | Hispanic |
| 14 | Texas Southern University | African American, Hispanic |
| 15 | Tuskegee University | African American |
| 16 | University of Texas - El Paso | Hispanic |
| 17 | Xavier University - New Orleans | African American |

# MISSION

## The HBCU/MI Environmental Technology Consortium Mission Statement

The HBCU/MI Consortium was formed (1) to respond to national R&D, policy formulation and minority manpower needs in environmental technology, hazardous, solid and mixed waste management, environmental restoration, and environmental health; and (2) to address limited minority participation in the public, private and non-profit environmental industries; limited environmental awareness among minorities; minimal interaction between HBCUs/MIs and majority universities, industry and interest groups; limited institutional development in environmental education and research; and lack of minority technology-based businesses in the environmental industry.

*"...one of our most urgent tasks is to strengthen our science and engineering workforce. The education pipeline -- from kindergarten through the Ph.D. -- is failing to produce workers needed to meet future demands...*

*Indeed, unless parents, schools, colleges, industry, professional societies, state legislatures, federal agencies, the President, and the Congress at in concert, our national science and engineering workforce will continue to erode and the prospects for maintaining an advanced industrial society will diminish."*

From the report *Changing America: The New Face of Science Engineering*

# Consortium Purposes and Strategies

The HBCU/MI Environmental Technology Consortium's response to the national environmental crisis is to increase minority participation in environmental professions by improving outreach and pre-college education; undergraduate education and postsecondary training; graduate and postgraduate education and research; and technology transfer. A description of the Consortium's Research, Education and Technology Transfer (RETT) Plan follows.

## Minority Outreach and Pre-College Education

Goal: To increase the amount, access and quality of mathematics and science education and information dissemination in minority communities.

### Objective 1

Develop and Implement Mathematics and Science Programs for Minority Parents and Children (Pre-K-12) and Pre-college Teachers

### Actions

- Literacy Programs
- Formal/Informal; School-Based/Home-Based Activities
- Student Recognition Programs
- Work/Study Programs
- Mathematics & Science Enrichment Programs (Saturday, Summer, and After-School)
- Career Awareness and Orientation Activities
- Parenting Skills

### Objective 2

Promote Public and Private Industry Linkages with Minority Elementary and Secondary Schools

### Actions

- Adult and Youth Awareness Programs
- School-Based Interventions and Awards/Recognition Programs
- Industry/Education Developed Learning Materials
- Industry Speakers, Precepts, Laboratory Experiences
- Student Interactions such as Science and Mathematics Fairs

### Objective 3

Develop Core Elements of Pre-college Programs in the Energy and Environmental Sciences

### Actions

- State/Local Education Department Joint Curriculum Planning and Design with Energy and Environmental Industry and National Laboratories
- Instructional Materials Development
- Video Development and Presentation on science-based activities and applications within the energy industry; simple "How to" experiments conducted by industry, university, and national laboratory scientists that can be relocated within local school districts

### Objective 4

Accelerate Certification and Professional Training of Science and Mathematics Teachers

### Actions

- Scholarships
- Specialized Institutes and Workshops
- Participation in Federal, State and Private Industry Research and Development Projects
- Teacher Retraining and Continuing Education in the Energy and Environmental Sciences

## Undergraduate Education and Post-Secondary Training

Goal: To increase the number of qualified minority professionals available to teach and work in the sciences and engineering, especially the energy, materials and environmental sciences.

### Objective 1

Develop and Implement Activities at the Undergraduate Level that will Increase the Number of Minorities Retained in the Pipeline for Graduate Training in the Sciences and Engineering

### Actions

- Scholarships
- Career Counseling Resource Materials
- Undergraduate Research Participation
- Summer Internships and Co-ops
- Role Model Training Programs for Minority Science Student Mentors

### Objective 2

Develop Programs to Retain Minority Faculty and Trainers as Mentors and Role Models

### Actions

- Undergraduate Research Programs
- Faculty Exchanges
- Institutional Rewards for Faculty
- Faculty Retention Incentive Programs
- Summer Industry Enrichment Programs

### Objective 3

Identify Elements and Recommend Implementation of Strong Undergraduate Programs in the Sciences, Mathematics and Engineering Disciplines with Minor Programs in the Energy, Materials and Environmental Sciences

### Actions

- Special Emphasis Courses -- Hazardous Materials, Radioactive and Hazardous Waste Management, Survey Techniques, etc.
- Teaching Materials -- Textbooks with Industry-defined Programs and Exercises; Computer Software Development; Hands-on Training
- State-of-the-art Environmental Process and Product Information Conversion to Teaching and Training Materials

## Graduate and Postgraduate Education and Research

Goal: To develop nationally recognized capabilities within the Consortium to provide graduate research, education and support to minority students at the master's and Ph.D. levels in those sciences and engineering that support the energy, environment, and solid, hazardous and radioactive waste handling industries.

### Objective 1

Develop a Clear Statement of the HBCU/MI Consortium's Capabilities Consistent with Federal, State and Industry Priorities and Needs

### Actions

- The HBCU/MI Consortium Capability Statement

### Objective 2

Plan and Coordinate the Development and Support of the Consortium's Interdisciplinary Academic and Research Programs that Build Upon Institutional Strengths and Track Records in the Sciences and Engineering

### Actions

- The HBCU/MI Consortium Interdisciplinary Program Description
- RETT Plan Update Consistent with DOE's Annual RDDTE Plan
- RETT Plan Update Consistent with other Federal, State and Private Industry Programs in Environmental Policy, Hazardous Materials and Waste Management

### Objective 2

Provide Competitive Fellowship Support and Industry Access to Minority Graduate Students Pursuing Master's and Ph.D. Studies at the Consortium Institutions in Energy and Environmental Sciences and Engineering

### Actions

- The HBCU/MI Consortium Fellowship Program
- Summer and Co-op Placement in the Public and Private Sectors

## Technology Transfer

Goal: To effect technology transfers among HBCUs/MIs, the environmental industry, and Federal and state governments.

### Objective 1

Create Consortium Technology Development Centers that Establish Linkages with the Environmental Industry and National and Federal Laboratories and Technology Centers for the Development and Application of Priority Technologies

### Actions

- Student/Faculty Placement with industry as Research and Development staff
- HBCU/MI and Industry Joint Technology Development
- Contract and Subcontract Opportunities
- Information Clearing House
- Faculty Exchange with Industry and Government Personnel

### Objective 2

Promote the Development of Competitive Minority Technical Entrepreneurial Talent and Businesses in the Environmental Technology Areas

### Action

- Resource Exchanges—personnel, specialized equipment, facilities

## Joint Technology Development

Minority Technical Businesses (MTB) Resource and Incubator Centers -- support services in contract management, business plan development, accounting, patent and non-disclosure policies, marketing, research, prototype development, etc.

### Objective

Establish Environmental Technology Minority Manpower Training Centers and Programs

### Actions

- Credit and Non-Credit Short Courses
- Environmental Technology Management Training Institutes
- Joint Development and Sponsorship of Certified Training Programs for Industry and Government Personnel

The Consortium's program has six prongs: program development; faculty development; curriculum development; recruitment and retention; outreach (pre-college education, community, business); and technology transfer.

The Consortium member institutions have continued to strengthen their individual infrastructures in order to implement the Consortium objectives. Some institutions

have created centers that serve as the focal point for environmental activities. These centers have spearheaded efforts to expand environmental curricula by modifying courses to add or upgrade environmental science content, or reexamined degree programs and course offerings, sponsored pre-college student and teacher training programs, and fostered research and technology development and transfer programs.

## Consortium Institution Demographics

Student Populations in Table 1 list the demographic data on students at the 17 HBCU/MI Universities. Twelve have between 75% and 99% African American students (Alabama A&M, Clark Atlanta, Florida A&M, Hampton, Howard, Jackson State, North Carolina A&T, Prairie View A&M, Southern, Texas Southern, Tuskegee and Xavier). Four institutions have over 50% representation of Hispanic students (Florida International, New Mexico Highlands, Texas A&M University-Kingsville, and the University of Texas-El Paso). A third minority group, American Indians, have a 4% representation at New Mexico Highlands and a 6% representation at Northern Arizona University.

### Table 1. The HBCU/MI Consortium Institution 1994-1995 Demographics

| | AAMU | CAU | FAMU | FIU | HaU | HoU |
|---|---|---|---|---|---|---|
| Type | public | private | public | public | private | private |
| Faculty | 299 | 251 | 425 | 896 | 394 | 2021 |
| Students | 5593 | 4480 | 9493 | 22,387 | 5582 | 11,919 |
| % Male | 46 | 32 | 42 | 42 | 41 | 41 |
| % Female | 54 | 68 | 58 | 58 | 59 | 59 |
| % African Amer. | 78 | 86 | 88 | 10 | 88 | 85 |
| % Hispanic | <1 | <1 | 1 | 52 | <1 | <1 |
| % Native Amer. Indian | <1 | 0 | <1 | <1 | <1 | <1 |
| % Asian | <1 | <1 | <1 | 3 | <1 | 1 |
| % Anglo | 12 | <1 | 8 | 35 | 9 | 1 |
| % International | 8 | 27 | 1 | 5 | 2 | 1 |

| | JSU | NMHU | NCAT | NAU | PVAM | SU |
|---|---|---|---|---|---|---|
| Type | public | public | public | public | public | public |
| Faculty | 315 | 121 | 529 | 614 | 305 | 530 |
| Students | 6346 | 2768 | 7580 | 20,131 | 5660 | 9502 |
| % Male | 42 | 42 | 50 | 41 | 52 | 43 |
| % Female | 58 | 58 | 50 | 59 | 48 | 57 |
| % African Amer. | 96 | 3 | 86 | <1 | 89 | 92 |
| % Hispanic | <1 | 65 | <1 | 9 | 1 | <1 |
| % Native Amer. Indian | <1 | 4 | <1 | 6 | <1 | <1 |
| % Asian | <1 | <1 | 1 | <1 | 1 | <1 |
| % Anglo | 3 | 27 | 12 | 80 | 8 | 5 |
| % International | 0 | 1 | 1 | 2 | <1 | 2 |

| | TAMU-K | TSU | TU | UTEP | XU |
|---|---|---|---|---|---|
| Type | public | public | public | public | public |
| Faculty | 245 | 545 | 529 | 808 | 203 |
| Students | 6046 | 9518 | 7580 | 16,275 | 3391 |
| % Male | 51 | 40 | 50 | 46 | 3190 |
| % Female | 49 | 60 | 50 | 54 | 69 |
| % African Amer. | 4 | 84 | 86 | 3 | 90 |
| % Hispanic | 64 | 3 | <1 | 64 | <5 |
| % Native Amer. Indian | <1 | <1 | <1 | <1 | 0 |
| % Asian | <1 | 2 | 1 | 1 | 2 |
| % Anglo | 27 | 27 | 12 | 22 | 6 |
| % International | 5 | 8 | 1 | 9 | <2 |

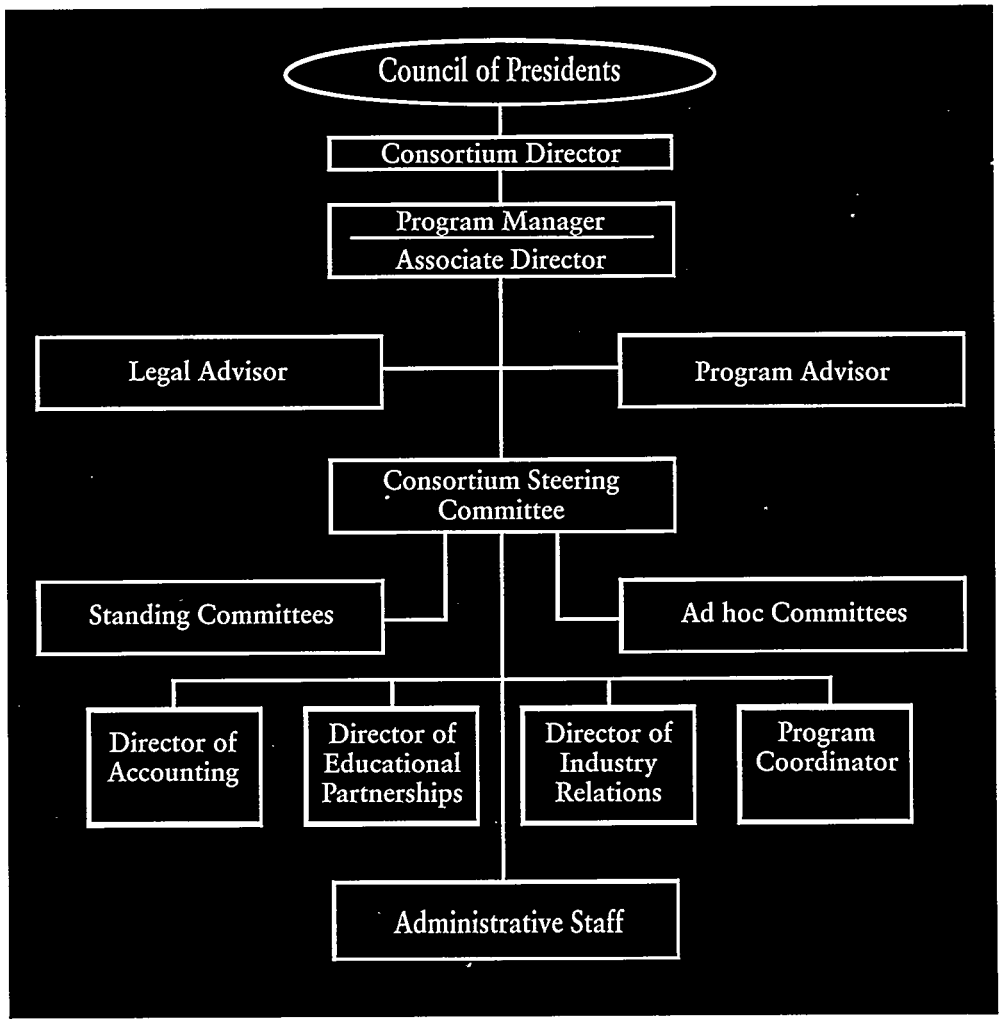
| | |
|---|---|
| Total Enrollment | >145,500 |
| Total Faculty | > 8,559 |
| % Male | 45 |
| % Female | 55 |

# Management

## Consortium Management

The policy making body of the Consortium is the Council of Presidents. The Consortium Director reports directly to the Council and serves as its secretary. A Steering Committee under the leadership of a chair, implements the Council's general policies. The chair of the Steering Committee also serves as a non-voting member of the Council.

## The Consortium Organizational/Management Flowchart




## The Council of Presidents

The Council of Presidents is the policy making body of the Consortium. The President of each institution serves as a member of the Council of Presidents. This Council meets once a year to review and discuss the Consortium's policies; to make recommendations concerning new and improved ways for continued implementation of the Consortium activities; and to discuss means for self-sufficiency.

Overall policy direction for the Consortium is provided by the Chair of the Council of Presidents. The current Chair of the Council of Presidents is Dr. Frederick Humphries, President of Florida A&M University.

The Consortium operates under the auspices of Clark Atlanta University in Atlanta, Georgia. The Consortium headquarters provides day-to-day management. It is managed by the Consortium Director, Dr. Kofi B. Bota, and staff. The director is assisted by the associate director and program manager, August O. Curley, and other support personnel.

## Steering Committee

The responsibilities of the Steering Committee are to implement the general policies of the Council of Presidents, recommend new directions for Council consideration and action, plan and evaluate the long- and short-term goals and programs of the Consortium, and carry out assignments or functions under the leadership of its chair. Committee members also act as the Consortium point of contact for the member institutions and provide general coordination for Consortium activities at their respective institutions. They assume local program management responsibility for institutional projects and the fiscal implementation of subcontracts issued by the Consortium to their institutions, subject to federal or other procurement and management regulations.

## Steering Committee Chairperson

The chair of the Steering Committee is responsible for general oversight of the affairs of the Consortium and the implementation of Council policy. In addition, the chair is responsible for the formulation, program direction, and operation of the Consortium Standing and Ad-Hoc Committees.

## Standing and Ad-Hoc Committees

These committees guide the Consortium's business in research, development, education, technology transfer, and training. There are four Standing Committees and two Ad-Hoc Committees:

## Standing Committees

Committee on Outreach and Pre-College Programs
Committee on Undergraduate Education and Postsecondary Training
Committee on Graduate and Post-Graduate Education and Research
Committee on Technology Transfer

## Ad-Hoc Committees

Committee on Communications
Committee on Quality Assurance/Quality Control

## The HBCU/MI Environmental Technology Consortium Council of Presidents

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# Activities and Achievements in Environmental Education and Training

Since 1990, the HBCU/MI Consortium has made substantial contributions in environmental education, technology transfer, research and policy analysis, and is working toward self-sufficiency. Programs conducted by the Consortium fall into four categories: outreach and pre-college education; environmental curriculum development at both the undergraduate and graduate levels; undergraduate and graduate research, summer internships; and technology development and transfer.

The Consortium institutions continue to develop environmental curricula. Since 1991, sixty-eight (68) new courses in environmental-related areas have been developed and twelve (12) existing courses have been infused with environmental topics. In 1994, several Consortium institutions collaborated to complete the development of computer-based environmental modules on topics such as ecological effects; hazardous waste; water pollution and air pollution. These modules are being beta-tested at several institutions for wider dissemination during the 1995-96 academic year.

**Consortium Activities for 1994-1995 included:**

| | | |
|---|---|---|
| 1994/1995 | EMPAC Program Review | |
| 1994/1995 | Recycling Program | Kingsville, TX |
| January 19, 1995 | DOE Office of Environmental Management Program Review | Dallas, TX |
| January 21-22, 1995 | Council of Presidents Steering Committee Meeting | Miami, FL |
| January 23, 1995 | Second Nature Partnership Leaders Workshop | Miami, FL |
| March 20-21, 1995 | Environmental Technician Training Program Cycle 1 | San Antonio, TX |
| May 1-4, 1995 | DOE Technical Qualifications Program Meeting | Albuquerque, NM |
| June 5-6, 1995 | Environmental Technician Training Program Cycle 2 | Arlington, TX |
| June 6, 1995 | DOE Telecommunications Russian Course | Atlanta, GA |
| July 24-26, 1995 | Partnership Leaders Workshop Steering Committee Meeting | Tuskegee, AL |
| August 7, 1995 | Industrial Liaison, Foster Wheeler Environmental | Boston, MA |
| August 7-8, 1995 | Environmental Technician Training Program Cycle 3 | Houston, TX |
| October 10-13, 1995 | DOE Office of Environmental Management Meeting | Las Vegas, NV |
| October 23-24, 1995 | Environmental Technician Training Program Cycle 4 | Arlington, TX |

# Achievements in Course and Curriculum Development

The Consortium institutions have strong science and engineering programs. Table 6 lists the degrees offered in the science and engineering disciplines. The Consortium members have continued to expand courses, update the content of existing courses and create multidisciplinary environmental courses.

Improving the quality of scientific instruction often necessitates faculty retraining to acquaint faculty with new technologies, research processes and problems being addressed by the national laboratories and the private and public sector research communities. Faculty internships or research partnerships were undertaken by the member institutions to achieve this objective.

Since the Curriculum Development Workshop I, held in June 1991 at Jackson State University, member institutions have established new courses, degree programs and curricula. Some universities have infused hazardous waste management, environmental restoration and technology development information into traditional courses.

The Consortium conducted Curriculum Development Workshop II in June 1993, in Atlanta, Georgia. The objectives of the workshop were to continue:

- developing and implementing environmental courses within the traditional disciplines in the sciences and engineering;
- developing and implementing minor concentrations in the environmental sciences and engineering as a complement to the classical "majors" in the sciences and engineering;
- developing action plans for follow-up and tracking; and
- extending the network for curriculum development.

Evaluations of the workshop revealed that the workshop objectives were accomplished with the number of courses, curricula and degree programs developed and implemented.

The Curriculum Development Workshop II showed the significance of the HBCU/MI Consortium as a valuable resource that addresses national and international environmentally trained human resources, hazardous waste management, environmental technology and environmental restoration needs.

Table 6 lists the new environmental courses that have been developed and implemented by the member institutions.

Table 7 lists the environmental degree program that have been developed or implemented by member institutions during the past five years.

## Achievements in Course and Curriculum Development

### Curriculum Development Table 6

| UNIVERSITY IMPLEMENTED | NEW COURSES | DEGREE PROGRAMS DEVELOPED AND/OR |
|---|---|---|
| AAMU | Course in Economics/Finance<br>Courses in Plant/Soil Science<br>Course in Biology<br>Course in Community Planning/Urban Studies<br>Courses in Civil Engineering<br>Course in Chemistry | B.S. in Environmental Science<br>M.S. in Environmental Science<br>Ph.D. in Environmental Science |
| CAU | Courses in Environmental Chemistry<br>Course in Environmental Law<br>Seminar in Environmental Science<br>Course in Ecology | M.S. and Ph.D. Programs in Environmental Health Sciences and Toxicology |
| FAMU | Courses in Environmental Remediation<br>Courses in Construction Engineering Technology<br>Courses in Environmental Science (Option)<br>Courses in Environmental Toxicology | B.S. in Environmental Toxicology<br>M.S. in Environmental Science<br>M.S. in Agricultural Science<br>M.S. and Ph.D. in Environmental Toxicology<br>Ph.D. in Entomology |
| FIU | Courses in Environmental Engineering | B.S. in Environmental Engineering<br>M.S. in Environmental Engineering |
| HaU | Courses in Environmental Chemistry<br>Seminar in Environmental Science<br>Courses in Chemical Analysis Methods<br>Courses in Techniques in Environmental Analysis<br>Courses in Environmental Management and Policy Analysis | |
| HoU | Courses in Environmental Microbiology<br>Courses in Environmental Chemistry<br>Courses in Environmental Engineering<br>Courses in Environmental Impact Analysis<br>Courses in Occupational Environment<br>Courses in Solid Waste Management<br>Courses in Environmental Management Policy<br>Courses in Environmental Health<br>Courses in Water Quality and Health | B.S. in Environmental Science |
| JSU | Courses in Occupational Safety<br>Courses in Environmental Economics<br>Courses in Environmental Planning and Administration<br>Seminars in Community and Economic Development<br>Seminars in Leadership Development Infusion | Ph.D. in Environmental Science<br>Ph.D. in Public Policy and Administration |
| NMHU | Courses in Water Resources and Biological Monitoring<br>Courses in Water Supply and Pollution Control<br>Courses in Environmental Law, Ethics and Policy<br>Courses in Toxicology and Risk Assessment I<br>Courses in Atmospheric Science and Pollution<br>Courses in Waste Management, Minimization and Handling | B.S. in Environmental Science<br>M.S. in Environmental Science<br>M.S. in Life Sciences with concentration in Environmental Health Science |
| NCAT | Courses in Environmental Sciences | |

## Curriculum Development

| UNIVERSITY IMPLEMENTED | NEW COURSES | DEGREE PROGRAMS DEVELOPED AND/OR |
|---|---|---|
| NAU | Course in Bio-Remediation<br>Courses in Environmental Engineering<br>Course in Environmental Laws and Biology<br>Courses in Environmental Management<br>Courses in Environmental Science<br>Introductory Course in Biology: "Slice of Life"<br>Courses in Liberal Studies in the Humanities and Social Sciences, integrating sustainability issues<br>Courses for Pre-Service Teachers<br>Course in Environmental Technology | B.S. in Environmental Science<br>M.S. in Environmental Chemistry<br>B.S. in Forestry<br>M.S. in Forestry<br>MLS in Liberal Studies<br>Ph.D. in Forestry |
| PVAM | Courses in Environmental Engineering<br>Courses in Biology Waste Water Treatment | M.S. in Environmental Toxicology |
| SU | Courses in Water Resources Management<br>Courses in Environmental Engineering<br>Courses in Environmental Sociology<br>Courses in Environmental Reporting<br>Courses in Hazardous Waste Management | M.S. in Environmental Science |
| TAMU | Courses in Environmental Engineering<br>Courses in Environmental Science<br>Courses in Environmental Chemistry<br>Courses in Environmental Toxicology<br>Courses in Environmental Geology<br>Courses in Meteorology<br>Courses in Hazardous/Solid Waste Design<br>Courses in Product Safety Design | M.S. in Environmental Engineering |
| TSU | Courses in Environmental Engineering Technology<br>Courses in Environmental Health<br>Major Courses in the Environmental Sciences<br>Ph.D. Program in Environmental Toxicology | M.S. in Environmental Engineering Technology<br>M.S. in Environmental Science<br>Ph.D. in Environmental Toxicology |
| TU | Courses in Plant and Soil Science<br>Courses in Hazardous Waste Management | B. S. in Environmental Science<br>M.S. in Environmental Science |
| UTEP | Courses in Chemistry Lab emphasizing Environmental experiments<br>Courses in Biological Sciences with an emphasis on Environmental Science<br>Courses in Toxicology | |
| XU | Courses in Ecology<br>Courses in Environmental Biology<br>Courses in Environmental Philosophy | |

| UNIVERSITY | SHORT COURSES |
|---|---|
| NAU | Environmental Engineering Curriculum Review<br>Geographic Information Systems (GIS) Curriculum<br>Ponderosa Group sustainability in the Curriculum |

## The HBCU/MI Consortium Member Institutions Degree Offerings Table 7

| Academic Degrees | AAMU | CAU | FAMU | FIU | HaU | HoU | JSU | NMHU | NCAT | NAU | PVAM | SU | TAMU | TSU | TU | UTEP | XU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Allied Health** | | | | | | | | | | | | | | | | | |
| BS | | x | | x | | x | | | | x | | x | | x | x | x | |
| MS | | | | x | | x | | | | x | | | | | | | |
| PhD | | | | x | | x | | | | | | | | | | | |
| **Agribusiness** | | | | | | | | | | | | | | | | | |
| BS | x | | x | | | | | | x | | x | x | x | | x | | |
| MS | x | | | | | | | | x | | | | x | | | | |
| PhD | | | | | | | | | | | | | | | | | |
| **Biochemistry** | | | | | | | | | | | | | | | | | |
| BS | | | | | | | | | | x | | x | | | | x | x |
| MS | | x | | | | x | | | | x | | | | | | | |
| PhD | | x | | | | x | | | | | | | | | | | |
| **Biology** | | | | | | | | | | | | | | | | | |
| BS | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| MS | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | |
| PhD | | x | | x | | x | | | | x | | | | | | | |
| **Chemical Engineering** | | | | | | | | | | | | | | | | | |
| BS | | x* | x | | x | x | | | x | | x | x | x | x | x | | |
| MS | | | x | | x | x | | | x | | | x | x | | | | |
| PhD | | | x | | | x | | | | | | | | | | | |
| **Chemistry** | | | | | | | | | | | | | | | | | |
| BS | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| MS | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | |
| PhD | | x | | | | x | | | | | | | | | | | |
| **Civil Engineering** | | | | | | | | | | | | | | | | | |
| BS | x | x* | x | x | | x | | x | x | x | x | x | x | x | x | x | |
| MS | x | | x | x | | x | | | x | | | x | x | | x | x | |
| PhD | | | | | | | | | | | | | | | | | |
| **Civil Engineering Tech** | | | | | | | | | | | | | | | | | |
| BS | x | | x | | | | | | | x | | x | | x | | | |
| MS | x | | | | | | | | | | | | | | | | |
| PhD | | | | | | | | | | | | | | | | | |
| **Computer Info Systems** | | | | | | | | | | | | | | | | | |
| BS | x | x | x | | x | x | | x | | x | | | | | x | x | x |
| MS | x | x | | | x | x | | | | | | | | | | | |
| PhD | | | | | | | | | | | | | | | | | |
| **Computer Science** | | | | | | | | | | | | | | | | | |
| BS | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| MS | x | x | x | x | x | x | x | | | | | x | x | | | x | |
| PhD | | | | x | | x | | | | | | | | | | | |
| **Dietetics and Nutrition** | | | | | | | | | | | | | | | | | |
| BS | x | | | x | x | x | | | x | | | | | x | x | | |
| MS | x | | | x | | x | | | x | | | | | x | x | | |
| PhD | | | | x | | x | | | x | | | | | | | | |
| **Economics** | | | | | | | | | | | | | | | | | |
| BS | x | x | x | x | x | x | x | | x | x | x | x | x | x | x | x | x |
| MS | x | x | | x | | x | | | | | | | | x | x | x | |
| PhD | | | | x | | x | | | | | | | | | | | |
| **Electrical Engineering** | | | | | | | | | | | | | | | | | |
| BS | x | x* | x | x | x | x | | x | x | x | x | x | x | x | x | x | |
| MS | | | x | x | | x | | | x | | | | x | | x | x | |
| PhD | | | x | x | | x | | | x | | | | | | | x | |
| **Electrical Engineering Tech** | | | | | | | | | | | | | | | | | |
| BS | x | | x | | | | | x | | x | x | x | | x | | | |
| MS | | | | | | | | | | | | | | | | | |
| PhD | | | | | | | | | | | | | | | | | |

## The HBCU/MI Consortium Member Institutions Degree Offerings

| Academic Degrees | AAMU | CAU | FAMU | FIU | HaU | HoU | JSU | NMHU | NCAT | NAU | PVAM | SU | TAMU | TSU | TU | UTEP | XU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Environmental Chemistry** | | | | | | | | | | | | | | | | | |
| BS | | | | | | | | | | x | | | | | | | |
| MS | | | | | | | | | | x | | | | | | | |
| PhD | | | | | | | | | | | | | | | | | |
| **Environmental Engineering** | | | | | | | | | | | | | | | | | |
| BS | | | | x | | x | | | | x | | | | | | | |
| MS | | | | x | | | | | | | | | x | | | | |
| PhD | | | | | | | | | | | | | | | | | |
| **Environmental Science** | | | | | | | | | | | | | | | | | |
| BS | x | | x | x | x | x | x | x | | x | | | | | x | | |
| MS | x | | | x | x | | x | x | | x | | x* | | x | x | | |
| PhD | x | | | | | | x | | | | | | | x | | | |
| **Geochemistry** | | | | | | | | | | | | | | | | | |
| BS | | | | x | | | | | | x | | | | | | | |
| MS | | | | x | | | | | | x | | | | | | | |
| PhD | | | | | | | | | | | | | | | | | |
| **Geology** | | | | | | | | | | | | | | | | | |
| BS | | | | x | | x | | x | | x | | | x | | | x | |
| MS | | | | x | | | | | | x | | | x | | | x | |
| PhD | | | | | | | | | | x | | | | | | x | |
| **Geophysics** | | | | | | | | | | | | | | | | | |
| BS | | | | | | | | | | x | | | | | | x | |
| MS | | | | | | | | | | | | | | | | x | |
| PhD | | | | | | | | | | | | | | | | | |
| **Industrial Engineering** | | | | | | | | | | | | | | | | | |
| BS | x | x* | x | x | | | | | x | | | | x | | | x | |
| MS | x | | x | x | | | | | x | | | | x | | | x | |
| PhD | | | | | | | | | | | | | | | | | |
| **Industrial Engineering Tech** | | | | | | | | | | | | | | | | | |
| BS | x | x | x | x | | | | | x | | | | x | | | x | |
| MS | x | | | | | | | | | | | | | | | | |
| PhD | | x | | | | | | | | | | | | | | | |
| **Marine Science** | | | | | | | | | | | | | | | | | |
| BS | | | | | x | | | | | | | | | | x | | |
| MS | | | | | x | | x | | | | | | | | | | |
| PhD | | | | | | x | | | | | | | | | | | |
| **Mathematics** | | | | | | | | | | | | | | | | | |
| BS | x | x | | x | x | x | | x | x | x | x | x | x | x | x | x | x |
| MS | | x | | x | x | x | x | | | x | x | | x | x | | x | |
| PhD | | | | | | x | | | | | | | | | | | |
| **Mechanical Engineering** | | | | | | | | | | | | | | | | | |
| BS | x | x* | x | x | | x | | | x | x | x | x | x | x | x | x | |
| MS | | | x | x | | x | | | x | | | | x | x | x | x | |
| PhD | | | | x | | x | | | | | | | | | | | |
| **Mechanical Engineering Tech** | | | | | | | | | | | | | | | | | |
| BS | x | | x | | | | | x | x | x | x | x | | | | | |
| MS | | | x | | | | | | | | | | | | | | |
| PhD | | | | | | | | | | | | | | | | | |
| **Microbiology** | | | | | | | | | | | | | | | | | |
| BS | | | | | | x | | | | x | | x | | | | x | x |
| MS | | | | | | x | | | | x | | | | | | x | |
| PhD | | | | | | x | | | | x | | | | | | | |
| **Natural Gas Engineering** | | | | | | | | | | | | | | | | | |
| BS | | | | | | | | | | | | | x | | | | |
| MS | | | | | | | | | | | | | | | | | |
| PhD | | | | | | | | | | | | | x | | | | |

## The HBCU/MI Consortium Member Institutions Degree Offerings

| Academic Degrees | AAMU | CAU | FAMU | FIU | HaU | HoU | JSU | NMHU | NCAT | NAU | PVAM | SU | TAMU | TSU | TU | UTEP | XU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Occupational Therapy** | | | | | | | | | | | | | | | | | |
| BS | | | | x | | | | | | | | x | | x | x | x | |
| MS | | | | x | | | | | | | | | | | | | |
| PhD | | | | | | | | | | | | | | | | | |
| **Pharmacology** | | | | | | | | | | | | | | | | | |
| BS | | | | | | | | | | | | | | | | | |
| MS | | | | | | x | | | | | | | | | | | |
| PhD | | | x | | | x | | | | | | | | | | | |
| **Pharmacy** | | | | | | | | | | | | | | | | | |
| BS | | | x | | | x | | | | x | | | | x | | | x |
| MS | | | x | | | | | | | | | | | | | | |
| PhD | | | x | | | | | | | | | | | | | | x |
| **Physics** | | | | | | | | | | | | | | | | | |
| BS | x | x | x | x | | x | x | x | x | x | x | x | x | x | x | x | x* |
| MS | x | x | x | x | x | x | | | | x | | | | x | | x | |
| PhD | x | | | | x | x | | | | | | | | | | | |
| **Plant Soil Science** | | | | | | | | | | | | | | | | | |
| BS | x | | | | | | | | x | | | x | x | x | x | | |
| MS | x | | | | | | | | x | | | | x | x | x | | |
| **Political Science** | | | | | | | | | | | | | | | | | |
| BS | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| MS | | x | | x | | x | x | x | | x | | x | x | | | x | |

# Minority Student Recruitment

### Environmental Careers

A major emphasis of the Consortium is nurturing students for environmental careers. In addition to scholarships and research assistantships provided by each Consortium institution for its own students, Associated Western Universities, Inc., Salt Lake City, (AWU, Inc.) also coordinates a Consortium-wide scholarship and fellowship program. In summer 1994, forty (40) students were placed in national laboratories throughout the country. Some of these fellows also participated in environmental research at their institutions.

While each member institution conducts its own outreach and pre-college programs, a Consortium-wide program coordinated by the Associated Western Universities, Inc. involves an intensive summer eight-week college-level course in analytical chemistry with environmental emphasis. In Summer 1994, this program was conducted by eight Consortium institutions -- Clark Atlanta University, Hampton University, North Carolina A&T State University, Northern Arizona University, Southern University, Texas A&M-Kingsville, and Tuskegee University -- for 236 high school students.

Twenty-two (22) faculty members and twenty-five (25) high school teachers served as instructors and coordinators. Eighty-one (81) percent of the students received a C or better grade; 55% indicated they were likely to pursue science/engineering majors; and 50% wanted to pursue chemistry or environmental science upon matriculating in college.

## Recruitment and Retention

The institutions are actively recruiting students for mathematics and science programs, emphasizing opportunities in environmental science careers. Activity in this area was marked by three distinctive strategies. First, financial support for students came through either the institution or the Environmental Management Career Opportunities for Minorities (EMCOM) program. Whenever possible, students were involved in research opportunities to build laboratory skills and to introduce them to the real world of scientific research careers. The EMCOM program is more fully described starting on page 35 of this report.

Second, many institutions funded tutoring/mentoring programs to support students in their academic courses and in gaining career awareness in the environmental technology areas. The third strategy used by many institutions was to create or expand bridge programs to recruit from 2-year and 4-year institutions. While some students may stop at two-year degrees with technician training, others were encouraged to complete bachelor's, master's, or doctoral work in the environmental technology areas.

## Outreach with the Public School System

The Consortium's programs offered support for developing or disseminating environmental science materials or curriculum enhancements for students. The emphasis for K-12 faculty is on updating teaching methodologies (e.g., adopting more of a hands-on, process model of instruction), improving curriculum content and linking technology development to current trends in the scientific community.

Other programs actively market the sciences and involve students in year-round programs. School-year efforts range from science fairs and classroom demonstrations to after-school and Saturday academies in which students are provided opportunities for hands-on involvement to arouse their interests in science and mathematics. Summer programs vary from two days to eight weeks, with residential or commuting arrangements on campus so that students may gain skills and experiences in the sciences, meet and interact with college students and faculty, take college courses and learn about the opportunities for and requirements of careers in the environmental sciences and technology. A Consortium-wide offering, now at eight schools, is the Environmental Management Pre-college Analytical Chemistry (EMPAC) program in which over 386 high school students, and 76 teachers have now participated. The EMPAC program is more fully described starting on page 45 of this report.

## Outreach with the Community-at-Large and Minority Businesses

Outreach activities also target the non-academic community. Good environmental practices such as establishing and publicizing recycling programs are being fostered. Programs address environmental issues in each locale to increase community awareness and minority involvement. A related outreach activity targets minority businesses in an effort to transfer technology skills necessary for competitive participation in the environmental restoration and waste management industry. Compared to their larger industrial counterparts, these businesses have limited R&D facilities and limited training funds. Both factors limit their ability to compete for contracts in environmental technology. This outreach work includes assessing the skills and interests of existing companies and directing them to the necessary education or training programs that will make them more competitive.

# The Environmental Management Career Opportunities for Minorities (EMCOM) Program

## 1994 EMCOM Students Summer Research Assignments

| | | |
|---|---|---|
| **Clark Atlanta University** | | |
| Abotsi, Godfried M.K. | ORNL | Evaluation of interim and final waste forms for liquid low-level waste treatment residues |
| **Florida International University** | | |
| Yih, Tachung | LBNL | CAD/CAM integration and laboratory automation projects |
| **Jackson State University** | | |
| Sun, Kunquan | LBNL | Environmental Health and Safety, Non-Ionizing Radiation |
| **New Mexico Highlands University** | | |
| Bentson, Kenneth P. | LANL | Field work, data evaluation, and literature review for pilot studies project |
| **Prairie View A&M University** | | |
| Passos, Alberto C. | LLNL | Re-evaluation of leaking under ground storage tank clean-up procedures for the state of CA |
| **Southern University A&M** | | |
| Chel, Sahib S. | PNNL | Develop and implement a computer integrated manufacturing laboratory |
| Omafuaire, Moses O. | RFETS | Radionuclide analysis of biota from ponds |
| **Texas A&M University-Kingsville** | | |
| Abdul-Razzak, Hayder | PNNL | Develop a parameterization of aerosol activation for climate models |

## 1994 EMCOM Graduate Student Summer Research Assignments

| | | |
|---|---|---|
| **Alabama A&M University** | | |
| Woods, Charles C. | HAZWARP | Assist project manger with RI/FS document review and risk analysis |
| **Clark Atlanta University** | | |
| McDonald, Victorine | Campus | Campus research related to thesis completion |
| **Florida A&M University** | | |
| Banks, Donna | Campus | Cellular and hepatoxicity of the antifungal benomyl |
| Ikaiddi, Margaretamary | Campus | Time course and dose effects of triadimefon on testosterone levels in rats |
| Nichols, Cristal G. | HAZWRAP | Biological pond studies at MR to assess risk to the public |

| | | |
|---|---|---|
| **Florida International University** | | |
| Carballo, Maritza | ORNL | Development of advanced ceramic composites |
| Davis, Horace R. | | Academic-year appointment only |
| Muguercia, Ivan | Campus | Microwaves for drying & sintering final product slurry to ceramic based waste |
| **Hampton University** | | |
| Gainor, Shawn | | Academic-year appointment only |
| Terry, Simone M. | | Academic-year appointment only |
| **Howard University** | | |
| Jackson, Michelle M. | ORNL | Identification and molecular analysis of TNT degrading bacteria |
| **Jackson State University** | | |
| Hall, Louis J. | LANL | Genetic analysis of interacting tropic levels in a stressed pinyon-juniper community |
| **Prairies View A&M University** | | |
| Ashley, Andrea D. | Campus | The application of complex mixtures of amorphous oxide phases for lead and mercury ion removal |
| **Texas A&M University-Kingsville** | | |
| Harr, Thomas L. | | Academic-year appointment only |
| Perez, Mary A. | Campus | Campus research toward degree requirements |
| Walzel, Allen D. | | Academic-year appointment only |
| **Tuskegee University** | | |
| Johnson, Jerry L. | ANL | Estimation of thermal resistance across silicon-indium interface |
| **University of Texas at El Paso** | | |
| Castillo, Ana M. | Campus | Conducted research in ground water analysis |
| Torres, Michael | | Academic-year appointment only |

## 1994 EMCOM Undergraduate Student Summer Research Assignments

| | | |
|---|---|---|
| **Alabama A&M University** | | |
| Freeman, Jenatta | LLNL | Characterization of the covalent DNA binding by a carcinogen found in cooked meats, PhIP |
| Minniefield, Kelvin D. | | Academic-year appointment only |
| Washington, Kimberly L. | | Academic-year appointment only |

## The Environmental Management Career Opportunities for Minorities (EMCOM) Program

| | | |
|---|---|---|
| **Clark Atlanta University** | | |
| Barnes, Samesha R. | | Academic-year appointment only |
| Jackson, Erica E. | HAZWRAP | Support ER self-assessment staff-review docs., data input, library organization |
| Nubie, Suzette M. | ORNL | Incorporate spreadsheet software into MASH v1.5 |
| **Florida A&M University** | | |
| Eddings, Joliette M. | ORNL | Review, analyze and manage storm water sampling data |
| Samuels, Nicole S. | FEMP | Assist Project Engineer involved with Horizontal Grout Barrier Test |
| Watkins, Kenneth T. | ORNL | Research application of optical and fiberoptic sensors to environmental monitoring fields |
| **Florida International University** | | |
| Carballo, Maritza | ORNL | Academic-year appointment only |
| Cazanas, Beatrice | Campus | Remediation of contaminated soil by electrokinetics |
| Keith, Laurel M. | ORNL | Provide technical support at Y-12 Plant in NDA and uranium field demonstration leaching studies |
| **Hampton University** | | |
| Freeman, Stanley L. | | Academic-year Appointment only |
| **Howard University** | | |
| Johnson, Willie L. | | Academic-year appointment only |
| **Jackson State University** | | |
| Johnson, Priscilla | HAZWRAP | Assist project manager with RI/FS document review and risk analysis |
| Moore, Jacqueline A. | ORNL | Assist with regulated waste engineering projects |
| **Mississippi State University** | | |
| Coleman, Mary E. | ORNL | Provide waste management and engineering and compliance technical support |
| **New Mexico Highlands University** | | |
| Gutierrez, Benjamin S. | LANL | Field work related to pilot studies for design of shallow waste burial sites |
| Martinez, Edward A. | PNNL | Interpreting IR photos and perform limited ground-level surveys of aquatic vegetation |
| Martinez, Eldon Q. | LANL | Field work, data evaluation, and literature review for Pilot Studies Project |

## The Environmental Management Career Opportunities for Minorities (EMCOM) Program

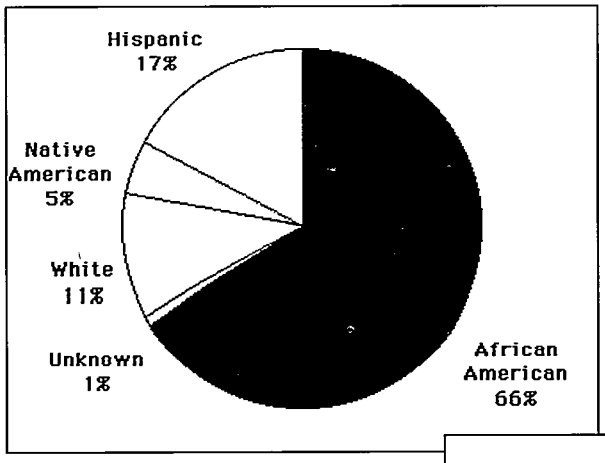
| | | |
|---|---|---|
| **North Carolina A&T State University** | | |
| Brinson, Earl J. | HAZWRAP | Assist with biological pond studies at MMR to determine if there is a risk to the public |
| Planes, Phillip | NREL | Develop a biological lactic acid process for production of lactic acid from biomass |
| Reid, James A. | SNL/NM | Research in heterogeneous photocatalysis |
| **Northern Arizona University** | | |
| Johnson, Angelee L. | LANL | Provide technical support for ambient air monitoring for radionuclides |
| Wero, Maeuneka C. | | Academic-year appointment only |
| **Prairie View A&M University** | | |
| Merchant, Larry E. | | Academic-year appointment only |
| **Southern University A&M** | | |
| Lynch, Barbara L. | ORNL | Development and implementa tion of knowledge based software |
| Mack, Cassandra R. | DOE-NO | Technical support to the ES&H Division in environmental sampling and analysis |
| Pilot, Bonique D. | LLNL | DNA in situ hybridization and fluorescence microscopy to test/evaluate "chromosome painting" probes |
| Pilot, Ebonique C. | LLNL | Data analysis, report writing and calibration work on a gamma-ray spectrometer |
| Robinson, LaSandra D. | HAZWRAP | Provide technical support for RI/ FS HAZWRAP managers |
| **Texas A&M University-Kingsville** | | |
| Harr, Thomas L. | | Academic-year appointment only |
| **Texas Southern University** | | |
| Buggs, Holton V. | Campus | Campus research toward degree requirements |
| Newsome, Tina M. | PNNL | Synthesis of solid acid catalysts and novel metal oxides |
| Terrell, Lamont R. | ORNL | Perform samples preparation utilizing modern analytical instruments and standard lab practices |
| **Tuskegee University** | | |
| Martin, Lealon L. | ORNL | Provide input and assist in the conduct and interpretation of several environmental research projects |

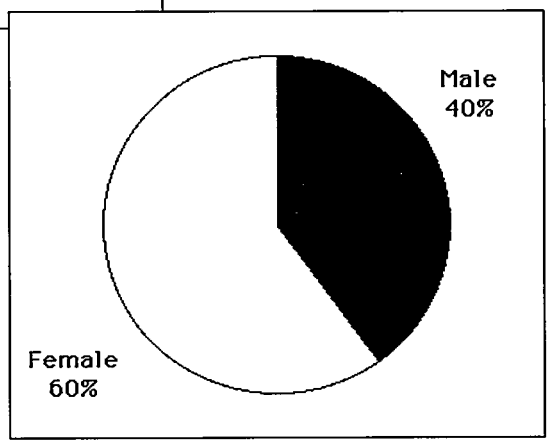
| | | |
|---|---|---|
| Thompkins, Toi D. | LANL | Perform corrosion testing in lab, collect data, model corrosion processes |
| **University of Texas at El Paso** | | |
| Rodriguez, Nancy V. | LBNL | Provide technical support to environmental remediation technology projects in Earth Science Division |
| **Xavier University of Louisiana** | | |
| Carter, III, Lawrence | PNNL | Synthesis of polyphophozene for cation/anion removal |
| Higgs, Felicia J. | FEMP | Preparation and analysis of samples containing radionuclide |
| Saulsberry, Torrence T. | ORNL | Application of robotics to Gamma-Ray Spectroscopy |
| Zippert, Alexandra | ORNL | Operation of data acquisition software for model development, data analysis and testing for Chemical Technology Division |

| | BLACK | HISPANIC | NATIVE AMERICAN | ASIAN/PAC. ISLE | CAUCASIAN | UNKNOWN | TOTAL |
|---|---|---|---|---|---|---|---|
| **Female** | **50** | **11** | **5** | **0** | **3** | **2** | **71** |
| **Male** | **27** | **8** | **0** | **0** | **6** | **0** | **41** |
| **Totals** | **77** | **19** | **5** | **0** | **9** | **2** | **112** |

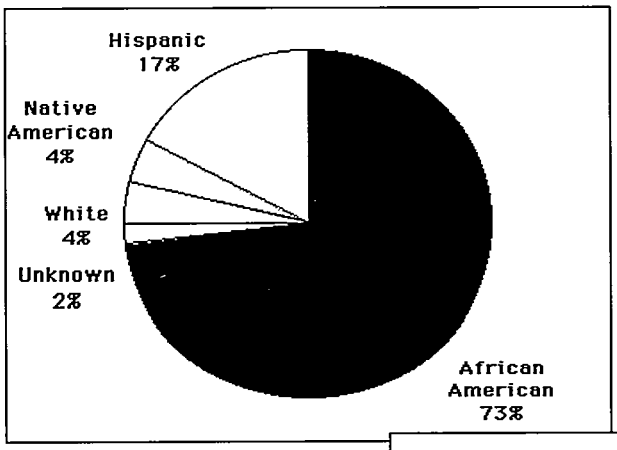
1994/1995 EMCOM Gender & Ethnicity

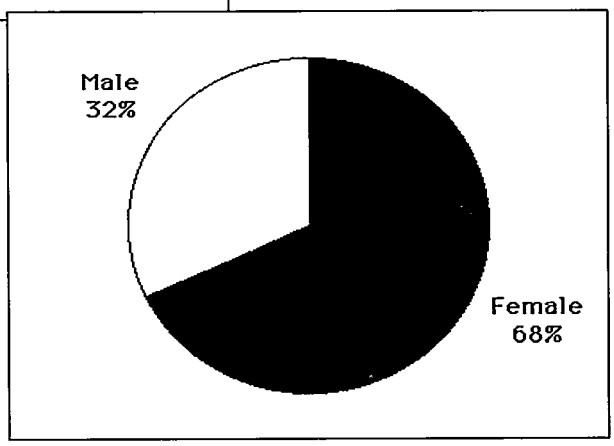
## The Environmental Management Pre-College Analytical Chemistry (EMPAC) Program




1994 EMCOM Gender and Ethnicity




1995 EMCOM Gender and Ethnicity

# The Environmental Management* Pre-College Analytical Chemistry (EMPAC) Program

The EMPAC Program is a rigorous campus-based academic achievement program adopted by the Consortium to strengthen the pre-college pipeline into undergraduate science and engineering disciplines. Initially piloted by AWU/DOE in 1985 at San Jose State University, the goal of this program is to motivate high school students to pursue science and engineering careers through providing them an opportunity to master a college level science course. Evaluation data from the first eight years of EMPAC show that the participants tended to elect undergraduate disciplines in the sciences and then to choose technology-based careers. These data specifically cite participation in EMPAC as a major factor in these decisions.

The choice of analytical chemistry as the academic content is especially pertinent to the achievement of the goals for this program and to the interests of the Consortium. The study of analytical chemistry involves students in a quantitative laboratory-based experience, with personalized support and supervision by a team of high school teachers and university faculty instructors. Engaging students in this way teaches them study techniques, independent thinking, and problem solving skills in a team environment. The required hands-on experiments with an environmental science focus, reinforced by relevant field trips and guest lectures, contribute directly to student understanding of environmental issues and needs. Many times, examples of these issues are found in their own home communities. Students emerge with a greater respect for their world and a desire to preserve it as both consumers and potential scientists. The program has also begun to incorporate microscale experiments into its laboratory component in recognition of the environmental impacts of even the small amounts of materials necessary to conduct these activities.

The program is conducted similarly on each site for a period of seven or eight weeks. Students attend lectures daily, have scheduled laboratory experiments and independent and team projects to round out each week. Field trips to governmental and industrial environmental research facilities and laboratories are part of every program. Invited speakers discuss environmentally relevant topics. Students receive university level credit if they complete the program satisfactorily.

A maximum of 20 students compose a class; mentors include the faculty, high school teachers, and laboratory assistants. Students receive a modest weekly stipend of $60; all tuition and fees and other course-related costs are provided. The value of the EMPAC Student Fellowship is approximately $3,350 averaged across the participating sites. Student demographics are presented in the 1994/1995 EMPAC Gender and Ethnicity charts.

| | BLACK | HISPANIC | NATIVE AMERICAN | ASIAN/PAC. ISLE | CAUCASIAN | UNKNOWN | TOTAL |
|---|---|---|---|---|---|---|---|
| Female | 112 | 13 | 18 | 14 | 18 | 4 | 179 |
| Male | 38 | 14 | 6 | 11 | 19 | 3 | 91 |
| Totals | 150 | 27 | 24 | 25 | 37 | 7 | 270 |

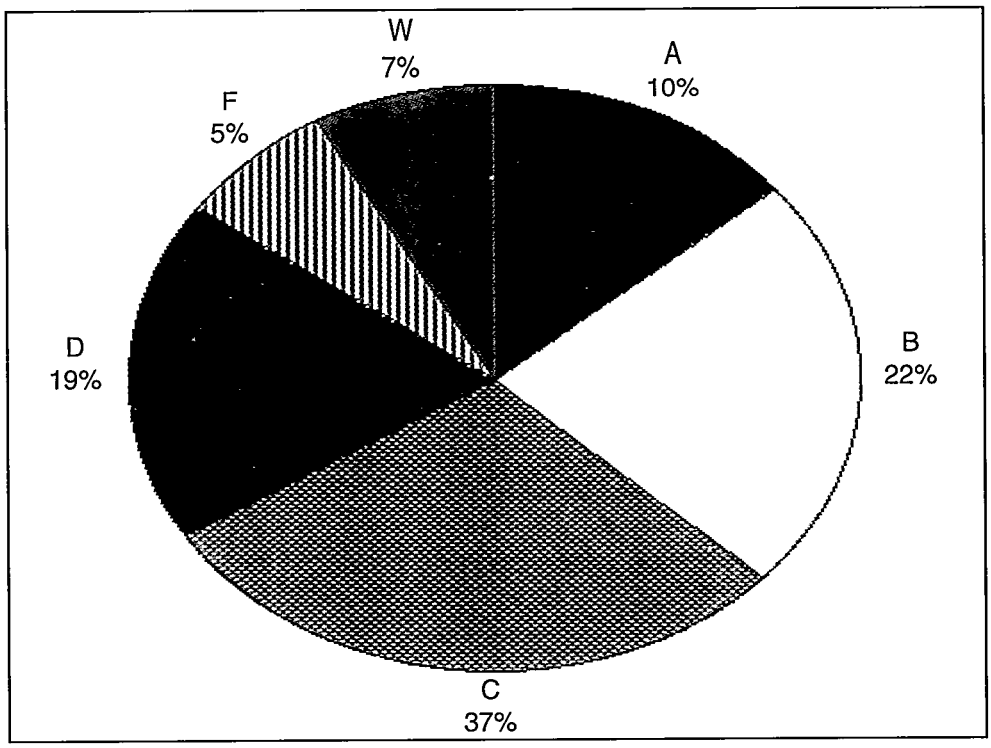
1994/1995 EMPAC Gender and Ethnicity

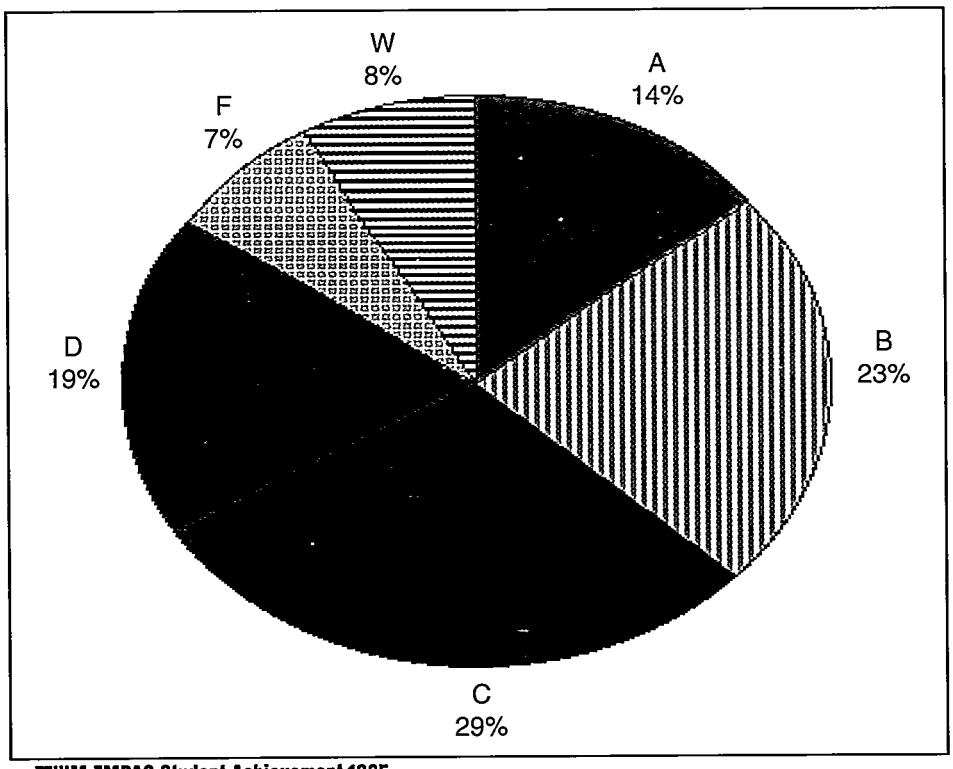
*In 1995 the name was modified to the Environmental Microscale Pre-College Analytical Chemistry Program.

## The Environmental Management* Pre-College Analytical Chemistry (EMPAC) Program

High school chemistry teachers selected to participate in the program as mentors and laboratory instructors receive a stipend of $550 weekly for the length of the program.

During 1994 and 1995, eight Consortium schools implemented the EMPAC Program: Clark Atlanta, Hampton, Jackson State, North Carolina A&T, Northern Arizona, Southern, Texas A&M and Tuskegee. Two hundred seventy students, thirty-three high school teachers, and twenty-seven faculty participated over the two years. More than 73% of the students achieved a grade of C or better. Viewed nationally, this approaches, and at some institutions exceeds, the achievement of undergraduates pursuing the same course content. These achievements are illustrated below.




ETWM EMPAC Student Achievement 1995

## The Environmental Management Career Opportunities for Minorities (EMCOM) Program

The program has been evaluated annually and student and teacher follow-up is continuing. The data after four years report that 62% of the students plan to take more science and environmental courses and 58% plan to major in a science or engineering discipline. Students also say they have gained self-confidence, learned new study and laboratory skills, and are more certain of their ability to succeed in college. Research shows that many students who lack these attributes find the transition to college difficult and tend to be less successful, especially in the early undergraduate years. Evaluation data from 1994 sites also shows that EMPAC students are more than 2.5 times more likely to receive awards for college than non-participants.

Teachers also report benefiting from the program, specifically in the learning of laboratory skills and techniques and in the application of analytical chemistry to environmental concerns. One year or more after the program, they introduce new experiments into their curriculum, implement safer laboratory practices, and advise students to consider enrolling in the EMPAC program to explore environmental science career possibilities.

No new sites began a planning year in 1995 due to funding constraints. Several operating sites have begun to plan to institutionalize their programs in 1996 and beyond and are seeking support from various internal and external sources.

### EMPAC Program Outcomes*: 1994-1995

- Participants: 270 Students
- 27 Faculty
- 33 Teachers
- Achievement: 73% of students received a C or better
- Gender: 66% of students are female
- Ethnicity: 84% of students are minorities
- Longitudinal Impact Study includes Clark Atlanta and Hampton Universities
- Student feedback shows EMPAC facilitates college awards
- Teachers report EMPAC helps them teach and interact more effectively with students; shows them students can do advanced level work.

# Education for an Environmentally Sustainable Future

A 1995 report on Sustainability in Higher Education indicates that meeting basic human needs now and in the future requires a major shift in the thinking, values, and actions of all individuals and institutions in their relationship with the natural environment. The report concludes that this paradigm shift must be led by the higher education institutions because they prepare most of the people who develop and manage society's institutions and who serve as teachers. HBCU/MI Consortium concurs with this conclusion and, in partnership with a nonprofit environmental education organization, Second Nature, Inc., accepted the challenge of developing the knowledge, skills and strategies that will effectively make environmentally just and sustainable living "second nature" to the next generation of leaders in society.

Second Nature, whose mission is to advance human and environmental well being through learning at all education levels, is working towards the development of a worldwide citizenry that has the knowledge, skills, and values necessary to improve the health, well being and quality of life through the pursuit of just and environmentally sustainable community and economic development. Second Nature facilitates the creation of regional partnerships between colleges and universities, governments, NGO's, industry and high schools. For the past three years, Second Nature, in partnership with the HBCU/MI Consortium, has provided a series of Partnership Leader Training Workshops for three to seven Partnership Leaders (PLs) from each of the seventeen Consortium member institutions. Partnership Leaders are faculty members from a variety of academic disciplines with strong educational skills who simultaneously have a strong commitment to using community resources to enhance environmental literacy. With the technical assistance of Second Nature, Partnership Leaders from the Consortium have been prepared to initiate and conduct faculty development programs at their universities.

The sustainable development education program is comprehensive and will eventually include all disciplines. It integrates environment, natural resource management and development knowledge, issues, problems, and values into the normal disciplinary teaching of the sciences, engineering, the social sciences, humanities, business, and the health professions at the college and university levels. These techniques avoid adding new requirements to already crowded curricula. It also gives students repeated exposure to environmental concerns, and helps them develop the environmental stewardship values and skills necessary for sustainability. This strategy is the most effective way to create the necessary paradigm shift and can be accomplished for less than the cost of a text book per student.

A supplemental grant award to the Consortium from the Department of Energy has made funds available to enhance the initial efforts of the HBCU/MI-Second Nature partnership. A Consortium wide competition was developed to solicit proposals from member institutions for the implementation of the Education for Sustainability agenda. A subcommittee was designated by the Consortium Steering Committee to develop a process and criteria to be used in the selection of six Education for Sustainability projects to serve as model programs of systems thinking and pedagogy and practice that support the movement towards environmental sustainability in higher education. An expert panel of national judges was identified through the Second Nature partnership to review proposals submitted by the member institutions.

Initially six grantees were selected. Reallocation of funds has allowed a total of eleven institutions to implement Education for Sustainability activities in the areas of Faculty Development, Community Outreach and Campus Stewardship. The eleven model programs will be implemented in 1996 at:

Clark Atlanta University

Hampton University

Howard University

North Carolina A&T University

Northern Arizona University

Southern University and A&M College

Texas A&M University

Texas Southern University

Tuskegee University

University of Texas @ El Paso

Xavier University

A web site has been developed to chronicle the project. The address of this site is http://galaxy.cau.edu/esproject/. Included at the web site for the HBCU/MI Consortium's Education for Sustainability Project is a description of the project, a listing of participating institutions, and a calendar of upcoming, current and past events associated with the project. Each institution is encouraged to provide detailed information about their campus activities. An online forum is being developed to encourage electronic dialogue on particular issues such as lead, radon and asbestos abatement and environmental health effects. Ultimately the syllabi and resource listings developed by individual faculty members will be shared through this site and case studies will be made available to the member institutions as well as to the greater community.

Currently, the HBCU/MI Environmental Technology Consortium and Second Nature are working toward a world in which all professionals will understand that the environment is the basis for all life and economic activity. Rather than being a competing interest, it is (as Peter Dunne of The New York Times has observed) the playing field on which all human activities compete. The vision is one in which:

Scientists, engineers, and business people should design technology and economic activities that sustain, rather than degrade, the natural environment, enhance human health and well-being, and mimic and live within the limits of natural systems. Economists and policy makers should create the incentives to make economic activity focus on creating meaningful jobs in an environmentally just and sustainable manner by making market prices reflect the full cost of production, including the cost to the environment, to human health and to local communities.

All professionals should understand their connection to the natural world and to other humans globally, e.g. where products and services come from, where wastes go, and what they do to humans and other living species; that driving a car in Ohio may cause flooding in Bangladesh through global warming; or that cutting down forests in Brazil may deprive someone in Hungary of a life-saving drug. Citizens should be able to discern real environmental risks to present and future generations and understand the complexities of dynamic, nonlinear processes that govern natural systems and many aspects of the socioeconomic system. They should to ask the critical questions which would help prevent today's solutions from becoming tomorrow's problems. They should have the values to keep population levels within the carrying capacity of the planet and curb human material wants while helping to fully develop the potential of all humans through national and international cooperation.

# Enhancing the Consortium's Programs

## Marketing the Consortium to Government, Industry and Local Communities

Building alliances has provided the Consortium with opportunities to introduce minority youth and adults to environmental issues, programs and careers. The Consortium has successfully established relationships with federal and nonprofit agencies. In an effort to enhance productivity and provide solutions to environmental issues through scientific analysis and research, the Consortium has partnered with environmental and energy related companies to create internship opportunities, and to provide scholarship and employment support for minority students.

## Corporate Relations

The HBCU/MI Consortium has become a national resource for establishing environmental literacy and career awareness among minorities, cooperative agreements with industry and research partnerships with national laboratories and agencies, and private sector entities. To ensure that future environmental scientists and engineers are prepared for the rigors of industry, academic institutions need to develop closer relations with corporations to address the broader issues of environmental management.

Collaborating with the environmental industry will ensure that both industry and institutional needs are identified and addressed. Forming partnerships with environmental industries will offer sustainability for both institutions and environmental management and provide on-going relationships which are mutually beneficial. Corporate relationships have provided the institutional members with excellent opportunities for their students and faculty specifically in the areas of Cooperative Education Programs, Faculty or Research Associate Technical Support, and Research and Development of Remedial Technologies.

### Some specific corporate partners include the following:

OHM Remediation Corporation established a cooperative partnership agreement with the Consortium in 1994. OHM, one of the nations leading on-site remediation services firms, combines leading edge technical expertise with more than 24 years of experience. The partnership with the Consortium will enhance the capabilities of the parties to accomplish environmental remediation and waste management programs and projects for agencies of the Federal, state and local governments and private industry. The partnership has also established opportunities in the areas of research, development, demonstration, testing, and evaluation and training in environmental restoration and waste management technologies.

OHM Remediation Services Corporation requested rates and quotations on several professional services for presentation of a workshop series seminar. Workshop series topics include: "Techniques of Management and Human Resource Management" and "Improving the Delivery of Government Services". The Consortium will help to finalize actions in development of the Mentor/Protégé Program under OHM's Air Force Center for Environmental Excellence (AFCEE) contract. These courses will be conducted at the protégé location in Oklahoma City, OK. The following institutions are participating in this effort: Clark Atlanta University, Northern Arizona University, and Prairie View A&M University.

Foster Wheeler Environmental Corporation has a subcontract agreement with the Consortium on the US Army Engineer District, Savannah, Total Environmental Restoration Contract (TERC). As a subcontractor in the proposal the Consortium will provide technical services in the areas of cooperative education programs, faculty or research associate technical support, and student internships.

USDA Forest Service Forest Products Laboratory has entered into a joint venture agreement with the Consortium to foster, diversify and encourage young scientists to consider careers in forest resource management research particularly in the area of pulp and paper research. Through summer internships students are matched with Forest Products scientists and engineers, who provide technical advice as well as supervision of projects.

## Enhancing the Consortium's Programs

The Fernald Environmental Restoration Management Company (FERMCO) continues to involve the Consortium in the Fernald environmental restoration site remediation. The Consortium provides technical support in the form of evaluations, basic and applied research, professional development and training. Member institutions provide technical reviews of task orders and proposal submissions which are evaluated by FERMCO. Thirteen (13) task orders have been undertaken.

The total value of these task orders is approximately $850,000. They include the following:

### Support of FERMCO Technology Council

Principal Investigator: C. Parker, CAU

### Program Management

Principal Investigator: C. Parker, CAU

### General Technical Support

General: K. Bota, F. Lyons-Gary, CAU
N. Monroe, FIU
R. Foust, NAU
R. Ford, SOU

ES&H Review: F. Lyons-Gary, CAU
Technical Needs: R. Ford, R. Mayweather, SOU
Risk Assessment Review: W. Auberle, NAU
Phosphate Immobilization: Rao, HOW

### Assistance in Developing a DOE/EPA Integrated Demonstrations Agreement

Principal Investigator: C. Parker, CAU

### Faculty-Student Internships

A total of eight students and one faculty.
Participants have been from CAU, FAMU, NCA&T and Southern.

Development of techniques for analysis of samples with high uranium concentration.
Principal Investigator: R. Foust, NAU

Evaluation of Technologies for the surface decontamination of structural steel.
Principal Investigator: A. Ebadian, FIU

Immobilization of uranium in contaminated soils using zeolites.
Principal Investigators: D. Cook, R. Szostak, C. Parker, CAU

Use of Fernald Videos and other materials for environmental courses.
Principal Investigators: R. Shackleford, FAMU
S. Burton, SOU

Review of Waste Characterization Technologies
Principal Investigator: A. Ebadian, FIU

## Other Program Activities

### Texas A&M-Kingsville

*Environmental Engineering Water Quality Program (EVEN/WOP)*
The general research theme for the EVE/WOP is the assessment and restoration of water quality in natural water bodies. While the primary focus is on natural systems, applications to engineered systems are also targeted. The current research focus of the EVEN/WOP is the evaluation of bioremediation technologies in oil spill clean-up in wetland environments. The EVEN/WOP is also a key component of the Texas A&M University System Environmental Ph.D. Pipeline Program, with disadvantaged minority Ph.D. candidates and expanding the research infrastructure and capabilities of the majority-minority institutions.

## Texas Southern University

*Partnership with Texas Natural Resource Conservation Commission*

Texas Southern University joined in a partnership with the Texas Natural Resource Conservation Commission (TNRCC) to get first-hand training and experience from the state's authority in air, water, and soil quality. Under this partnership, TNRCC worked with Environmental Health and Environmental Engineering Technology professors in providing innovative training, instruction, and instrumentation which assisted each department in meeting its course objectives.

## Parsons Engineering Science Partnership

Parsons Engineering Science, Inc. requested that the Consortium partner with them on the Total Environmental Restoration Contract by the US Army Corps of Engineers, Alaska District. The Consortium and Parsons also teamed on the Tulsa TERC and was in the final selection process.

## Marine Corps Technology Transfer Office Initiative

The Marine Corps Technology Transfer Office has entered into negotiations with Florida A&M University to serve as a pilot project to develop or incubate a start-up business by combining the resources from Marine Corps technologies with FAMU's engineering and business schools. New Mexico State University has been suggested as the other pilot site. Once a successful model has been completed, the Marine Corps Headquarters office will extend this program to other HBCUs and MIs. On February 10, 1995 a meeting was held in Tallahassee with Mr. Joe Johnson, Marine Corps Technology Transfer Office; Dr. Charles Kidd, Dr. Franklin Hamilton, and the Dean of the Engineering and Business School. In addition, Ms. Janice Whisenhunt-Healey of the Naval Warfare Station in Orlando joined the meeting to preview Marine and Naval technologies available to this program. Ms. Faye Lyons-Gary, Director of Industrial Relations for the Consortium, also attended.

## EPSI Materials Survey

Materials from the Environmental Partners Scholarship and Intern Program (EPSI) have been sent out to the associated industry members of the Consortium. SAIC has returned their information and has requested an employment partnering agreement with the Consortium.

## Fluor Daniel, Inc. Partnership

The HBCU/MI Consortium has entered into a Cooperative Agreement with Fluor Daniel, Inc. to establish a relationship intended to act as a catalyst to increase the participation of African-American and other Minority resources in the nation's environmental restoration and waste management efforts. This agreement is a separate agreement from the FERMCO project and will allow the Consortium to team with Fluor Daniel on governmental procurements and to initiate cooperative education opportunities.

## DOD-HBCU/MI Technical Assistance Conference

Ms. Faye Lyons-Gary attended the DOD-HBCU/MI Technical Assistance Conference entitled "Pro-Active Matching of HBCU/MI Capabilities to DOD Needs," on April 19-20, 1995 in Atlanta, GA. The conference examined methods to match DOD's needs to HBCU/MI technical and administrative capabilities.

## Meetings/Workshops/Training Sessions/Appointments

On Friday, June 9, 1995, Mr. August Curley made a presentation via teleconference to the Russian 3rd Environmental Remediation Course at Martin Marietta Energy Systems in Oak Ridge, TN. During the teleconference Mr. Curley gave a program overview of the Consortium's Academic Partnership Agreement with the Department of Energy.

HBCU/MI ET Consortium staff met with Fluor Daniel, Inc. representatives Dick Teater, Group President, Power and Government; Barbara Zilli, Manager, Federal,

Small & Disadvantaged Business Program; and Jim Clark, President, Fluor Daniel Technologies, on Wednesday, June 21, 1995 at Clark Atlanta University. Ms. Sheila Little, Senior Director of DOE Sales at the Savannah River Site, was unable to attend. The group was welcomed by Dr. Kofi Bota and was given an overview of the Consortium by Mr. August Curley. Ms. Zilli presented an overview of Fluor Daniel; and Mr. Teater and Mr. Clark presented the action plan for the Consortium-Fluor Daniel proposed partnership.

### Naval Warfare Center in Orlando, FL

Ms. Abi Ingleton, Interim Industrial Relations Liaison for the Consortium, visited a lab at the Naval Warfare Center in Orlando, FL on September 29, 1995. This visit involved the development of a small business incubation project in the area of Technology Transfer. Other visitors to the lab included Mr. Joe Johnson, Director of the Marine Corps SBIR, and faculty and staff from Florida A&M University, including Dr. Franklin Hamilton, Director of Sponsored Research.

### Hazardous Waste Workers Operations

Twelve (12) persons from HBCU/MI Consortium institutions completed the 80 hours Hazardous Waste Worker course at Laborer's AGC in Livonia, LA on August 20-25, 1995. This was the second half of the course. The first part was offered in February 1995. The participants also completed the train-the-trainer course. Universities represented were Clark Atlanta, Florida International University, New Mexico Highlands, Northern Arizona, Texas Southern, Tuskegee, Southern University at Baton Rouge and Xavier. Certification and licenses were received for the Hazardous Waste Worker component.

### Alabama Agricultural and Mechanical University

#### Center for Global Hydrology, Soil, Climatology and Remote Sensing

Alabama A&M University was awarded $1.5 million per year for five years by NASA to establish and operate a Center for Global Hydrology, Soil, Climatology and Remote Sensing. This Center will have an interdisciplinary focus on campus involving several key disciplinary areas, including Biology, Chemistry, Engineering, Plant and Soil Science and Environmental Science. It will have an internship component and a component to develop young faculty role models. Dr. Tommy Coleman, associate professor of soil science, will serve as the Center Director.

### US Army Missile Command Invites Unsolicited Proposals

The US Army Missile Command at Redstone Arsenal in Huntsville, AL has invited unsolicited proposals related to environmental science issues from Alabama A&M University investigators to address environmentally safe munitions disarmament and disposal.

### Energy Research and Development Technology Transfer Symposium

The third annual HBCU/Private Sector/DOE Energy Research and Development Technology Transfer Symposium was held on April 26-29, 1995 at Clark Atlanta University. Participants included faculty and students from the HBCU/MI Consortium member institutions and other HBCUs/MIs. Students made poster and oral presentations. An integral part of this conference was the Stakeholder meeting, held on April 29. The purpose of that meeting was for DOE to gather stakeholder ideas and concerns regarding the Department's HBCU program. Participants included DOE representatives, industrial partners and state energy offices.

### World Resources Institute

In September, Dr. Janet W. Brown of the World Resources Institute (WRI) visited Clark Atlanta University to begin conversations about possible cooperation between WRI and the HBCU/MI Consortium.

## Enhancing the Consortium's Programs

### Florida Agricultural and Mechanical University

#### Marine Corps Technology Transfer Partnership

The Marine Corps Technology Transfer Office has negotiated with Florida A&M University to serve as a pilot project to develop or incubate a start-up business by combining the resources from Marine Corps technologies with FAMU's engineering and business schools. Once a successful model has been completed, the Marine Corps Headquarters office will extend this program to other HBCUs and MIs. On February 10, 1995 a meeting was held in Tallahassee with Mr. Joe Johnson, Marine Corps Technology Transfer Office; Dr. Charles Kidd, Dr. Franklin Hamilton, and the Dean of the Engineering and Business School. In addition, Ms. Janice Whisenhunt-Healey of the Naval Warfare Station in Orlando joined the meeting to preview Marine and Naval technologies available to this program. Ms. Faye Lyons-Gary, Director of Industrial Relations for the Consortium, also attended.

### Florida International University

#### FERMCO Project

As a representative example, FIU and FERMCO are conducting an engineering study for the comparative analysis of surface blasting decontamination technologies for structural steel. The study consists of performing field demonstrations of seven prominent, commercially available decontamination blasting technologies and soda blasting, an emerging technology. The seven prominent blasting technologies include: ultra high pressure water, ice, sponge, plastic, steel shot, and CO2 pellet. Data relating to health and safety, capital costs, operation and maintenance requirements/ costs and secondary waste management will be gathered during field testing and vendor information. The methods of collecting and reporting the data will be such that other remediation sites can use this information in performing their decision making process, when choosing a decontamination technology for structural steel.

A related project, under the direction of Dr. Noman Munroe, involves electrokinetic remediation of heavy metal-radionuclide-contaminated soil. The objective is to demonstrate the ability to remove heavy metal contaminants and/or radionuclides from unsaturated soil by ionic migration due to electrical fields that induce movement of contaminants. Anions migrate toward the anode and cations redistribute toward the cathode. The contaminants can then be removed from the system by either plating on the electrode, ion exchange near the electrode, or by extraction of fluid or soil from the neighborhood of the electrode.

### Hampton University

#### Hampton University's Working Group for Environmental Science and Technology

Hampton University's Working Group for Environmental Science and Technology held meetings with two outside groups to establish teaming arrangements for joint environmental contracts.

#### Fisher Environmental Consulting

The discussion with this organization focused on developing joint proposals and contracts for submission to the Department of the Navy for environmental work on selected waterways in the Hampton Roads area with a focus on mixing zone studies; dilution modeling; chemical and biological analysis; and the application of GIS to monitor environmental pollution.

#### Robinson Parks and Associates

This group is interested in developing the concepts of Geobiotics for application in learning and teaching science, mathematics, and engineering. The meeting was to develop a working agreement with which Hampton University and Robinson Parks and Associates will seek funding from the Global Learning and Observations to Benefit the Environment (GLOBE) Program. The joint program will be designed for pre-college students.

## Enhancing the Consortium's Programs

### Drinking Water Testing

Sheila Piper, laboratory technician in the department of chemistry, is testing the drinking water on Hampton University's campus for trace metals in its certified drinking water laboratory.

### Biology Research

The biology department has hired a laboratory technician, Mrs. Karla Harmon, to help them with their Craney Island Project. Mrs. Harmon and graduate students will be analyzing Phragmites sp., Spartina sp., Suadea sp. and Salicorna sp., for trace metals. They are also working on a mechanism to isolate metal intake on these plants.

### Army Corps of Engineers Indefinite Delivery Contract

In partnership with Hampton University, CDM Federal Programs has won an Indefinite Delivery Contract from the US Army Corps of Engineers for a multi-year Environmental Assessment of the Chesapeake Bay. Hampton University's role in the program will be to provide expertise in the areas of estuarine ecology, water quality measurements, risk assessment, and GIS mapping.

## Howard University

### SERDP BioConsortium Group Meeting

Dr. Jim Johnson attended and presented results at the DOD Strategic Environmental Research and Development Program (SERDP) BioConsortium group meeting at the Waterways Experiment Station in Vicksburg, MS. The Howard University team, headed by Dr. Johnson, is part of a thrust group studying technologies for the remediation of polyaromatic hydrocarbons (PAH) contaminated soils. The Howard group will be evaluating composting technology and other thrust members will evaluate cascading bioslurry reactors and batch slurry reactors.

## Jackson State University

### Manufacturing Best Practices Workshop

The Departments of Technology and Industrial Arts, Continuing Education and Information Systems sponsored a Manufacturing Best Practices Workshop at the University Center, Jackson, MS on April 21, 1995. The purpose of the workshop was to share technical information on innovative eronmental technologies by using databases. Mr. Spivey Douglas from the Oak Ridge Center of Manufacturing Technology, Office of Industrial Competitiveness, Martin Marietta, attended the workshop.

## New Mexico Highlands University

### Environmental Science Monitoring Well

New Mexico Highlands University will install a down-hole monitoring equipment, including bailers, for the environmental science monitoring well that was drilled during the Spring, 1995 semester.

## Northern Arizona University

### Explomet: International Conference on Metallurgical and Materials Applications

On August 6-10, 1995, EXPLOMET, the International Conference on Metallurgical and Materials Applications of Shock-Wave and High-Strain-Rate phenomena was held in El Paso, TX. Consortium member, Northern Arizona University and the University of Texas at El Paso joined institutions, other academic institutions and federal organizations, such as Sandia National Laboratories, Lawrence Livermore National Laboratory, and Los Alamos National Laboratory, to exchange information and develop applications.

## Prairie View Agricultural and Mechanical University

### HBCU/Private Sector Energy Research and Development Technology Transfer Symposium

Three students and one staff member attended the Third Annual Historically Black College and Universities/Private Sector Energy Research and Development Technology Transfer Symposium in Atlanta, GA on April 27-29, 1995.

## Enhancing the Consortium's Programs

### EPA Grant Award

Dr. Hylton G. McWhinney received a $68,000 grant from EPA through the Hazardous Substance Research Center, South and South West (LSU) to collaborate with Dr. Mark Weisner of Rice University on a project titled "The Role of Competitive Adsorption on Suspended Sediments in Determining Partitioning and Colloid Stability."

### Technology Transfer Conference

Texas Southern University and Prairie View A&M University joined AT&T, Foxworth & Dinkins, Inc., the HBCU/MI Environmental Technology Consortium and the Department of Energy in hosting the third annual HBCU/MI Minority-Owned Business National Technology Transfer and Commercialization Conference, entitled "Commercializing Technology ... A Growth Area for the 21st Century." The conference was held on October 22-24, 1995 in Houston, TX. It provided "hands-on" information and opportunities on the technology transfer and commercialization process from leading experts in the nation. The conference brought together HBCUs, minority-owned businesses, industry and federal agencies to discuss commercializing both private and public sector developed technology.

### Southern University and Agricultural and Mechanical College - Baton Rouge

### LMRICS Project Team Site Visit

The site visit for the Southern University Lower Mississippi River Interagency Cancer Study (LMRICS) Air Assessment was held on March 27, 1995 at Southern University, Baton Rouge. The purpose of this site visit was to discuss issues surrounding air assessment and to provide an opportunity for Southern University researchers to demonstrate their capabilities for conducting research in the LMRICS project categories including the following areas: health outcomes which target biomarkers for exposure; health risk assessment, behavior which will involve ethnographic studies for demographic profiles, and environmental health data for trend analysis and geographical information systems (GIS).

Activities surrounding the visit included an interactive session for faculty researchers, a visit of the research facilities in the Chemistry department and the Health Research Center, and a meeting of the SUBR-LMRICS project team. Participants in the site visit included Dr. William Hartley, LMRICS Environmental Section Project Manager and professor of toxicology at the Tulane Medical Center School of Public Health; Mr. Dan Harrington, Research Associate and Tulane Medical Center Graduate Student; Craig Johnson, GIS Coordinator for the Louisiana Office of Public Health; and Donna Williams, Administrator for the Stanley Scott Medical Center in New Orleans, LA. Dr. Hartley described opportunities for collaborative research between Tulane and Southern in the LMRICS outyears. SU researchers provided profiles on current and proposed environmental initiatives of LMRICS relevance.

### Coastal Wetlands Fossil Project

Drs. Robert Ford and Trent Montgomery met with Department of Energy officials on August 30, 1995 to present a project entitled "Historically Black Colleges and Universities (HBCUs), DOE, Los Alamos and Oak Ridge National Laboratories, and Industry Partnerships in Education and Training for Environmental and Fossil Energy Research." This project proposes Southern University as the leader for a consortium of Los Alamos and Oak Ridge National Laboratories, Louisiana Land and Exploration Company and other federal, state and industrial partners. These partners will endeavor to develop a research effort that will create employment, educational and training opportunities for science and technology students and faculty of

HBCUs. This initiative would also examine critical environmental and fossil energy issues facing the United States, strategically targeting the Louisiana coastal wetlands. The Louisiana wetlands project will involve integrated observational, experimentation and computational analysis of the complex, interrelated causes of coastal wetlands loss in Louisiana and an evaluation of the costs and benefits of possible mitigation measures.

### Texas Agricultural and Mechanical University - Kingsville
### Environmental Technician Training Program
### Department of Defense (DOD/TEEX)

Cycle 3: August 7-8, 1995, Houston, TX. Number Impacted: 12
Cycle 4: October 23-24, 1995, Arlington, TX. Number Impacted: 22

Steve Sun, graduate student, environmental engineering, and Aseneth Lopez, undergraduate student, electrical engineering, attended an Environmental Technician Training Program to provide training in the areas of math and science. Training and worksite education was provided in environmental restoration, hazardous materials and waste management, and other environmental remediation and environmental technology applications relevant to the Department of Defense and Department of Energy defense facilities. Training was provided for four to eight weeks at the fully staffed and equipped training facilities in Arlington, San Antonio and Houston.

### Texas Natural Resource Conservation Commission (TNRCC) Near Non-Attainment Meeting

Dr. Ray N. Finch, Chairman and associate professor for environmental engineering, Texas A&M University-Kingsville; and Dr. Kuruvilla John, assistant professor, environmental engineering, Texas A&M University-Kingsville, attended the Texas Natural Resource Conservation Commission (TNRCC) Near Non-Attainment meeting at the J.J. Pickle Research Campus; Austin, TX on October 3-4, 1995. Drs. Finch and John attended the meeting for the purpose of gathering information on the types of projects and the general cost estimates for the proposed projects pertaining to the Near Non-Attainment Areas - Ozone Alert Project.

### Recycling Program

This program uses students under faculty guidance to plan and execute a recycling program on the Texas A&M University-Kingsville Campus. The goal of the program is to teach environmental conservation to students through hands-on experience in a recycling program.

### Texas Southern University
### NASA Proposal for Center for Toxic Contamination Studies

Dr. Bobby Wilson, professor of chemistry, submitted an $8.1 million proposal to NASA headquarters for funding of the "Center for Toxic Contamination Studies." The primary goal is to carry out research at the cutting edge in the study of toxic contaminants in an enclosed environment. The proposed research will be accomplished through the development of four inter-dependent clusters supported by a team of TSU scientists in collaboration with researchers from Rice University and Johnson Space Center, all in the Houston, TX area. If funded, the research clusters will address:

- toxic contaminants in air systems;
- toxic contaminants in water systems;
- toxic contaminants in soil and hydroponic systems, and
- toxic contaminants in plant systems as they are generated an enclosed environment.

### Continued Cooperative Agreement with Egyptian Universities

Through a combination of research, academic exchange and team sharing, the environmental chemistry and toxicology research in Dr. Mahmoud Saleh's laboratory is continuing its efforts to look at environmental solutions to expand the habitability of Egyptians beyond the river basins. Two projects currently under research include: 1) the Human Milk Project; and 2) the Effect of Normal Exposure to Pesticides. In the "Human Milk" project, researchers are studying pollutants in human milk, such as the amount of lead, pesticides and the protein profile. Researchers include Dr. Saleh and

Dr. Alaa Kamel at Texas Southern University, and two visiting researchers from Cairo University in Egypt, Dr. A. Sabae from Alexandria University (Alexandria, Egypt) and Dr. Mohammed from Cairo University (Cairo, Egypt). In the "Effect of Normal Exposure to Pesticides" project, researchers are investigating how pesticides can penetrate clothing and the skin. Researchers are concerned about the impact that pesticides have especially on children. The research team includes masters and doctorate students. The Environmental Protection Agency and USAID are partners in this project.

### Hazardous Waste Workers Operations

Mr. H. B. (Rickey) Spivey, Jr. completed the 80 hour Hazardous Waste Worker course at Laborer's AGC in Lavonia, LA on August 21-26, 1995.

## Tuskegee University

### Rural and Private Well Water Testing

The Water Quality Laboratory provided services to rural low income people. Testing was done on water for nitrates, lead and some selected pesticides. About 100 water samples were received and tested.

### Environmental Monitoring in the City of Prichard, AL

Tuskegee has reached a memorandum of understanding to work with the city of Prichard and other community based organizations in the city to organize and hold an environmental and health awareness workshops.

### NAREL-TU Soil Monitoring Program

Faculty and students are working with USEPA-National Air and Radiation Laboratory to develop methods for sampling soil for radioisotopes and to develop standards for clean-up of soil contaminated with radioisotopes. Tuskegee and NAREL have just completed a radon survey in homes of African Americans in Central Alabama.

## University of Texas - El Paso

### American Wind Energy Association Award

Andrew Swift, engineering professor, was honored with the 1995 Academic Award for excellence in wind turbine research by the American Wind Energy Association. Much of his research involves advanced wind turbine rotor design and control, focusing on two-bladed teetered rotors, variable speed machines, and wind turbine control systems.

### Passive Solar Demonstration

Mike Cormier, program coordinator of the Energy Center, conducted a passive solar demonstration at Consortium member New Mexico Highlands University. Steve Cook, program coordinator at the Energy Center, is publishing a monthly newsletter about passive solar homes and is establishing a Texas Renewable Energy Database.

# Executive Management

**Dr. Frederick S. Humphries**
President
Florida A&M University

**Dr. Kofi B. Bota**
Vice President for Research and Sponsored Programs
Clark Atlanta University

## Solar Still Applications Presentation

Solar still applications for water purification was presented to the United Nations Development Program work session on September 11, 1995 by CERM coordinator, Mike Cormier. Mr. Cormier will make a similar presentation to a group from the EPA, CDC, Pan AmericanHealth Organization (PAHO) and Canadian Environmental Groups. Solar stills distill water in a cost effective manner and may play a significant role in providing pure water in Third World countries.

**Dr. Frederick S. Humphries,** Florida A&M University's eighth president, is the current chair of the Consortium Council of Presidents. He graduated magna cum laude in 1957, receiving the Bachelor of Science degree in Chemistry from Florida A&M University, and was awarded the doctorate in chemistry by the University of Pittsburgh. Dr. Humphries' achievements as a student and as an educator have won him significant honors, including the Thurgood Marshall Education Achievement Award, and the University of Pittsburgh Bicentennial Medal of Distinction. He began his professional career as a commissioned officer in the U. S. Army and, subsequently, has held several prestigious positions, including president of Tennessee State University.

He has served on many boards, committees and commissions, and presently is a member of The White House Science and Technology Advisory Committee, the chair of the NAFEO Science and Technology Advisory Committee, the Board of Directors of the Florida Prison Rehabilitative Industries, Diversified Enterprises, Inc., and a host of others. Dr. Humphries has made numerous contributions to higher education in general, and higher education for African Americans in particular.

**Dr. Kofi B. Bota,** Clark Atlanta University, serves as the Director of the Consortium, Secretary to the Council and Chair of the Steering Committee. He is Vice President for Research and Sponsored Programs and Professor of Chemistry at Clark Atlanta University (CAU). Over the past two decades, Dr. Bota has served in several professional and administrative capacities at Clark Atlanta, including Associate and Professor of Chemistry and Physics (1979-1986), Chair of the Department of Physics (1980-1982), Provost and Vice President for Academic Affairs (1982-1986), and Acting President (1983-1984).

In these positions, he has provided managerial and academic program development leadership for a wide range of disciplines, including the natural sciences and technology, science and mathematics education, international affairs and development, public administration and policy, criminal justice and economic development.

Dr. Bota also has provided leadership on the national, regional, and local scenes on legislative, R&D, policy and education issues in higher education and pre-college, and government/industry/university partnerships. He has a special commitment to the

meaningful involvement of minorities and HBCUs in these issues. He has played a key role for HBCUs in discussions of these matters with the Department of Energy, the Agency for International Development, NSF, NASA, EPA, DOD, and other federal agencies.

Dr. Bota is chair of the energy subcommittee of the Science and Technology Advisory Committee of the National Association for Equal Opportunity (NAFEO). In this capacity, he has organized several workshops on energy technologies for the Department of Energy. He was elected the first Director of the HBCU/MI Consortium in January 1990. He is also Director of the HBCU Fossil Energy Consortium formed in December 1988. Dr. Bota serves on the EPA National Advisory Council for Environmental Policy and Technology (NACEPT). He has been appointed an inaugural member of the Board of Trustees of the National Environmental Education Foundation established in November 1990, by Congressional Act. Dr. Bota has participated in several environmental and science and technology policy discussions, workshops, and conferences of the Army Environmental Policy Institute (AEPI), U.S. Army Toxic and Hazardous Materials Agency (USA THAMA), and other federal agencies.

Dr. Bota's areas of research expertise are stochastic processes in physical and chemical systems, physical properties of polymers, and chemical kinetics. He has published several scientific papers in these and related areas.

## Mr. August O. Curley
### Program Advisor

August O. Curley, EPA Visiting Scientist at Clark Atlanta University, serves as the Manager of the HBCU/MI Consortium. Mr. Curley has over 32 years experience in government R&D, Laboratory Program Planning and Development and Management. His research includes analytical methods adopted nationally and internationally for chlorinated hydrocarbon compounds in human blood and other substrates. He has been principal and co-principal investigator on several major human and domestic animal poisonings nationally and internationally involving organomercurials, arsenic, chlorinated hydrocarbons, chlorinated phenols, and organophosphorous compounds used as insecticides and nerve gases.

He has served as an expert to the World Health Organization (WHO) in Geneva, Switzerland on DDT, and conducted collaborative studies on Chlorinated Hydrocarbon Insecticides in World Populations as related to cancer induction for the WHO International Agency for Research on Cancer in Lyon, France. He has served as an Environmental Advisor for the Ministry of Industry to the Arab Republic of Egypt for development of pollution control in its public and private sector industries. Under this assignment, he assisted the Egyptian government in establishing environmental laws, an Environmental Affairs Agency, and an Environmental Monitoring Laboratory for a water, wastewater and air quality monitoring program in the industrial sector. He provided consultation to USAID on the metropolitan, provincial and canal cities water, wastewater and infrastructure projects.

He served as consultant to the World Bank, Washington, D.C. on the Mediterranean Basin Project for Pollution Control. He has published more than 31 articles on pesticides and toxics in peer reviewed journals, two book chapters and an International Symposium Proceeding. He has served as an expert witness for the Department of Justice on Kepone and the Republic of France, Pontoise on hexachlorophene. He was also an advisor to the State of North Carolina on polychlorinated biphenyl discharge along public roads.

## The HBCU/MI Environmental Technology Consortium Staff

Kofi B. Bota, Ph.D., Director
August O. Curley, on IPA Assignment from USEPA as Program Manager
Anastasia Ingleton, Industrial Relations Specialist
Mary Jackson, Administrative Secretary
Bernice M. Jones, Financial Assistant
Kimberly Wherry, Office Assistant
Jacqueline R. Williams, Program Coordinator
V. Anne Heard, on IPA Assignment from USEPA as Environmental Regulations Legal Advisor
James McDuffie, on IPA Assignment from USEPA as Training Advisor
Collette M. Hopkins, Ph.D., Associate Director for Partnerships
Kim N. Jefferson, Assistant to the Associate Director for Partnerships

## Support Contractors

Associated Western Universities, Inc.

The Associated Western Universities, Inc. (AWU), a consortium of forty-two universities, directly supports the U.S. Department of Energy's (DOE) mission to develop and maintain educational and training activities which ensure that the scientific and technical needs of the energy R&D community are met.

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| Member Institution | Council of Presidents | Steering Committee Members |
|---|---|---|
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| Florida International University | Dr. Modesto A. Madidque | Dr. M.A. Ebadian |
| Hampton University | Dr. William R. Harvey | Dr. Isai T. Urasa |
| Howard University | Dr. Joyce Ladner | Dr. James Johnson |
| Jackson State University | Dr. James E. Lyons, Sr. | Dr. Abdul Mohamed |
| New Mexico Highlands University | Dr. Selimo Rael | Dr. Robert Lessard |
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| Texas Southern University | Dr. James Douglas | Dr. Bobby Wilson |
| Tuskegee University | Dr. Benjamin Payton | Dr. Walter Hill |
| University of Texas - El Paso | Dr. Diana Natalicio | Dr. Charles Turner |
| Xavier University - Louisiana | Dr. Norman C. Francis | Dr. Sally O'Connor |

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