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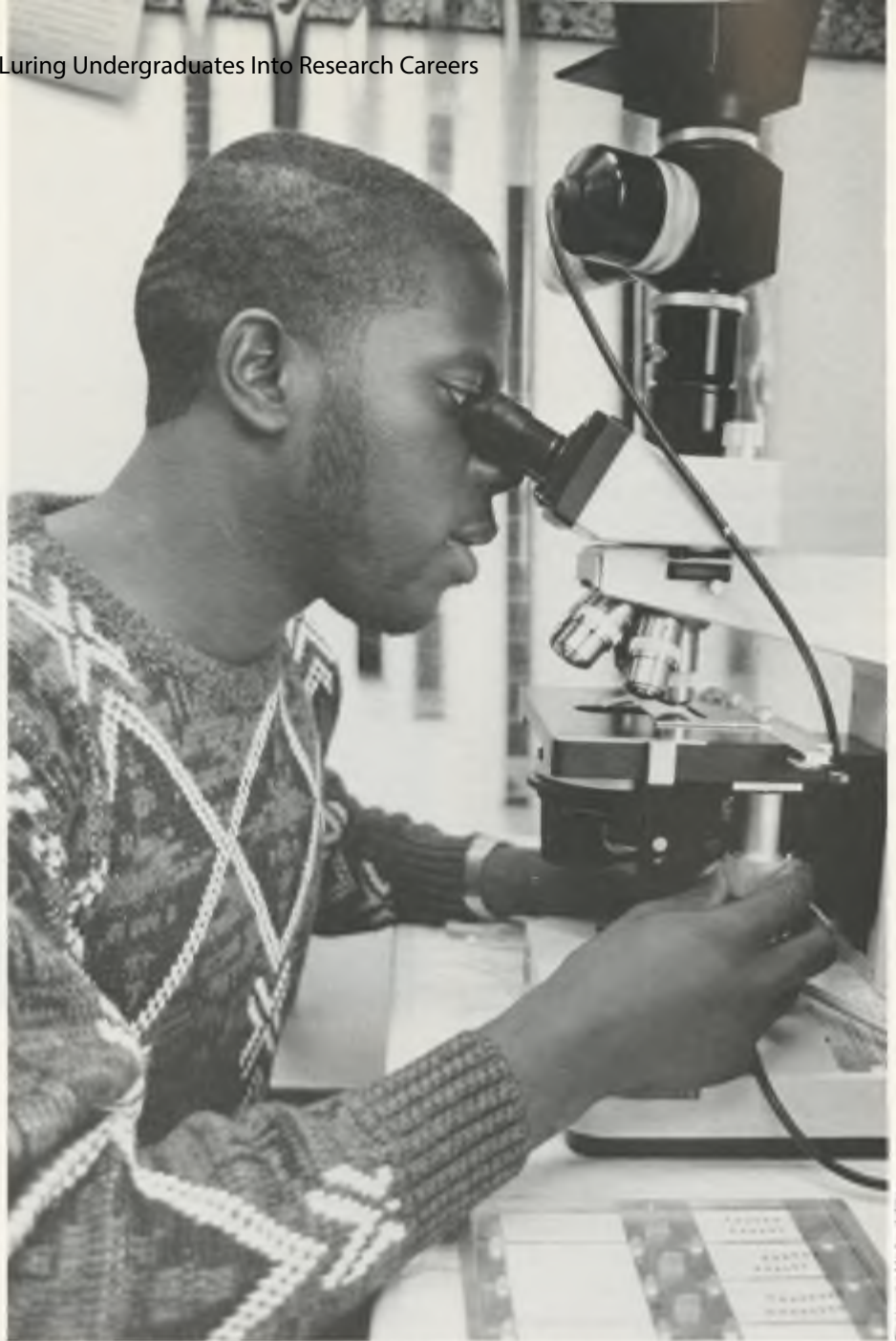
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ON THE HILL

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MARC stands for Minority Access to Research Careers. The MARC program, which is supported by the National Institute of General Medical Sciences of the National Institutes of Health, aims to spur just that.



Photos by Maurice Litta

Max Voltaire, a zoology major in the MARC program, examining specimen.

Luring Undergraduates Into Research Careers

By Harriet Jackson Scarupa

Six students in a microbiology laboratory in Howard's Ernest E. Just Hall took turns using a syringe to carefully insert bacterial cell proteins into tiny compartments in a gel-filled container called a casting stand. They then hooked up the casting stand to a machine that would hit it with 75 volts of electricity for 12 hours.

At the end of that time, the students would return to stain and destain the gel. This would enable them to see the bands which would indicate the different components of each protein.

These were steps in *gel electrophoresis*, a technique used to separate proteins on the basis of molecular weight. "It is one of the essential techniques used by those working on the frontier of biological sciences," explained Broderick Eribo, the bacteriologist who was supervising the students' work. "Without gel electrophoresis, for example, it is almost impossible to do genetic engineering."

At previous lab sessions each student had been given a species of bacteria to grow, has prepared the media to grow it in, and had monitored the bacteria's growth in order to draw a growth curve. Then Eribo had asked them to extract the protein from the remaining bacteria in the culture media and to analyze that protein using gel electrophoresis.

In going about these tasks, the students had been exposed to some of the principal instruments used in biological research today, among them the pH meter, centrifuge and spectrophotometer. Not only had they learned something of the theory behind these sophisticated instruments, but they also had learned how to use them to solve specific problems.

They did this in a special undergraduate course, Laboratory Instrumentation, that was offered at the university last summer.

A week after that session on gel electrophoresis, the same six students met in

a conference room in the same building for the final meeting of another special undergraduate course, Introduction to Research Methods. Their assignment: to present mock research proposals before a panel of six Howard teacher-researchers.

One by one, the students stood before a podium to present their hypothetical research plans. Some students were nervous, others so assured it seemed as if they'd made such presentations all their lives. Most were tired, having stayed up all night to write and type their proposals. In order to complete the assignment, they'd had to scrutinize sample research proposals, zero in on a topic they'd like to investigate, study the scientific literature to see what other kind of work had been done on the subject. They'd then had to spell out exactly what research they intended to do, how they planned to do it, what its significance was, how much it would cost and how long it would take.

From time to time during the presentations, a faculty member would raise a question or proffer a bit of advice. Example: When one student blithely reported that his research project could be completed in six months, Lafayette Frederick, chairman of the botany/microbiology department, cautioned him. "Oftentimes you can't get your techniques together in six months," Frederick said. "You are going to find out that in research 85 percent of your time will involve getting your techniques together, 15 percent getting your data."

At the end, though, the veteran researcher had some reassuring words for the students. "I want to compliment you for the hard work you've done with something that was totally unfamiliar to you," he told them. "A lot of graduate students don't know how to write a research proposal. But knowing your capabilities and caliber, we thought you could do it."

These, indeed, were special students. They were MARC students. Introduction

to Research Methods and Laboratory Instrumentation are special MARC courses. And Lafayette Frederick is director of Howard's MARC program, one of 57 such programs in the nation.

MARC stands for Minority Access to Research Careers. The MARC program, which is supported by the National Institute of General Medical Sciences of the National Institutes of Health, aims to spur just that. Its specific goal is to increase the number of minority students who will go on to earn the Ph.D. or M.D./Ph.D. degrees and become researchers in the biomedical sciences. [The formal name of the program is the Minority Access to Research Careers Honors Undergraduate Research Training Program, but this is usually shortened, for obvious reasons.]

The program seeks to achieve its goal by providing a cadre of bright, science-oriented minority undergraduates with hefty doses of hands-on research experience in a variety of settings, an enhanced curriculum, the mentorship of committed and productive scientists and an introduction to such practical matters as writing grant proposals, making presentations at professional meetings and publishing in scientific journals.

The Rationale

The why of the MARC program should be obvious after even the most cursory glance at any number of statistics all documenting a singular reality: Black Americans (who constitute some 12 percent of the U.S. population) are dramatically underrepresented in the hard sciences.

The most recent statistics issued by the National Science Foundation (NSF) show that Blacks account for 2.5 percent of the nation's employed scientists and engineers and an even smaller 1.4 percent of those scientists and engineers who hold doctorates.

The academic pipeline appears to offer little redress for this underrepresentation. Last year, the NSF reports, Black students earned only 222—or 1.8 percent—of the 12,480 doctorates awarded to U.S. citizens in graduate science and engineering programs. They earned only 5 of the 698 doctorates awarded in physics and astronomy, 11 of the 1376 doctorates awarded in chemistry, 45 of the 2971 doctorates awarded in the biological sciences, 10 of the 345 doctorates awarded in mathematics . . . Take any other recent year and the statistics will be similar.

Many of the nation's scientific leaders have become acutely aware of the need to change this statistical picture, not only because bringing Blacks and other underrepresented groups into science and engineering is a "good" or "right" thing to do, but because it is in the nation's self-interest to do so.

Since the early 1980s, the proportion of U.S. college freshmen choosing science and engineering majors had declined. At the same time, the number of foreign students enrolled in U.S. science and engineering graduate programs has been on the increase. What both trends portend is a potential future shortfall in the skilled scientific/engineering manpower that is so essential to the nation's progress. Blacks and other minorities—whom demographers predict will make up a growing proportion of the college-age population in the years to come—constitute a vital untapped source of this manpower.

As NSF director Erich Bloch remarked in a Howard speech some time ago, "If we expect to produce enough technically-trained people to sustain growth and to compete, we must find ways to encourage Black participation in science and engineering.

"The Black and other minority populations in this country provide an opportunity—one we, as a nation, cannot afford to miss. Our motive is not altruistic; it is pragmatic. The nation needs to develop all its human resources."

It is against this backdrop that the MARC program can perhaps best be viewed.

The Focus

The program focuses on bringing more Blacks and other minorities into just one scientific area where they are seriously underrepresented, but it is a particularly important area. "The biomedical area encompasses those disciplines in the sci-

ences that are engaged in research that may have some medical implications," explains Frederick as he sits in his Just Hall office amidst books, photographs, papers and specimens all relating to his own specialty: the study of fungi. "Sometimes the applications of biomedical research to medicine are not direct applications, but the spin-offs from this research may provide clues to the answers to medical questions."

It is biomedical researchers who were responsible for major breakthroughs in the

The why of the MARC program should be obvious after even the most cursory glance at any number of statistics all documenting a singular reality: Black Americans are dramatically underrepresented in the hard sciences.

prevention, control and treatment of diseases that plagued mankind in the past. It is biomedical researchers who are in the forefront of the drive to find ways to prevent, control and treat diseases that continue to plague mankind. Even though Blacks are disproportionately afflicted by any number of diseases (e.g. hypertension, sickle cell anemia, certain kinds of cancer, AIDS), historically few Blacks have been involved in biomedical research. The relatively small number of Black undergraduate students with strong backgrounds and aptitude in the sciences and the interest to pursue postbaccalaureate education traditionally have headed for medical or dentistry school—not Ph.D. programs in the sciences. And that has been understandable.

As Frederick observes, "Doctors, dentists, lawyers, ministers, and, at one time, teachers, were the people in the Black community who were looked up to, as you know. It's still pretty much that way today—especially as far as medicine is concerned—so that the average Black parent looks with favor on his or her son or daughter becoming a physician. It's a pro-

fession that has prestige; it provides a good living; and it's what the parent knows."

It's far less likely that such a parent will know much about what a molecular biologist might do, for instance, and the intellectual, societal and even financial rewards such a career can bring. What is true for the parent is more often also true for the child.

"Because of lack of exposure, oftentimes Black students are completely unaware of the opportunities and satisfaction research can bring," Frederick contends. "Many undergraduate students assume that there isn't a whole lot left to be done in research. Students may ask me something in class and I'll say, 'Well, we don't know that,' and one might say, 'Why don't we know that?' and I'll say, 'The work hasn't been done.' And then I point out that we only have sort of an infinitesimal amount of knowledge right now, that there is a vast area out there that needs to be discovered and that there is as much opportunity for them to make a contribution as anyone else. Many students have never thought about that before."

And so the MARC program seeks to broaden the career horizons of bright students in six academic departments within the College of Liberal Arts: botany/microbiology; chemistry; mathematics; physics; psychology; and zoology.

The Program

Students begin the program in the summer before the junior year when they take Laboratory Instrumentation and Introduction to Research Methods. The first, as noted, gives them hands-on experience using some of the research instruments biomedical scientists use. The second gives them an overview of how scientists collect, handle and present data; introduces them to scientific literature; helps them hone the library skills they will need to write scientific papers; and enables them to observe some ongoing research projects at the university on subjects as diverse as the chemistry of insect hormones and the profile of a particular disease-causing bacteria. It is in this course, too, that they write and present those mock research proposals.

Frederick doesn't believe it is premature to get students thinking about research proposals at this stage of the game. "One of the big criticisms of minority scientists with funding agencies," he says, "is that if you can finally stimulate minority scientists to write a grant proposal, so

often the proposals submitted are poorly written. Many minority scientists lack grantsmanship skills. So this [the mock proposal assignment] was a chance to provide our students with an initial opportunity, an initial chance to develop those skills."

During the fall and spring semesters of the junior and senior years, MARC students supplement their regular academic studies with MARC courses that are more non-traditional and comprehensive than the typical undergraduate science course. Some of these courses are restricted to MARC students; some are open to any student who meets the prerequisites. Some were already in the curriculum; others were added especially because of the program. (A listing of these courses: Quantitative Biology; Brain and Behavior; Introduction to Mathematical Biology; Biophysics; Organismal Biology; and Recombinant DNA Techniques, the latter an example of an offering that was not available to students in the College of Liberal Arts before the advent of the MARC program.)

The program also sponsors mini-courses for its participating students on the light microscope, the scanning electron microscope, photographic techniques for research, and the use of computers in research.

And the program sponsors weekly interdisciplinary MARC seminars featuring speakers from both inside and outside the university community. Some of these speakers use the occasion to explain their own research (e.g. "The Development of a Possible Antidote for Cyanide Poisoning"); others to raise societal issues related to scientific research (e.g. "Ethical Issues in the New Reproductive Technologies"); still others to offer some practical advice (e.g. "Writing and Publishing a Scientific Paper.")

The formal academic side of the MARC program goes hand in hand with the actual research MARC students are required to carry out (for academic credit) under the supervision of a faculty member in one of the six departments involved in the program. "The students are not expected, necessarily, to conceive a project on their own," explains Frederick. "Instead they work on a research problem that is ongoing in the laboratory, not as spectators, but as junior research associates." As a result of such collaboration, a few MARC students have been included as co-authors of research articles published in refereed journals, an unusual accomplishment for an undergraduate.

All MARC students are required to write a senior thesis based on their research. They also present their research at a special one-day colloquium held at Howard at the end of each academic year and often at an annual national MARC conference as well.

MARC students' most sustained and intensive research experience occurs not during the regular junior or senior academic years, but in the summer between. While some students pursue this research at Howard, most do so elsewhere. Ex-

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*—Lafayette Frederick,
director of Howard's MARC
program*

plains Frederick, "We actually encourage the students to go away because we feel that's a broadening experience." Through the years students have worked in laboratories affiliated with Washington University, the State University of New York at Buffalo, Cornell University Medical Center, the University of Cincinnati, the University of Kansas Medical Center, the National Institutes of Health, the Food and Drug Administration, Bell Laboratories and Brookhaven National Laboratories, among others.

Consider the experiences two MARC students had last summer: Max Voltaire worked on a research project at Howard; Susie Rosenthal did so at the Massachusetts Institute of Technology (MIT).

Voltaire, a zoology major from New York City, did his research under the supervision of Franklin Ampy, a professor in the zoology department. That research focused on the effect of a drug called dimethylnitrosamine, which has been identified as an environmental carcinogen, on the parts of the cell known as the mitochondria. [Mitochondria are power plants for cells, producing the fuel for the cell to

function properly.]

Voltaire's specific task was to compare the mitochondria of cells in bone plaque tissue of rats that had been injected with the drug to that of untreated rats. Working with micrographs of these cells, he quantitated the surface and volume of the mitochondria using a technique called the stereological morphometric method. His intent, he says, was to get "direct evidence" of the impact of the drug.

His task sounds simple enough—just a bit of measuring. But not quite. To the layman, a micrograph of a cell looks like a meaningless assemblage of shapes and blots. [A micrograph is a picture of the image formed through a microscope, in this case, an electron microscope.] "Learning how to pick out where the mitochondria are and then tracing them, was challenging," Voltaire says. "I also had to do some background research on why dimethylnitrosamine, which is found in such everyday products as margarine and preserved meat, is considered harmful. And reading the books on stereological technique was challenging. It's a technique I couldn't have learned through the regular curriculum."

The chance to become familiar with this technique and learn how to apply it appealed to him, he says. Why? "I find it interesting, you know, to learn new things."

Susie Rosenthal would undoubtedly agree. A microbiology major from Boyce, La., Rosenthal worked at MIT's Center for Cancer Research in a laboratory directed by immunologist David Raulet. The laboratory is involved in studying the normal development of T cells, special kinds of white blood cells that play a key role in the body's immune system. "It was basic research," she says, "but it will have future medical applications."

"We were looking at the development of T cells in vitro—which is in organ culture—as opposed to in vivo—which is in the animal itself," she explains. "The main point of this is that if we can set up a system in which the development of T cells outside the animal is the same as inside the animal then we won't have to use animals for everything we do."

Not only did the MIT experience provide her with hands-on experience with organ culture, but it also exposed her more fully to the field of immunology, which she now thinks she would like to pursue in graduate school. "Before, as a microbiology major, I'd only seen one dimension of immunology," she says.

She relates other pluses from her summer experience. "Being at MIT has given me an added dimension to looking at research," she says. "When you're at Howard, you're involved with classes, you're involved with other things; to get away to be with a group of people who are, I guess, 'inspired' was a really good experience. I was able to see people for whom research is a 24-hour thing. There are quite a few Nobel Prize winners in biomedical science at MIT, which added another dimension to being there. There were times when something was not going right in the lab and someone would say, 'Well, let's go across the street and ask the person who invented the procedure.' And that was very good."

Rosenthal became interested in doing research at MIT when she visited the institution on a MARC-sponsored trip to a meeting of the American Association for the Advancement of Science (AAAS) in

Boston last year. And that brings up a final major component of the MARC program: providing opportunities for students to attend meetings of such national and regional organizations as the AAAS, the American Society of Microbiology, the National Institute of Science, the Society for Neuroscience, the Association of Southeastern Biologists and the American Zoological Society.

The purpose of these trips is, again, to help broaden the students' career horizons as well as to show them some professional networking in action.

The Participants

Students apply to the MARC program sometime in their sophomore year and have their application screened by a selection committee. Successful candidates must be U.S. citizens or permanent residents; must be majoring in botany/microbiology,

Since the program began at Howard in 1980, it typically has been able to support between 8 and 10 students a year. This year, 12 students are enrolled, a record number.



Susie Rosenthal working at MIT immunology laboratory.

Photo by MIT

chemistry, mathematics, physics, psychology or zoology; and must express a strong interest in a career in biomedical research.

Those students selected for the program receive full tuition and regular fees (unless they already hold a scholarship from some other source); a 12-month stipend (set at \$5,005 this year); travel expenses to attend professional meetings; and modest support for research materials. They do so for the duration of the junior and senior years, provided they maintain their academic eligibility. Upon graduation, if they go on to pursue the Ph.D. or M.D./Ph.D. degree in the biomedical sciences they become eligible for a similar level of support via the national MARC program.

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Ask those entering the program why they wanted to be in it and you hear some common themes.

Sherri Lewis, a zoology major from Little Rock, Ark., says she was drawn to the program by an interest in research she dates to assisting in a research project at Philander Smith College near her home when she was in high school. She was also drawn to the program, she says, "by the money, I must admit."

"I want to get an M.D./Ph.D.," she says. "I'm especially interested in taking care of sickle cell patients—maybe because I have an uncle who has sickle cell—and I'm also interested in sickle cell research. The reason I want to get both degrees is that I think not only is it important for us to practice medicine but to really advance it for those who practice it. That's really terrific."

Roderick Brown, a botany major from Madison, Wisc., also has his sights set on

a future M.D./Ph.D. degree. He, too, had some earlier experience in a research laboratory while in high school.

"I think if you're in medicine—right now, I'm thinking about orthopedics—doing some research will help you understand your specialty," he says. "Studying bone marrow, blood, stresses on the bones, that kind of thing, is important for orthopedics. Doctors are great for treating illnesses, but by research one can actually wipe out these illnesses altogether. Minorities, who are stricken with a lot of diseases, especially can benefit from research. I also feel there are a lot of opportunities for minorities in research, which is another reason why the program attracted me."

Len Tassy, a zoology major from Montclair, N.J., isn't quite as sure about a career as a biomedical researcher as some in the program and he candidly expresses his reason why. "I would like to do research, but I definitely know that I'll be

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Broderick Eribo, assistant professor of microbiology (right) pointing out components of bacterial cell proteins to MARC program students **Sherri Lewis** and **Len Tassy**.

headed for med school," he says. "Even though research is quite stimulating and gratifying one must weigh the factor of money. You'll never be sure of your earning potential doing research, but as a doctor you'll definitely have some idea of how much you can be making.

"I think a combined M.D. and Ph.D. is a good thing because you can go either way [into research or practice]," he continues. "But a Ph.D., by itself, even though it's considered more prestigious by the scientific community, to me is a more iffy kind of thing because you have to depend on the government to get grants to do your research and all that."

Later, Tassy is worried about how his words will be interpreted, given the MARC program's stated intent. "I'm not ruling out the idea of doing research," he says quickly. "Already I'm starting to find the subject of my [mock] proposal quite interesting: how steroids lower the responses of the body's immune system." Still later, he says, "The more I think about it, I'll probably do the M.D./Ph.D."

Tassy's back-and-forth remarks illustrate how overcoming what Frederick describes as "the lure of the M.D." remains a challenge facing the program. (Some observers aren't particularly concerned if some MARC students do end up as practicing physicians. After all, there's still a need for more Black physicians in the nation, even

though their underrepresentation isn't as acute as that of Black biomedical researchers.)

Craig Cameron, a 1987 Howard graduate and MARC program alumnus who is now enrolled in a Ph.D. program in biochemistry at Case Western Reserve University, understands the hesitation some have about opting for medical research instead of medical practice. But, he points out, "there's no guarantee" an M.D. will be an automatic ticket to wealth, especially in these days of spiraling malpractice insurance costs and the like. "There's more monetary gain possible in a research career in private industry, especially at the management level," he believes. Consider, for instance, the case of biotechnology.

An August 2 article in *The Washington Post's* Health section entitled "The Growing Industry of Gene-Spliced Drugs" reported that "biotechnology—the science and business of using human genes to fashion new drugs and other products—is a multibillion-dollar undertaking." The article cited a congressional Office of Technology Assessment report, noting: ". . . there are currently 403 U.S. companies dedicated to biotechnology, and 70 other corporations with 'significant investment' in the field. U.S. industry is spending up to \$2 billion a year; the federal government is spending another \$2.7 billion.

"The payoffs so far include drugs that

stop heart attacks in progress, improved growth hormone and a cheaper vaccine for hepatitis B.

"Doctors hope the technology will provide new ways to attack AIDS, cancer and other diseases. . . ."

The research Cameron is undertaking for his Ph.D., for example, involves studying a particular protein in a particular virus that causes cancer in birds. While the virus only affects birds, there are similar viruses that cause similar cancers in humans. The intent of his project, he says, is "to understand the mechanism by which different viruses can convert normal cells to cancer cells."

It's the type of project that captures his imagination in such a way that he is confident his decision to seek a Ph.D., instead of an M.D., was correct. "Medicine is so specialized these days you can end up getting yourself into a rut where you're doing the same thing year after year after year and I know after awhile I would definitely get bored with that," he says. "Whereas in basic research, and even in developmental research, as your interests change your projects can change and you can have more mobility."

Stephanie LeMelle-Thomas, an alumna of the MARC program, is in the fourth year of an eight year M.D./Ph.D. program at Mt. Sinai Hospital in New York City. There she spends hours in a molecular

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MARC students (left to right) Jonna LaGrone, Gena Alexander, Roderick Brown and Sherri Lewis.

biology laboratory manipulating solutions of DNA (deoxyribonucleic acid, the master chemical of genes) isolated from the genes of the African claw-toed frog.

It's all part of her dissertation research on the oncogene myb. "An oncogene is a

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gene derived from a virus that can infect cells and the present theory is that oncogenes can cause cancer in mammalian systems," she says. "So if I can control the oncogene's expression by looking at its DNA and manipulating it, I can control its ability to induce cancer."

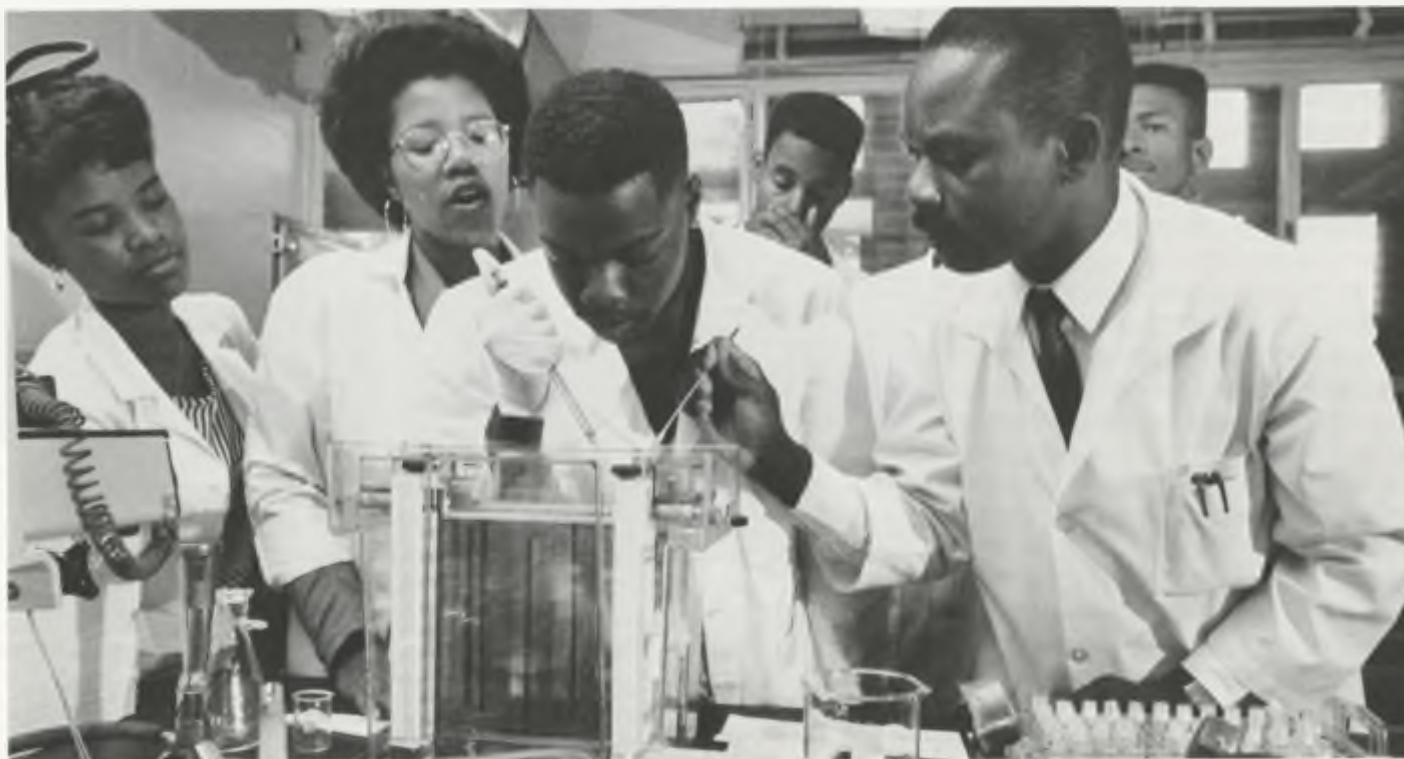
She considers such research "preventive medicine." "I like the concept of preventive medicine," she says, "and I think one of the easiest ways to approach that is through molecular biology. The molecule is where it all starts. For any cell to become 'sick' you have to look at the molecules. It's either 'sick' because of a biochemical imbalance or a genetic imbalance that causes a biochemical imbalance. So if you can nip that imbalance in the bud before it gets to the point where it makes the cell 'sick,' you can prevent that sickness from happening."

"Molecular biology is a great area to be in. It's the 'cutting edge of science,'" she adds, laughing at the expression, one with Madison Avenue overtones these days. "That's what everyone likes to say," she acknowledges. "There's always a big conflict between traditional biochemists and molecular biologists because we want to go for the DNA and the RNA (ribonucleic acid, a chemical relative of DNA) and they're looking at large molecules. They say they think they're on the cutting edge and we think we're on the cutting edge."

Given LeMelle-Thomas' enthusiasm—not to mention her commitment to do "cutting edge" research—it's not surprising that when several people learned about an article being prepared on the MARC program, they said, "Oh, you have to talk to Stephanie LeMelle."

The national office of the MARC program, in fact, has called upon her on several occasions to speak about the program before different audiences. "She's been one of the top students that we have in the country from the program," says Elward Bynum, who directs the MARC program for the National Institute of General Medical Sciences (NIGMS) of the National Institutes of Health (NIH).

The praise flows both ways. "The program has had a tremendous impact on my life," LeMelle-Thomas says. "If it hadn't been for MARC, I wouldn't have had the opportunity—both educationally and financially—to do what I'm doing now. The people involved in the MARC program are tremendous and they're doing all sorts of work in all sorts of different areas and you, as a MARC student, have access to them. You can't quantitate the amount of information that you can get just from being in a lab and working with people who are involved in research, have been involved in research and are committed to research. It has definitely prepared me for what I'm doing now."



Broderick Eribo, assistant professor of microbiology (right), instructs MARC program students Jonna LaGrone, Sherril Lewis and Roderick Brown (foreground, left to right) with a gel electrophoresis experiment.

The Origins

That someone affiliated with Howard should be held up as an exemplar of the program and should become a public advocate for the program seems only fitting, in one sense. For it was a Howard-affiliated person who was instrumental in bringing the MARC program into being. That person was Geraldine Pittman Woods, best known on the Howard campus for her 13-year tenure as chairman of the Board of Trustees.

In 1964 Woods was appointed to the advisory council of the NIGMS. It was an appointment she used to address the need to improve science education at minority institutions and to encourage more Blacks to go into the sciences. Later, as a consultant to the director and staff of the NIGMS, she visited many of the nation's four-year predominantly Black institutions as well as some institutions with large constituencies of other minorities.

Based on her observations, she wrote a report proposing that the National Institutes of Health support research, training and faculty development in the biomedical sciences at predominantly minority institutions. [Woods, herself, holds a B.S. in biology from Howard and M.S. and Ph.D. degrees in neuro-embryology from Radcliffe College and Harvard University, respectively.]

One result of her efforts was the Minority Biomedical Research Support (MBRS) program, established in 1972. This program, which comes under the aegis of NIH's Division of Research Resources, funds research projects at predominantly minority institutions.

Another result of her efforts was the MARC program, established that same year. It began with two components: a faculty fellowships program, which provides support for faculty members at predominantly minority institutions to either complete their Ph.D.s or do postdoctoral research; a visiting scientist program, which enables predominantly minority institutions to invite prominent scholar-scientists to their campuses as teachers, consultants, researchers.

In 1977 the MARC Honors Undergraduate Research Training program—the subject of this article—was implemented.

The Impact

Today MARC undergraduate training programs exist not only at historically Black institutions, but also at some predomi-

ADAMHA-MARC

The MARC Honors Undergraduate Research Training program has served as the model for another smaller, newer program which aims to increase the number of minorities who will go on to do graduate work in disciplines related to alcoholism, drug abuse and mental health and will then pursue research, particularly research dealing with physiological and psychological influences on behavior.

That program is funded by the Alcohol, Drug Abuse and Mental Health Administration, hence its acronym, ADAMHA-MARC.

Some 500 students from 11 predominantly minority institutions have gone through the program since it began in 1980. At Howard, 46 students, primarily psychology majors, have gone through the program, with 8 enrolled in it this year.

The selection criterion for admission, the impact, the "perks" enjoyed by participants as well as the program's structure mirror that of its older counterpart.

Students enter the program in the summer before the junior year when they take an intensive computer course and get exposure to some ongoing research projects at Howard in areas such as perception, attitudinal change, and stress.

During the junior and senior academic years, they combine their regular studies with some special ADAMHA-MARC courses (e.g., Drugs and Human Behavior, Computers in Behavioral Research); attend a weekly interdisciplinary seminar-colloquium; and participate in research under faculty supervision (though they are not required to write a thesis.)

The most sustained research opportunity under the program occurs during the summer between the junior and senior years and in this, too, students are encouraged to work on projects at another institution in order to broaden their research exposure. "This also has pragmatic value because when students in the program apply to graduate school, it's quite impressive to be able to have recommendations from known researchers at another university," observes Lloyd Sloan, a social psychologist who

directs Howard's ADAMHA-MARC program.

Thus students in the program have been involved in a minority adolescent mental health evaluation project at the University of Michigan; have participated in studies on brain function, neurotransmitters and behavior at the University of California at Berkeley; have worked on a study on the identification and treatment of alcoholics being undertaken at the University of Connecticut Medical Center . . .

One novel twist of the ADAMHA-MARC program is that while Howard participants have pursued summer research off-campus, some participants in ADAMHA-MARC programs at other institutions have done so at Howard.

Last summer, for instance, Lisa Barnes, a psychology major at Spelman College, administered a variety of stress-inducing tests to stroke patients as part of a research project directed by Howard psychologist Alphonso Campbell. "We know that high levels of anxiety impair performance," she explains. "We were just trying to get more evidence to support the theory that it's the left hemisphere of the brain that is involved. We also wanted to see how valid these tests are for a minority population."

Barnes, who had transferred to Spelman from Wellesley, has done research every summer since high school, but last summer was the first time, she says, she had done so in a predominantly Black environment. It was an experience she cherishes. "Seeing a lot of Black professional people doing research has given me so much more direction," she says. "I knew I was interested in the brain, but I didn't know what my field might be. I just knew I like to study things like memory and learning, but I didn't really know what I could do with that."

"When I came to Howard I saw people who were actually doing work in those areas and they talked to me and told me how they got where they were and the opportunities that there were when you finished grad school . . . Actually, now I'm thinking about coming to Howard for grad school."

In the early days of the ADAMHA-MARC program, all the students involved were

nantly white institutions with sizable minority populations, be they Black, Hispanic, Native American or Pacific Islander. "Of the 1200 individuals who have gone through these [57] programs to date, about 85 percent have gone on to higher education," reports Bynum. "And about 60 percent of those who go on to higher education have gone to graduate schools and the other 40 percent to professional schools."

After citing similar statistics, a recent

report issued by the congressionally established Task Force on Women, Minorities and the Handicapped in Science and Technology stated:

"Of federal programs established to give minorities and women access to science and engineering, we found the Minority Access to Research Careers (MARC) of the National Institutes of Health closest to what we need today."

Howard's was the fourth MARC under-

psychology majors, Sloan notes. The goal was to steer them into the research side of psychology and not the clinical or service-providing side of psychology, where Blacks traditionally have been concentrated. That goal is still intact but in recent years the program has had a more interdisciplinary focus, drawing from students and faculty in some other areas as well (e.g., anthropology, sociology, social work, even zoology.)

Asked if there was an overall description that could apply to the kind of research students pursue via the program and are encouraged to pursue after it, Sloan answers, "The 'behavioral' tag might be the one that does it.

"That could mean studying an individual human being completely externally—by looking at his or her personality or manipulating a situation to see how the person behaves. It could mean looking at cell level interventions whereby you introduce a small bit of chemical to a particular region of an organism's brain to find out what that is going to do to the operating system of the brain to alter the way the organism behaves."

The reason a government entity concerned with alcoholism and drug abuse would be interested in research with a "behavioral tag" shouldn't be perplexing. Says Sloan, "Alcohol and drugs are two of the main chemical influences on behavior. *Behavior* is really the thing that brought alcoholism and addiction to people's attention. We know how addiction occurs externally, but we don't know why it occurs internally—what it is in the body or brain that causes the attachment to these substances. That's what a lot of people are studying."

The hope is that some of the graduates of the nation's ADAMHA-MARC program will be among those seeking answers to such important biobehavioral questions.

Of the 46 students who have gone through Howard's ADAMHA-MARC program, Sloan reports, 36 have gone to graduate school, primarily in research-oriented programs, and 4 are in the application process.

One of the program's alumni, Audrey Murrell is now an assistant professor in the social program of the psychology depart-

ment at the University of Pittsburgh.

Recalls Murrell, a 1983 Howard graduate: "Before I joined the [ADAMHA] MARC program I had done a lot of clinically oriented volunteer work at a crisis intervention center and an outpatient facility of St. Elizabeth's [a mental hospital in D.C.] and I found out early on that that wasn't the type of psychology I wanted to do.

"A very good friend of mine was an [ADAMHA] MARC student and she told me about the program. I already had done some volunteer research work at Howard with Dr. Martha Mednick and I wanted to continue that. So I thought, 'Why not do that research under the program?' I would get more structure, additional courses and also a stipend."

Participation in the program solidified her interest in research. "It was the experience in the program and the contact with the faculty members who were part of the program that led me to decide to go to graduate school to be a research psychologist," she says.

Murrell earned her Ph.D. in social psychology in May 1987 from the University of Delaware, the place she had gone to participate in a summer research project on sexual stereotypes and perceptions of competence while a Howard undergraduate in the ADAMHA-MARC program. She earned the degree in record time. "I think one of the reasons why I was able to finish both the master's and doctorate in 4 years was that I had the [ADAMHA] MARC experience," she says.

"We need more [minority] individuals trained in research methodology because that's where the techniques and the emphasis come from that are applied in practice," she says. "And we need to start being able to set our own agenda in that respect. We shouldn't do it after the fact. After the techniques and the orientation have been established in the laboratory, we shouldn't then start saying, 'Well, this doesn't apply to a minority population.' We need to set our own agenda as to what sort of techniques will apply to that population." □

graduate training program established in the nation. To date, Frederick reports, 58 students have gone through the program, with 95 percent of them going on to higher education—50 percent to graduate programs and 45 percent to medical and dentistry schools. Some individuals overlap both percentages because they opt to pursue joint M.D./Ph.D. degrees.

Through the years, the impact of the MARC program at the university has ex-

tended far beyond the relatively small number of students the program has been able to support financially. Frederick cites some beneficial spin-offs:

□ Some of the MARC courses as well as the MARC seminar are open to non-MARC students, thus broadening the overall curriculum.

□ Equipment purchased via the program has enhanced the instruction and research capabilities of the six academic

departments involved in the program.

□ The research productivity of faculty affiliated with the program has increased, as measured by a jump in published research papers.

□ The visible example of the MARC students has stimulated other students to consider research careers, many for the first time.

There have been some more intangible benefits as well. Sometimes bright students—even at an institution where people tend to speak reverently of "excellence"—can feel isolated, different, self-conscious about being a "nerd" or a "brain" or a "brainiac," or whatever the lingo of the day is, and that can serve as a brake on their intellectual aspirations and accomplishments. The MARC program acts as an antidote to this. "When you get very bright students together they can feel relaxed and they don't have to apologize for being bright," says veteran physics professor Warren Henry, who coordinates Introduction to Research Methods and several other components of the program.

MARC students tend to agree. Remarks Sherri Lewis (GPA: 3.92): "Meeting the other MARC students and getting to work with them is a lot of fun because there are a lot of students who don't take learning seriously—I don't know why they're here—but to mix minds with MARC students is really interesting."

It's interesting—and stimulating—for the faculty as well. "These are not the regular classroom students who are just interested in 'taking a course,'" says Broderick Eribo. "These are special students who have a very strong interest in what they are doing. They make jokes, but they are serious. You instruct them, and they follow you precisely. You give them an assignment, they get it done. They don't ask the easy, less interesting questions. Sometimes I may have to check my references, look at the cross-references, to be able to answer their questions. And sometimes, there are really no references for the questions they ask. To teach students like that is very rewarding."

Eribo may not be the most unbiased observer. He is, after all, affiliated with Howard's MARC program. Elward Bynum is not. Yet he echoes Eribo's views. "Howard's is one of the most outstanding programs we have," he says. "And that's probably because of the pool of students that is available at Howard." □