New Directions

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By John B. Slaughter

Frederick Douglass, in his historic 4th of July oration, said: "We have to do with the past only as we can make it useful to the present and the future."

In science, during the past 25 years, we have seen scientific knowledge applied to "real" world problems for extraordinary social gains. We are considering engineering crops genetically to make them disease resistant. We have discovered how to control many crop pests by using mimics of natural attractants that are harmless to humans. Our scientific laboratories have experimented with gene-splicing in the effort to enable plants like corn to make their own nitrogen and eliminate the need for costly fertilizer.

We have developed beams of coherent light that give the garment industry a new cutting instrument, and physicians a new fusing instrument for adhering detached retinas in the human eye. We now have tunable lasers that detect toxins in moldy grain. These are the same lasers that have revolutionized the study of chemical reactions.

Twenty-five years ago, it would have been difficult to imagine that we would use needle-thin beams of light for communications; where we once relied completely on the flow of electrons in copper wire, advances in materials science would enable us to use a flow of photons encased in glass fibers to transmit signals over distances.

We have witnessed the actual formation of the earth's crust, seen valuable minerals spawned at mid-ocean ridges, and realized that we might, one day, learn to harvest and employ them in our industry. Satellite pictures now enable us to predict weather conditions, and we have begun to understand major climate changes from the earth's ancient history recorded in its crust.

Some aptly compare the impact of the computer revolution and the invention of the silicon microchip to the invention of the Gutenberg Press. Physicians now use, to diagnose their patients, 3-dimensional pictures of living organs obtained by high speed scanners using computer technology. The computer is bringing us into a completely new era in business, banking, marketing, education and leisure pursuits. There are already more than one million personal computers in existence.

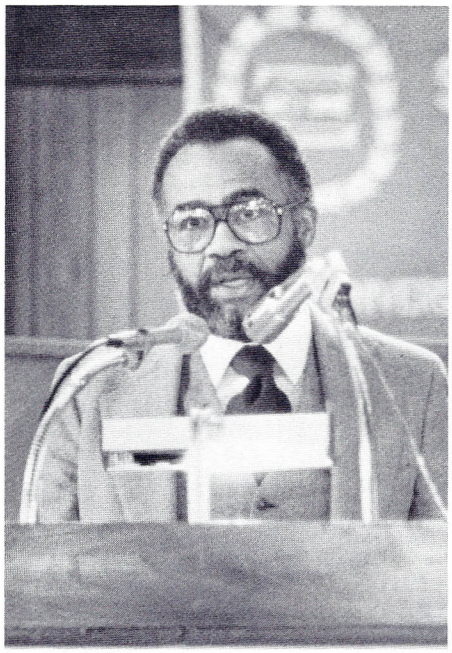
The past generation of scientific research is bearing fruits for present and future needs, and we can see the direction that some of our future research will take. At the same time, we must come to terms with past policies that may not serve us well in the future and with problems that we have allowed to develop. In the coming years, we will see advances in health care, in food production, in silicon chips, in computer technology and in robotics—to cite but a few areas.

The research in science and technology will continue to be concentrated in universities—the principal training centers for scientists, engineers, and technologists. At a time when the nation is experiencing a shortage of scientists and engineers with advanced training, universities are plagued with funding shortages that undermine their ability to alleviate this shortage.

During the past 25 years, we have witnessed an enormous escalation in government support for research and development in universities. It is possible to argue that as universities received substantial government support during the 1960s and '70s, they failed to cultivate corporate and philanthropic support.

Despite the fact that the federal government currently supports about half of all the research and development programs in the nation—at universities and elsewhere—non-federal sources of support (mostly industry) have been growing more rapidly of late than federal sources. This shift in funding has particular significance for predominantly Black colleges and universities. A recent National Science Foundation study of "Resources Supporting Scientific Activities in Predominantly Black Colleges and Universities" found that these institutions currently are responsible for only about 1 percent of federal sponsored research. Not surprisingly, of the 105 Black institutions surveyed, Howard University received the most in research and development funds. But the overall 1 percent figure is dismaying, especially in light of the fact that federal expenditures in research and development made up a larger share of the total from all sources in Black colleges and universities than in other institutions of higher education. While federal support is low, outside sources are even more negligible. Adding to this disturbing picture is the fact that between 1973 and 1980 Black institutions lost ground in the percentage of federal research and development obligations in engineering while all other institutions showed increases.

It is essential that we capitalize on existing federal support and develop new partnerships with private funding sources, not only to insure that higher educational institutions—particularly predominantly Black colleges and universities—participate fully in scientific



and technological developments in the future, but also in order that we as a nation more fully utilize our human resource potential in the areas of science and technology.

The nation faces a shortage in the supply of scientists and technologists; at the same time, universities are experiencing a shortage of Ph.D.'s to teach and carry out research in many scientific fields. In the midst of these shortages, we fail to make full use of all of our talent. A recent National Science Foundation report on *"Women and Minorities in Science and Engineering"* reveals these distressing facts.

Employment in science and engineering was up by almost 25 percent between 1974 and 1978 for all minorities, but they still were only 4 percent of the science and engineering work force. Even that figure does not truly reflect the situation, because one subgroup—Asian-Americans—is overrepresented (in terms of its proportion in the total population) in engineering and all science areas, except in psychology and social science.

In education, Blacks in 1979 earned only 6 percent of science and engineering bachelor's degrees, 4 percent of master's degrees, and less than 3 percent of the doctorates. Yet about 12 percent of the 1978 class of high school graduates were Black. Looking at fields of study, we find even greater distortions. Blacks enrolled in engineering training increased by more than 100 percent between 1972 and 1980, but still earned only 2 percent of the engineering degrees granted in 1980.

If we return for a moment to the report on "Resources Supporting Scientific Activities in Predominantly Black Colleges and Universities," we find that in 1980 less than 1 percent of the graduate science students and only .3 percent of the graduate engineering students in the U.S. were enrolled in Black colleges and universities. Not surprisingly, we find similar figures for the faculty. Only 2 percent of all scientists were on the faculties of predominantly Black institutions. Again, it is not surprising that Howard topped the list in all of these categories.

While graduate science and engineering enrollments in the 105 schools surveyed are low, together they award undergraduate degrees to students who eventually constitute 50 percent of the nation's Black engineers and doctors. Science and engineering activities at these institutions must be strengthened in order that opportunities for both graduate and undergraduate students in these fields not be lost.

At the same time, we must encourage students to enter and remain in these fields. Today, Black Americans are in fact attending college in record proportions. But in science and engineering, the dropout rate for Black students is much higher than for all other persons. In all areas of math and science, the higher the educational level reached, the greater the dropout rate.

I do not think this situation results from the prospect of long years of hard work to get the degree—since that has always been the case. I believe it has a lot to do with how young people perceive the social value of the "hard" sciences—and their opinion of how others perceive it.

The social and behavioral sciences clearly have an almost immediate social value. It is our job to recognize, and help others to understand, that the mathematical and physical sciences have not only technological value but social value as well. □

John Slaughter, Ph.D., formerly director of the National Science Foundation, is chancellor of the University of Maryland, College Park. The above was excerpted from an address at the 25th Anniversary Observation of the Howard University Chapter of Sigma Xi, the Scientific Research Society of North America, which was held on November 17, 1982, at the Andrew Rankin Memorial Chapel.