

The Role of America's Historically Black Colleges and Universities in  
Building the Capacity of Africa's Science and Technology Infrastructure

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## Abstract

The 105 Historically Black Colleges and Universities (HBCUs) in the United States are indispensable to the education of the nation's African American population, and are potentially valuable partners to Africa as the continent mobilizes to enhance its science and technology (S & T) infrastructure. These institutions have impeccable track records of graduating thousands of America's brightest students in the science, technology, engineering, and mathematics (STEM) disciplines. Collectively, America's HBCUs can contribute to Africa's S & T thrust by increasing the admission and enrollment of African STEM students; forming capacity-building institution-to-institution partnerships, and by collaborating to help bridge the digital divide at African universities.

African political and academic leaders need to engage in an open and ongoing dialog with America's African American higher education community so that the HBCUs potential on the continent may be optimized.

## Introduction

In ascertaining the role that Historically Black Colleges and Universities may play in Africa's future, an historical overview of these institutions is instructive. Understanding the purpose and the circumstances surrounding their formation provides useful insights into their special relationship with Africa. These institutions have extraordinary and untapped capabilities in science-related fields. Their faculties, facilities, scientific instrumentation, and laboratories can be made available to their African colleagues if appropriate protocols can be created to do so.

## Overview of Historically Black Colleges and Universities

The Historically Black Colleges and Universities and Universities (HBCUs) in the United States have made great strides in providing educational opportunities for African Americans, Africans, and people from around the world. From their humble beginnings, these institutions have grown to make significant contributions to American society, and to provide educational opportunities for low-income and academically disadvantaged students who would otherwise have been denied a higher education. While the first HBCU dates back to 1837, most were established in the mid -and- late 1880s. After the American Civil War in 1865, HBCUs were founded to provide for the education of newly freed slaves who were forbidden by laws and social practices from enrolling in traditionally white colleges or universities. The first HBCUs were private, nonprofit institutions started by black churches and white philanthropists, and received no support from either the federal government or state. Federal laws passed in 1862, and more significantly, in 1890, helped to establish and finance publicly-funded

HBCUs. In particular, the Second Morrill Act of 1890 established nineteen land-grant colleges to provide public funds for the education of blacks in the states that still maintained segregated educational systems. Despite statutory provisions, public funding for these institutions was very low and inequitable compared to the allocations made to the white land-grant universities founded in 1862.

For decades after their establishment, HBCUs were virtually the only institutions providing tertiary educational opportunities for African Americans, and for students from Africa and the Caribbean desirous of an American college or university education. In the 1950s, however, federal laws enacted to make it unlawful for states to continue to operate segregated public educational systems forced traditionally white colleges and universities in the south to begin to admit African American students, and other students of color. In the early 1960s, seventy percent of all African American college students were enrolled in HBCUs (Williams, 1993). As more formerly all-white institutions opened up to admit African Americans, the percentage of these students enrolled at HBCUs began to erode rapidly, declining from thirty-six percent in 1968 to eighteen percent in 1976. The 1980s and 1990s ushered in a resurgence in the enrollment of HBCUs. Barton (2004) found that students attending these colleges and universities cite 5 compelling reasons for doing so: their outstanding academic reputation; the attractive financial packages (bursaries) offered; strong parental influence; comparatively low tuition costs; and the perception that these institutions are superior at job and career preparation. Today, there are 105

HBCUs enrolling almost 300,000 students or about 24 percent of all African Americans attending colleges and universities. In recognition of their powerful role in educating African Americans for well over 100 years, President Ronald Reagan established the White House Initiative on Historically Black Colleges (Executive Order 12320). During their existence, HBCUs have:

- Provided undergraduate training for three-fourths of all Blacks holding a Doctorate; three-fourths of all black officers in the armed forces; and three-fourths of all federal judges.
- Graduated more than three-fourths all degrees conferred to African Americans in dentistry and medicine;
- Accounted for 50 percent of black college faculty in traditionally white research universities;
- Led institutions awarding baccalaureate degrees to black students in the life sciences, physical sciences, engineering, and mathematics

## Africa and the Historically Black Colleges and Universities

The relationship between the HBCUs and Africa, and indeed, developing countries, dates back to the nineteenth century. The unique missions of Tuskegee, Clark Atlanta and Howard Universities inspired them to be engaged in international education virtually since their beginning. In the 1899, Tuskegee Institute (now Tuskegee University), at the request of the German government, sent a team of scientists to Togo to teach cotton cultivation. Furthermore, because of its acknowledged success in vocational agricultural education, Tuskegee became a prototype for countless industrial schools in other countries. Clark Atlanta and Howard Universities have similar historic programmatic ties with the continent.

A more recent example of the Diaspora partnership is the Tertiary Education Linkages Project (TELP), which is a United States Agency for International Development-funded initiative. Managed by the United Negro College Fund-Special Project (UNCF-SP), and launched in 1998, TELP was designed to strengthen 15 Historically Disadvantaged Universities scattered throughout the Republic of South Africa. TELP is another example of a focused strategic partnership between HBCUs and African universities aimed at building institutional capacity.

Like African Americans, Africans and other students from the Diaspora seeking an American college education prior to passage and enforcement of laws banning segregation, could only do so at an HBCU. Hence up until the early 1970s, it was the HBCUs that welcomed Africans and other students from the developing world. The first president of Nigeria, Dr. Nnamdi Azikiwe, graduated

from an HBCU, Lincoln University, in 1930. Dr. Kwame Nkrumah, the first president of Ghana, graduated from the same institution in 1939. Other African luminaries who are products of HBCUs include Angie Brooks, who served on the Supreme Court of Liberia and as president of the United Nations General Assembly; E. Romeo Horton, founder of the Bank of Liberia; and Ambassador Willie Fitzjohn of Sierra Leone. These names are only indicative of the thousands of African graduates who were trained as educators, physicians, engineers, and civil servants (Frierson, 1995).

A comprehensive survey of enrollment of foreign students conducted at HBCUs in the early 1980s by Garibaldi (1984) showed that from the mid and later 1970s through 1980-81, some of the larger HBCUs reported enrolling upwards of 2,000 African students on their campuses annually. The same survey indicated that even at smaller institutions, African students matriculated in the hundreds.

HBCUs continue to be important to the academic aspirations of African students. For instance, *Black Issues in Higher Education* (July 2004) reports that some 13 percent of Howard University's student population comes from the Africa. Similar comparative percentages are reported for other HBCUs. While Africa has undoubtedly reaped economic and social benefits from the graduates produced by HBCUs in the form of a "brain gain", these institutions have likewise been beneficiaries of having students from the continent on their campuses. American students gain cross-cultural enrichment from contacts with international students. In many cases, Africans are the first international students with whom their American peers interact, thus helping them to overcome their insularity.

Furthermore, African and international students are an important source of tuition revenues for American institutions of higher learning. According to the *Chronicle of Higher Education* (September 2004) these students pay almost 70 percent of their educational costs, receiving only 20 percent of their academic expenses from their institutions. At the national level, international students constitute exceptional goodwill for the USA, and are often considered an undervalued foreign policy asset. Spending \$12 billion annually, international students represent America's fifth largest service sector export.

African Americans understand the Diaspora kinship with Africa. Accordingly, the historic relationship between HBCUs and the continent extends beyond the education of African students and scholars, encompassing collaborative projects, student and faculty exchanges and curricula initiatives. HBCU faculties have, and still are, engaged in research that range from the highly practical, facilitating economic and technological development, to the intensely intellectual. These partnerships have spawned research in such technological areas as tropical agriculture, virology, HIV/AIDS, microbiology, and the treatment of tropical disease. A large number of these projects were faculty-initiated; others were externally funded. Space constraints do not permit a complete inventory of all the past and ongoing collaborative projects between Africans and their Diaspora faculty colleagues at HBCUs. Following are recent examples of science and technology collaborations in Africa. Note that this is not an exhaustive listing.

Table 1. Ongoing HBCU Linkages in Africa

Institution	S & T Activities in Africa
Clark-Atlanta University	Technical assistance in Egypt, Madagascar, Togo, Zaire
Central State University	Senegal (water management)
Howard University	Malawi (health research)
Florida A&M, Alabama A&M University of Maryland – Eastern Shore	Cameroon, Zambia (agricultural research)
Langston University	Ethiopia (goat production)
Tuskegee University	Egypt (water purification)
Mississippi Consortium (includes HBCUs)	Mauritius (information technology)
Wiberforce University	Nigeria (meat processing)
Florida Memorial College	Niger (information technology)
Florida A & M University	Tanzania (information technology)

Sources: Frierson (1995); and UNCF-SP

A plausible argument may be made that the relationships are uneven, and lack strategic focus. One explanation is that academic partnerships offering meaningful social, economic, and scientific prospects require significant, and often, unbudgeted, finances. The HBCUs rely heavily on external funding to advance their international education activities, and availability, purpose and timing of funding opportunities from external sources are influential in the initiatives pursued.

### HBCUs Degree Productivity in the Science and Technology Disciplines

As chronicled above, it was America's Historically Black Colleges and Universities that, for decades, afforded educational access to African Americans, Africans, and students from the Caribbean and other developing countries. In the science, technology, engineering and mathematics (STEM) disciplines, HBCUs continue to be indispensable to students of color. Each year, *Black Issues in Higher Education* publishes national data on degree productivity of America's colleges and universities. Some of the findings are listed below:

- Seven of the eleven top eleven universities that produce African American engineers are HBCUs.
- Ten of the top ten colleges that graduate African American scientists are HBCU
- Eight of the top eleven producers of African American baccalaureates in agriculture, agricultural operations and related sciences were HBCUs
- Sixteen of the top 21 producers of African American baccalaureates in biological and biomedical sciences were HBCUs
- The top twelve producers of African American baccalaureates in physical sciences are HBCUs.

Barton (2004) reports that even after decades of racial integration of America's higher educational system, black students who attend HBCUs are more likely than blacks who attend traditionally white institutions to choose a STEM discipline as an academic major. The study finds that 22 percent of black HBCU males and 16 percent of females choose a STEM major compared to 15 percent of black males and 9 percent of black females attending traditional white colleges and universities. The reality is that Blacks attending HBCUs will be

steered towards STEM and business disciplines lucrative fields from which African American and other minorities have been traditionally excluded.

In graduate STEM education, data published by *Black Issues* show continued productivity by HBCUs. For example:

- Three of the top ten producers of African American PhDs are HBCUs.
- HBCUs account for four of the top ten producers of doctorates in biological and biomedical sciences
- Six of the top producers of masters degrees in the physical sciences, and five of the top producers of master’s degrees in mathematics and statistics are HBCUs.

Table 2 summarizes the productivity of HBCUs in producing masters and doctoral graduates in the STEM disciplines.

Table 2. HBCUs Graduate School Productivity in STEM Disciplines

Discipline	Number of HBCUs Ranked Among Top 10 Producers	
	Masters Degree	Doctorate Degree
Agriculture and Related Sciences	3	--
Biological and Biomedical Sciences	4	4
Computer and Information Sciences	2	--
Engineering	2	3
Health Professions and Clinical Sciences		3
Mathematics and Statistics	5	--
Physical Sciences	6	1

Source: Black Issues in Higher Education (July 29, 2004)

The National Association for Equal Opportunity (NAFEO), a policy and advocacy organization of public and private HBCUs, reports that 42 percent of all doctorates earned each year by African Americans in STEM disciplines are graduates of HBCUs. Another study of African American females who earned a doctorate degree in the sciences between 1975 and 1992 found that three out of four earned their baccalaureate degrees from an HBCU (Jackson, 2001).

## The HBCUs and Africa's Scientific and Technological Development

Few would argue that technological innovation is a primary driver of productivity increases and economic growth in any society. Integration of science and technology (S & T) into the cultural and social fabric of Africa's consciousness is considered crucial to the continent's path to modernity. Zeleza, et al (2003) details the level of scientific and technological innovations in Africa. With 13 percent of the world's population, Africa has .36 percent of the world's scientists, and accounts for less than one half of one percent of the global expenses on science and technology, Africa's scientists publish less than 0.8 percent of global peer-reviewed scientific publications, and hold less than 2 percent of the world's registered patents.

Most experts agree that over the long run, Africa's prosperity is linked to the development of its people resources, especially those with skills acquired in tertiary education. This certainly is not a new paradigm. In a seminal address to launch the University of Dar es Salaam in 1970, legendary African statesman, Dr. Julius Nyerere (1971), the president of Tanzania, outlined the three main functions of his new university: to transmit advanced knowledge; to advance new frontiers of knowledge; and to develop the manpower needs of society. Although dramatic progress has been made in increasing university enrollment in Africa's universities since the 1970s, the continent is still in need of a vast pool of scientifically and technologically trained talent. For instance, while in countries such as Cuba and the United States university enrollment is 2,461 and 5,591 per 100,000 residents respectively, in no nation sub-Saharan Africa does the figure exceed 500 (Hoffman, 1996). The situation facing Africa's S&T talent pool is not

merely that of dearth of indigenously trained expertise. The reality is that, for a myriad of factors, vast numbers of African academics and other locally-trained experts emigrate, resulting in a daunting “brain drain” from the continent.

The HBCUs are capable of making significant and sustained contributions to the twenty-first century Africa science and technological infrastructure in two ways: development of human capacity in S&T; forging institution to institution partnerships; and the digitizing of African university and libraries. As documented earlier, these are not new experiences for HBCUs in Africa. What is presented below, however, is a more focused strategy to build upon the decades-old relationships between African American institutions of higher learning and the African continent.

#### Building Human Capacity in Stem Disciplines

America’s HBCU institutions must commit themselves to increasing the pool of Africa’s S & T labor force. NAFEO and UNCF (an organization of private HBCUs) are the two important policy-making and advocacy group for African American higher education. African academic and political leaders should convene a Diaspora STEM Project summit meeting with NAFEO, UNCF and HBCU leaders to create a consortium to increase their enrollment of African students in the STEM disciplines. Under this proposed protocol, the HBCUs that offer baccalaureate or graduate programs in the STEM fields shall agree to set aside admissions slots for talented African students at their respective institutions, beginning as early as August 2006.

Given the history and institutional capacity of the HBCUs in the STEM disciplines, the Diaspora STEM Project could greatly, and relatively quickly, add

to the talent pool of African scientists and technologists. Data provided by the *Chronicle of Higher Education* show the enrollment of African students in American colleges and universities over the past eight years:

<b>Year</b>	<b>Total Foreign Student Enrollment</b>	<b>Total African Student Enrollment</b>
1996-97	453,787	<b>20,874</b>
1998-99	490,933	<b>26,019</b>
<b>2003-2004</b>	<b>572,509</b>	<b>40,648</b>

According to *The Chronicle*, 61 percent of these international students enroll in STEM disciplines. The assumption is made herein that African students select STEM disciplines proportionate to other international students. This would amount to 24,673 Africans enrolling in STEM programs in academic year 2003-2004.

Under the proposed Diaspora STEM Project, HBCUs would commit to increasing by ten percent the number of Africans majoring in science and technology, with a built-in 5 percent annual enrollment growth. Beginning in 2006, for instance, the aggregate incremental enrollment of African STEM scholars would be 2,591. Among the 94 HBCUs offering 4-year degrees, this would represent an average institutional commitment of 27 new African STEM scholars. The larger HBCUs could agree to take more, while the smaller ones would take less. Assuming a three percent annual enrollment increase in African student enrollment in America, the Diaspora STEM Project would add an aggregate of 43,704 new African scientists and technologies to the continent's labor force over a ten-year period as indicated in Table 2.

Table 3: Projected Diaspora STEM Initiative Enrollment

<b>Year</b>	<b>Total Students in USA</b>	<b>African Normal and Science Technology Enrollment</b>	<b>HBCUs African STEM Enrollment</b>
<b>2004</b>	<b>40,648</b>	<b>24,673</b>	2,467
<b>2006</b>	<b>41,867</b>	<b>25,414</b>	2,541
<b>2007</b>	<b>43,123</b>	<b>26,176</b>	2,618
<b>2008</b>	<b>44,417</b>	<b>26,961</b>	2,696
<b>2009</b>	<b>45,750</b>	<b>27,770</b>	2,777
<b>2010</b>	<b>47,122</b>	<b>28,603</b>	2,860
<b>2011</b>	<b>48,536</b>	<b>29,461</b>	2,946
<b>2012</b>	<b>49,992</b>	<b>30,345</b>	3,035
<b>2013</b>	<b>51,492</b>	<b>31,255</b>	3,126
<b>2014</b>	<b>53,036</b>	<b>32,193</b>	3,219
<b>2015</b>	<b>54,628</b>	<b>33,159</b>	3,316

Note: Normal enrollment is exclusive of the HBCU STEM initiative

This incremental STEM pool computes to 840 new S & T experts for each member of the African Union. Under this initiative, the African “brain drain” is reversed to “brain gain” for the continent.

Funding for the 10 percent incremental enrollment of African STEM students at HBCUs would, of course, be a significant challenge. It would be necessary to pursue a multi-pronged approach to securing the financial resources necessary to build Africa’s scientific capacity. From the HBCUs community would be expected scholarships, tuition discounts, and fee waiver. The presidents and chancellors would be called upon to make the education of Africans a high institutional priority with the concomitant financial support. Currently, international students receive 20 percent support from their respective

institutions. In the Diaspora STEM Project, this support would increase to 30 percent.

The international donor community would be solicited for the equivalent of forty percent of the scholars' educational expenses; currently it provides only 3 percent. Targeted donor organizations are the World Bank, African Development Bank, the U.S. Agency for International Development, and private philanthropic foundations such as Gates, Rockefeller, and Ford in the United States. The consortium of HBCUs and African universities shall present joint funding proposals to these prospective donors.

The home governments in Africa would boost their contribution to STEM scholars from a current 3 to thirty percent. Donor organizations, and America's HBCUs, are attracted to shared sacrifices, and respond favorably to proposals demonstrating endogenous financial commitments to major project initiatives. While recognizing the fiscal constraints inherent in African economies, the Diaspora STEM project must receive meaningful and sustainable governmental support. After all, it is the countries themselves that will reap the societal and economic dividends from an enhanced S & T labor force.

This human capacity building initiative calls for joint investments by the HBCUs, donor community, and national governments. The scarce resources appropriated to STEM students could be allocated elsewhere. A positive return from these investments must be the expectation. For this to be realized, the educated science and technology intelligentsia must return to their native countries, upon completion of studies, and be placed into meaningful and

strategic positions where their skills may be optimized. In addition, it is imperative that national governments afford university graduates competitive compensation packages commensurate with their level of education. Failure to do so would reverse the “brain gain” back to the African “brain drain,” and continue the emigration of scientists which Hoffman (1995) estimated at 23,000 annually.

#### Institution to Institution Linkages

It is proposed herein that NAFEO and UNCF form a consortium with the Association of African Universities (AAU) to develop the institutional capacity of African universities in three specific areas: science and technology infrastructure; formation of science and technology institutes; and digitization of African university libraries. Enhancement in these 3 critical areas will facilitate the meeting of some of the unmet needs in African universities.

A two-pronged strategy is proposed for the development of S & T infrastructure, consisting of infrastructure upgrades, and curriculum collaborations. First, the HBCUs with graduate STEM programs would partner with targeted African universities to upgrade their S & T labs, equipment, instrumentation and research facilities. Teams of scientists would collaborate to inventory the needs of the local universities, and submit joint funding requests to local government and potential donor organizations for upgrades. The collaboration would encompass faculty exchanges, joint research projects, visiting professors, and the opportunity for sabbaticals.

The second component of the partnership strategy aimed at a sustainable S & T infrastructure is the establishment of collaborative curriculum projects.

Here, HBCU and African scientists would review comprehensively the curricula of the STEM disciplines in their respective institutions with an objective of leapfrogging them to world-class, cutting-edge levels. The identification and implementation of “best practices” will be one activity outcome. The immediate beneficiaries are students enrolled in the disciplines; in the long run, the communities to which graduates return will gain from an enlarged pool of superbly educated scientists. By taking advantage of information and communications technology and existing opportunities like the African Virtual University, and the Internet, this curriculum collaboration can be effected with relatively few barriers.

Upon formation of the proposed AAU-NAFEO/UNCF consortium, institutions would be paired commensurate with their mission, programs, and interests. By so doing, the curricula consortia would be executed following a decentralized, institution-institution approach. This allows for scientists and administrators to develop collegial, working relationships with a degree of built-in evaluation, reporting, and accountability.

A partnership between HBCUs, other American universities, African universities and the tertiary education bureaucracies on the continent could be formalized to establish science and technology institutes (STI) in various Sub-Saharan African countries. Modeled on the successful Technikons in South Africa, and the institutes of technology in India and elsewhere, these technology-based institutions could become key cogs in Africa’s development engine. The STI’s would emphasize fundamental sciences, such as physics, chemistry,

mathematics, computer science, and biotechnology, and applied disciplines like manufacturing. As in India and South Africa, the STI's could quickly become centers of research excellence, promoting open-minded intellectual inquiry and basic and applied research aimed at technological improvement and societal development, thereby fostering an indigenous innovation culture. The STI's would be instrumental in growing a community of scholars, and help formulate and execute national policy on areas in which countries can achieve scientific excellence. The HBCU land-grant institutions have well over 100 years of research experience that could be adopted, with appropriate modifications, to the establishment of African STIs.

#### HBCUs and the Digitizing of African Universities

The HBCUs can partially address Kargo's (2002) description of the inadequacies of the libraries in Africa's universities by establishing collaborations to help bridge the digital divides on the continent. The working hypothesis here is that the relatively low level of information and communications technologies (ICT) present in much of Africa poses a barrier to its S & T capacity. A suggested ICT consortium would consist of the Black Caucus of the American Library Association (ALA), working in tandem with the Africa Section of the International Federation of Library Associations. These are two duly constituted organizations that could be sprung into collective action by the leadership of the ALA and HBCUs.

The expertise provided by the ICT consortium could have a profound impact on the universities. Their capacity would be enhanced to create electronic

databases; develop Web-sites on local, regional, and international information; create information highways; digitize their academic documents; establish information literacy programs. Included in the ICT consortium would be exchange programs between African American and African librarians and information technology scholars. This consortium would open up a brave new world of e-journals, databases, and Web-based publication opportunities for S & T scholars and scientists.

Clearly, the HBCU community in America has a valued role to play as the continent mobilizes toward a sustainable science-based future. The next step requires an open and ongoing dialog between African leaders and the African American academicians about partnership and linkage possibilities.

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