

# The Globalization of Health Research: Harnessing the Scientific Diaspora

Nalini P. Anand, JD, Karen J. Hofman, MD, and Roger I. Glass, MD, PhD

## Abstract

The scientific diaspora is a unique resource for U.S. universities. By drawing on the expertise, experience, and catalytic potential of diaspora scientists, universities can capitalize more fully on their diverse intellectual resources to make lasting contributions to global health. This article examines the unique contributions of the diaspora in international research collaborations, advantages of harnessing the diaspora and benefits to U.S. universities of fostering these collaborations, challenges faced by scientists who want to work with their home countries, examples of scientists engaging with their home

countries, and specific strategies U.S. universities and donors can implement to catalyze these collaborations. The contributions of the diaspora to the United States are immense: International students enrolled in academic year 2007–2008 contributed an estimated \$15 billion to the U.S. economy. As scientific research becomes increasingly global, the percentage of scientific publications with authors from foreign countries has grown from 8% in 1988 to 20% in 2005. Diaspora scientists can help build trusting relationships with scientists abroad, and international collaborations may improve the health of underserved populations at

home. Although opportunities for diaspora networks are increasing, most home countries often lack enabling policies, infrastructure, and resources to effectively utilize their diaspora communities abroad. This article examines how some governments have successfully mobilized their scientific diaspora to become increasingly engaged in their national research agendas. Recommendations include specific strategies, including those that encourage U.S. universities to promote mini-sabbaticals and provide seed funding and flexible time frames.

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Over the past century, U.S. research universities have advanced the frontiers of knowledge for the benefit of the United States and the rest of the world.<sup>1</sup> They have made especially valuable contributions in biomedical science, leading to improved quality of life both in the United States and abroad.<sup>2–4</sup> Despite these advances, however, the global burden of disease continues to disproportionately affect the world's poor, and disparities in health are resulting in tragically high mortality rates in the developing world.<sup>5</sup>

These disparities provide today's modern U.S. research universities an exceptional

opportunity to build on their public missions and to lead the way in harnessing science to improve global health. Research universities are especially qualified to confront this challenge, and they stand to gain from making them a priority. Indeed, the conduct of research and the translation of the resulting advances into improved health around the globe can be critical components of universities' efforts to globalize their campuses. To capitalize effectively on this opportunity, university leaders will need to promote and nurture campus cultures that support and encourage faculty, students, and administrators to seek out new opportunities to address global health challenges.<sup>6</sup> U.S. universities have a unique resource on their campuses that can play a valuable role in this effort: the scientific diaspora.<sup>7–12</sup> Séguin and colleagues<sup>13</sup> report, "Scientific diasporas have been defined as self-organized communities of expatriate scientists and engineers working to develop their home country or region, mainly in science, technology, and education."

A tension exists between the retention of these expatriate scientists in the United States and encouraging them to return home. To compete with countries that are rapidly expanding their scientific and technological capabilities, the United States needs to attract and retain individuals

whose skills will enable the nation to compete in the new technology-based global economy. However, developing countries also need a sustainable and critical mass of in-country researchers that can effectively address local needs and priorities, earn the trust of local study populations, develop long-term relationships with local and national policy makers, and serve as full partners in international research collaborations.<sup>14</sup>

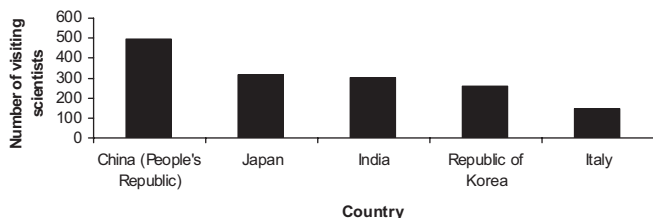
This article does not address this controversy. Rather, it focuses on immigrants who have already made the decision to stay in the United States. As the research and development (R & D) enterprise becomes increasingly global, the issue of "brain drain" in health research is being recast as "brain circulation."<sup>15</sup> (Brain drain has been defined as "the migration of health personnel in search of a better standard of living and quality of life, higher salaries, access to advanced technology, and more stable political conditions in different places worldwide."<sup>16</sup> Brain circulation is used to describe a pattern of migration in which "a cycle of study and work abroad may be followed by a return to the home country to take advantage of high-level opportunities."<sup>17</sup>) Foreign-born scientists are increasingly building relationships with professional colleagues back home while remaining anchored

**Ms. Anand** is advisor, public-private partnerships and legislative affairs, Division of International Science Policy, Planning and Evaluation, John E. Fogarty International Center, U.S. National Institutes of Health, Bethesda, Maryland.

**Dr. Hofman** is director, Division of International Science Policy, Planning and Evaluation, John E. Fogarty International Center, U.S. National Institutes of Health, Bethesda, Maryland.

**Dr. Glass** is director, John E. Fogarty International Center, and associate director, International Research, U.S. National Institutes of Health, Bethesda, Maryland.

Correspondence should be addressed to Ms. Anand, Division of International Science Policy, Planning and Evaluation, John E. Fogarty International Center, U.S. National Institutes of Health, Building 16, Room 211, 16 Center Drive, MSC 6705, Bethesda, MD 20892-6705; telephone: (301) 402-7348; fax: (301) 496-8496; e-mail: (anandn@mail.nih.gov).



**Figure 1** Countries sending the most visiting scientists to the U.S. National Institutes of Health as of September 2007.

Source: Division of International Services, Office of Research Services, Office of the Director, U.S. National Institutes of Health. Foreign Scientists at NIH by Country. Available at: (<http://www.nih.gov/catalyst/2008/08.03.01/page8.html#visiting>). Accessed January 5, 2009.

in the United States.<sup>18</sup> New research suggests that knowledge acquired and generated by émigrés is finding its way back to home countries more than ever before.<sup>19</sup> U.S. universities can encourage and foster this diaspora effect, whereby emigrants' skills, networks, and knowledge generate significant benefits in their home countries. University leaders should develop strategies to facilitate collaboration between foreign researchers who choose to stay in the United States and local scientists in their home countries. Such strategies can catalyze opportunities for universities to strengthen their global health research activities and make a lasting impact on health worldwide.

Accordingly, this article addresses the following key questions. First, what unique contribution does the diaspora make in international scientific collaborations? Second, why should U.S. academic institutions turn to the diaspora, and what benefits can these institutions derive by fostering this type of activity? Third, what are the key barriers and challenges faced by diaspora scientists who want to contribute to

scientific development in their home countries? Fourth, what are some examples of environments, institutes, and initiatives that encourage engagement between diaspora scientists and their home countries? And, finally, what strategies can U.S. universities and donors implement to catalyze this activity?

**The Scientific Diaspora's Contribution to U.S. and International Research Collaborations**

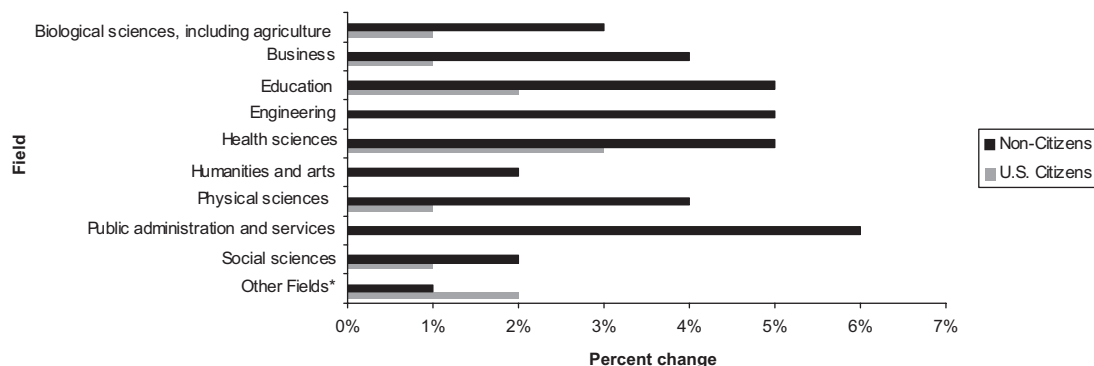
The United States is the primary destination for many highly skilled workers.<sup>20</sup> For example, in fiscal year 2007, close to half of the 2,800 foreign scientists conducting research on just the campus of the National Institutes of Health (NIH) were from Asia (Figure 1).<sup>21</sup>

A significant proportion of the scientific diaspora have come to the United States first as students.<sup>22</sup> The proportion of these students who remain in the United States after completing their studies varies by country of origin. Of those who stay, a high proportion move into R & D. In fact, 72% of foreign scientists in R & D

in the United States are former foreign students.<sup>22</sup>

The U.S. economy benefits from this inflow of international students. In 2007–2008 alone, foreign students and their families contributed a net of \$15 billion to the U.S. economy through their tuition and living expenses.<sup>23</sup> Data collected by the Institute of International Education highlight the high numbers of foreign students at academic institutions. During the past decade, foreign student enrollment in U.S. universities has grown consistently, reaching 623,805 in 2007–2008, 7% greater than the previous academic year (2006–2007).<sup>23</sup> In 2007–2008, new international student applications to U.S. colleges and universities increased by 10% compared with the previous academic year.<sup>23</sup> The Asian region contributes the greatest number of students, accounting for 59% of the total U.S. international enrollment.<sup>24</sup> The United States saw an all-time high in enrollment rates among Chinese students in 2007–2008, with a growth of 19.8% compared with the previous year, followed by India and the Republic of Korea, whose numbers of students grew by 12.8% and 10.8%, respectively.<sup>23</sup>

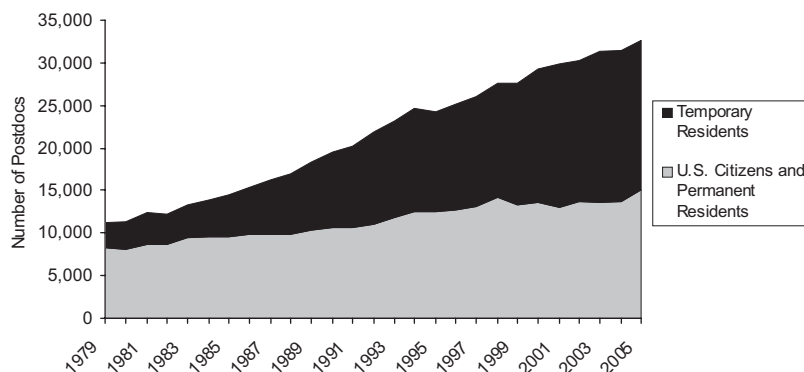
The enrollment of foreign students in graduate programs has grown at a greater rate than the enrollment of U.S. citizens in almost every field, including health sciences<sup>25</sup> (Figure 2). In 2006, 16% of graduate students were foreign.<sup>25</sup> In science, temporary residents earned 27% of the graduate-level biological sciences degrees, 40% of the graduate-level physical science degrees, and 48% of the graduate-level engineering degrees.<sup>25</sup>



**Figure 2** Average annual percentage change in graduate enrollment, by citizenship and fields of study, 1996 to 2006.

Source: Redd KE. Graduate Enrollment and Degrees: 1996 to 2006. Available at: ([http://www.cgsnet.org/portals/0/pdf/R\\_ED2006.pdf](http://www.cgsnet.org/portals/0/pdf/R_ED2006.pdf)).<sup>25</sup> Accessed January 5, 2009.

\*Other fields include architecture, communications, home economics, library science, and religion.



**Figure 3** Biological and medical sciences post docs by citizenship/visa status, 1979 to 2006.

Sources: Garrison HH, McGuire K. Education and Employment of Biological and Medical Scientists: Data from National Surveys [PowerPoint document]. Available at: ([http://opa.faseb.org/pdf/July%20-%20Dec%202007/Training%20MASTER%202008%20\(data%20tables\).FINAL.10.05.07.ppt](http://opa.faseb.org/pdf/July%20-%20Dec%202007/Training%20MASTER%202008%20(data%20tables).FINAL.10.05.07.ppt)). Accessed January 5, 2009.

The data from 2006 came from Howard H. Garrison, deputy executive director of public affairs, FASEB, written communication, March 10, 2008.

Furthermore, in 2003, more than one third of science and engineering doctorate holders were foreign-born, and, in biological sciences, more than 37% of doctorate holders were foreign-born.<sup>20</sup>

In 2004, more than 50% of postdoctoral scholars in the life sciences were temporary residents.<sup>26</sup> Of those postdoctoral scholars with non-U.S. PhDs, 25% were from China and 11% were from India.<sup>26</sup> The number of foreign post docs has steadily and significantly increased during the past 30 years (Figure 3).

Foreign recipients of U.S. doctorates in the biological sciences made plans to stay in the United States in growing numbers during the past two decades. In the early 1990s, about 50% of foreign students reported that they planned to stay in the United States after graduation; from 2002 to 2005, 74% of those surveyed by the National Science Foundation (NSF) had definite plans to stay, with especially high percentages reflected among Chinese (90%) and Indian (88%) graduates.<sup>27</sup>

NSF data also illustrate the contribution of foreign education to the highly skilled U.S. workforce. For example, in 2003, 55% of foreign-born college graduates in the United States held at least one postsecondary degree from a non-U.S. institution, and 41% had received their highest degree from a foreign institution (Table 1).<sup>20</sup> In this same year, more than one third of foreign-born U.S. residents with doctorates had received their doctorates from foreign institutions.<sup>20</sup>

However, the sheer numbers of foreign-trained researchers do not alone reflect the benefits of investments in education made by other countries to the U.S. scientific enterprise. For example, from 1990 to 2004, almost half of the U.S. Nobel laureates in science fields were immigrants, and 37% received their graduate education at foreign institutions. Among the prizes awarded in science, foreign-born U.S. Nobel laureates outnumbered U.S.-born Nobel laureates in the field of chemistry.<sup>26</sup> In addition, compared with their share of the science and engineering labor force in the United States, foreign-born and foreign-educated scientists are “overrepresented among authors of the most-cited scientific papers and inventors of highly-cited patents.”<sup>19</sup> Almost a quarter of international patent

applications filed in the United States are from foreign nationals.<sup>28</sup> This figure translates into almost 14,000 patent applications from Chinese immigrants and more than 10,000 from Indian immigrants. Following the trend seen among foreign-born Nobel laureates, about one quarter of all patents authored by foreign nationals are in the field of chemistry.<sup>28</sup> Finally, graduate programs are significant reservoirs of new research and knowledge, with foreign students providing inexpensive labor for research and teaching.<sup>20</sup>

The science and technology infrastructure in the United States has benefited, and will continue to benefit, from the inflow of foreign students and scientists who have received educational support and training elsewhere. The number of foreign-born scientists in the United States has already reached a critical mass. Measuring the contributions made by foreign scientists working in the United States is an onerous task. Clemens and Pettersson<sup>29</sup> found that “there exists no comprehensive and systematic bilateral database of the international flows of people for all countries, much less one that provides details about the migrants, such as their occupation.” Although no specific evidence exists, it seems plausible that foreign scientists have not only enriched the scientific workforce but have also bolstered the United States culturally and economically.

## Why Harness the Scientific Diaspora?

### Advantages of working with the diaspora

Immigrants rarely cut all ties with their home countries. Foreign residents often have extensive communication with friends and family in their home countries. This communication has increased because of falling costs and improved information and communication technologies.<sup>14,19</sup> Some data suggest that highly educated immigrants, especially those who have some work experience in their home countries, actively maintain connections with former colleagues and academic institutions.<sup>7</sup> Because these immigrants maintain strong relationships with those whom they have left behind, they are well positioned to build new international partnerships in their countries of origin.

**Table 1**  
**Share of College-Educated Foreign-Born Individuals in United States Holding Foreign Degrees, 2003\***

Degree level	Foreign university	
	% Highest	% Any
All	41.4	54.8
Bachelor	47.9	49.7
Master	26.8	58.6
Doctorate	36.3	78.6
Professional	49.5	58.5

\* Source: Regets MC. Research Issues in the International Migration of Highly Skilled Workers: A Perspective with Data from the United States. Available at: (<http://www.nsf.gov/statistics/srs07203/pdf/srs07203.pdf>). Accessed January 3, 2009.<sup>21</sup>

In addition to professional and personal connections in their home countries, these researchers also build such relationships here in the United States, and they are, therefore, uniquely placed to facilitate exchange and bring together potential partners from both places.

Diaspora researchers also have a deeper and more accurate understanding of the cultural, linguistic, and logistical issues that might arise in their home countries, and they can help to navigate such complexities. On a practical level, their knowledge of the educational systems, bureaucracies, and political realities and their potential access to policy makers make them valuable bridge-builders between the United States and their home countries.<sup>14</sup> As Kapur and McHale<sup>14</sup> put it, “While information is context-invariant, knowledge and understanding are more context-dependent.”

In general, policy makers and potential scientific collaborators in other countries may more readily trust someone who shares their culture and experiences and may, therefore, be more amenable to working with diaspora researchers. In fact, diaspora scientists often engender trust on both sides and, as part of both cultures, can bridge differences. In addition, some diaspora scientists feel that they have a significant and personal stake in strengthening sustainable, local scientific infrastructure in their home countries. These scientists feel personally accountable to both United States and home country institutions, which will help to ensure more robust and long-term research capacity and collaborations (Daniel D. Tshala-Katumbay, assistant professor of neurology and staff scientist, Center for Research on Occupational and Environmental Toxicology, Oregon Health and Science University, and adjunct professor of tropical neurology, University of Kinshasa, DR Congo, oral communication, August 9, 2007; and Hala Azzam, assistant professor and program director, Global Health Resource Center, University of Maryland at Baltimore, oral communication, August 13, 2007). Finally, some diaspora scientists can be extremely passionate and morally committed advocates for scientific collaboration with their home countries, understanding the local needs and priorities and the unique challenges that their in-country colleagues

face (D.D. Tshala-Katumbay, oral communication, August 9, 2007; and H. Azzam, oral communication, August 13, 2007).

A notable example from the diaspora is Calestous Juma of Kenya, the director of the Science, Technology, and Globalization Project at Harvard University. After his postgraduate education in the United Kingdom, he returned to Kenya and founded the African Centre for Technology Studies in Nairobi.<sup>30</sup> After working for the United Nations as the executive secretary of The Convention on Biological Diversity, he now serves on the Harvard faculty and remains active in the Kenyan research community. He has been named one of Kenya's 100 most influential people, has been inducted as a member of the Kenya National Academy of Sciences, and contributes a weekly column on innovation and development to the Kenyan-based *Business Daily*.<sup>31</sup> Although quantifying the specific impact of publishing a regular column in a Kenyan newspaper is difficult, doing so has allowed Professor Juma to draw attention to contemporary issues in the West. By advocating for innovation and biotechnology in the context of African development, the column could lead to change by Kenyan policy makers.

### Benefits to U.S. universities

As globalization demands more integrated academic disciplines and research collaborations, U.S. research universities have started to view their public service missions in a global context.<sup>6</sup> Those universities with a vibrant international dimension will be well positioned to lead the United States in education and research in the 21st century. Science is an inherently international enterprise. If scientists conduct research in isolation, scientific progress will be slow, inefficient, and less robust. Scientific research has become increasingly global during the past decade. The percentage of scientific publications with authors from multiple institutions in multiple countries grew from 8% in 1988 to 20% in 2005.<sup>32</sup> As the world becomes smaller and flatter, and as developing countries invest more in biomedical research, U.S. collaboration with scientists in these settings on issues of shared importance is critical. Collaboration will help to ensure that the United States and its educational

institutions remain leaders of discovery and innovation and internationally competitive in the life sciences.

Interest in global health is exploding on U.S. university campuses, including medical schools and schools of public health. Through a serious commitment to enhancing global health, universities can harness this energy and intellectual capital, and they can demonstrate leadership on issues of global significance in an increasingly interconnected world.<sup>33</sup> Many universities understand this potential and have taken steps to build and expand expertise in international issues on their campuses. Several have already established centers for global health and have developed global health curricula on campus.<sup>6</sup>

In addition to coordinated global health activities within campuses, U.S. universities are increasingly forming partnerships with universities abroad to create and develop international collaborative degree programs. According to a 2008 Council of Graduate Schools survey, approximately 38% of U.S. graduate schools overall have established at least one type of collaborative graduate degree program with a graduate academic institution abroad.<sup>34</sup> This rate is even higher among larger research universities: 60% of the 50 largest graduate institutions have at least one collaborative degree program.<sup>34</sup> Although European institutions are the most common partners for these arrangements, Chinese and Indian institutions have emerged as key partners as well (Table 2). Building partnerships through the diaspora can help ensure that U.S. universities remain or become increasingly competitive in recruiting top students from abroad.

According to the 2008 survey, roughly 31% of all U.S. graduate schools plan to institute new collaborative degrees, certificates, or other arrangements with foreign universities within the next two years (2009–2010).<sup>34</sup> Diaspora scientists can play a valuable role in the establishment and long-term success of these programs.

More specifically, to gain and maintain international recognition in global health research, universities must have robust research and training activities with partners in developing countries. Diaspora scientists can be instrumental in boosting universities' research portfolios

Table 2

**Distribution of International Collaborative Graduate Degree, Certificate, or Other Programs, in the United States by Country, 2008\***

Country	% <sup>†</sup> Master's	% <sup>†</sup> Doctorate	% <sup>†</sup> Certificate or other
Europe (including the United Kingdom)	36	17	0
China (People's Republic)	18	3	0
India	14	0	0
Republic of Korea	12	5	0
Taiwan	8	0	0
Middle East <sup>‡</sup>	5	0	2
Australia	3	0	0
Other	26	8	2

\* Source: Redd KE; Council of Graduate Schools. Findings From the 2008 CGS International Graduate Admissions Survey—Phase II: Final Applications and Initial Offers of Admissions. Available at: ([http://www.cgsnet.org/portals/0/pdf/R\\_IntlAdm08\\_II.pdf](http://www.cgsnet.org/portals/0/pdf/R_IntlAdm08_II.pdf)). Accessed January 3, 2009.<sup>34</sup>

<sup>†</sup> Percentages are based on respondents who indicated that they had established one or more graduate dual/double, joint, certificate, or other graduate programs with an international (non-U.S.) college or university. The responses are not mutually exclusive (respondents may have had collaborative programs with universities in more than one country or region).

<sup>‡</sup> Middle East: Bahrain, Cyprus, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Palestinian Authority, Qatar, Saudi Arabia, Syria, Turkey, United Arab Emirates, and Yemen.

by helping to catalyze partnerships and build trust between researchers across continents and cultures. Some U.S. academic institutions, particularly state universities, are under considerable pressure to respond to domestic problems. However, research conducted with international partners in different populations and settings around the world can benefit people both in developing countries and in the United States. As health research moves toward understanding the complex interrelationships among environmental exposure, genetic susceptibility, and human disease, different populations worldwide will require extensive epidemiological studies. These studies will require global collaboration, data sharing, and pooled analyses among researchers, which can eventually bring benefits back home.

The ability of the diaspora to help facilitate scientific collaborations with home countries can enable U.S. institutions to develop knowledge relevant to domestic health. For example, low-cost diagnostics and more nimble health services strategies used in resource-poor countries can also benefit underserved segments of the U.S. population. In a research collaboration involving the United States and a developing country institution, the developing country collaborator might learn about new methodologies and tools

in investigating diseases, and the U.S. collaborator might learn how exposure to certain environmental factors impacts susceptibility to disease. This knowledge might then enhance a collaborator's research targeted at domestic problems (D.D. Tshala-Katumbay, oral communication, August 9, 2007). As an associate dean of a large midwestern university recently put it, "We serve the local community by connecting it to the broader world."<sup>6</sup>

### Key Barriers and Challenges Facing Diaspora Scientists

The ability of home country institutions to utilize diaspora talent is critical. The innovative capabilities of any given country are largely dependent on its absorptive capacity—that is, its adeptness to "recognize the value of new, external information, assimilate it, and apply it to commercial ends."<sup>35</sup> Thus, developing countries require a highly skilled workforce that is knowledgeable about the latest scientific or technological developments in order to effectively implement new discoveries.<sup>35</sup> Diaspora scientists can serve as conduits and facilitators, but the public, private, and academic sectors in home countries must actually carry out scientific initiatives or projects. In other words, scientific diasporas can help to catalyze new activities, but home country institutions must be able to implement them.<sup>7</sup> Some

argue that "the quality of home country organizations appears to be the single most important determinant of diaspora initiatives."<sup>7</sup>

However, home countries often lack appropriate and enabling policies, infrastructure, and resources to effectively utilize the knowledge, skills, and connections of diaspora communities. For example, strong home institutions need the following:

- a baseline level of physical research infrastructure (including laboratory facilities, support personnel, and information and communication technology),
- administrative and management capabilities (e.g., grants management, stewardship of funds),
- the ability and stability to follow through on financial commitments, and
- the support (financial and/or otherwise) of the national government.<sup>7</sup>

Significantly, diaspora scientists must have scientific partners in their home countries who are not only trained to conduct high-quality research but also motivated, perhaps by incentives, to apply for funding on their own, which helps to ensure full and equitable partnerships. Therefore, countries must be able to fund their own research. Some developing countries have been able to develop this level of infrastructure, but others have not (H. Azzam, oral communication, August 13, 2007).

An example of such an enabling environment is the U.S.-Africa Materials Institute (USAMI), a virtual research institute at Princeton University that aims to improve global health by providing advanced materials and structures (e.g., using nanotechnology on the study of cancers, to detect the disease, deliver drugs, and effect genetic repair) for societal development.<sup>36</sup> Connecting scientists from 17 universities in Africa to the United States,<sup>36</sup> USAMI allows African scientists to conduct research at Princeton-affiliated laboratories, and USAMI funding has established new laboratories in Africa. The scientific collaboration made possible by USAMI and its founder-director, Winston Soboyejo, has resulted in the creation of an organic electronics

laboratory in Nigeria, which, in turn, has led the Nigerian government to finance a national nanotechnology program in the country.<sup>37</sup> In addition to infrastructure, countries must make the effort to actively integrate the diaspora into local research programs and education, including formal advisory roles, research posts in academic institutions, and participation on health and research policy panels (Oluwole O. Odujinrin, president and chief medical officer, Customized Therapeutics LLC, oral communication, August 11, 2007).

Security issues, economic policies, and political instability can be major factors in preventing scientific diaspora communities from fully engaging with their home countries. To illustrate, the Chinese diaspora had little effect on China until it opened its borders to international trade in 1980. Before that transformation, international trade and investment, as well as ideas originating from abroad, were viewed with such distrust that Chinese emigrants could do little to help their home country.<sup>14</sup> Many Central American, African, Middle Eastern, and Central European countries have large diasporas; however, their own economic policies and political instability significantly impair the ability of these diaspora scientists and researchers to make an impact.<sup>14</sup> Diaspora scientists from these regions are unlikely to invest their knowledge in their home countries without a high prospect of long-term economic growth. Thus, “the poorest countries tend to gain the least from brain circulation, inward Diaspora-led investment, and subsequent increases in their productive capacity.”<sup>38</sup> Diaspora scientists may not be able to enter or reside in their home countries safely, and in-country institutions may not be able to function in an effective and stable manner.<sup>14</sup> Even if a country is politically stable, diaspora scientists may become frustrated if their in-country colleagues struggle to access resources and become mired in bureaucracy.<sup>7</sup>

Finally, there is a possibility that a small number of scientists may take unfair advantage of home country resources for scientific or personal gain. In addition, in-country scientists may resent diaspora researchers who are perceived as receiving special privileges or financial advantages from the local government or home country academic institution.<sup>39</sup> In

these situations, resentment and mistrust may have an adverse impact.

## Examples of Diaspora Initiatives and Lessons Learned

### Asian diasporas

**China.** For years, the Chinese government has proactively encouraged Chinese scholars living abroad to return to China, and the number has dramatically increased during the past 10 years.<sup>40</sup> Between 1978 and 2006, roughly 1 million Chinese left to study abroad, and 275,000 returned home during the same period.<sup>41</sup> Remarkably, 81% of the members of the Chinese Academy of Sciences are returned overseas students.<sup>42</sup> The Chinese government has dedicated \$25 million to set up a center and Web site to aid Chinese scholars who have returned, either temporarily or permanently, to the country.<sup>13</sup>

Zhou Ji, distinguished alumnus of the University of Buffalo (UB), exemplifies how scientists from the Chinese diaspora can advance opportunities at home. Appointed as minister of education in March 2003, Zhou oversees the world’s largest education system. Zhou obtained his doctorate from the UB School of Engineering and Applied Sciences and earned the title of distinguished alumnus for his work in promoting higher education and increased collaborations between China and the United States. According to the vice provost of UB, “Zhou is one of a great many outstanding Chinese students who have completed advanced degrees at UB and gone on to highly successful careers back home . . . . It’s a tribute to UB’s early and extensive involvement in China, beginning in the late 1970s, that UB has attracted so many excellent students from that country.”<sup>42</sup> A member of the Chinese Academy of Sciences, Zhou has worked extensively in the ministry of education to promote study-abroad opportunities for Chinese students while also encouraging them to return home.<sup>42</sup>

Recently, Chinese universities have created “million-yuan professorships” with exorbitant annual salaries (compared with those earned by in-country Chinese scientists), equivalent to \$125,000. In addition, the Chinese Ministry of Education has funded the Chinese Academy of Sciences to operate its “100 Talents Program.” Fellowship

recipients receive high salaries, and most get new housing, a new laboratory, imported equipment, and a research team that consists of graduate students and research staff. Regardless of their positions in overseas institutions, these returnees immediately become full professors.<sup>39</sup> The substantive focus of these programs is cutting-edge science, such as biotechnology, nanotechnology, energy efficiency, environmental protection, and material sciences.<sup>40</sup>

To encourage researchers to return home, some proponents consider part-time academic appointments more enticing to attract top-notch researchers. In response, China’s ministry of education created lecture chairs for part-time scholars at the rank of associate professor or higher. The recipients are required to spend no fewer than three months (or two, under special circumstances) in China.<sup>39</sup>

Reaction to these programs has been mixed in that they have created tensions between returning and local scientists. Returnees enjoy perks that are not available to local scientists. This tension lends some doubt to the programs’ general effectiveness in building trust and long-term collaborative relationships between scientists. In addition, whether part-time scholars can contribute to China’s long-term scientific development in a meaningful way is questionable.<sup>39</sup>

**India.** The government of India is providing incentives to its diaspora such as the provision of dual citizenship, the recognition of persons of Indian origin by creating a special ministry and arranging special conferences, and the organization of a research scientist scheme that encourages diaspora scientists to teach at Indian universities.<sup>13</sup> In addition to the government’s efforts, organizations such as the U.S.-based Indian American Council facilitate collaboration between Indian diaspora living in the United States and their in-country counterparts in areas such as health care and scientific research.<sup>43</sup>

The Public Health Foundation of India (PHFI), a public-private partnership initiative, is strengthening institutional capacity in India in public health training, research, and policy development. The goal is to establish five to seven Indian institutes of public health by 2014; two institutes

were successfully launched in 2008. The institutes will initially train more than 1,000 public health professionals per year, and leaders plan eventually to produce as many as 10,000 graduates annually. In addition, PHFI is establishing a research network of public health and allied institutions that will undertake scientific and policy research with the purpose of advancing public health goals in priority areas.<sup>44</sup> The Association of Schools of Public Health in the United States is providing educational and technical assistance. PHFI is also partnering with several U.S. schools of public health, such as those at Harvard University, Johns Hopkins University, and the University of Minnesota. One strategy PHFI hopes to implement in the first three to four years is to draw on visiting faculty. Some of these faculty will have had formal training in public health and will have taught in U.S. academic institutions. Others may not be affiliated with a U.S. university but will have had pertinent field experience, either performing research or working in civil society. More than 100 people abroad have expressed interest in serving on the faculty. According to K. Srinath Reddy, president of PHFI, “The Indian diaspora see this as a good way of coming back to the home country in a supportive academic environment where they can be productive and continue to collaborate with some of the best institutions in world.”<sup>45</sup> PHFI was established in 2006, and the long-term success of this model is not yet known; however, PHFI is a well-funded initiative, with strong support from the Indian government and outside academic institutions and foundations. Moreover, India already has a strong and growing R & D base. Therefore, this initiative holds much promise.<sup>44</sup>

### African diasporas

**South Africa.** In 2006, South Africa’s National Research Foundation (NRF) established the South African Research Chairs initiative, which is open to both in-country and diaspora scholars. Objectives of this initiative are (1) increasing the number of world-class researchers in South Africa, (2) strengthening and improving the capacity of higher education institutions to generate and apply new knowledge, and (3) stimulating strategic research in a variety of areas that have been selected as

high-priority areas for South African scientific development. Each chair is focused on a particular research theme, such as indigenous knowledge, health technologies, and nanotechnology. The aim of this initiative is to set up 210 research chairs by 2010, which translates into a 10-billion-Rand investment in research capacity over 15 years.<sup>46</sup> Through this program, a well-established researcher may receive up to 2.5 million Rand a year in a package that includes salary, student grants, and cost of research. Based on a positive peer review, the annual grant is renewable for a period of up to 15 years.<sup>47</sup>

South African Research Chairs provides the possibility of a concrete position for South African diaspora scientists, from which they can make a longer-term impact on the research landscape of the country. Although individuals already working in the country currently constitute two thirds of the appointments—so far, 70 research chairs have received appointments—the eventual goal is to reach 60% of the appointments coming from the diaspora. In this spirit, despite a recent setback in which the science and technology department failed to secure funding, the next round of awards will most probably be limited to applicants from outside South Africa.<sup>48</sup>

**Nigeria.** For the past several years, the government of Nigeria has actively promoted more involvement by the Nigerian diaspora in Nigeria’s economic development. In 2000, an organization called Nigerians in Diaspora Organization in the Americas (NIDO) was established. The Nigerian government recognized NIDO as the umbrella organization through which Nigerians in the Americas, including the Caribbean, might leverage the economic, human, and technological resources of the Nigerian diaspora to enhance Nigeria’s development. In addition, the organization promotes cooperation and facilitates networking among Nigerian diaspora. Particular projects include a database and information initiative, which aims to provide tools that link Nigerian skills and expertise with Nigeria’s government, industry, and academic sectors in their training and economic development needs. Other initiatives include housing, health care, and education projects. In 2005, Nigeria’s

president, Olusegun Obasanjo, designated an annual National Diaspora Day.<sup>49</sup> It is on this day in July that Nigerians remember and appreciate the contribution of their expatriate nationals in the country’s development.

### Latin American diaspora

When the Network of Colombian Researchers Abroad (“Red Caldas”) was established in 1991, its main objective was to make young Colombian researchers abroad part of the Colombian scientific community and national research programs through collaborative research projects. Initially, Red Caldas established *National Nodes* in 27 countries, bringing together 874 diaspora researchers and graduate students. A *Central Coordination Node* that served as a hub for all *National Nodes* managed the information and communication system, facilitated connections with in-country researchers, helped to formulate collaborative projects, and provided funding that was approved through a peer review process. A few years after its inception, the organization slowly lost the momentum that it had built initially. The *National Nodes* lost relevance, and more effective, specialized research networks that cut across the national nodes replaced them. The emerging specialized research networks are likely to be successful and sustainable because they are less centralized and are based on scientific expertise and interest; therefore, they have a more focused agenda, a more clearly defined membership, and better-delineated projects and responsibilities.<sup>50</sup>

### Strategies to Consider

In June 2006, researchers at the University of Toronto published the results of qualitative research on the needs and perceptions of multiple diaspora residing in Canada regarding assisting their home countries. The authors’ recommendations primarily targeted national governments, particularly the Canadian government.<sup>13</sup> In contrast, the strategies proposed below focus on the potential of academic institutions and donors, such as national governments, international organizations, international development agencies, nongovernmental organizations, research funding agencies, and the private sector, to better engage the scientific diaspora in global health

research. Through relatively small but strategic investments, universities and donors can play a valuable role in enabling interested diaspora scientists to engage with their home countries in fruitful ways that can enhance scientific progress and benefit the scientific collaborators, their institutions, the two countries, and world health.

### Donors

To absorb and effectively utilize their scientific diaspora, home countries must know the locations of their scientists and their areas of expertise. In addition, diaspora scientists at various institutions need a practical way to connect with each other. Therefore, donors might consider providing technical and financial support for the formation and maintenance of diaspora networks (such as those in Columbia and Nigeria) as well as a small administrative core that can cement the linkages. The expertise brought back home by diaspora scientists can be translated into local research priorities, grants, and manuscripts by in-country professionals and staff. Actual projects are critical. Initial interest decreases after a few years, as network members tire of meetings and discussions that bear no results. Tangible outcomes must be a key objective of such networks if they are to be sustainable and make a long-term impact on the home country.<sup>7</sup>

As discussed above, strong educational institutions that are responsive to the global knowledge economy are ultimately necessary both to sustain the attention and commitment of the scientific diaspora and to enable collaborations based on full scientific partnership. Therefore, strengthening institutional capacity in home countries (including physical infrastructure, information and communications technology, medical informatics capability, administrative capacity, and scientific expertise) is critical not only to a home country's scientific and economic development but also to its ability to turn brain drain into brain circulation and to absorb and utilize knowledge through its diaspora.

Finally, donors can support universities in their efforts to enable more interaction between diaspora and their home countries (see suggested strategies below).

### Universities

As discussed above, U.S. universities have reaped significant benefits from the presence of foreign-born scientists on their campuses and the educational investments of those scientists' home countries. Universities can show their own beneficence by finding effective ways to give back to these countries while at the same time harnessing high-quality science to improve global health.

Universities can create and maintain an environment and culture that understands the value of global health research, the advantages of diversity, the intellectual contributions made by diaspora scientists, and the unique role that these scientists can play in catalyzing partnerships with their home countries. Of course, not all diaspora researchers are interested in investing their energy and resources in this endeavor. However, many are willing to do so, and universities should encourage this kind of dedication, explore ways to make these activities less burdensome, and consider implementing incentives for the diaspora scientists on their campuses to engage with their home countries. Specifically, U.S. universities can

- actively involve diaspora scientists in campus global health initiatives as they are being designed and implemented by soliciting their ideas and tapping into their knowledge and understanding of the local landscape.
- encourage the development of long-term relationships between diaspora scientists and researchers in their home countries through periodic visits, conferences, workshops, short courses at home institutions, and collaborative research projects. These activities can begin with small ventures, which might gradually expand as working relationships solidify. For example, diaspora scientists could begin by conducting special lectures or seminars or mentoring students on particular projects. Eventually, these activities might develop into larger research initiatives.<sup>7</sup>
- create a new track for diaspora scientists who are interested in research collaborations with their home countries. This could take the form of mini-sabbaticals for junior and senior faculty, with small seed funding to cover travel and other expenses, with

the expectation of resulting concrete joint projects or initiatives. Assessments of faculty evaluations often do not differentiate between U.S. and international research, even though the latter often involves significant additional challenges.<sup>6</sup> Therefore, in this track, university administration might, in their promotion and tenure policies, account for logistical challenges that arise when working with international partners, such as longer time frames to sustain international research and collaborate with partners overseas. Of course, this consideration would apply to international research involving nondiaspora scientists as well.

- allow researchers enough time in-country to be responsive to local needs and priorities and to make a sustainable impact. Universities might support programs that enable diaspora scientists to spend more time working on specific projects in their home countries. For example, the Fogarty International Center at the NIH (<http://www.fic.nih.gov>) funds programs through which scientists can spend significant amounts of time in developing countries for research and training activities. Willingness of the university and the scientists to devote this time will signal a sense of seriousness and purpose to in-country collaborators, build trust more effectively, and enhance the scientists' accountability both in the United States and in the home country (D.D. Tshala-Katumbay, oral communication, August 9, 2007).

Some activities do not require much time on-site (e.g., teaching a particular clinical technique), and some can be addressed online (e.g., working with scientific editors to improve the quality of local medical journals). Other projects require a significant amount of time in-country. The key here is that universities should be nimble and should allow their researchers the flexibility to engage in global health research or capacity-building activities without being penalized. In fact, universities can design incentives that reward such engagement.

### Future Research

As the U.S. scientific workforce increases its engagement in global health, the

scientific diaspora should be seen as a valuable resource to promote dialogue and cooperation. This community can facilitate a unique exchange of scientific views and experiences that could have lasting benefits to a broad group of stakeholders, including the diaspora scientists' home and host institutions as well as governments. To ensure full advantage, research is needed to guide the various stakeholders in the management of some of the thorny issues that might arise during the process. For example, more careful documentation of the specific contributions and benefits is required. The scientific community also needs to better understand how to manage some of the tensions that arise between returning scientists and those who have remained in their home countries. Further research in these and other areas will play an important role in developing specific programs and creating policies to ensure successful collaborations.

## In Sum

University leaders with the foresight to globalize their campuses have an opportunity to strengthen that strategy by encouraging and supporting foreign scientists working and studying at their institutions. By investing in a campus culture that encourages students, faculty, and administrators to think and act boldly with respect to improving global health, U.S. universities can play a leading role in enhancing the health not only of those who live in the developing world but of those living within the United States. In particular, by drawing on the scientific expertise, experience, and catalytic potential of diaspora scientists on their campuses, universities can more fully capitalize on diverse intellectual resources to make lasting contributions to global health. Scientific diaspora communities in U.S. universities have much to offer their home countries and their adopted U.S. institutions; therefore, both sides must create enabling environments that not only allow collaborations with home country institutions but actively encourage and invest in them.

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