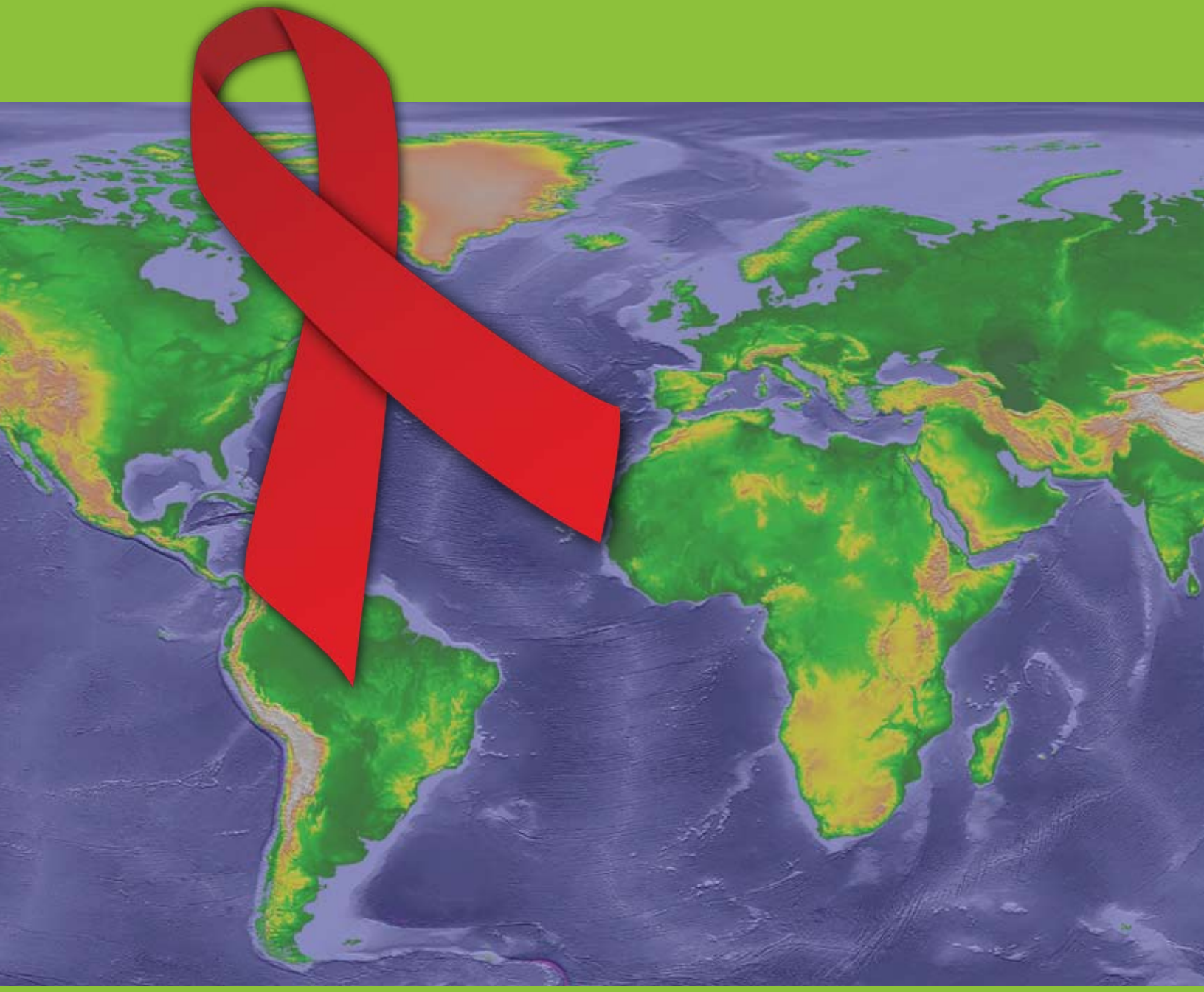
CenterPiece

Research Scholarship, Collaboration, and Outreach at Northwestern University

SPRING 2009



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CenterPiece

Volume 8, Number 2

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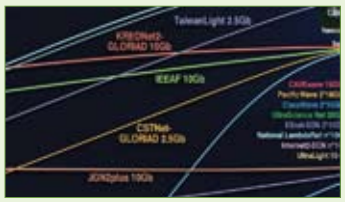

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NORTHWESTERN UNIVERSITY

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COVER — The Red Ribbon Project was created by the New York-based Visual AIDS Artists Caucus in 1991. The Ribbon is a symbol for both the fight against AIDS and drug abuse prevention.

The topical relief world map is from www.ngdc.noaa.gov/mgg/global/global.html.

NORTHWESTERN SOLUTIONS TO A GLOBAL EPIDEMIC: HIV/AIDS

Faculty members, postdocs, and students from disciplines as varied as bioengineering, the social sciences, marketing, global health studies, anthropology, medicine, and even library science are at the forefront of Northwestern's effort to combat one of the greatest global medical problems of our time: HIV/AIDS. They are assisted in their efforts by funding from a galaxy of sources, including the National Institutes of Health (NIH), the National Science Foundation, the Fulbright Program, the Bill & Melinda Gates Foundation, and the Doris Duke Foundation, among others.

What follows is an overview of some of these projects.

Nkem Dike, REACH associate program director

Research Alliance to Combat HIV/AIDS

Six years ago Richard Joseph, political science and former director of the Program of African Studies, initiated a collaboration with the University of Ibadan in Nigeria that would become the Research Alliance to Combat HIV/AIDS (REACH). A three-year, $3 million grant from the Bill & Melinda Gates Foundation in 2006 funds the research, for which Joseph is principal investigator.

REACH conducts social science and community-based research with the goal of building the capacity of researchers studying the Nigerian HIV/AIDS epidemic. "REACH is not just another HIV/AIDS research program. We use community-based and social science methods to go into Nigerian communities and find out why people are not getting tested," says Nkem Dike, research associate at the Roberta Buffett Center for International and Comparative Studies, the project's coordinator. >>

A REACH field staff member (left) and Rachel Weber, REACH postdoc pictured at the Badeku field site. Photograph courtesy of Nkem Dike.

REACH aims to develop the research skills of Nigerian social scientists so they can quantify the extent of the epidemic and tease out the underlying reasons for its spread—learning, for example, why people don't use condoms in one community while their use is widespread in another. More than 100 Nigerian faculty, graduate students, and field assistants have participated in two survey research projects in 12 locations. They collect, clean, and analyze the data—a requirement of Nigerian policymakers and, thus, a priority in the Gates grant. The REACH researchers are working with State Action Committees on AIDS and the National Action Committee on AIDS in Nigeria.

REACH is sponsoring a major conference in Nigeria next fall where findings will be presented to healthcare workers and policymakers. According to Joseph, a book is being prepared to demonstrate REACH's scientific advances as well as its important governance and capacity-building dimensions.

Center for Innovation in Global Health Technologies

The Bill & Melinda Gates Foundation also is funding a Northwestern project to develop and produce affordable diagnostic devices for infectious diseases, particularly AIDS, plaguing developing countries. The four-year, $4.9 million grant helped create the Center for Innovation in Global Health Technologies (CIGHT),

David Kelso, biomedical engineering, principal investigator, CIGHT

Kearsley Stewart, anthropology, principal investigator on a Fulbright New Century Scholar Institutional Partnership Grant

which brings together interdisciplinary expertise from across Northwestern.

David Kelso, biomedical engineering, serves as principal investigator on the grant. He and his research team at McCormick have developed prototypes for testing devices that show whether infants have become infected with HIV from their mothers. The key time of transmission of the virus is during the birthing process, but the virus can also be passed on through breast milk.

"Point-of-care testing of this kind isn't necessary in the United States, because here specimens can be sent into central laboratories and the results will be available the next day," says Kelso. "In Africa, conditions are far different. For example, in some countries less than 20 percent of births take place in a medical setting where mothers can be tested and treated."

Kearsley Stewart, anthropology, has acted as an informal advisor to the center, drawing upon her more than 15 years of conducting health research in Africa. A few years ago she introduced Kelso to leading Ugandan HIV/AIDS researchers—and described the challenges of placing his infant testing diagnostic equipment in a rural health clinic. "To maximize the effectiveness of this new medical technology, it is critical that it be culturally appropriate for the rural health environment and reflect local ideals about the usefulness of that technology," Stewart explains.

Often African laboratories cannot depend on even a regular supply of electricity or potable water. "We've developed new ways to collect blood and separate plasma from cells that don't require electricity or expensive equipment," says Kelso. In the prototype diagnostic devices "all processes take place within a sealed cartridge. These are platform technologies that also may be broadly applicable to other diseases endemic in the developing world." >>

Collecting the Popular Culture: "It's No Longer News to Us"

Patricia Ogedengbe, librarian, Herskovits Library of African Studies and Fulbright scholar, 2007/2008

Unrelated to CIGHT but illustrating the culture researchers are dealing with is the Northwestern University Library's collection of HIV/AIDS educational materials from Nigeria. Patricia Ogedengbe, a librarian in Northwestern's Melville J. Herskovits Library of African Studies, the largest Africana unit in the world, collected Nigerian posters and artifacts on a 2008 Fulbright fellowship trip.

"In Africa, posters are used for education," says Ogedengbe. "They show the history of ideas in bright colors."

Ogedengbe's focus is HIV posters, although she also collected videos of public service messages about HIV/AIDS, photos of billboards and pamphlets, and other artifacts including T-shirts and even a dustpan with an AIDS awareness message. Ogedengbe curated the library's collection as "It's No Longer News to Us: HIV/AIDS Educational Materials from Nigeria," from December 1, 2008, through February 26, 2009. These materials are now available in the Library's permanent collection.

Kara Palamountain, executive director of the Global Health Initiative at Kellogg (center, seated in green shirt), leads a group of Northwestern medical students, a few newly minted MBAs, and healthcare workers in a rural South African hospital through a 'low-tech' conjoint analysis designed to help understand the product attributes that these healthcare workers value most in a diagnostic test. Northwestern students pictured here are Mark Price, 2007 graduate of Kellogg School of Management (upper left hand corner) and Jefferson Jones, Feinberg School of Medicine (behind Palamountain on the left).

Kellogg Contributes Marketing Savvy

While Kelso works with engineering design students to develop medical diagnostic tests, Kellogg graduate students have been conducting research in South Africa and other countries into the marketing, distribution, and government regulation of such devices. "Last year we sent 30 students to Tanzania after a 10-week class," says Kara Palamountain, executive director of the Global Health Initiative at Kellogg. "They studied traditional market research techniques used in medical product develpment in developed countries and then had the opportunity to apply them in a less-developed country, reengineering or even redesigning them to fit the territory."

The students were split into six teams to address different aspects of the project: working with health-care providers, government agencies, international agencies, the private sector, and local distributors and community-based organizations. "The idea is to figure out how all those groups work together to implement or adopt a medical product in their country," says Palamountain. This year's class is preparing for a trip to Uganda.

Researchers from the Feinberg School of Medicine also are involved in Dave Kelso's CIGHT project: They will soon run some of the prototypes through preclinical trials to ensure that CIGHT has the blood samples needed to prove whether the assays work or not." Together we're trying to take this medical testing equipment and miniaturize it so it's portable, easy to use, rugged, accurate, battery operated, and meets the needs of people in these resource-limited settings," says Palamountain.

Kelso and Palamountain are working with corporate collaborators Abbott Labs and Inverness Medical, which develop and market medical diagnostics, to set up field tests for the prototypes in Africa as early as this summer.

AIDS Research at Feinberg School of Medicine

The journal *Science* recently identified Northwestern as the second most influential institution in HIV/AIDS research, after only the NIH's National Institute of Allergy and Infectious Diseases—despite the fact that the University doesn't even rank in the top 20 for NIH funding. Frank J. Palella, infectious diseases, authored the single most-cited paper on the subject, "Declining Morbidity and Mortality among Patients with Advanced Human Immunodeficiency Virus Infection," published in the *New England Journal of Medicine* in 1998. In the article, Palella reports that potent anti-HIV cocktails led to a steep decline in disease and death in the United States.

According to Robert Murphy, infectious diseases and director of global health research for HIV/AIDS, the reason for Northwestern's success in HIV/AIDS research is the diversity within Feinberg's Department of Infectious Diseases. "Each person here is working on a different aspect of AIDS research. They are all strong in their particular fields, and their work complements each other's," Murphy says. He specializes in international clinical trials, while Palella studies data-based outcomes of AIDS treatment in different locations. Steven Wolinsky, infectious diseases, concentrates on virology and human genetics.

Murphy is principal investigator on two projects funded by the NIH's Fogarty International Center. The first aims to develop a research training program for trainees from Nigeria and Mali. Working with Murphy on this project is academic director Babafemi Taiwo, infectious diseases, as well as Kearsley Stewart. Last summer Murphy and Taiwo inaugurated the program at the University of Ibadan and Jos University in Nigeria and the University of Bamako in Mali.

"We are helping to build the infrastructure for treatment and care of HIV-infected people," says Taiwo, who originally came to Northwestern as an Infectious Diseases Fellow. His current research interests include HIV drug resistance and strategies for optimal antiretroviral treatment in resource-limited settings. "The program with which we are affiliated in Nigeria currently has between 50,000 to 70,000 patients under treatment for HIV/AIDS. We are helping train highly educated health professionals, including nurses." >>

Kearsley Stewart and Northwestern students in 2008 visiting the government rural health clinic of Joel Kibonwabake in Mulabana, Ssese Islands, Uganda. Back row, left to right: Alex Knell, Ryan Grossheim, Jessa Baker, Joel Kibonwabake, Priscilla Kibonwabake, Sameer Kapadia, Vic Mazzone, Mina Farahzad; Front row, left to right: Alyssa Eisenstein, Dara Carroll, Kearsley Stewart, Annelyse Ahmad, Anita Panjwani, Sophia Golden (not pictured: Mara Botman and Dan Wozniczka).

Robert Murphy, infectious diseases and director of global health research for HIV/AIDS

Frank J. Palella, infectious diseases

Babafemi Taiwo, infectious diseases

Research ethics is an emphasis in the training. "We try to approach the concept of research ethics from an African point of view," says Stewart. "Yet 95 percent of funding for AIDS research in Africa comes from U.S. or European research protocols, so we need to work together to develop culturally appropriate research and training methodology."

Murphy and Taiwo also work together on PEPFAR, the U.S. President's Emergency Plan for AIDS Relief. Their role is to provide technical expertise in the areas of AIDS treatment, management of AIDS-related complications, and training of local practitioners with the goal of developing local independence in treatment and care.

Murphy recently founded and was named director of Feinberg's Center for Global Health, a comprehensive center to facilitate international experiences for its students, trainees, and faculty members. The mission of the center is to promote and build sustainable research and education programs through local partnerships around the world.

HIV/AIDS Research Ethics: Finding a Common Language

Kearsley Stewart was the principal investigator on a Fulbright New Century Scholar Institutional Partnership Grant collaborating with Seggane Musisi, professor of psychiatry, and Nelson Sewankambo, dean, faculty of medicine, at Makerere University in Uganda. The goal

of the partnership was to encourage an intellectual exchange between American and Ugandan scholars on ethics in health research in Uganda. The grant supported an electronic workshop between participants in Uganda and faculty members at the two universities.

"There is an assumption among Western medical researchers that all that is required to close the gap in medical and research ethics knowledge between 'us and them' is to train Africans in the standard American research protocol," Stewart says. "In fact, the conduct of medical research in the United States can benefit from a collaboration with Ugandans, particularly in examining the problem of language choice and comprehension during the informed consent process in the United States."

Stewart currently is applying insights from her work in Uganda to Robert Murphy's new HIV/AIDS training grant in Nigeria and Mali. Collaborative HIV/AIDS research between international institutions has profoundly changed the dynamics of global health research, according to Stewart, and Northwestern is at the forefront of that movement.

Global Health Education

Murphy's second Fogarty Grant, awarded last fall, enables the University to broaden its existing global health program and offer it to many more faculty and students. The grant will support Northwestern's creation of about 12 new courses and research opportunities abroad as well as a concentration in global health for students in the Feinberg School of Medicine.

"Learning about the rest of the world improves our health care system," says Dévora Grynspan, director of international program development for Northwestern and author of the grant. Grynspan has helped develop two programs in Africa—one each in South Africa and Uganda—where students learn firsthand about the condition of HIV-positive people in Africa. "This is not only about how we are going to save the rest of the world," says Grynspan. "There is a lot for us to learn as well. Our research becomes more relevant if we have a comparative perspective. The knowledge our students acquire about the cultural, economic, and political context of the spread of HIV/AIDS will make them better researchers in the future."

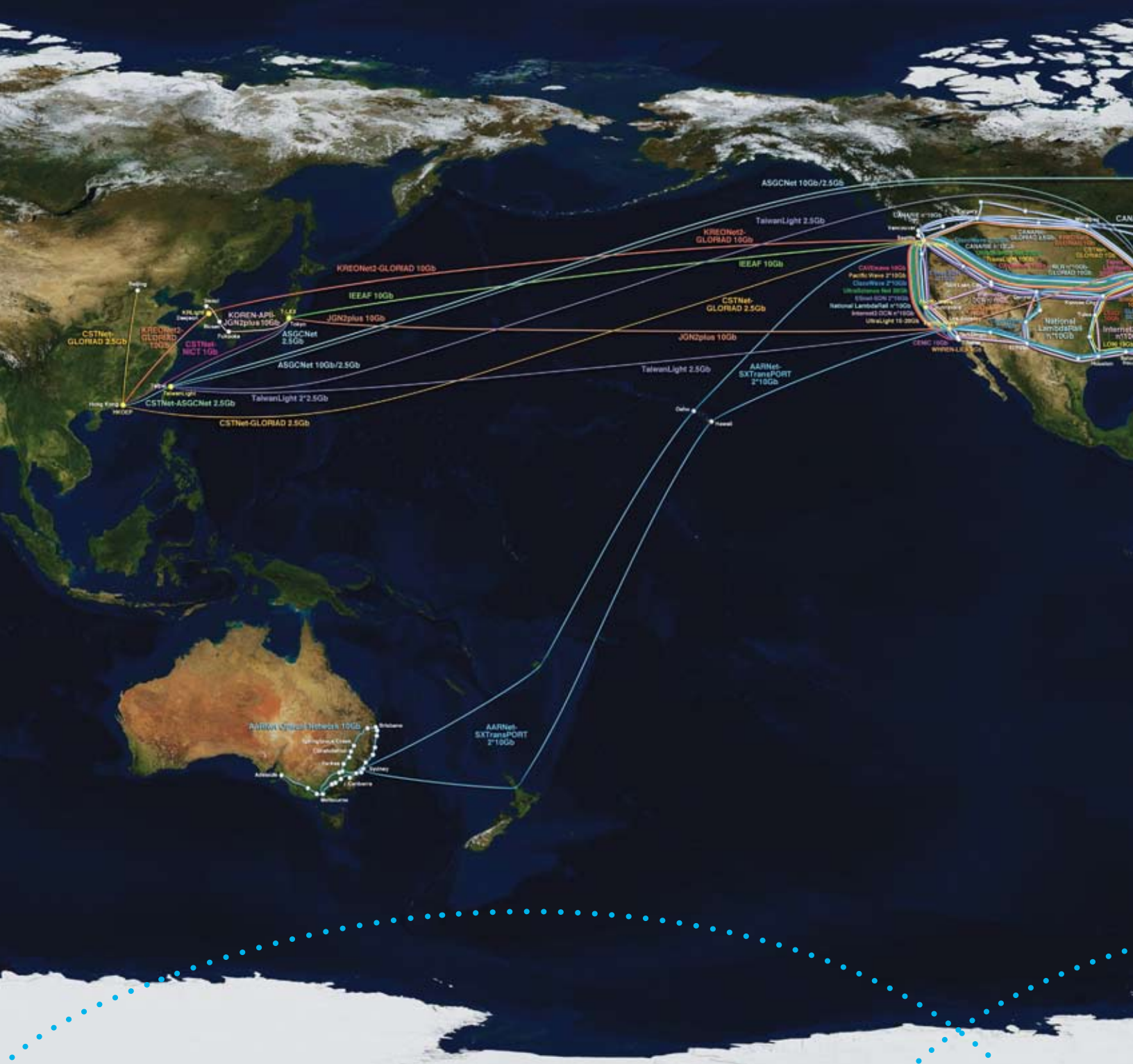
—By Joan Naper

AIDS in Africa

Sub-Saharan Africa is the area of the world most heavily affected by HIV: The region accounts for 67 percent of all people living with HIV and 72 percent of AIDS deaths in 2007. Northwestern researchers presently are conducting research in the sub-Saharan nations of Nigeria and Uganda.

Nigeria is the most populous country in Africa, with approximately 140 million people, an estimated 2.6 million to 3.2 million of whom are living with AIDS. Although AIDS incidence is higher in countries such as South Africa and Zambia, Nigeria—because of its large population—has been one of the most challenged of sub-Saharan countries. An estimated 640,000 to 4.1 million Nigerian orphans lost their mother, father, or both to AIDS.

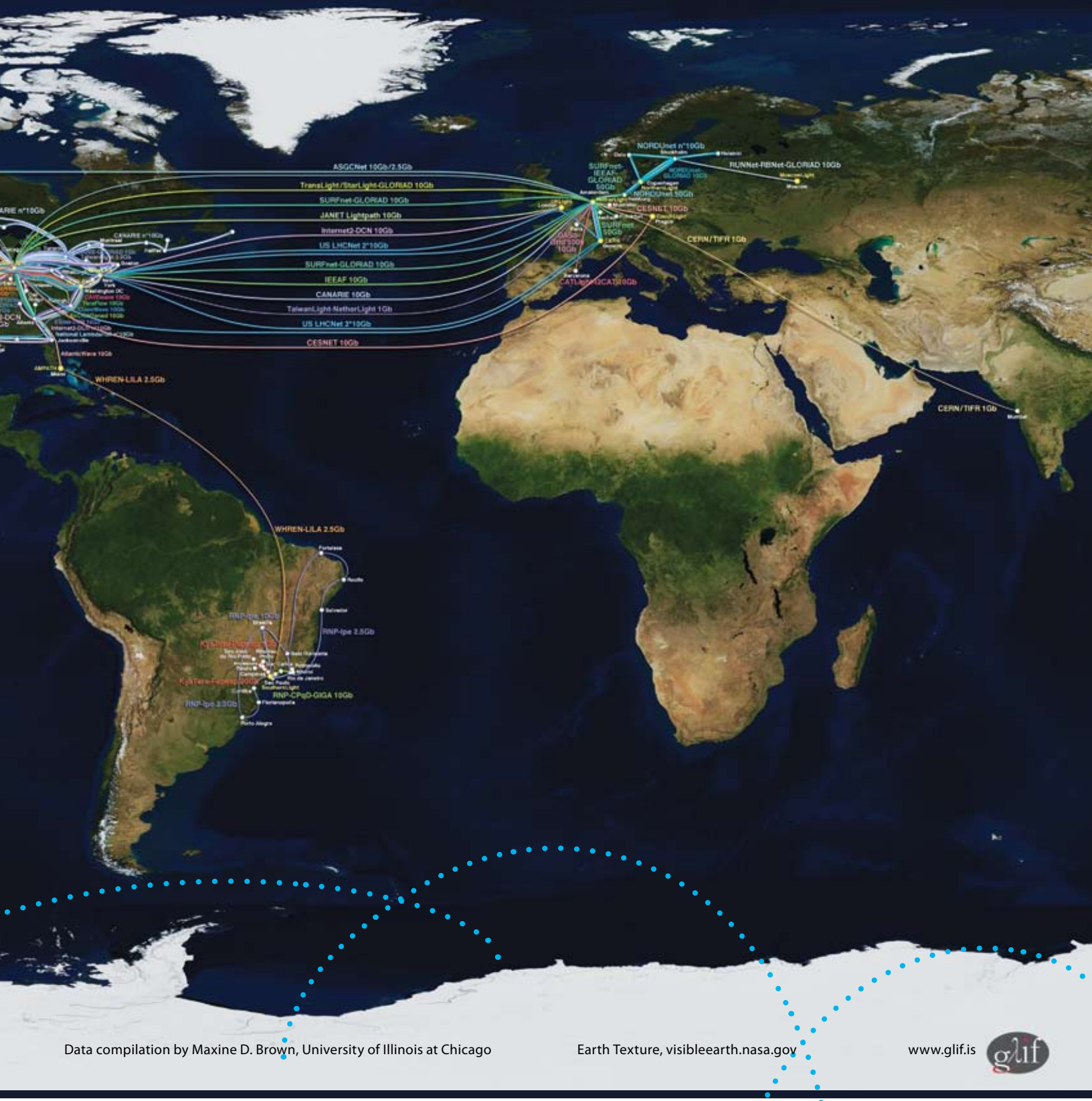
Uganda, which is a landlocked nation south and east of Nigeria, is much smaller, with population of nearly 31 million people, of whom 940,000 are living with AIDS. Between 68,000 to 89,000 Ugandans died of AIDS in 2007, leaving 1.2 million children as orphans.



GLIF Map 2008: Global Lambda Integrated Facility

Visualization by Robert Patterson, NCSA, University of Illinois at Urbana-Champaign

StarLight Advanced International Communications Exchange: Distributing Science Data to a Network Near You



The excitement about science today is not just in its discoveries, but also in new teaching approaches. The availability of enormous amounts of data from a variety of sources throughout the world is revolutionizing how science is practiced and taught. Faculty members and students in the sciences and engineering now have the ability to demonstrate and perform modeling, simulations, and animations using computers that are able to handle huge amounts of data. These new tools support traditional theory development and physical experiments and are revolutionizing scientific methods for the discovery of new knowledge.

Behind these real-time activities is an international grid of optical fibers that carry the enormous load of data generated and used by today's scientists. The fibers are organized to support multiple networks similar to, but much more highly advanced than, the common Internet. An important nexus on this network is StarLight, an advanced international communications exchange that interconnects all major research and education networks in the world and that resides physically on Northwestern's Chicago campus.

StarLight was designed by researchers for researchers: It provides scientists with advanced high-performance communications services that will not be commercially available for many years. StarLight is the "optical STAR TAP" (Science, Technology, and Research Transit Access Point) and interconnects research sites worldwide to distribute data, computing power, and access to specialized instruments. StarLight is one of the core exchanges for the international Global Lambda Integrate Facility, which supports more data-intensive science projects than any other communications facility in the world (see centerfold, previous pages).

Joe Mambretti, director of iCAIR

Demonstrations on the Nanoscale

StarLight is an improvement over the original Internet, which began as a tool for information exchange by scientists and federal agencies. The needs for secure information exchange have grown enormously over the years, and the original Internet has become a generic commodity with limitations in performance, flexibility, and quality, according to Joe Mambretti, director of

Northwestern's International Center for Advanced Internet Research (www.icair.org), StarLight's parent organization.

Today's science requires gigabytes (1000^3), terabytes (1000^4), and petabytes (1000^5) of data rather than mere megabytes (1000^2). An example of how StarLight brings such vast amounts of data into the classroom can be found at Northwestern's National Center for Learning and Teaching in Nanoscale Science and Engineering (NCLT), the first national center for education in nanoscale science and engineering in the United States, funded by the National Science Foundation (NSF).

Robert P. H. Chang, materials science and engineering and director of the NCLT, worked with Seng-Tiong Ho, electrical engineering and computer science, and his graduate students to develop several computer simulations and animations that demonstrate basic principles of light on the nanoscale. These simulations are available to students through the NCLT web site at www.nclt.us.

"Nature has always used nanotechnical properties," says Ho, who has worked with Chang to teach high school students about nanotechnology in summer programs and teaches undergraduate courses in engineering design in which students explore the nanoscale using simulations to demonstrate principles of light. "We use these light interaction simulations to explain phenomena of nature such as the colors of the sky and a butterfly's wings, as well as how nanocosmetics can be transparent."

Thanks to the power of StarLight, students can perform interactive online experiments examining photonic band gaps and light scattering with particles of different sizes in which the electromagnetic field of the light is calculated to a high precision. They are able to type in parameters to vary the wavelength, particle size, and incidence angle to visualize in real time how light performs on the nanoscale—processes that require massive amounts of computing power.

Connecting Scientific Results with Scientists

"Scientists today need to be able to use increasingly large volumes of data from around the world," says Mambretti. "The only way they can effectively utilize this data is through specialized distributed networks."

Mambretti says that the current trend in communications is secure, reliable, and customizable networks, which are already being provided to large science communities. StarLight serves as a proving ground for these innovative high-performance networking services. "StarLight represents the future of networking," he adds. "It provides powerful, unique services."

The StarLight network has been developed by the International Center for Advanced Internet Research, the Electronic Visualization Laboratory at the University of Illinois at Chicago (UIC), and the Mathematics and Computer Science Division at Argonne National Laboratory in partnership with Canada's CANARIE and the

Nature on the Nanoscale

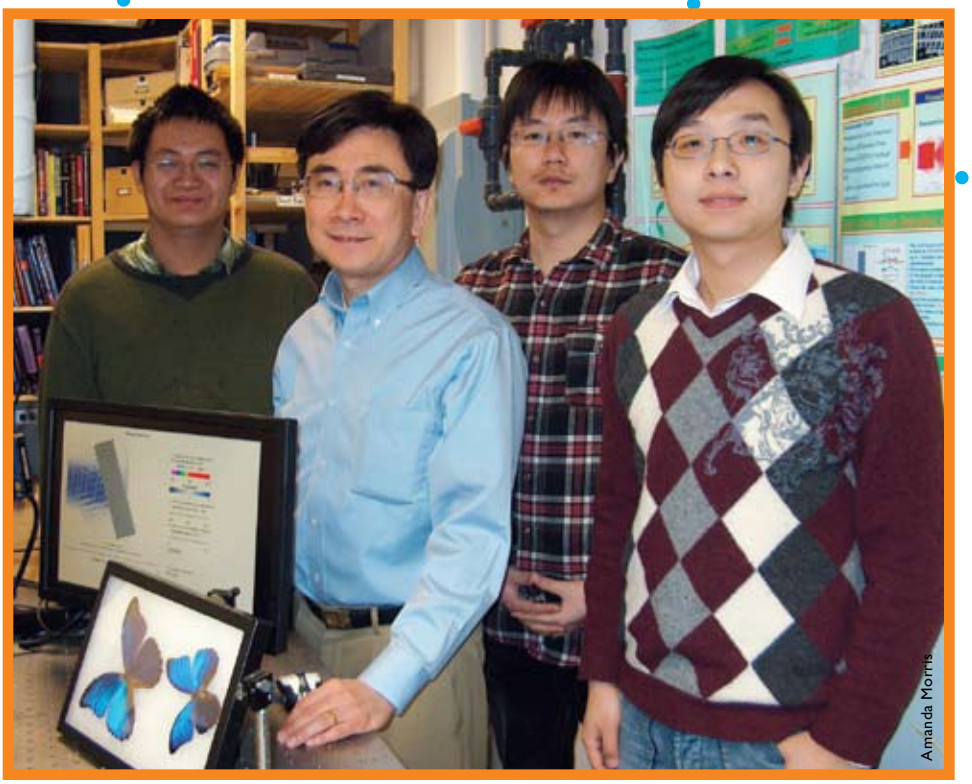
This is a photograph of a Morpho peleides.

This tropical butterfly's wings are iridescent cobalt hue not from pigment, but from the thousands of semitransparent scales that filter blue from the visible spectrum and radiate it out from the wings—changing colors by differential refraction of light because of the way the light is scattered in its nanostructure. The color is based on the existence of certain chemical pigments in the wing as well as the wing's physical structure. The structure determines the nature of interaction between light and matter.

According to Seng-Tiong Ho and his students, the butterfly wing structure is multilayered and periodically repeating, as can be seen through a scanning electron microscope (SEM).

For example, the wings of a typical tropical Blue Morpho butterfly contain cover and ground scales. Both types of scales have many ridges with intervals between them of 1.4 micrometers and 0.6-0.7 micrometers respectively. A cross-section of the ridge of a ground scale consists of 6 to 8 layers with a separation of about 200 nanometers between them. The reflectivity of the Morpho's wings reaches as high as 55 percent at around 450 nanometers. The high reflectivity is due to the way light reflects off the wings' construction of multiple layers with an extremely small separation between them.

[*Explanation of the science based on the work of Seng-Tiong Ho, Tamar Seideman, Jim Chen, Maxim Sukharev, Boyang Liu, Yeh Fei, Joseph Yelk, Xi Chen, and Xiangyu Li.*]



Seng-Tiong Ho, electrical engineering and computer science is pictured with graduate students from his group. Left to right: Yunan Zheng, Seng-Tiong Ho, Xi Chen, and Xiangyu Li.

Netherlands' SURFnet. StarLight has been made possible by major funding from the NSF to UIC and Northwestern.

For more than 15 years StarLight and its predecessor have supported high-energy physics research, including building high-performance connections with the Large Hadron Collider at CERN (European Organization for Nuclear Research) in Switzerland. Thousands of scientists throughout the world study fundamental physics by investigating what happens when particles collide. Through a dedicated optical-fiber network (LHCnet, funded by the U.S. Department of Energy's Office of Science), StarLight supports the delivery of information from CERN to labs at many U.S. research centers, including FermiLab in Batavia, Illinois. Residing at FermiLab and linked by thousands of miles of optical fiber supported by StarLight is a room that replicates the control room at CERN; here U.S. scientists can determine how and when to run experiments at the Large Hadron Collider and other scientific instruments at CERN.

StarLight also links radio telescopes around the world to allow for real-time data correlation. Recently, the world's largest single-aperture telescope, the Arecibo radio telescope in Puerto Rico, was connected to other radio telescopes around the world.

StarLight also is available to all major U.S. government agency networks, including the U.S. Geological Survey, the Department of Energy's Energy Science Network, and NASA's Information Science Network. The Geological Survey, for example, collects, monitors, analyzes, and shares scientific understanding of the weather, the land, the nation's waterways, and other natural resources. The information it collects from satellites, surveys, and other monitoring systems provides impartial scientific data to researchers, resource managers, and policymakers. StarLight enables the rapid transport of this information, including extremely high-resolution satellite images.

The StarLight facility was recently featured on a program about the future Internet produced by WTTW, the Chicago Public Broadcasting station. The program may be viewed online at www.wttw.com. Go to "Chicago Matters" and select "The StarLight Project."

Chicago is StarLight's hub

Why is the network headquartered in Chicago? "Chicago has always been a hub," says Mambretti. Historically, Chicago has been the center of the nation's waterways, railroads, and airplane routes. "Chicago's not a center by accident. People fought to create these specialized facilities."

Mambretti credits Mort Rahimi, vice president information technology and chief technology officer, and University President Henry S. Bienen for having the vision to support the network. "Henry Bienen and Mort Rahimi have been wonderfully supportive because they have a global, international perspective," says Mambretti.

—by Joan Naper

iLabs: Bringing High School Science Back to the Future

If you could transport yourself back 50 years to attend a high school science fair, chances are that you'd see a few volcanoes exploding from the chemical reaction of vinegar and baking soda. Perhaps you'd even spot some experiments involving testing water on litmus paper with an eyedropper, or the rolling of a small car down a ramp to test friction.

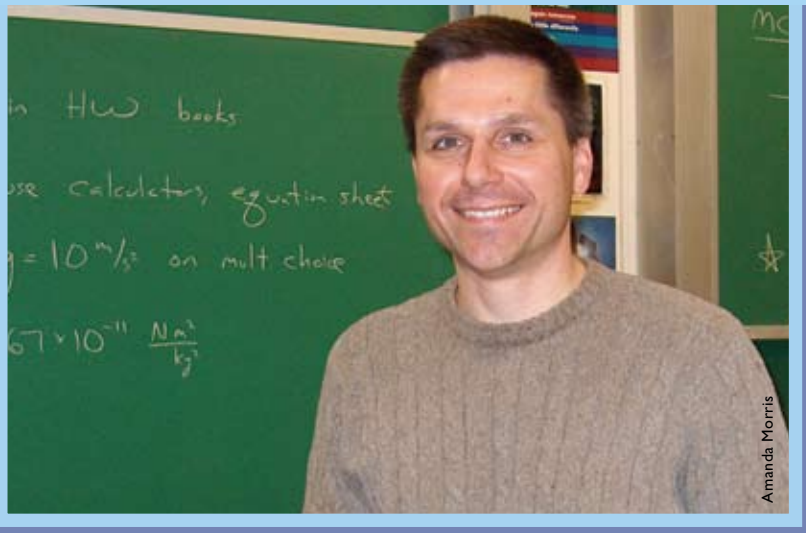
Kemi Jona, education and social policy and OSEP director

But now with the major advances in science and technology that have brought us the Internet, DNA sequencing, and electric cars, one would expect a modern-day science fair to look far more advanced. The sad truth, however, is that although the world has changed a lot scientifically in the past 50 years, the standard high school science course—in all of its test tube and Bunsen burner glory—has changed very little. And a science fair today would look shockingly similar to those of prior decades.

Closing the Gap

"There is a growing gap between the practice of science that's happening by researchers at Northwestern and other institutions, and what science looks like in high school," says Kemi Jona, research associate professor and director of the Office of Science, Technology, Engineering and Math Education Partnerships (OSEP). "And that gap keeps getting bigger and bigger."

To help close this ever-expanding gap, Jona—along with colleagues in OSEP at Northwestern and the Center for Educational Computing Initiatives at the Massachusetts Institute of Technology (MIT)—received a



Mark Vondracek. physics teacher at Evanston Township High School

$1 million grant from the National Science Foundation to take the concept of online laboratories, or iLabs, and put them into high schools.

Access Anytime, Anywhere

iLabs are experimental facilities that can be accessed through the Internet, allowing students to complete experiments from anywhere at any time via a webcam and remote controls. But the labs are not to be confused with the virtual world. The high-tech equipment is real and yields real scientific data. Moreover, due to its highly accessible nature, these labs can even be assigned as homework, allowing students to run more reports at home and collect more data.

"Students are always online and very tech-savvy now," says Jona. "So the fact that they don't get to touch the device doesn't faze them at all."

While iLabs are currently being used by large research institutions and universities as a way to share expensive scientific equipment, Northwestern is the first to make these remote labs accessible in high schools. Jona cites the example of the Large Hadron Collider in Switzerland, which is the world's largest and highest-energy particle accelerator. "Scientists everywhere are able to run experiments, collect data from the collider, and then analyze it without actually going there," he says. "That's probably the biggest example in the world. Now, sharing it for educational purposes is the piece where we're really out in front."

Of course, returning to the earliest stages of the universe with the Large Hadron Collider is material that students probably will never get to in any high school. But Jona has begun testing more appropriate instruments in the class of Mark Vondracek who teaches advanced physics at Evanston Township High School. Vondracek—who has known Jona for 13 years through Northwestern's Center for Talent Development—and his class of juniors and seniors were able to access a Geiger counter and use it to measure a radioactive source at the University of Queensland in Australia to complete an experiment in radioactivity.

"The fact that you can control it from 8,000 miles away is cool," says Vondracek, a former particle physicist and 2005 finalist for Illinois Teacher of the Year. "You can't do true science within a classroom environment anyhow. Nowadays people don't have the time or the facilities or the equipment." >>

Map showing locations of iLabs around the world. Courtesy of MIT.

And lack of resources has been the biggest challenge facing science classes of today. Jona hopes that iLabs will help close the gap between schools with many facilities to share and those with less to work with.

"My vision is to level the playing field in terms of providing better and more equal access for students regardless of where they live. For example, there's already some work going on with iLabs in Africa where there really are few resources available," he says. "Ultimately, I hope to create a worldwide resource that brings more students into science and scientific careers."

Vondracek adds that another problem with high school science is the reluctance for teachers to bring technology into the classroom. Whether it's having colleagues from a different country give podcast lectures or taking virtual tours of science museums, he says that technology is a powerful learning tool that should be embraced rather than feared. "Even if students don't go into science," he says, "iLabs expose them to video conferencing and communication skills that are things they have to be comfortable with."

iLabCentral.org

To integrate iLabs into regular high school science curricula, Jona hopes to turn the web site iLabCentral.org into a hub where students and educators can go to find, share, and access facilities, similar to an eBay-type marketplace. "Right now, you have to go fishing around on different web sites to find instruments, and it's a real pain for teachers and students," says Jona.

The site will also facilitate the payment of small fees that an institution might need to charge for usage. Right now, there are nine instruments available on the site: an inverted pendulum at the University of Queensland and several at MIT: a microelectronics device characterization lab, a dynamic signal analyzer, an educational laboratory virtual instrumentation suite, a polymer crystallization experiment, a shake table, a heat exchanger, force on a dipole lab, and neutron spectroscopy labs. Jona says that Northwestern will put some of its devices online starting this summer.

Next, Jona and his group in OSEP will perform a formal pilot test with 20 or 30 teachers and their students from around Chicago and the country. Vondracek hopes that once iLabs are made a more permanent part of the classroom, they will help students learn to think more like scientists.

"True research isn't something you can get from a half-hour lab, from out of some book, that you do only one time," he says. "Unless kids work on a single problem over a long period of time, they can't get the gist of what science is all about." ◗

—By Amanda Morris

NU-Q Expands Northwestern's Global Scope

Northwestern University celebrated the opening of its new campus in Doha, Qatar, on March 23. John Margolis, who serves as dean of the Doha campus, praised the efforts of the Northwestern University in Qatar (NU-Q) faculty and staff in ensuring the success of the campus's initial year of operation. "Launching a new campus 7,000 miles and nine time zones away from Northwestern's home campus was not without its challenges," he says. "That the inaugural year has been so successful is a great tribute to the hard work—and good cheer—of the talented and dedicated NU-Q team."

A group of more than 70 Northwestern trustees, administrators, faculty, and students traveled to Doha to tour Education City and to participate in inaugural events, which were sponsored by the Qatar Foundation. Other universities with branch campuses in Education City are Carnegie Mellon, Cornell, Georgetown, Texas A&M, and Virginia Commonwealth.

NU-Q offers two four-year undergraduate degree programs, both closely modeled on Evanston campus curricular offerings and taught by faculty with appointments in Evanston: At NU-Q, the School of Communication awards a bachelor of science in communication degree with a major in media industries and technologies, while the Medill School of Journalism awards a bachelor of science in journalism.

NU-Q's inaugural class of 38 students began course work in August 2008. Applications for admission to the class of 2013 were 50 percent higher than for the inaugural class. Eventually 160 students are expected to be enrolled at NU-Q.

Margolis says that the Qatar initiative should bring benefit not only to the Gulf region but also to the University's home campus. "I am hopeful that many faculty serving at NU-Q will return to the Evanston campus with not only an enriched sense of an immensely important part of the world but also new research or creative agenda formed in Qatar as well as valued new collaborators," he says.

Jay Walsh, vice president for research, was part of the Northwestern group visiting Qatar. "As the start-up phase of NU-Q's education programs settle in, our faculty in Qatar have an opportunity to explore media and communications collaborations that just do not exist in the United States," Walsh says. "Further, as Northwestern becomes more generally known in Qatar, there could be Qatar-based opportunities for faculty in the sciences that are challenging to pursue in the United States."

—By Grant Upson, Qatar Support Office

Noshir Contractor, industrial engineering and management science, communication studies, and management and organizations, was one of the faculty who traveled to Doha. He presented information about the Science of Networks in Communities (SONIC) research lab that he directs at Northwestern in Evanston.

Photographs by Stephen Anzaldi

In addition to attending the NU-Q Inaugural Ceremony and a half-day seminar program mounted by the School of Communication and the Medill School of Journalism, Northwestern officials, faculty, students, and staff had an opportunity to tour the city during their March visit to Doha, Qatar. Pictured is the Souq Waqif (marketplace).

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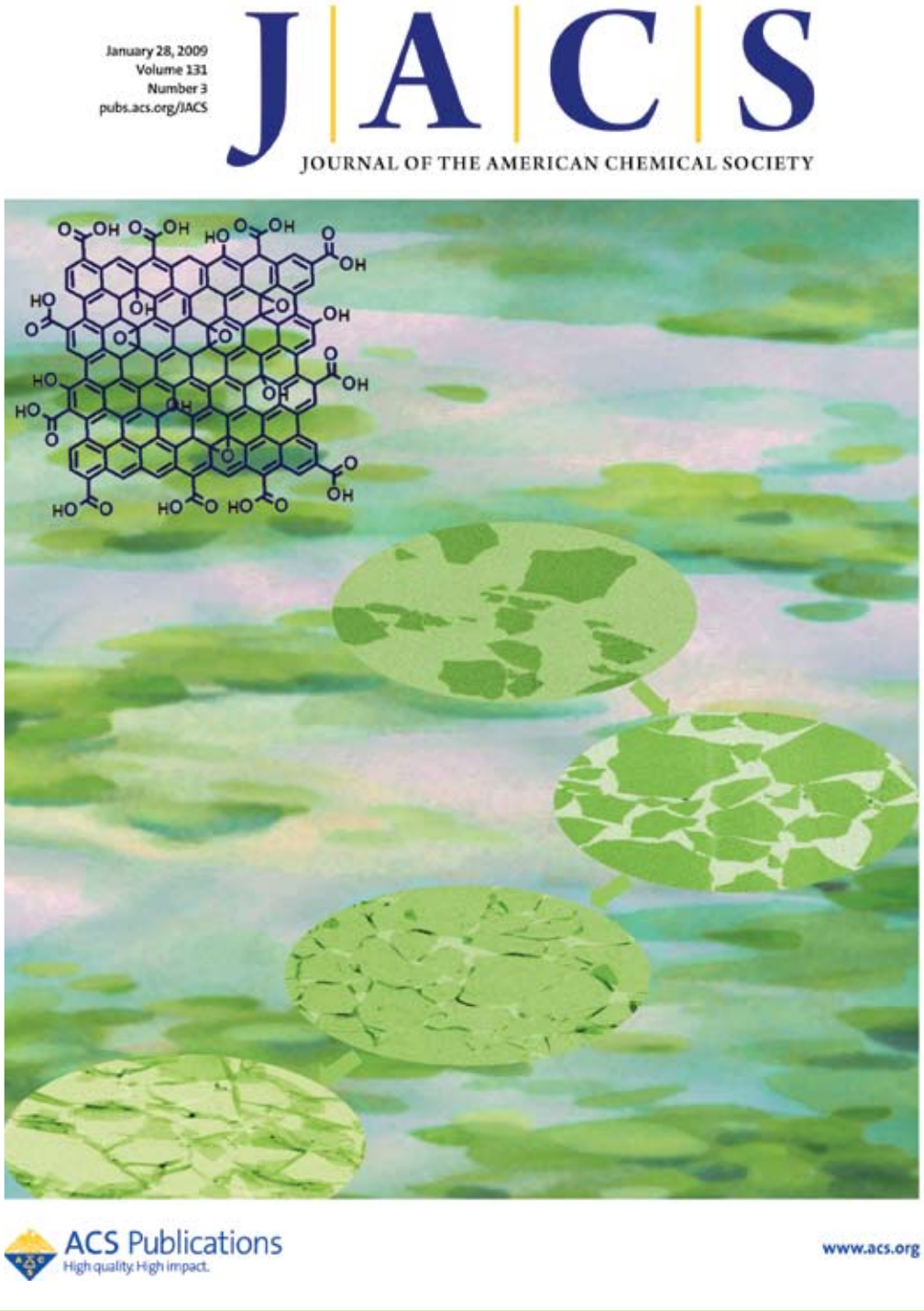
Jiaxing Huang, materials science and engineering, and his research group at the McCormick School of Engineering and Applied Science set out to investigate the assembly behavior of graphite-oxide sheets. Graphite oxide is often used to make graphene, a material of great interest to scientists who believe it could be used to produce low-cost carbon-based transparent and flexible electronics. Like graphene, graphite oxide is essentially a sheet that is only one atom thick, but can be as wide as tens of micrometers.

Huang and his group studied the sheets by putting them onto a water surface — a process called Langmuir-Blodgett assembly, which keeps the sheets flat and allows scientists to move them around. Their results reminded the researchers of water lilies on a pond. To demonstrate the idea, Huang asked his sister to help create a Chinese water painting similar to Claude Monet's series of water lily paintings.

The research was published as the cover article in the January 26 issue of the *Journal of the American Chemical Society*, and the water lily artwork was chosen for one of the first illustrated covers in the 130-year history of the journal. Huang's research was featured twice more in *Chemical and Engineering News*: on January 26, 2009, as a news piece reporting the discovery, and on March 2, 2009, as a long cover article reviewing graphene research in which the artwork also appeared.

—Adapted from a *McCormick News* article by Emily Ayshford.



Single layers of graphite oxide can float on an air-water interface just like water lilies. Monolayers of flat graphite oxide sheet can thus be obtained by Langmuir-Blodgett technique with continuously tunable densities as shown in the four images from the scanning electron microscope (presented as lily pads on the journal cover). Reproduced with permission from *Journal of the American Chemical Society*, January 28, 2009, 131(3). © 2009 American Chemical Society.

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