## ELEMENTS

## Sustainable Sciences Institute

The Sustainable Sciences Institute is building the capacity of scientists in the developing world to address local problems.

What do you do after you graduate from Harvard University with an undergraduate degree in biochemistry? For Eva Harris, now a professor in the School of Public Health at the University of California, Berkeley, the answer was simple: set off for volunteer work in revolution-torn Nicaragua. In 1988, after being dropped off at the Ministry of Health, she asked her Nicaraguan colleagues, "What do you want to learn?" The answer was, "We want to learn molecular biology."

Undaunted by the scarcity of electricity and running water, Harris developed a week-long course to teach local scientists molecular biology techniques, including the then newly developed 'polymerase chain reaction'. Using water baths, Bunsen burners and ice, Harris and her Nicaraguan colleagues were able to amplify genomic DNA from *Leishmania* for the first time—thus providing the Nicaraguans with a much-needed noninvasive method for detecting and speciating the devastating parasite.

That experience "really opened my eyes to the possibility that one could take existing technology and knowledge and adapt it to the specific conditions [of the developing world]," Harris says. Beginning from this experience, and with money from a 1997 MacArthur fellowship, Harris founded the Sustainable Sciences Institute (SSI; http://www.ssilink.org) to give scientists in the developing world, as she describes, "the resources, the tools and the confidence to be able to address their own problems."

Based on the success of this initial workshop and of subsequent sessions, SSI now provides instruction on a range of scientific topics, with new courses regularly being developed. The goal of these workshops is to provide technical skills that directly respond to local needs and that can be immediately implemented. For instance, Harris describes the impact of a workshop SSI conducted in Peru for rapidly typing dengue virus, the cause of dengue fever: "Two weeks later, the first outbreak of dengue in Lima occurred. That same day, the Ministry of Health was able to identify the virus, type it and get their control program going."

SSI works to nurture *in situ* expertise. "Over the years we have trained people in Latin America," describes Maria Elena Peñaranda, the scientific director of SSI, "so now our trainers can come from Latin America." The workshops also serve to bring together scientists within a country. Gabriel Trueba, director of the Institute of Microbiology at the Universidad San Francisco de Quito, describes SSI-sponsored workshops in Ecuador: "We have had attendees from the Health Ministry, other universities, and institutions, which has provided a great opportunity for establishing interinstitution collaboration."

This transfer of scientific knowledge is complemented by a full spectrum of support. "We don't just train people and leave them," notes Peñaranda, "we keep supporting their research with knowledge, reagents and equipment they might want, and small seed funding. When you nurture a good team of people, then they take off." For instance, Trueba notes that, in addition to funding, SSI has provided "unconditional help with reagents and equipment" in his efforts to understand how diseasecausing *Leptospira* bacteria persist in local water supplies.

'Nirvana' is when local capacity has been built to the point that SSI can open an on-site office to coordinate research efforts, according to Harris. SSI's office in Nicaragua, for example, has a team that is following 3,700 children to learn about dengue transmission. Initially they were using tracking approaches requiring minimal technology; however, despite the lack of infrastructure, the Nicaraguan team felt that automation and computerization could make the project more successful. As Harris describes, "within two months the Nicaraguan team had completely transformed our site using fingerprint scans, bar codes and PDAs. The site is now super high tech—and completely Nicaraguan innovation." In an example of how building local capacity can have broad influence, the Nicaraguan Ministry of Health is planning to work with SSI to implement the same technologies to improve vaccination and prenatal care efficiency.

SSI has generally been involved in transferring existing technologies to the developing world. However, sometimes the needed technology does not exist. SSI is funding a collaboration between Harris and engineers at UC Berkeley to develop an inexpensive handheld diagnostic device that can be used for identifying dengue virus and other infectious diseases. Harris and SSI wanted to ensure that this technology could be made available in the developing world at the lowest cost possible, which requires protecting the intellectual property rights on the technology so

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that it will not be patented and sold for profit by someone else. "What do you do about IP for these inventions?" Harris asks. "Berkeley had nothing in place to deal with anything like this."

As a result, SSI worked with UC Berkeley to develop new licensing language in which products based on a technology can be developed 'for profit' in the developed world, but must be made available at low cost in developing countries. This effort by SSI to obtain a 'royalty-free' license has had an unexpected ripple effect in the United States. In 2003 UC Berkeley set up the first university 'socially responsible licensing program' with the goal of maximizing the global benefit of university research (http://ipira.berkeley.edu/docs/sociallyresponsible10-05.pdf), and other universities are considering similar strategies (*Nature* 444, 412–413, 2006). "I feel like we've made a huge contribution," says Harris, "not just at Berkeley, but spilling over into other universities—it has become kind of a movement."

In an editorial in *Science* entitled "A Challenge to the World's Scientists" (*Science* **299**, 1485, 2003), Kofi Annan writes, "Ninety-five percent of the new science in the world is created in the countries comprising only one-fifth of the world's population." Harris's advice for scientists interested in addressing this inequality reflects her long experience in Latin America: "There is a huge world out there and a lot of really wonderful, smart people. Respectful long-term partnerships are the way to approach making a significant impact, and it is very rewarding on both sides."

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This article is part of the Global Theme on Poverty and Human Development, organized by the Council of Science Editors. All articles from the Nature Publishing Group are available free at http://www.nature. com/povhumdev. The content from all participating journals can be found at http://www.councilscienceeditors.org/globalthemeissue.cfm.