Turning one lab's trash into another's treasure

Miguel Omar Velardez was bracing himself for his return to Argentina after years at richly funded Harvard University. He had a position lined up at the University of Buenos Aires, and the Argentinian government was paying for his move, but start-up funds were not a part of the package. "They say, 'we love you, we love your research, this is your place: 36 square meters of empty lab and no grants so far.'"

Seeding Labs

Helping hands: Volunteers from Seeding Labs test and pack equipment for labs in resource-poor countries.

When Velardez heard from a friend that he could get used lab supplies for a pittance, he jumped at the chance. Seeding Labs, a nonprofit launched in 2002 by a group of Harvard graduate students, found him a titer-plate shaker, a stirring hot plate and a UV illuminator, all discarded by Doug Melton's lab at the university.

Two graduate students came by and picked up the equipment, and three others tested the pieces to see if they worked. By the time you read this article, the equipment will be in Argentina, helping Velardez work out the role of the protein neuregulin in puberty.

"I want to demonstrate that with just a little help, you can do very good science here in a developing country," says Velardez.

The help Velardez received is a natural extension of what many researchers in resource-poor countries already do—accept *ad hoc* donations from colleagues in rich countries. Since the nonprofit's launch, Seeding Labs volunteers have donated old but serviceable lab equipment worth about $300,000 to 11 labs, spending only $8,000, mostly on shipping.

"We had all worked in labs in developing countries, we had seen firsthand what it means to do science in these countries," says cofounder Nina Dudnik, a molecular biology student at Harvard's medical school who has spent time working in the Ivory Coast. "We walked the halls at night and saw the trash that people were putting out, and half of it was usable lab equipment. It seemed obvious."

The 70 volunteers collect water baths, vortexes, PCR machines, pipette tips and the like, test the machinery and make simple repairs. Funding comes from the New York–based 'angel investor' Echoing Green, Harvard, and the Sustainable Sciences Institute in California (see page 1132). Seeding Labs is seeking more funds to expand and establish a scientific advisory board to help vet and prioritize requests.

The group's recipients were initially labs in South America that were working with the Sustainable Sciences Institute and have expanded to include Paul Farmer's Haitian charity Partners in Health and Congo Protestant University in Kinshasa, which opened a medical school last year.

"There are about 20 organizations in the country that donate surplus hospital equipment," says Melvin J. Loewen, a former president of the university who now coordinates support for it from his home in Indiana. "Our frustration was that we couldn't find anything that was dealing with the chemistry, biology and physics of pre-med. I think what these grad students are doing in the Boston area is excellent."

Emma Marris, Columbia, Missouri

Sometimes the simplest solutions are the best. Scientists have transformed a blender into a centrifuge (**a**), recycled gloves (**b**) used a soda bottle as a make-do ice bucket (**c**), devised a simpler flow cytometer (**d**) and invented a tip washer for rinsing out pipet tips (**e**).

a

Sustainable Sciences Institute

c

Sustainable Sciences Institute

b

Sustainable Sciences Institute

Simpler tests for immune cells could transform AIDS care in Africa

Over the past decade, access to costly AIDS drugs in the developing world has expanded dramatically. But deciding who could most benefit from those drugs hasn't become much easier.

Simpler, cheaper versions of the test that can indicate when an HIV-positive individual needs treatment could bring quality HIV care to even the remotest parts of Africa. Academic researchers, industry and nonprofits are all developing new tests, at least seven of which are already in use, with six more in various stages of development.

In richer countries, doctors determine who is in need of antiretroviral drugs by assessing the infected individual's CD4-cell count, which reflects the health of their immune system. Those individuals with fewer than 200 CD4 cells, the immune cells that HIV destroys, need drug therapy even if they appear healthy.

CD4 cells are usually tallied by an expensive and complicated machine called a flow cytometer, a standard tool in biology labs. The bulky machines require a steady supply of electricity and highly trained technicians. "For these rural parts of sub-Saharan Africa, there's no way a flow cytometer is going to work," says Steven Reid, project manager of the CD4 Initiative, a public-private effort that aims to develop cheaper tests.

At a minimum cost of about $50,000, the standard machine is also well beyond the reach of most developing countries. Healthcare workers instead often rely on their instincts or wait until a person is visibly sick before providing treatment.

"That completely compromises their care," Reid says. "A simple test to say, 'You need treatment [or] you don't' would be a huge step forward."

Funded by an $8.6 million grant from the Bill & Melinda Gates Foundation and overseen by Imperial College London, the CD4 Initiative expects to debut a simpler version of the test by 2011 that would be as easy to use as a home pregnancy test. The test would take in a drop of blood and generate a symbol—perhaps a plus or minus sign—to indicate whether an individual needs to start drug therapy.

Scientists in South Africa have also tried to simplify CD4 testing by eliminating some of the steps in the conventional tests. "[The steps] add extra cost and are really not necessary," says Debbie Glencross, a hematologist at the University of the Witwatersrand in Johannesburg.

Her shortcut slashed the cost of a test from about $80 to $7, prompting all 52 government labs in South Africa to implement it. The new test may even be more accurate, because fewer steps leave less room for error, Glencross adds. "Even if we had all the pots of money in the world I wouldn't swap back."

Debbie Glencross; University of the Witwatersrand

Sheer volumes: Sorting through samples to identify those in need of AIDS drugs is complicated and time-consuming.

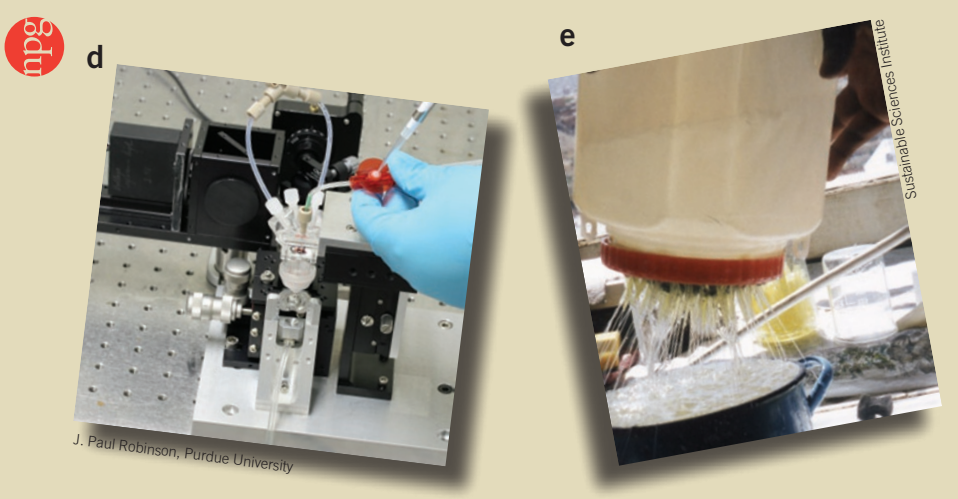
Glencross's method still relies on a basic flow cytometer and a lab in which to operate it. Another model, developed by J. Paul Robinson, director of Purdue University's Cytometry Laboratories, could be used in villages that lack labs or even electricity.

Robinson's prototype is a rechargeable mini-cytometer small enough to fit in a suitcase and simple enough to be used with little training. But finding funding for its development has been difficult. Since he received an initial $250,000 donation from Cleveland-based company Parker Hannifin, "not a single penny has come from anybody," Robinson says.

With 4.8 million people in need of antiretrovirals in sub-Saharan Africa alone, however, the potential market for a new test is enormous—and has prompted several companies to join the fray. In 2004, California-based Guava Technologies released a portable flow cytometer. That same year, BD Biosciences, which garnered $500 million in cytometry-related sales last year, agreed to slash the cost of its two most basic machines by about a third in Africa and the Caribbean.

Still, these machines are out of reach for most: Guava's version sells for $35,000 and BD's cheapest machine for $25,000. Robinson, who operates a nonprofit called Cytometry for Life, expects to see his model cost about $5,000. "It's truly a low-cost solution," Robinson says. "That gives me confidence that at some point someone will see the light and fund us."

Cassandra Willyard, New York



INGENIOUS INVENTIONS