



RICE 360° Institute for Global Health Technologies

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"Students and faculty in Rice 360° are developing solutions to some of the world's most difficult challenges of health and poverty. The program is an outstanding example of how premier scholarship, research and education come together at Rice to move beyond the walls of the academy for global benefit."

- David W. Leebron
Rice University President

COMPACT MICROSCOPE A MARVEL

In a paper published online in the journal PLoS ONE in August, Rice alumnus Andrew Miller and co-authors show that his portable, battery-operated fluorescence microscope, which costs \$240 to manufacture, stacks up nicely against clinical laboratory grade microscopes that retail for as much as \$40,000 in diagnosing signs of tuberculosis.

Miller and colleagues at The Methodist Hospital Research Institute (THMRI) analyzed samples from 19 patients suspected of having TB. Miller's instrument, called the GlobalFocus microscope, performed just as well as the lab's reference-standard fluorescence microscope. The team reported similar findings were obtained in 98.4 percent of the samples tested.

Miller created the 2.5 pound microscope as his senior design project last year, working with



Andy Miller with the Global Focus Microscope, which can accurately detect tuberculosis and malaria.

faculty in Rice 360°. The goal was to make an inexpensive, portable, and highly capable microscope that could be used in clinics in developing countries that have limited access to lab equipment and may lack electricity.

The microscope was built with off-the-shelf parts encased in a rugged plastic shell. Light to power the 1,000-times magnification microscope comes from a top-mounted LED flashlight.

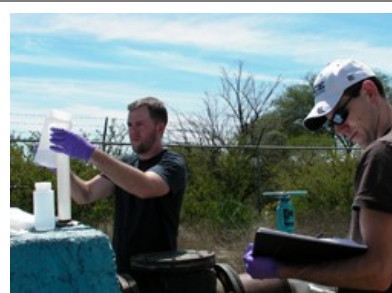
Miller and Rice have contracted with a medical device consultant, 3rd Stone Design, to produce 20 microscopes that will be ready for field testing this fall.

"This is hugely significant as a point-of-care tool clinicians can use for tuberculosis patients, whether they're in Asia or Africa or even in West Texas," Edward Graviss, director of the TMHRI Molecular Tuberculosis Laboratory, said. "The first identification of TB is usually made with a smear, and it will be good to

(Continued on page 3)

"NANORUST" ARSENIC FIELD TESTS BEGIN IN GUANAJUATO

In March 2010, researchers from Rice's Center for Biologi-



Student researchers test water quality in Guanajuato, Mexico.

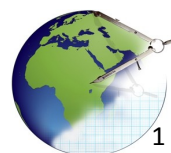
cal and Environmental Nanotechnology (CBEN) performed the second round of field tests on nanomagnetite, or "nanorust", in Guanajuato, Mexico. Researchers fitted three wells with filters packed with gravel, sand, and nanorust, to remove arsenic from the water as it is pumped from the ground.

Nanorust, particles of iron oxide smaller than living cells, has been shown to remove arsenic from water.

It is a promising, affordable treatment method for communities and homes in the developing world.

Vicki Colvin, Pitzer-Schlumberger Professor of Chemistry, and CBEN Director, developed nanorust in collaboration with Civil and Environmental Engineering Professor Mason Tomson.

—Excerpted from a report by Jade Boyd



LETTER FROM THE DIRECTOR

In 2007, Rice 360° began with a handful of faculty, staff, and students. As of August, the technologies and programs developed by our students have benefited 45,000 people in 21 countries.

Rice 360°'s students and faculty have a lot to be proud of this year. Our students in the Beyond Traditional Borders initiative have developed promising new health technologies that have caught the eye of CNN, Yahoo!, *The New York Times*, and media around the world. Undergraduates have published studies showing that their technologies perform as well as their more expensive counterparts, an extraordinary accomplishment. Once again this summer, 17 interns implemented their designs in Africa and Central America, gathering critical feedback that students will use this year to improve future technology designs.

Faculty members in the Institute have begun to bridge the divide between the lab and the field with field tests and clinical trials. In Mexico, researchers led by Vicki Colvin, Pitzer-Schlumberger Professor of Chemistry, tested the efficacy of nanorust – tiny magnetite particles – in removing arsenic from groundwater. These are some of the first tests of nanotechnology in the field. In Botswana and China,

clinical trials are underway for low-cost optical imaging systems for cancer screening. These field tests and clinical trials are tremendously important in ensuring that global health technologies developed by Rice and our collaborators at the Texas Medical Center can improve health in the world's most vulnerable populations.

In 2007, Rice 360° began with a handful of faculty, staff, and students. As of August, the technologies and programs developed by our students have benefited 45,000 people in 21 countries. We are excited about the future of Rice 360°, as it continues to use bioengineering, nanotechnology, interdisciplinary education, and international partnerships to turn the tide on some of the most difficult challenges of health and poverty. Thank you for joining us in this important mission.

Dr. Rebecca Richards-Kortum
Stanley C. Moore Professor of Bioengineering
Director, Rice 360° and Beyond Traditional Borders



Rice 360° & Beyond Traditional Borders Collaboration Sites



"BTB showed me that I could combine my love of science, health and technology with my interests in entrepreneurship and management to make a positive and lasting impact in the lives of others." - Jasper Yan, microenterprise intern in Malawi, 2010

COMPACT MICROSCOPE A MARVEL



The GlobalFocus microscope in beta-prototyping.

days to get the smear to the lab. “

“The idea was to compare a field-grade type microscope with what we see in a standard TB laboratory, such as what we have at Methodist,” he said. “When we compared the results between the two microscopes, there was no

significant difference. The quality is there, and you’re not going to miss anything by using one of these point-of-care microscopes.”

Co-authors on the paper include Gregory Davis, Maria Oden, Mark Pierce, Randall Olsen, Mohamad Razavi, Abolfazi Fateh, Morteza Ghazanfari, Farid Abdollahimi, Shahin Pourazar and Fatemeh Sakhaee.

—By Mike Williams, adapted from Rice News

“[The Global Focus microscope] is hugely significant as a point-of-care tool clinicians can use for tuberculosis patients, whether they’re in Asia or Africa or even in West Texas.”

DIAGNOSTIC LAB IN A BACKPACK GOES TO WORK IN ECUADOR

Rice 360° sent 24 Diagnostic Lab-in-a-Backpacks to Ecuador in 2010.

The portable diagnostic laboratory, designed by undergraduates studying Global Health Technologies at Rice, will give clinicians and villagers in the remote jungles and mountains of the South American nation better access to health care.

To date, the packs have been used to improve care for an estimated 20,000. Over the next

year, this number will grow to 85,000 people.

“When the emergency vehicles get as far as they can by road, doctors can carry the backpacks to where they’re needed,” said BTB Director Yvette Mirabal. “This is the first really big leap, to

get a large number of these tools into the hands of people and into the communities for which they were meant.”



BTB staff member Stephen Wallace explains tests in the backpack to Ecuadorian clinicians.

STUDENT REPORT FROM MALAWI

Last summer, I had the opportunity to participate in one of Rice 360°’s Beyond Traditional Borders (BTB) internships. I spent five weeks in Mbabane, Swaziland, at the BIPAI Center of Excellence, and five weeks at St. Gabriel’s Hospital in Namitete, Malawi.

My experiences in both Swaziland and Malawi taught me enormous lessons about project implementation, technology development, and resource barriers. But the internship did more than teach me about medical technology implementation. I



Elizabeth “Z” Nesbit with the Diagnostic Lab-in-a-Backpack in Malawi.

left Africa after the summer with a deeper understanding of

people, of life struggles, and of culture.

I spent most of my time in Malawi testing the Community Health Outreach Backpack, a kit designed for rural treatment, diagnostics, and health education. I traveled with one of the outreach nurses by motorbike from one community to the next, testing the kit and collecting feedback. The necessity of the backpack was astonishing.

(Continued on page 4)

SAVE THE DATE

Dec 1, 2010

Joia Mukherjee
Medical Director
Partners in Health

**6pm - Biosciences Research
Collaborative Auditorium**

Dec 7, 2010

In Business for Global
Health

6pm - Shell Auditorium



Rice 360° is a \$60 million signature initiative of the Centennial Campaign.

Our priorities are:

Designing New Technologies to Improve Global Health

\$30 million

Disseminating new technologies

\$20 million

Training Students to Solve Global Challenges

\$10 million

How to Give

To learn more about how you can contribute to Rice 360° in ways that are meaningful to you, please contact Sara Lillehaugen, director of development, at 713-348-3077 or sdl@rice.edu.

CLINICAL TRIALS UNDERWAY ON CANCER SCREENING DEVICE

Clinical trials have begun for a low-cost cancer-screening device with the potential to revolutionize cancer detection in the developing world.

Researchers in the lab of Rebecca Richards-Kortum, Stanley C. Moore Professor of Bioengineering and Director of Rice 360°, are collaborating with researchers at the University of Botswana and Mount Sinai Medical School to test two devices in Botswana and China.



Researchers at First University Hospital in Changchun, China, use the high-resolution microendoscope to screen for esophageal cancer.

The devices are wide-field and high-resolution optical imaging systems for the detection of cervical, esophageal, and oral

cancer. They are low-cost, portable, and battery-powered, making them particularly well suited for use in the developing world, where it is estimated that 80% of patients present with cancer that is incurable at the time of diagnosis.

"Early detection of cancer has tremendous impact on long-term patient survival and quality of life. However, in the developing world, diagnosis is often based only on clinical signs and symptoms," Richards-Kortum said. "We hope to provide high-quality diagnostic imaging tools that can provide information immediately at the point of care, regardless of the level of infrastructure, reducing morbidity and mortality due to cancer."

The system combines macroscopic imaging through the wide-field system, which can identify regions of tissue that are suspicious, with

microscopic imaging through a high-resolution microendoscope, which can help distinguish benign conditions, such as inflammation, from tissue that is cancerous. In Botswana, graduate student Tefo Bubi is working with University of Botswana faculty member Doreen Ramogola-Masire to test for cervical cancer using the high-resolution microendoscope. The clinical trial began in July.

Since May, Richards-Kortum's lab has worked with Dr. Sharmita Anandasabapathy, gastroenterologist at New York's Mt. Sinai Medical Center, in a study at the First University Hospital in Changchun, China, to use the high-resolution microendoscope to screen for esophageal cancer. The prevalence of squamous cell esophageal cancer in China is one of the highest in the world. The trials also incorporate screening in the colon and lower gastrointestinal region. Approximately 30 patients have been screened as part of the trial.

—Lauren Vestewig

REPORT FROM MALAWI

(Continued from page 3)

One of the patients who benefited from the kit was a 62-year-old man who had just lost four of the toes on his left foot to an infection. We used the kit to sterilize the amputation and dress the wound. Soon after, we used the kit to monitor the vital signs and glucose levels of a 100+-year-old grandmother. This woman was alive before the benefits of penicillin were known, before we monitored glucose levels, and long before St. Gabriel's Hospital was in existence. Needless to say, I can't imagine that, even in her wildest dreams, she ever

thought that she would benefit from the use of this kit.

Since I left St. Gabriel's Hospital, 14 CHO backpacks have been designed, sent, and incorporated into the hospital's outreach program. As I apply to medical school, and begin the next journey in life, I can rest assured that St. Gabriel's Hospital, my second home, is left in good hands with BTB.

—Elizabeth Nesbit, Rice '11

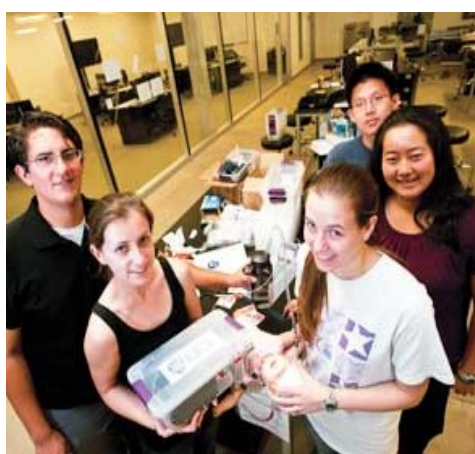


Z Nesbit uses the CHO pack in Malawi.

STUDENTS WIN FIRST IN BUSINESS PLAN COMPETITION

For the second year, students traveled to Rwanda in February as part of a unique global health technology commercialization class offered in the Jesse H. Jones Graduate School of Business. The course is taught by Marc Epstein, distinguished research professor of management. Maria Oden, professor in the practice of bioengineering and director of Rice's Oshman Engineering Design Kitchen, advised the teams. The course is made possible by a grant from the National Collegiate Inventors and Innovators Alliance and a gift from Molly and Jim Crownover.

Teams included infantAIR, whose product was a Continuous Positive Airway Pressure device; Life Packs Inc., whose product was a suite of medical backpacks; SmartDrip, whose product was an intravenous-therapy drip monitor; and Easy-



Undergraduates Michael Pandya, Jocelyn Brown, Katie Schnelle, Haruka Maruyama, and Joseph Chen with the CPAP device they designed.

Dose, whose product was a clamp to regulate dosing for oral syringes.

This was the first year undergraduate engineers joined the MBA students on teams.

"Working directly with the undergraduates -- the inventors of the devices -- was so helpful," said Will Pike, an MBA student

on the infantAIR team. "Jocelyn was amazing. She fit into our group perfectly, and her technical expertise was complementary to ours about business. She was probably our best presenter too -- she'll ace any business communications course."

In May, InfantAIR won \$11,750 in the Rice Business Plan Competition, including first prize for Best Social Venture. The InfantAIR team members were MBA students Cynthia Hu, Will Pike, David Tipps and Martha Vega, and bioengineering undergraduate Jocelyn Brown.

The undergraduate engineers from the course won the undergraduate business plan competition for their plan for the Smart Drip IV drip monitor.

—Jessica Stark contributed to this story.

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RICE WINS \$3.7M FOR CANCER RESEARCH

The Cancer Prevention and Research Institute of Texas (CPRIT) has granted \$3.7 million to Rice University researchers to fund an innovative cancer diagnostics program.

The funds will help the lab overseen by John McDevitt, Rice's Brown-Wiess Professor in Bioengineering and Chemistry, in its mission to make the Texas

Medical Center (TMC) the hub for diagnostics research into cancer and other diseases.

The work is made possible by McDevitt's development of a cost-effective Bio-Nano-Chip that can provide patients with early warning of the onset of disease, cutting the time and cost of treatment. McDevitt is principal investigator of a multi-

investigator project that totals \$6 million for cancer research, of which Rice's portion is \$3.7 million. The remainder of the grant will be subcontracted to investigators at the University of Texas M.D. Anderson Cancer Center, Baylor College of Medicine and the University of Texas Health Science Center at San Antonio.

— By Mike Williams, adapted from Rice News

RICE 360° FACULTY AND STUDENT AWARD WINNERS

Nia Georges, professor and chair of Anthropology —George R. Brown Award for Superior Teaching

Students:

Amanda Hu—Fulbright Scholar

Cindy Dinh—Harry S. Truman Award

Dan Erchick—Linda Faye Williams Prize for Social Justice

Andy Miller—Hershel M. Rich Invention Prize

Katy Miller—Wagoner Foreign Study Scholar

Joshua Ozer—Morty Rich Community Service Scholarship

Jasper Yan—Wagoner Foreign Study Scholar

Rice 360°s Blog

Learn more about what Rice 360°'s faculty, students, and partners are doing to address global health issues at:

blogs.chron.com/rice360

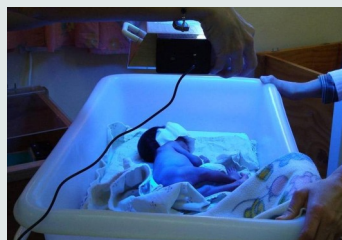


Rice University

Global Health Technologies

Design Competition

April 8 & 9, 2011



The Global Health Technology Challenge

Identify a challenge in delivering health care in the developing world and design a technology to solve the problem.

The 2011 Competition:

- Open to teams of undergraduates made up of students from any major.
- The competition registration form will be available on Rice University's Beyond Traditional Borders website (btb.rice.edu) early November.

*Forms must be completed by noon on February 1, 2011
Accepted teams will be notified by March 1*

- The competition will be held in conjunction with the Beyond Traditional Borders 'Transitioning Technologies from Labs to LDCs Symposium', April 9, 2011.
- Accepted teams will be eligible to receive a stipend of at least \$300 to assist with travel to Houston, TX.
- Teams will make an oral presentation as part of the competition and present a poster at the meeting. The top 4 teams will receive recognition and awards.

More information on the 2011 Global Health Technologies Design Competition is available at www.btb.rice.edu

Questions? Please email beyondtraditionalborders@rice.edu



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HOWARD HUGHES MEDICAL INSTITUTE

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An initiative for the advancement of appropriate, high-value innovations in global health biotechnology

BEYOND TRADITIONAL BORDERS



RICE 360°

Institute for Global Health Technologies



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April 9, 2011

TRANSITIONING TECHNOLOGIES FROM LABS TO LEAST DEVELOPED COUNTRIES SYMPOSIUM

*Rice University
Houston, TX*

Featuring

- **Case Studies** of successful global health technologies in transition
- Presentations on **new global health technologies under development**
- Focus on **Point of Care Diagnostics, Point of Use Water Treatment, Vaccines, and Social Enterprise.**
- **NEW** global health technology **Student Design Competition**
- **Poster Session** on global health technology research & design for undergraduate & graduate students

Join **RICE 360°: INSTITUTE FOR GLOBAL HEALTH TECHNOLOGIES** and leading experts in the field of appropriate, sustainable *health technologies for use in least developed countries* as they advance the discussion of how health technologies go *from prototype to wide-scale dissemination in the developing world.*



For free symposium registration,
information on abstract submission,
& design competition entry

VISIT WWW.RICE360.RICE.EDU

or contact rice360@rice.edu



RICE 360°

Institute for Global Health Technologies

Rice 360° works with communities to design and implement low-cost, high-performance technologies that prevent disease, improve health, and reduce poverty. These successful partnerships provide a model for larger and enduring efforts throughout the world.

Beyond Traditional Borders — the undergraduate initiative of Rice 360° — challenges students through multi-disciplinary education programs to develop sustainable innovations in technology and education that address pressing global health challenges.

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