



engineeringworldhealth

Annual Report
October 2013 - September 2014



Letter from the Board Chair and the CEO

Dear Friends,

“Unique” is a word often misused to mean “not so common.”

But Engineering World Health truly is unique. No other organization so effectively empowers students from the developed world and students in local communities in Africa, Asia, and Latin America to put practical biomedical engineering knowledge to work to save countless lives.

All of us at Engineering World Health are deeply grateful for the vitally important support students, universities, donors, and volunteers provide that is allowing EWH to expand its reach: In 2014, every single one of our programs grew in numbers of participants and impact on those who benefit from our work. Here are some snapshots of what EWH accomplished in 2014:

SUMMER INSTITUTE: In this, our signature program, EWH sent 71 carefully selected, outstanding students for two months to live and work in Nicaragua, Tanzania, and Rwanda. Together, they put into service \$1.5 million worth of medical equipment. Because of their work, incubators are fixed so premature babies live; blood pressure cuffs are mended so pre-eclampsia is discovered and treated before a woman dies in childbirth; anesthesia machines are installed so surgeries can safely occur. The list goes on...

Our students come to this program determined to get out of their comfort zone, and to contribute. They are a diverse group: in this year’s class, nearly half were women, and 42% were of Asian, African, or Latino ethnicities. They came from 27 different universities, and eight countries. Our students thus have a global experience in every part of the program, including their living and classroom experiences.

In exit interviews, literally every one of our students said they would recommend the program to a friend. The experience is both life-saving for those whom they serve, and life-changing for our students.

TRAINING BIOMEDICAL ENGINEERING TECHNICIANS IN THE DEVELOPING WORLD: The World Health Organization and other researchers tell us that at any given time, from 40 to 70% of equipment in developing world hospitals is not functioning. A major reason is the absence of trained technicians to maintain and repair the equipment to keep it in working order. With support from the GE Foundation, EWH has so far created programs in four countries - Rwanda, Honduras, Ghana, and Cambodia - and has just launched a new program in Nigeria. The EWH programs train local hospital workers and students to become skilled BMETs. In addition, EWH trains faculty at a local partnering school who, after several years, are able to run the program entirely on their own. In 2014, we succeeded in turning over our Honduras program to our local partner. In Rwanda, we will soon have trained 80 BMETs - virtually every BMET in the country! And, in 2016, we will be turning the program over to the local technical college in Kigali.

DESIGN COMPETITION: In 2014, 15 teams competed in our Design Competition, a challenge to design inexpensive medical devices for use in very low-resource areas. The exercise is both educational and practical: we just learned from our 2012 winners that they've raised \$1.25 million to help move their design into commercial production.

CHAPTERS: EWH University Chapters grew to 32 in the US and abroad, including Chapters in Australia, India, Ghana, Yemen, and Denmark. Chapters invite speakers to talk about global health and engineering challenges; they build Kits that EWH engineers have designed; and they reach out to their local communities with activities provided by EWH to get kids excited about science and engineering.

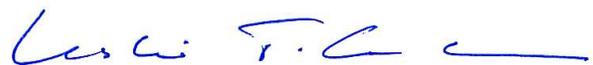
STEM (Science, Technology, Engineering, and Math) for K-12 students: In 2014, we designed a line of "kits" for K-12 students (you can see them, and accompanying videos, on www.ewh.org). With funding from the Biogen Idec Foundation, based in North Carolina, and in partnership with Boys and Girls Clubs and North Carolina State University, our staff instructed over 1,000 elementary and middle school students in STEM activities this year.

As we look ahead to 2015, we plan to launch new opportunities for our students in Latin America and Asia, while keeping a close eye on issues of health and safety in the countries in which we place staff and students. As we exercise the unique skill set and determination that characterize Engineering World Health, there is so much work to be done and so many who generously give of their time, talents, and funds to do it. We thank you for taking this journey with us.

Sincerely yours,



*Michael R. Tracey, Ph.D.
Board Chair and President
Vice President, Research &
Development
Codman Neuro*



*Leslie J. Calman, Ph.D.
CEO*



Our Mission

To inspire, educate, and empower the biomedical community to improve health care delivery in the developing world.

Engineering World Health:

- Provides students from around the world with the life-changing educational experience of repairing vital medical equipment in the world's most resource-poor communities.
- In collaboration with local partners in Asia, Africa, and Central America, creates locally-sustainable training programs for biomedical engineering technicians (BMETs).
- Engages the next generation through K-12 STEM (science, technology, engineering and math) curricula, university chapters, and design activities to improve global health.

EWH believes we have a responsibility to stay true to these values:

- Ensuring a scientifically-based and creative educational experience.
 - Leaving the communities in which we work with greater capacity than we found them.
 - Finding workable solutions through innovation and creativity.
 - Serving while partnering with local educators, hospitals, and clinics.
 - Promoting self-reliance and capacity building.
 - Providing challenge without compromising safety.
-



BMET Training & Centers of Excellence

Hospitals in the developing world often lack skilled biomedical technicians, resulting in constant disruption of care as vital medical equipment falls into disrepair. With 40 to 70% of equipment in developing world hospitals not functioning, even highly skilled doctors and nurses are unable to diagnose and treat patients.

In partnership with the GE Foundation, Duke University, in-country educational institutions, and local Ministries of Health, EWH has created Biomedical Equipment Technician (BMET) Training Programs in five countries - Rwanda, Honduras, Ghana, Cambodia, and Nigeria - to train local hospital workers and students to become fully qualified BMETs. Each program includes a three- to four-year curriculum which becomes an accredited academic program, and each is specially designed to fit the needs of the local population. We also train future trainers who soon take over the program, with the ultimate result that we leave the countries we work in with a sustainable source of well-trained BMETs.

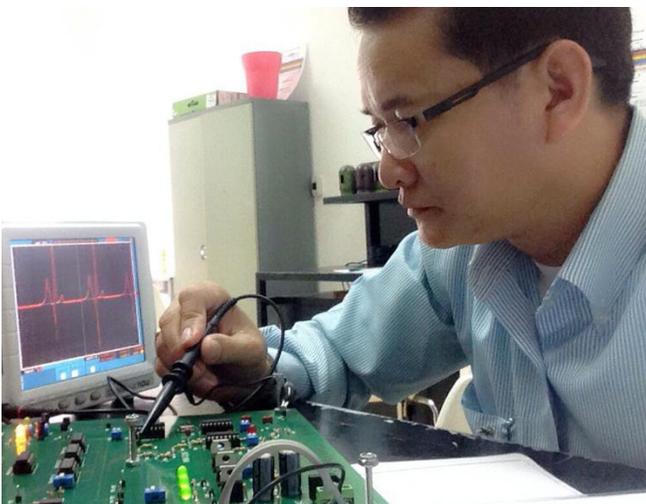
Highlights of 2014:



- *Cambodia* - 27 students are in training, along with three faculty who are taking the program with our students. A third and larger cohort will begin in November 2014.

We faced challenges this year when our On the Ground Coordinator, Mr. Sarith, died in a traffic accident, and one of our staff became ill. Nevertheless, the program remained on track. We greatly miss our colleagues and thank them for their invaluable contributions to BMETs in Cambodia.

We recruited two new expatriate BMETs who are teaching and mentoring students. They are also teaching Cambodian BMETs how to operate the new Center Of Excellence (COE). EWH was fortunate to have a Luce Foundation Scholar for part of this year. Many thanks to Claire Duvalet for her assistance developing the curriculum and preparing the COE.



- **Nigeria** - In 2014, EWH launched a new BMET Training program in Lagos, Nigeria. With a population of over 173 million people, this booming nation needs a strong healthcare system with dependable infrastructure and well-trained staff at all levels.



So far, we have established a schedule, procured medical equipment for training, signed an MOU, hired staff, and received 24 applications from potential students! Our first classes will start in November.

- **Rwanda** - EWH has directly trained 58 students, 35 of whom have graduated and now work in hospitals throughout Rwanda. We are also assisting our educational partner, IPRC, which has registered 120 students of their own in a full-time program. Since the program started in 2009, Rwanda has progressed from a country with almost no trained BMETs to a country with 175 BMETs trained or in training, working in hospitals to improve the health system.

In addition, EWH is training 10 faculty members who will help transition the program into a longterm sustainable endeavor run by IPRC.





- **Honduras** - Started in 2010, the Honduras BMET Training program has been a great success. This year, EWH transitioned the program to our educational partner, the *Instituto Nacional de Formación Profesional* (INFOP), and it is now a fully self-sustaining operation.

Working together with Duke University, we also inaugurated the EWH digital library this year. More than 200 open source documents – all pertaining to the biomedical field, repair, & maintenance – are now available to BMETs all over the world.

We leave Honduras with three trained faculty members and a fully-accredited BMET Training program. INFOP inducted 48 new students this year, with more applicants waiting to be admitted into the program.

Centers of Excellence are state-of-the-art biomedical workshops designed to give BMETs a fully-equipped space to repair biomedical equipment and to train future technicians. These premiere facilities provide BMETs and students with training in management and proper procedures, up-to-date information, and access to the sophisticated testing, measurement, and diagnostic tools they need to understand, manage, and work effectively with modern medical equipment.

In Cambodia, the COE at Calmette National Hospital was recently inaugurated by the King of Cambodia.

In Rwanda, we have put the Kanombe Hospital COE on line and working (complete with tools and instruments), while building another at Ruhengeri Hospital in Musanze.

With the generous support of the GE Foundation, EWH has completed Centers of Excellence at Kintampo, Mampong, Axim, Apom, and Sunyani Regional Hospitals in Ghana. All workbenches, stools, and shelves were locally designed and manufactured. The facilities now have inventories and planned preventative maintenance programs. EWH trained and mentored BMETs in the COEs, and facilitated a biomedical engineering training program between the Sunyani Polytechnic College and the Sunyani Regional Hospital COE. Both organizations are now cooperating to train additional students. We are shortly concluding our operations in Ghana and have achieved all of our goals successfully.



Summer Institute

In much of the developing world, donated hospital equipment lies unused due to the absence of technicians to install and maintain it. In response to this need, EWH sends outstanding engineering students to Nicaragua, Tanzania, and Rwanda every summer to make an immediate contribution to the communities in which they live and work for two months. Following a month of immersive training, EWH students are placed in under-resourced hospitals where they spend the next month repairing vital medical equipment. EWH works in close partnership with Duke University and Texas A&M.

SI 2014 included 71 students from 8 countries (including Denmark, Canada, Germany, Singapore, India, & Saudi Arabia) and 27 different universities. The group comprised 49% women, and 42% students of color. Together, they repaired an estimated \$1.5 million worth of life-saving technology. Repairs were made on any equipment the hospital needed to function, ranging from stethoscopes to ultrasound machines, washing machines to back-up power generators. Students also exercised creative problem-solving skills to perform special projects around the hospitals in collaboration with the medical staff.



Nicaragua

Twenty-five students repaired 188 pieces of equipment, including electrosurgery units, air conditioners, centrifuges, aspirators, and a blood bank refrigerator. They also completed eight special projects, including creating a pediatric play area.



"I'm really grateful to see 'outside of the textbook.' It's important to experience real world problems. ...Whenever I thought about what engineers do, I thought they were the people who sit at a desk with a calculator, very removed from the final product. This experience has definitely shown me there's hands-on stuff engineers can do. I had thought it was a desk job: now I see it's more of way of thinking than any type of job."
-Elliot Russell, Syracuse University

Tanzania

Our 27 students repaired 369 pieces of equipment, including an operating table, an ultrasound machine, and a vaccine refrigerator. They also completed 12 special projects, including installing curtains and heaters in a maternity ward, adding mosquito nets over beds in a pediatric ward, and building 17 beds.

“We went into the operating theater and found two suction pumps that were broken - so they couldn’t do any surgeries. We took the suction pumps and 10 minutes later a guy came running in and said, ‘We need the suction pumps NOW!’ because they had an emergency surgery. We had just finished fixing it, so they used it immediately.”

-Mathias Sørensen, Aalborg University



“We made five incubators work. At [our hospital], no one had been able to use an incubator in four years, and we finally got it working on the last day.”

*-Semira Hissabu,
Technical University of Denmark*

Rwanda

Our newest Summer Institute hosted 19 students in its second year. They repaired \$416,000 worth of equipment in 208 pieces (nearly double 2013!). Students also renovated BMET repair shops alongside our BMET training program students.

“Our biggest accomplishment was installing a patient monitor. They didn’t have any working and didn’t know how to use this one. We had to get the correct manual. I’ve worked with patient monitors before, but I’d never seen this kind and I had all these different things in front of me with doctors watching, but I was able to figure it out with trial and error.” -Laura Alderfer, Rochester Institute of Technology



Student Programs

University Chapters raise awareness among students regarding healthcare challenges that beset the developing world and the medical technology issues unique to resource-poor settings. Participation in EWH Chapters helps students connect to a global network of biomedical engineers committed to solving health challenges and introduces them to ways they, too, can make a difference.

In 2014, 32 student chapters from universities all over the world affiliated with EWH.

Boston University
 California Polytechnic - San Luis Obispo
 Chung Yuan Christian University, Taiwan
 Clemson University
 Cornell University
 Duke University
 Georgia Institute of Technology
 ITESM Monterrey, Mexico
 Lovely Professional University, India
 North Carolina State University
 Northwestern University
 Purdue University
 Robert Morris University
 Rochester Institute of Technology
 Stony Brook University
 Technical University of Denmark

Texas A&M University
 University of California - San Diego
 University of Colorado - Boulder
 University of Connecticut
 University of Illinois - Chicago
 University of Iowa
 University of Missouri - Columbia
 University of New South Wales, Australia
 University of Portland
 University of Rochester
 University of Texas - Austin
 University of Science & Technology, Yemen
 Vanderbilt University
 Virginia Commonwealth University
 Washington University in St. Louis
 Yale University

EWH University Chapters provide students with the unique opportunity to participate in a variety of student programs:



VCU, last year's Chapter of the Year, introduces Girl Scouts to Engineering



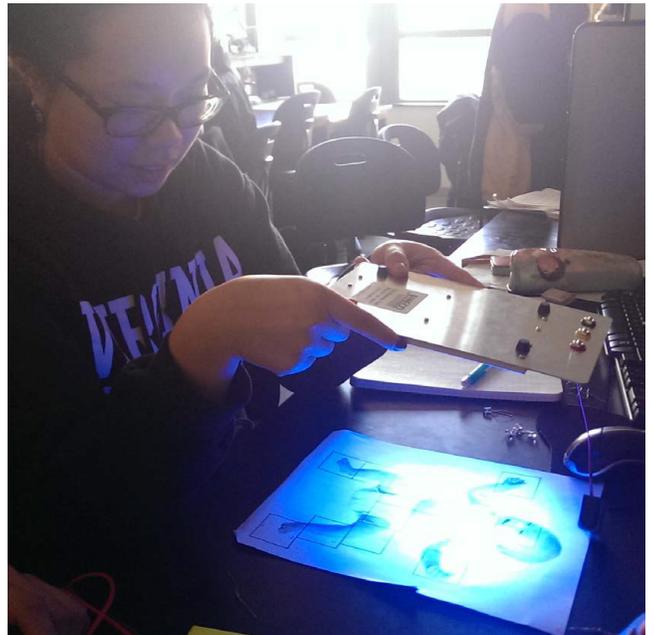
University of New South Wales boasts the first Chapter in Australia!



STEM Outreach - University students volunteer to teach K-12 students, sometimes using EWH-designed Kits, providing young students an introduction to the possibilities of biomedical engineering careers.

Kits provide hands-on training, insight and understanding of important biomedical engineering concepts and the practical electronic fabrication skills needed by both engineers and technicians.

This year, EWH designed eight new Kits and made them available to everyone. We are now selling them on Amazon and our website, creating online video guides, and developing even more curricula for 2015!



Design Competition - EWH Chapters are invited to participate in our annual Design Competition for cash prizes. Through extensive interviews with healthcare providers in developing countries, EWH identifies healthcare challenges specific to the developing world and then asks teams to design new technologies that might deliver the most positive impact for patients in these settings. Teams may also conduct their own research to find useful projects. Fifteen teams competed in the 2014 Design Competition, sponsored by Ortho Clinical Diagnostics.

The 2014 winners are:

1st place: Washington University in St Louis Chapter, ZnDermal: A Transdermal Zinc Delivery System

2nd place: Clemson University Chapter, CryoCover: Low-Cost Neonatal Hypothermia Therapy

3rd place: Cornell University Chapter, Vaccine Refrigeration Device

STEM K-12 Education

This year, EWH partnered with the Biogen Idec Foundation to reach over 1,000 elementary, middle, and high school students with activities such as building phototherapy lights and ECG Simulators. The EWH STEM program introduces challenges in healthcare delivery in developing countries and demonstrates through hands-on learning how science, technology, engineering, and math can help to solve these global challenges.

By inspiring children today to pursue STEM education and careers, EWH is helping to build future generations of biomedical engineers.



Our STEM Education program focuses on including girls and children of color as we work to close the diversity gap and create a more innovative, more creative community of scientists and engineers for tomorrow.

Middle School students from Rocky Mount, North Carolina, complete their Optical Heart Rate Monitor Kit



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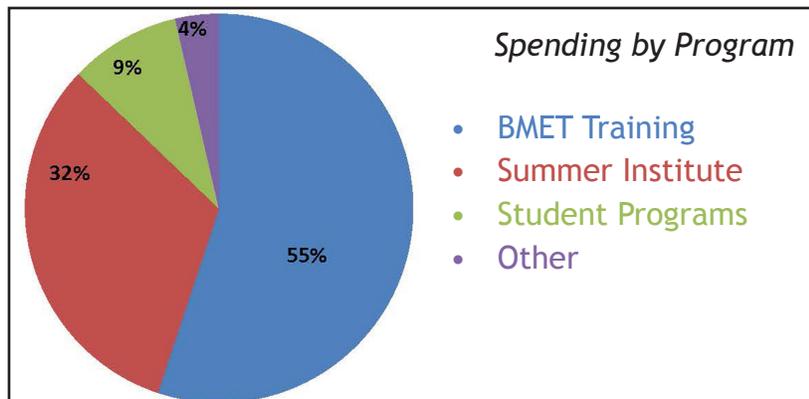
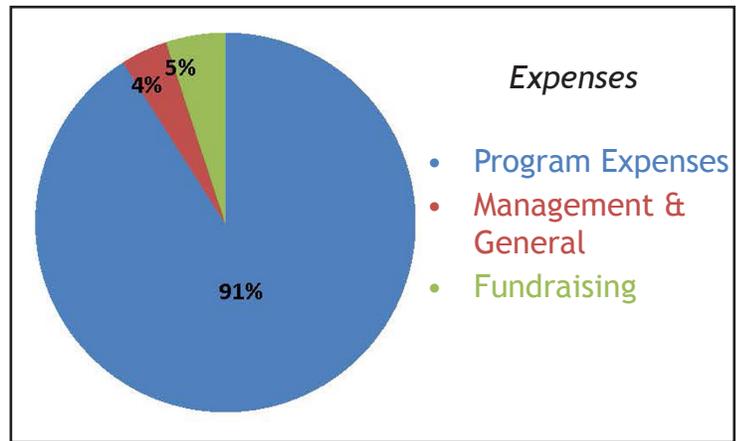
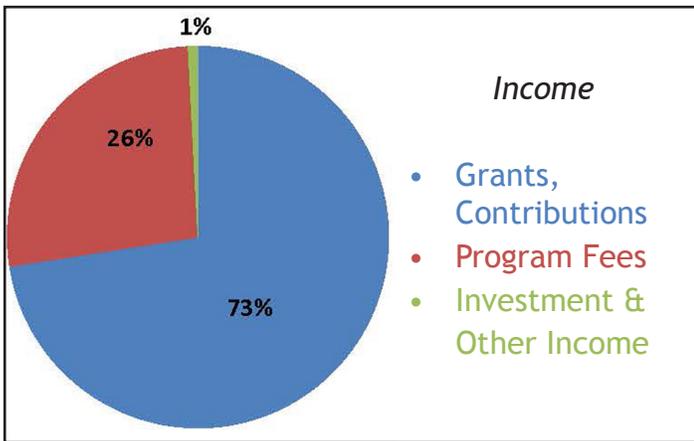
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Engineering World Health Statements of Financial Position

Statement of Activities	FYE 9/30/14	FYE 9/30/13
Revenue, Support, & Other Income		
Grants & Contributions	\$1,538,268	\$1,688,867
Program Fees	564,643	397,980
Investment & Other Income	17,707	24,652
Total Revenue, Support, & Other Income	\$2,120,618	\$2,111,499
Expenses		
Program Expenses	\$1,676,750	\$1,520,566
Management & General	73,075	109,198
Fundraising	92,487	120,013
Total Expenses	\$1,842,312	\$1,749,777
Net Assets		
Change in Net Assests	\$278,306	\$361,722
Net Assets at Beginning of Year	\$1,274,549	\$912,827
Net Assets at End of Year	\$1,552,855	\$1,274,549



2014 Funding Partners

Foundation and Corporate Donors:

BD	National Instruments
Biogen Idec Foundation	National Society of Black Engineers
Covidien	The Donald & Alice Noble Foundation
Derfner Foundation	Ortho Clinical Diagnostics, Inc
FJC	Tensentric
GE Foundation	
Hamilton Roddis Foundation	

Special thanks to the Wallace H. Coulter Foundation for the early and generous support that enabled us to grow.

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Thank you to everyone who has supported Engineering World Health! Your generous contributions build a healthier future.

Saving Equipment Is Saving Lives



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