



engineeringworldhealth

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**Annual Report**  
**October 2016—September 2017**



## Letter from the Board Chair and the CEO

### Dear Friends of Engineering World Health,

The past year has been turbulent: everything from earthquakes and hurricanes to global political upheavals. It can feel exhausting. But this is exactly when our work matters most.

**Engineering World Health builds connections. It builds competence. It builds resilience.**

Whether a Summer Institute participant is teaching hospital technicians in Tanzania how to build infant warmers, or a January Institute participant in Guatemala is learning the skills she needs to design for low-resource environments, or a biomedical engineering technician (BMET) student in Nigeria is accessing our digital, open-access resource library, our goal is the same: to create working, resilient healthcare systems. We improve the ability of low-income country hospitals to provide quality services to more people, every day.

This past year, in nine countries, Engineering World Health volunteers, students, and professionals put their skills to work alongside local hospital staff, repairing hospital equipment in extremely resource-poor environments and building local capacity to sustain it.

The participants in our 2017 Summer & January Institute programs fixed 1,403 pieces of hospital equipment - including oxygen concentrators, infant incubators, patient monitors, and much more - worth an estimated \$2.8 million.

In addition, each team worked closely with hospital staff to complete a project designed to have a lasting, tangible impact on the hospital. A few examples: In Nicaragua, one group constructed a new maintenance workshop. In Tanzania, one team repaired eight wheelchairs while another designed and constructed five pairs of pediatric crutches. In Rwanda, a team designed and installed a rack to securely store 54 oxygen cylinders. Multiple teams installed hand sanitizer dispensers and water filtration systems, built bili lights for jaundiced infants, and translated instruction manuals for equipment.

In Uganda, for the first time, we built teams comprising two Duke Engage students and one local, Makerere University, student. The program offers a unique focus on design, with participants working closely with a variety of medical centers, including the Katalemwa Cheshire Home, a rehabilitation center that creates assistive devices for children with disabilities. The Institute was so successful that EWH is expanding our Uganda presence to increase the number of summer students and adding a January Institute in partnership with the University of New South Wales.

**We build sustainable capacity.**

So many countries suffer from an inadequate supply of biomedical engineering technicians. In 2017, in Nigeria and Ethiopia, we partnered with local governments and schools to train

engineers to become teachers of BMETs - ensuring that, in the future, there will be a trained workforce for this vital service. Additionally, EWH transitioned programs to local control in Honduras, Rwanda, and Cambodia.

Engineering World Health focuses on education - for university students and developing world BMET students - because we believe knowledge builds resiliency, global understanding, and partnership. When it's an American engineer designing equipment with low-resource environments in mind, or a Rwandan BMET using internet forums and international contacts to troubleshoot hospital equipment, hospitals, patients, and countries all benefit.

We are grateful to our partnering donors, universities, and Ministries of Health who understand that teaching sustainability and adaptability is crucial to building resilient and accessible health care. Resilience comes from people who appreciate the importance of supporting young people who give of their time and energy, enthusiasm and skill, to improve the future of health care in some of the world's most resource-poor communities.

Thank you,



*Michael R. Tracey, Ph.D.  
Chair of the Board of Directors*



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



## Our Mission

***To inspire, educate, and empower the biomedical community to improve healthcare 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.

***EWB 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.





## Summer & January Institutes

The EWH Summer & January Institutes recruit exceptional students to live and work in developing countries, fixing equipment, training and learning from staff, and experiencing first-hand what low-resource hospitals need so that as they go forward in their engineering careers, they can creatively meet those needs.

136 participants joined the Summer & January programs in seven countries this year. The participants, 55% of whom were women, carried passports from 20 countries and represented over 30 universities. Together, they repaired 1,403 pieces of equipment, worth an estimated \$2.8 million.

In 2017, EWH ran three January Institutes and five Summer Institutes. To accomplish this, we have expanded our university partnerships to include Duke University, Texas A&M University, the University of New South Wales, the Technical University of Denmark, Rochester Institute of Technology, George Mason University, the Nordic Five Tech Alliance, and Makerere University.



*“The most significant moment during my time in Cambodia was fixing a centrifuge for the hospital’s STD clinic when both had broken at the same time. They couldn’t continue to work without a centrifuge, so it was a very rewarding repair.” — Patrick May, Cambodia*

January Institute Country	University Partner	Number of Participants	Pieces of Equipment Returned to Service	Estimated Value
Cambodia	UNSW	23	252	\$504,000
Nepal	SI Alumni	4	32	\$64,000
Guatemala	RIT & GMU	17	76	\$152,000

Summer Institute Country	University Partner	Number of Participants	Pieces of Equipment Returned to Service	Estimated Value
Nicaragua	-	11	223	\$446,000
Rwanda	TAMU	16	160	\$320,000
Uganda	Duke	13	105	\$210,000
Tanzania	Duke	24	355	\$710,000
Nepal	Nordic 5 Tech	28	203	\$406,000

*"I have learned a great deal about electronics, troubleshooting techniques, and gained valuable perspective on issues of global health. I feel like I have come a long way from where I was in the beginning of the program, and for that I am proud." — Kelsey Li, Uganda*

*"Our greatest accomplishment was training the staff. They were very interested and you could see they really wanted to learn how to use the equipment to help patients." — Indri Lynarko, Cambodia*



*"We fixed a hot water heater. That's what we were appreciated for the most. It was nice to see the hospital start using it right away. The manager has thanked us for it every time he sees us and asks us to fix something else." — Kyle McCarry, Tanzania*

*"This program has inspired me to continue helping developing nations. The Summer Institute sets you up with the right mindset—asking people what their problems are and listening to their ideas rather than applying your own assumptions." — Emily Weller, Tanzania*



*"Seth and I retrieved six IV pumps from the medical equipment graveyard in Hospital Asunción. By mixing and matching working parts among those six pumps, we were able to fix three of them. One was put in the neonatal ward, while another was put in the pediatric ICU, and the last one was waiting for a new home." — Kevin Smith, Nicaragua*





*"I've developed a new mindset regarding international work, and how much of an international exchange it can be. There is so much that I learned just through talking to local Nicaraguans, about their history, their lifestyle, their mindset, and I've been able to use my skills to help them. This exchange has become a focus of mine—it embodies what I would like to do in the future as a career, if possible."*

— Janaye Matthews, Nicaragua



## 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 2017, 50 student chapters from universities all over the world affiliated with EWH.

### US Chapters

Arizona State University  
Binghamton University  
Boston University  
California Polytechnic Institute-San Luis Obispo  
Clemson University  
Cornell University  
Duke University  
Elon University  
Georgia Tech  
George Washington University  
Johns Hopkins University  
Michigan Tech University  
North Carolina State University  
Northeastern University  
Northwestern University  
Purdue University  
Santa Clara University  
St. Philip's College  
SUNY at Buffalo  
SUNY Jefferson

Syracuse University  
Texas A&M University  
University of Arkansas  
University of Bridgeport  
University of California-San Diego  
University of Connecticut  
University of Illinois-Chicago  
University of Maryland  
University of Minnesota  
University of North Carolina  
University of Portland  
University of Texas-Arlington  
University of Texas-Austin  
University of Texas-Dallas  
University of Wisconsin  
Vanderbilt University  
Virginia Commonwealth University  
Washington & Lee University  
Washington University in St. Louis  
Western New England University

### International Chapters

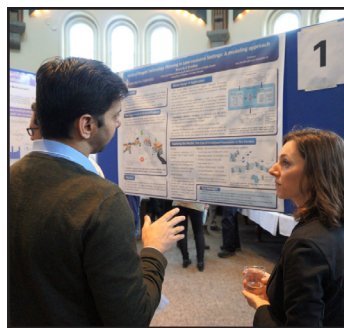
Autonomous University of Mexico State  
Chung Yuan Christian University, Taiwan  
Makerere University, Uganda  
Technical University of Denmark  
University of Aalborg, Denmark

University of Ghana  
University of New South Wales, Australia  
University of Sheffield, UK  
University of Toronto, Canada  
University of Twente, The Netherlands

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



*The University of Toronto Chapter hosted its third global health symposium.*



*The Makerere University Chapter welcomed first year biomedical students with the Freshmen Challenge Design Competition.*







**STEM Outreach** – Summer Institute participants in Tanzania had the opportunity to return to the School of St. Jude in Arusha and lead a variety of STEM lessons with the students.

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**Kits** provide understanding of important biomedical engineering concepts and introduce the hands-on electronic fabrication skills needed by both engineers and technicians.

Our Summer Institute participants in Rwanda visited the Agahozo Shalom Youth Village to build Kits with the students.



**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 needs specific to the developing world and then challenges teams to design new technologies that might deliver the most positive impact for patients in these settings.

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The 2017 winners are:

*1st place: Purdue University Chapter, AutoCPR: Low Cost, Accessible CPR*

*2nd place: Chung Yang Christian University Chapter, Vital Aid: Patient Monitoring for Large Casualty Events*

*3rd place: Vanderbilt University Chapter, Solaleo: Low Cost Vacuum Sterilization*

## BMET Training & Centers of Excellence

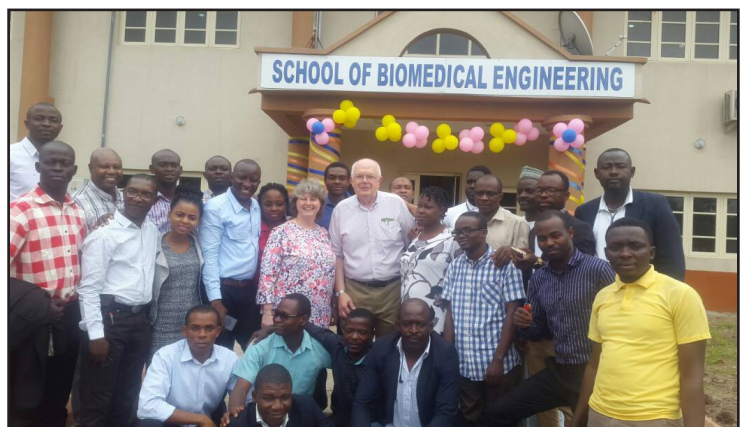
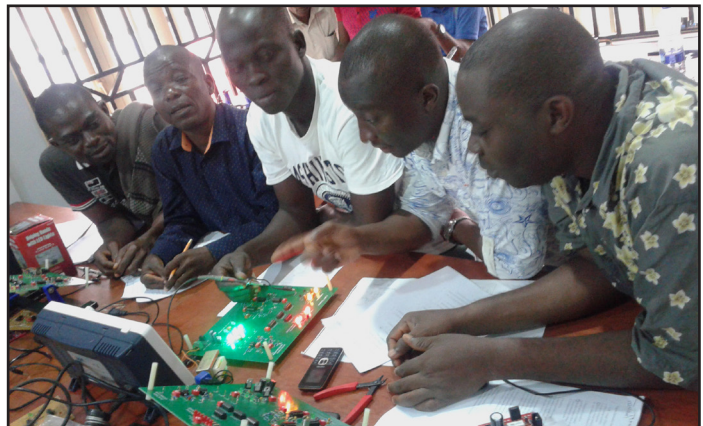
While our Summer & January Institutes teach university students the impact of their engineering work and the value of good design in order to foster the next generation of engineers, EWH also works to build more sustainable healthcare systems right now.

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 6 countries – Rwanda, Honduras, Ghana, Cambodia, Nigeria, and Ethiopia – to train local hospital workers and students to become fully qualified BMETs. Each program is specifically designed to fit the needs of the local population. We also train future trainers to take over the program, with the ultimate result being that we leave the countries we work in with a sustainable source of well-trained BMETs.

### Highlights of 2017:

*Nigeria* – This year, Nigeria accredited the BMET Training program at the Lagos University Teaching Hospital.

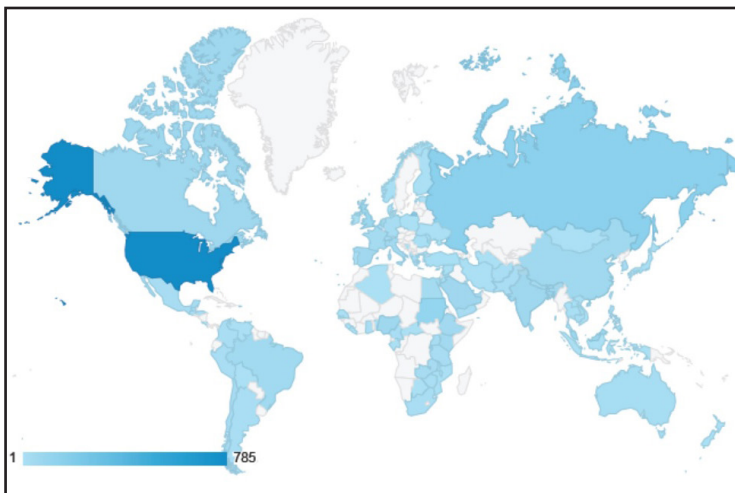
25 BMET students graduated, and we completed work on the Center of Excellence. A new class will begin in 2018.







*Ethiopia* – The BMET program in Ethiopia to train the trainers concluded in June, 2017. This year, 20 students graduated from the program at the Tegbareid Technical and Vocational Training College. EWH also installed instruments and equipment at the Training College, and completed the Center of Excellence at Alert Hospital in Addis Ababa.



*BMET Library* – Now in its second year, EWH's online, open-access BMET Library continues to be a resource for technicians and engineers around the globe.

Over 1500 users visited the library this year, with Sudan, Malaysia, India, and Nigeria among our top 10 user-locations.

The Library – which can be found at <http://library.ewh.org/> – now hosts over 420 articles and 49 complete books focused on troubleshooting, healthcare technology maintenance, and device repair.



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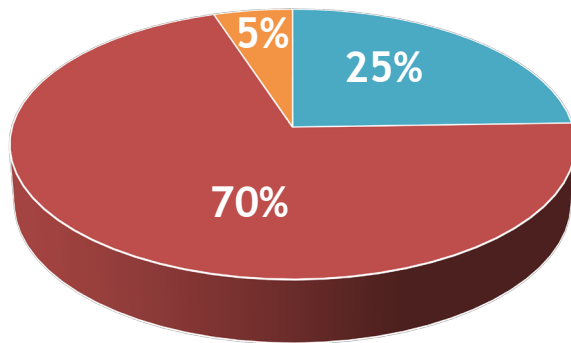
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## Engineering World Health Statements of Financial Position

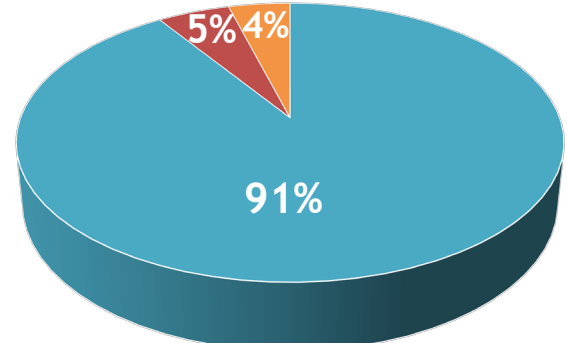
Statement of Activities	FYE 9/30/17	FYE 9/30/16
<b>Revenue, Support, &amp; Other Income</b>		
Grants & Contributions	\$248,949	\$1,434,313
Program Fees	715,004	723,584
Investment & Other Income	51,725	38,853
Total Revenue, Support, & Other Income	\$1,015,678	\$2,196,750
<b>Expenses</b>		
Program Expenses	\$1,557,672	\$1,779,071
Management & General	86,871	73,590
Fundraising	74,042	64,049
Total Expenses	\$1,718,585	\$1,916,710
<b>Net Assets</b>		
Change in Net Assets	\$(702,907)	\$280,040
Net Assets at Beginning of Year	\$1,999,186	\$1,719,146
Net Assets at End of Year	\$1,296,279	\$1,999,186

Income



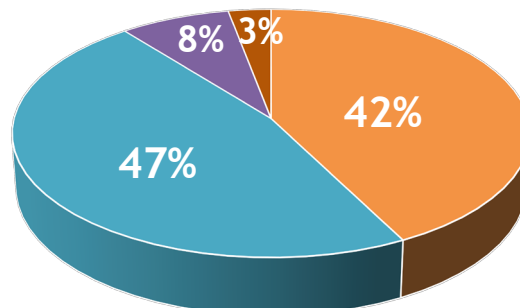
•Grants, Contributions •Program Fees •Investment & Other

Expenses



•Program Expenses •Management & General •Fundraising

Spending by Program



•BMET Training •Summer Institute •Student Programs •Other

## **2017 Funding Partners**

### **Foundation and Corporate Donors:**

Access Health Care Nepal	Hamilton Roddis Foundation
Corning Foundation	Integra Foundation
Danaher	National Instruments
Derfner Foundation	The Donald & Alice Noble Foundation
FJC	Tensentric

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

### **Individual Donors:**

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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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