

RICE360

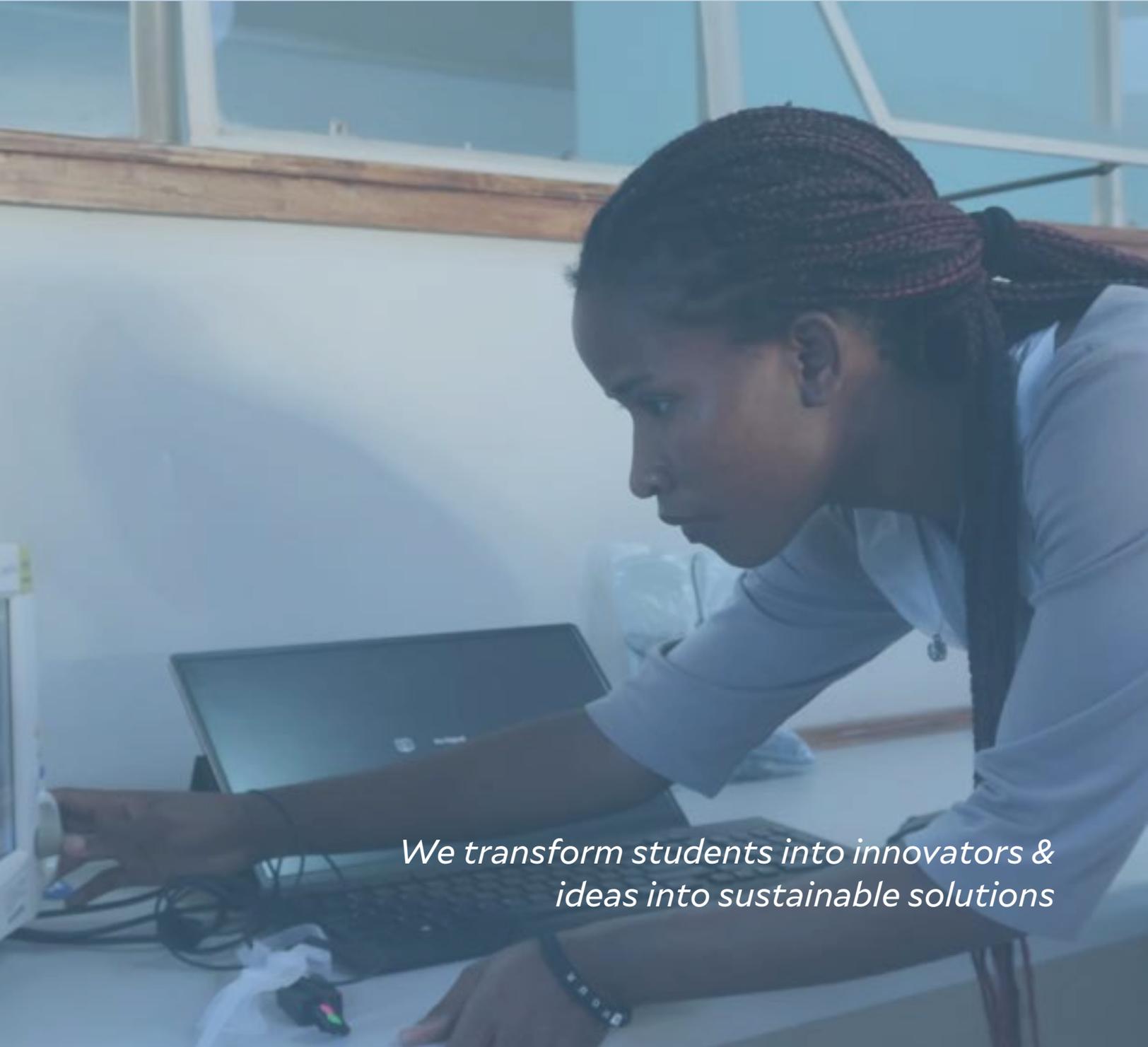
INSTITUTE FOR GLOBAL
HEALTH TECHNOLOGIES

2021 - 2022



YEAR IN REVIEW

*We transform students into innovators &
ideas into sustainable solutions*





“Coming into (the Rice360 internship), I knew that I was interested in global health. However, six weeks later, I knew with certainty that the impact made by these projects is so incredible that I can’t see myself doing anything but global health work in my career. Not only did I gain hands-on experience (and I mean hands-on: sawing, drilling and even crawling headfirst into an oil drum to install UV lightbulbs) that equipped me well for future engineering projects, but I also formed unique relations, professional connections, deep and continuing friendships with the other interns, and even a new friend from Malawi. I now feel like a real engineer – and not only that but an engineer fueled by a genuine passion for serving others around the world.”

VANESSA GARLEPP
CLASS OF 2023, BIOENGINEERING

About the front cover: Global Health Fellow, Maureen Mebo Valle, setting up and testing BreathAlert before a clinical study begins in Malawi.

LETTER FROM OUR CO-DIRECTORS



Dear Friends,

Progress continues! When we founded Rice 360, we could not have imagined where we would be today—two years into a global pandemic while continuing innovations for global health.

Students and engineers at Rice and at our partner institutions around the world have been busy this year developing technologies to address global health challenges in low-resource settings. You’ll read about some of their exciting projects in the subsequent pages.

We are deeply grateful to the many partners and funders who make innovation possible through Rice360. It is our great privilege to be part of a global team that is dedicated to solving problems together.

Thank you for continuing on this journey with us.

Wishing you all the best,

Rebecca and Maria

LETTER FROM OUR ADVISORY BOARD CHAIR

Dear Friends,

On behalf of the Rice360 Advisory Board, I would like to thank the many supporters of Rice360 Institute of Global Health Technologies, our global partners, and Rice University’s leadership for helping make this year successful. Despite continued global challenges, Rice360 and its partners made fantastic progress continuing the development of technologies and expanding invention education this year. I appreciate the many ways you support Rice360 and make its success possible.

It is inspiring to see the talented minds of Rice360 interns, fellows, and innovators at Rice University and at partner universities in Africa making a difference and solving global health challenges. I am proud to support Rice360 and encourage you to continue supporting innovative education and technologies for global health.

Jay Collins



Rice360 Education Program Highlights



Global Health Technologies Minor Women's Health - IUD Development

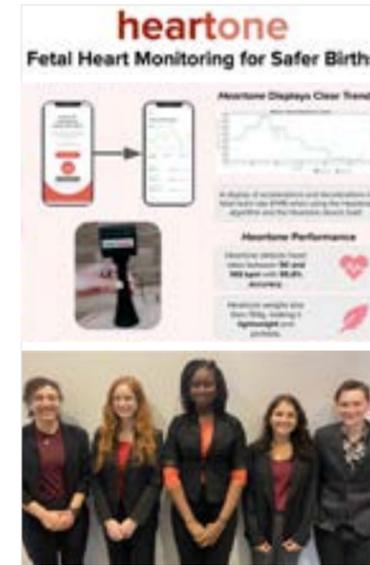
Team gIUDe, winner of the 2022 Rice360 Innovation Award, designed an Intrauterine Device (IUD) to reduce pain during insertion. In addition to being a reliable method of family planning, IUDs can reduce uterine bleeding and protect the uterine lining from dysplasia (pre-cancer or cancerous changes). However, the insertion procedure for an IUD can be extremely painful, which makes it not readily selected by patients. Team gIUDe designed a novel IUD that reduces the pain associated with the IUD insertion procedure and ultimately allows for accessible reproductive health and planning.

gIUDe Senior Design Team: (Class of 2022) Magdah Omer, Lily Didcock, Kaitlyn Heintzelman, Nneoma Ome, Adeola Dosunmu.



Global Health Technologies Minor Neonatal Health – Low-cost Solution for Gastroschisis

Gastroschisis is a birth defect in which a baby's intestines are exposed outside of the body through a hole in the abdomen. High income countries use a treatment with an approximat 99% survival rate that places the intestines in a silo bag to protect the intestines and funnel them back into the body. However, almost 0% of newborns with gastroschisis survive in Africa due to a lack of accessibility to manufactured silo bags. Team No Mo' Silo was awarded Best Technology for Low-Resource Settings Design at the 2022 George R. Brown Engineering Design Showcase for their functional, low-cost solution to gastroschisis to help enable greater survival of newborns with this birth defect in tertiary care hospitals in Uganda. Team members were Vanshika Jhonsa '23, Shreya Jindal '24, and Shriya Shah '23.



Global Health Technologies Design Competition International Innovation and Design

Rice360 hosted its 12th annual design competition in April 2022. Participants included teams from universities in Africa and the United States. The teams presented their global health innovations to a panel of judges who selected the winners.

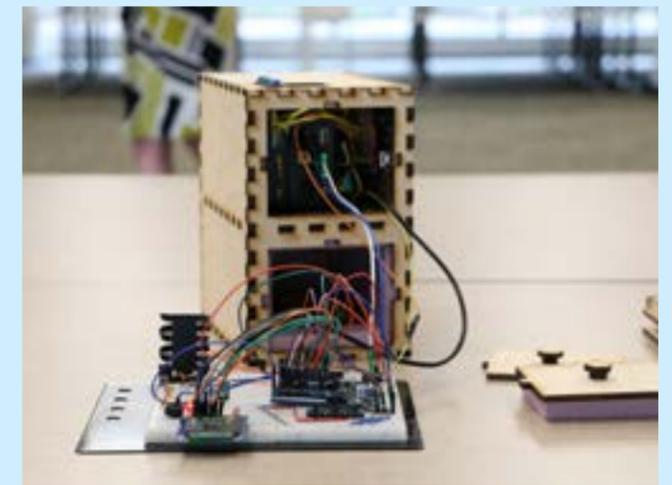
Team Baby Beatz, from Georgia Tech, was awarded first place for their prototype Heartone, a low-cost fetal heart monitor app.

Team EquinOx, from Johns Hopkins University, took second place for its design to address health equity in blood-oxygen monitoring.

Team Modulo Prosthetics, a haptic, low-cost thumb prosthetic designed at University of Pennsylvania, won third-place

Team Chrysalis, from the University of Pennsylvania, won the People's Choice Award for its design of a swaddle that helps newborns suffering from neonatal abstinence syndrome.

Read more about the competition and finalists online. [RICE.EDU/NEWS](https://www.rice.edu/news)



Rice360 Global Health Technologies Internships Global Health – Wastewater Sampling for Remote Settings

2021 Rice360 and SEED interns worked on the next iteration of a water sampling system for remote settings including global low-resource settings. The device is used to identify tainted or contaminated water in remote areas that do not have access to laboratory equipment. It is a portable device and uses battery power to incubate multiple petri-film samples in a single batch to test for e. Coli, which is an indicator of the water's overall purity. This type of testing device is crucial to reducing illnesses related to water-borne pathogens.

Petri-FI Design Team: Sara Barker '22, Nancy Lindsey '24, Teja Paturu '22, and Kenton Roberts '24.



We discover & evaluate the biological, social, economic, & structural factors that give rise to health inequities

Maternal and Newborn Health SPOTLIGHT

On April 12, 2022, Rice360 Institute for Global Health Technologies hosted Dr. Angelica Floren, MD, to share her lessons regarding a holistic approach to improving maternal and newborn health care in the Dominican Republic.

You can read more about her work at [RICE360.RICE.EDU/NEWS](https://rice360.rice.edu/news)

Innovations for the Marketplace



Newly launched: BiliDx Bilirubinometer!

With our partners at **3rd Stone Design**, BiliDx (formerly BiliSpec) has been launched and is available at **NEST360** implementation sites. Thank you to the team, including Rice researchers Alyssa Shapiro and Jessica Anderson, who worked to show the effectiveness of these low-cost total serum bilirubinometers. An article on their work was **recently published in *Pediatrics***.



Celsi Monitor (with 3rd Stone Design)

We completed verification and validation activities for Celsi Monitor, a continuous temperature monitor that consists of a reusable temperature probe, reusable abdominal belt, and monitor. We completed clinical testing and are currently in the process of obtaining a CE Mark for the product.



Celsi Warmer (with 3rd Stone Design)

We continued technical development of Celsi Warmer, a conductive warmer that uses a physiological closed loop to achieve the desired infant temperature. We produced an alpha prototype and successfully completed clinical and laboratory assessments of the prototype.



BreathAlert

We continued development of BreathAlert, a respiratory rate monitor that also detects apnea. BreathAlert is designed for use with Celsi Monitor as a dual parameter monitor that displays temperature and respiratory rate and alerts the caregiver during apneic events. It is being evaluated against a model that mimics breathing patterns of a preterm baby and through clinical evaluation in adults and healthy term infants in the US.



Colostomates

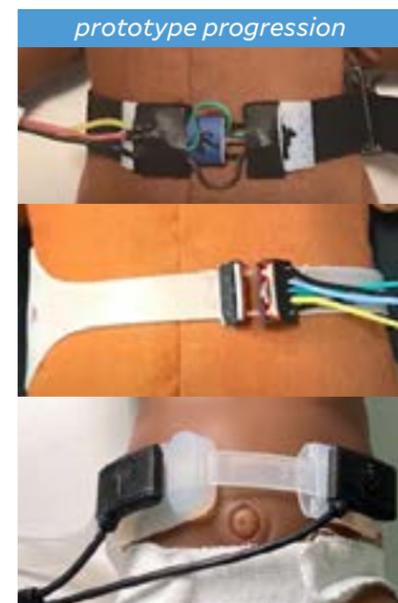
We continued refinement of an affordable, sustainable ostomy bag developed at Rice360. Improvements include updated materials, lighter weight fabrics, wearability improvements, and updates to making the seals more leakproof. Trials with ostomates will begin in 2022.

Global Health Technologies Fellowship Spotlight

Rice360 Institute for Global Health Technologies offers post-baccalaureate fellowships for exceptional early-career engineers with an interest in medical technology for low-resource settings. During their time as Rice360 fellows, they become part of our international teams and often travel to support the development of Rice360 supported projects.



JOSH COYLE
PROJECT: BREATHALERT



prototype progression

Recently, Rice360 fellow, Josh Coyle, went to Malawi to work with our colleagues at Queen Elizabeth Central Hospital on BreathAlert. The following is his account of his time in Malawi.

The BreathAlert project seeks to provide reliable, accessible respiratory monitoring for premature infants no matter where they are born. The device empowers caregivers to detect, diagnose, and treat respiratory illnesses which often occur in small and sick newborns and can cause disproportionate harm in low-resource settings.

When I joined Rice360 as a fellow nearly a year ago, I recognized this as one of those rare chances to combine my skills and passion into a cause that unequivocally matters. I had aspired for an opportunity like this since high school; and I had spent my years at the University of Washington working to become qualified for it. Joining Rice360 meant moving from aspiration to action. The transition required frequent confrontation with challenges, but soon the process of improving the BreathAlert became truly rewarding. A few weeks ago, it culminated with a study in Malawi.

During my first few months at Rice360, we completely redesigned BreathAlert. Our team made a cautious leap to an entirely new sensor design, straying from one that had been in development since 2014, when undergraduates conceived the device.

The next few months were defined by meticulous questioning, testing, and questioning again. If this sensor is too bulky, will it still detect the smallest baby's smallest breath? If that cable is too long, will we lose the signal? And what if it is too short? The uncertainties compounded. I approached them with the best of my technical ability, often meeting my limits and relying on teammates in Houston, California, and Malawi for support.

[Read more of Josh's and our other GLHT Fellows' accounts in their blog series.](#)

[RICE360.RICE.EDU/FELLOWSHIP](https://rice360.rice.edu/fellowship)

Rice360 Global Health Fellows

Abby Chapin | Colostomates

Josh Coyle | BreathAlert

David Kimmey | Celsi Warmer

Shababa Matin | LUCIA & Usability Studies

Natalie Mitchell | Validation Studies with Celsi Monitor & Celsi Warmer

Invention Education Design Studios at African Partner Universities

Along with several African universities, Rice360 is part of an ecosystem of innovators who work to invent the next generation of technologies that support newborn care and other global health needs. Universities in Africa have established six partner design studios in Ethiopia, Malawi, Nigeria, and Tanzania.



Malawi | The Malawi design studios hosted the 4th Annual Malawi Innovators Design Competition in February 2022. The design studios at Malawi University of Science and Technology (MUST) and Malawi University of Business and Applied Sciences (MUBAS) received an invitation from the State House for the President of Malawi, Dr. Lazarus Chakwera, for their work mass-producing and distributing 80,000 face shields during COVID-19. The goods and services produced for local businesses and hospitals by the design studios established new forms of revenue generation (~\$40,000) and local partnerships.



Tanzania | The Dar es Salaam Institute of Technology (DIT) design studio student innovators won the People's Choice Award at the 2021 Rice360 Undergraduate Global Health Technologies Design Competition. DIT hosted its own design competition with the winner being a student team that designed a Bubble CPAP device. The winners' CPAP design moved on in May 2022 to receive first place in the National Competition in Science, Technology, and Innovation. The award was presented by the Vice President and the Prime Minister of Tanzania.



Nigeria | The design studio at the University of Ibadan (UI) successfully hosted the first annual design competition, convening invention education stakeholders from across Oyo State, Nigeria. An incubator designed for electrical outages was the winning entry. At the design studio at University of Lagos (UNILAG), institutional stakeholders acted as faculty project mentors for teams of undergraduate student interns that benefited from the multi-disciplinary structure. The Deputy Vice Chancellor of UNILAG attended the internship final project exhibition and presented student awards.

Invention Education Toolkit

In October 2021, Rice360 launched the Invention Education (IvE) Toolkit, an open-source platform for educators that enables the sharing of knowledge and experiences to support the implementation of invention education in sub-Saharan Africa.

The IvE Toolkit was developed by a team of collaborators from 16 institutions across ten countries in Africa, Europe, and North America. The Toolkit includes key literature, best practices, case studies, and teaching and design resources to help faculty build a community of invention education at their universities.



Partner & Student Awards

Rice360 Innovation & Leadership Award, 2022

Dr. Anne Hansen received the Rice360 Innovation & Leadership award for her work to develop and implement national standards for newborn care in Rwandan hospitals.

Rice360 Global Champion Award, 2022

Ginger Sall '71 was awarded with the first Rice360 Global Champion Award for her individual commitment to global health and improving health equity for all people worldwide.

Rice360 Alumni Leadership Award, 2022

Dr. Tara Barry '10 received the Rice360 Alumni Leadership Award in recognition of her work in establishing health equity for patients who undergo surgery.

Rice360 Impact Award, 2022

Team Epiwater and Team HydronaFlask received the Rice360 student impact award. They partnered with University College Hospital & University of Ibadan in Nigeria to expand access to community level surveillance of COVID-19 through improved wastewater sampling, with both projects continuing onward through these partnerships.

HydronaFlask Senior Design Team: (Class of 2022)

Aayushi Shah, Sally Yan, Meheret Adera, Annie Nguyen.

Epiwater Senior Design Team: (Class of 2022)

Celeste Traub, Oscar Soto, Lucas Esnaola, Arinze Appio-Riley, Emily Zhou, Kung Narkcharoen.

Rice360 Service and Advocacy Award, 2022

Bhavya Gopinath '22 and Sachi Khemka '22 received the Rice 360 Student Service and Advocacy Award for their exemplary service and advocacy for equity in global health. This year Bhavya and Sachi formed and led the "Check the Tech" Alternate Spring Break experiential learning opportunity for Rice students, developing a curriculum to explore racial disparities in health technology, in partnership with Rice360, Johns Hopkins University, and others, and are currently working to disseminate key findings from their work.

Rice360 Innovation Award, 2022

We are honored to recognize the gIUDe capstone design team with the Rice360 Innovation Award for their creativity and ingenuity leading to innovations in global health technologies. The gIUDe team developed a novel IUD design to reduce pain during insertion and improve access to family planning.

gIUDe Senior Design Team: (Class of 2022) Magdah Omer, Lily Didcock, Kaitlyn Heintzelman, Nneoma Ome, Adeola Dosunmu.

Rice360 Student Leadership Award, 2022

Alex Lammers '22 received the Rice360 Student Leadership Award, for his notable contributions to Rice360 during his time at Rice, which included helping launch a new innovation design studio in Malawi as an intern, serving as a Rice360 teaching assistant, providing core leadership for the 2020 internship program, and being a key contributor to training videos for the NEST360 initiative, an international alliance to end preventable newborn deaths in African hospitals.

Advisory Board

Board Members

John Abikhale, MD '88

Steven Alley, MD

James "Jim" Barry, '84 MBA, PA

Subha Barry '85 MBA, PA

Mamadou Beye

Jay Collins, MBA, '68, Board Chair

Renuka Gadde, MBA

Elizabeth Gillis

Leith Greenslade, MBA, MPA

Michael Merson, MD

Elizabeth Molyneux, FRCPC, FRCM, DSC hc, OBE

Josh Ozer '11

Barry Rabner

R. John Stanton, Jr. '62

Amy Sutton, '89/'90

Guillermo "Memo" Treviño '83

Christina Lagos Triantaphyllis '08

Youseph Yazdi '87, MBA, PhD

Members Emeriti

Robert E. Campbell, PhD

Andrew "Andy" Miller '09

Leighton Read, MD '73

Daniel Watkins, PhD '84

Lewis T. "Rusty" Williams, '71, MD, PhD

Members Ex-Officio

Jim Crownover, '65

Ways to Give

Thank you to our community of generous supporters that make the work at Rice360 possible.

MAKE A GIFT BY MAIL

Rice University Attn: **Emily Bull_Rice360**

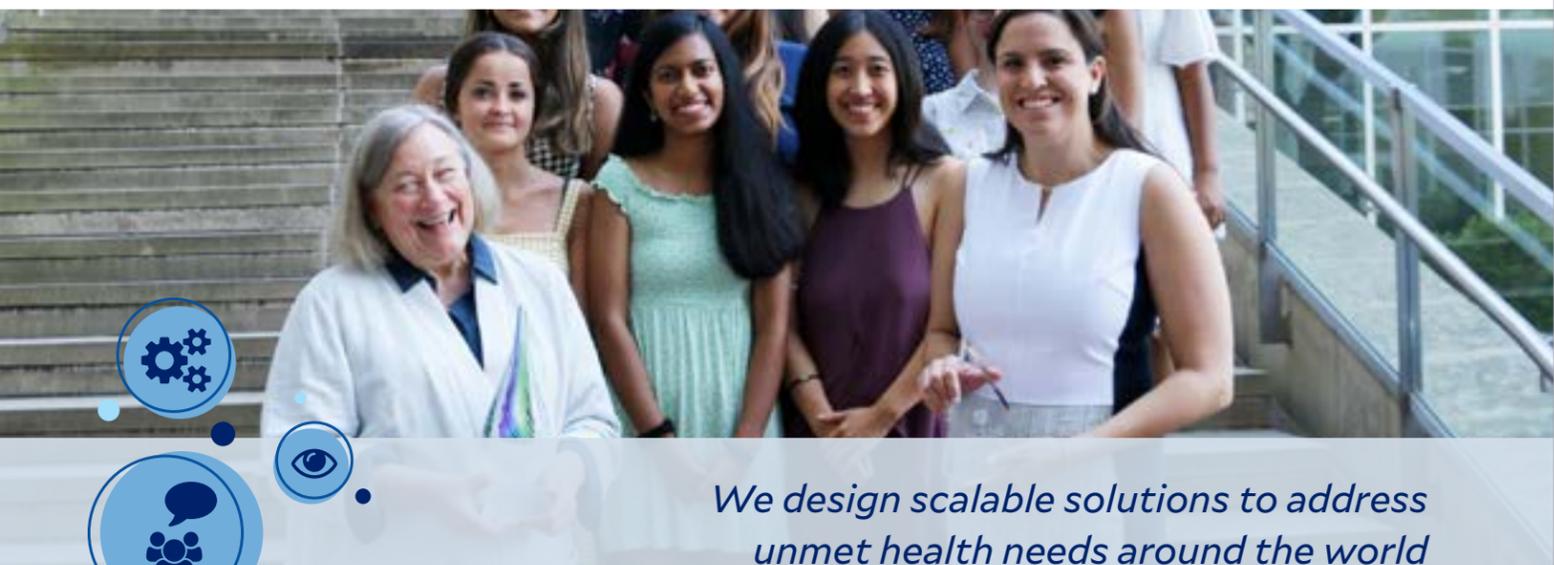
Office of Development MS-81

P.O. Box 1892

Houston, TX 77251-1892

MAKE A GIFT ONLINE

riceconnect.rice.edu/donation/rice360



We design scalable solutions to address unmet health needs around the world



RICE360
Institute for Global Health Technologies

About the back cover: Student Interns, part of Team NESTation, present their design at the 2022 Internship Showcase. Their design's goal is to improve biomedical technology support stations in low-resource settings.



*WE INNOVATE
FOR GLOBAL IMPACT*

RICE360@RICE.EDU | RICE360.RICE.EDU