

In the Department of Macromolecular Science and Engineering at CWRU, Erin Xu '18 tests the stress and strain properties of different polymers as part of the chemical synthesis of a new adaptive plastic film.



Rachel Wang '17, pictured with her research mentor Dr. Ken Singer, measures and compares fluorescent dyes in a CWRU Physics lab to help develop new methods of multilayer optical storage.

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HB.edu/SREP



curricular **FUSION**

Dr. Crystal Miller holds the Kettering Fund Chair for Student Research at Hathaway Brown, and she serves as the Director of the Science Research & Engineering Program. She also is an adjunct instructor

at Case Western Reserve University and a visiting scientist at Cleveland Clinic. She earned an undergraduate degree in neuroscience and English from Muskingum College, and a Ph.D. in neurosciences from CWRU. She obtained her own grant funding for postdoctoral research on the role of inflammation in Alzheimer's disease, and she spent a decade as a bench scientist before she came to HB.

Patricia Kelly Hunt is the Founding Director of the SREP. During her tenure, she has been named one of the Top 20 Teachers in the U.S. by *USA Today*, and she has been honored by the Siemens Foundation and Society for Science and the Public. She holds an undergraduate degree in geology from Case Western Reserve University and a Master of Science in geochemistry from Kent State University. Prior to founding the SREP at HB in 1998, she had a 13-year career as a researcher at BP, authoring numerous technical publications and earning three U.S. patents.

Miller and Hunt bring the strength of scientific knowledge, insight, and professional relationships to bear in the SREP. Through their efforts, HB students have been given opportunities to contribute to hundreds of medical, engineering, physics, chemistry, space flight, biology, archaeology, robotics, astrophysics, and other research projects at world-class institutions including CWRU, NASA Glenn, University Hospitals, Cleveland Clinic, and the Cleveland Museum of Natural History.

FOR MORE INFORMATION:

Please contact Dr. Crystal Miller at cmiller@hb.edu or 216 320 8796 EXT 7249.

ON THE COVER:

Alanna Brown '17 works with her research mentor Dr. Arne Rietsch to determine how bacteria infect host cells through her research in the CWRU Department of Molecular Biology and Microbiology. All photos by Jason Miller.

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WE LEARN NOT FOR SCHOOL, BUT FOR LIFE



Girls K-12 Coed Early Childhood
Shaker Heights, Ohio

The Science Research & Engineering Program is part of Hathaway Brown's innovative Institute for 21st Century Education. Learn more at www.hb.edu/institute.

proven
RESULTS

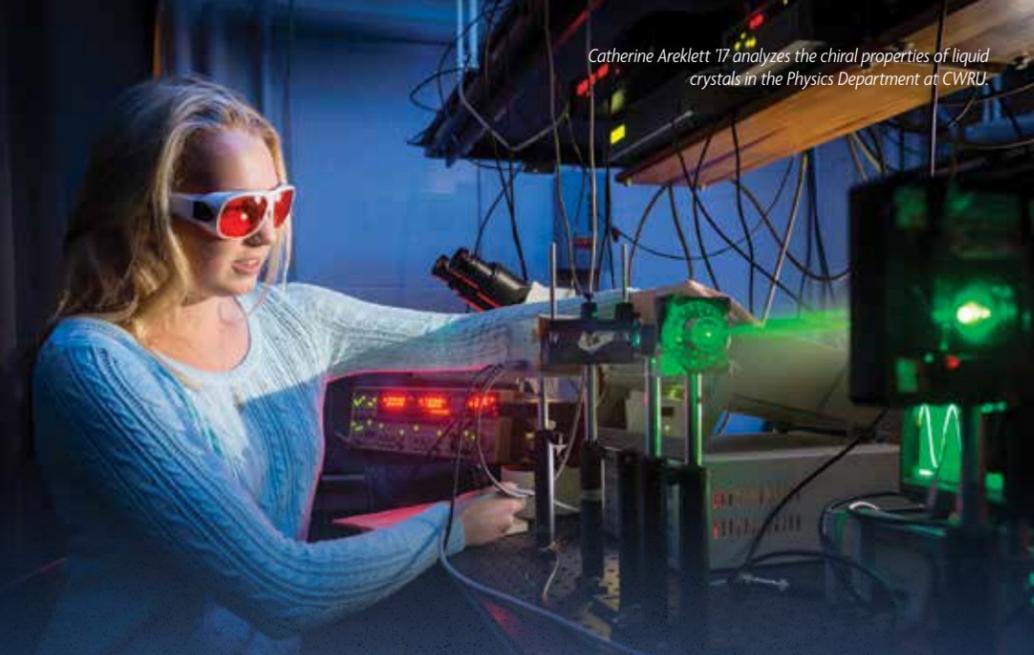
Hathaway Brown's groundbreaking signature **SCIENCE RESEARCH & ENGINEERING PROGRAM** unlocks high school girls' innate potential, placing them in professional laboratories at world-class institutions to do the work that can change lives



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SCIENCE RESEARCH & ENGINEERING PROGRAM

Catherine Areklett '17 analyzes the chiral properties of liquid crystals in the Physics Department at CWRU.



program NUCLEUS

By opening the doors to laboratories that students otherwise might not be able to enter until college or graduate school, the Science Research & Engineering Program at Hathaway

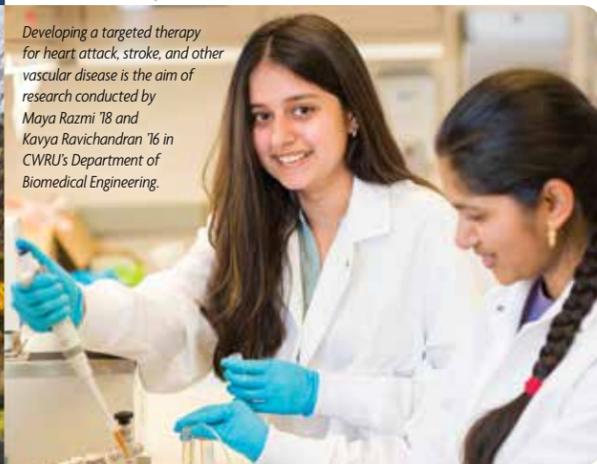
Brown is bridging the divide between the traditional high school curriculum and the real world. Since 1998, more than 500 girls have participated in the SREP, earning placements in innovative research settings, working directly with practicing scientists, contributing to cutting-edge research in numerous fields, authoring and co-authoring scholarly articles published in scientific journals, and winning unparalleled recognition in prestigious national and international awards competitions. HB is proud to partner with such outstanding institutions as Case Western Reserve University, Cleveland Clinic, University Hospitals, the Cleveland Museum of Natural History, and NASA Glenn Research Center in this pioneering and longstanding initiative.

control GROUP

The Science Research & Engineering Program at HB is especially effective and influential because it was created for girls. Studies have demonstrated that while women surpass men in written examination, they often lack the confidence to showcase their intellect in application. Yet before they graduate from 12th grade, HB's SREP students are essentially able to try on the role of professional researchers, learning under the direct mentorship of practicing scientists in a laboratory setting. This invaluable experience fosters the tenacity to pursue studies in traditionally male-dominated arenas. In just its first decade, the SREP saw 58 percent of its alumnae declare college majors in science, technology, engineering, and math, compared to the national average of 16 percent of women entering college who declared majors in STEM fields.



At CWRU's Squire Valleeve Farm, Lane Chesler '17 measures the effects of climate change on spring ephemerals.



Developing a targeted therapy for heart attack, stroke, and other vascular disease is the aim of research conducted by Maya Razmi '18 and Kavya Ravichandran '16 in CWRU's Department of Biomedical Engineering.

scientific METHOD

The SREP is a four-year elective course of study offered through the flagship Institute for 21st Century Education at Hathaway Brown. Roughly one-third of all HB Upper Schoolers participate each year. When they are freshmen, SREP students explore science and engineering disciplines through the SREP Seminar, a discussion class that allows them to identify research options that fit their interests at area partner organizations. SREP's in-house Research Directors then facilitate the arrangement of individual research initiatives. More than 200 professional scientists and researchers have partnered with SREP students since the program was founded. Sophomores, juniors, and seniors enrolled in SREP become reliable members of research teams at a number of Greater Cleveland institutions. The girls commit to working in their respective labs an average of once per week during the school year and several weeks each summer. Before they graduate, SREP students must prepare a formal scientific manuscript on their research, which documents their work and is entered into national and international competitions.

data POINTS

300+ Research publications authored or co-authored by SREP students

9th of all schools in the nation for Siemens Competition Finalists, 1999-2016

Data compiled by the College Board

160 Finalists/Semifinalists in the Intel and Siemens competitions

MORE

Intel Science Talent Search* finalists than all other schools in the state of Ohio combined

*formerly Westinghouse Science Talent Search

- HB is the only school in the state, and one of only a handful of schools in the country, to have earned a direct affiliation with the Intel International Science and Engineering Fair, the world's largest pre-college science competition. This means that HB students can go directly to ISEF competition without first qualifying through a regional science fair.
- The SREP has been featured nationally on *PBS NewsHour* and *PBS Women in Science* television programs, and in *USA Today*, *Inventor's Digest*, *Seventeen*, *Teen People*, *Weekly Reader*, and more. Additionally, SREP students and their work have received a fair amount of local and regional media attention.

supporting EVIDENCE

Those familiar with the program are impressed with the outcomes achieved by Hathaway Brown's SREP. Fuller versions of the testimonials contained here and several additional endorsements of the program may be found online at www.hb.edu/SREP.

The SREP leadership team helped me figure out how to choose a research endeavor that was tied to a family friend's illness and thereby begin to understand the bench-to-bedside trajectory. The experience no doubt shaped my pursuit of training in clinical medicine and also my academic training in anthropology; though I ended up being a medical doctor and a social scientist rather than a bench scientist, the development of my research inquiry skills originated with the SREP.

Amy Saltzman Porter HB '01,
AB PRINCETON UNIVERSITY; MD/PhD
HARVARD UNIVERSITY; PEDIATRICS
RESIDENT, CLEVELAND CLINIC

Working in a Cleveland Clinic lab in high school exposed me to the excitement of scientific discovery and laid the foundation for me to develop a true passion for research. I attribute so much of what I have done and the opportunities I have been afforded to the SREP program. It helped me reach my highest goals and set me on the path I'm on today.

Catherine Koch HB '10,
BS MIT; MARSHALL SCHOLAR;
MSc OXFORD UNIVERSITY; MD/PhD
CANDIDATE AT HARVARD MEDICAL
SCHOOL AND MIT

While other girls had ballet or violin or another traditional extracurricular activity that they excelled at, mine was being able to investigate phenomena in a research setting. There is probably no other high school in the world where I would have been able to realize my potential. Because I was not the perfect student with exceptional grades, without the SREP, quite frankly I probably would have fallen through the cracks elsewhere.

Kyra Sedransk Campbell HB '03,
BS MIT; PhD UNIVERSITY OF CAMBRIDGE;
U.S. PATENT HOLDER FOR AN
ARTIFICIAL MITRAL HEART VALVE;
ROYAL SOCIETY-EPSRC DOROTHY
HODGKIN RESEARCH FELLOW
AT IMPERIAL COLLEGE, LONDON

The SREP experience was an incredible way to build confidence. At West Point, there were only 12 cadets in my class of 911 students who majored in physics, and I was one of only two women. The experience of learning challenging material and conducting independent research in high school made me confident that I would succeed in a difficult major. I also felt that the SREP cultural expectation that women can and do excel in traditionally male-dominated fields like science and math gave me confidence that has served me well as an Army officer.

Anne Hammerstrom Stark HB '01,
BS WEST POINT; MARSHALL SCHOLAR;
MPhil CAMBRIDGE UNIVERSITY;
MLitt UNIVERSITY OF ST. ANDREWS;
HELICOPTER PILOT, U.S. ARMY;
HARVARD LAW SCHOOL STUDENT

The Hathaway Brown Science Research & Engineering Program is a truly exceptional endeavor. HB students are uniformly gifted, motivated, and able to work in a group setting. It sets the standard for the nation.

Christopher Coburn
VICE PRESIDENT, INNOVATION AT
PARTNERS HEALTHCARE;
FORMER EXECUTIVE DIRECTOR,
CLEVELAND CLINIC INNOVATIONS;
FATHER OF CAROLINE HB '06, GEORGETOWN '10;
AND BRIDGET HB '12, GEORGETOWN '18

The relationship of HB's Science Research & Engineering Program with NASA has been a model for other schools to follow. It has caused positive change through inspiration and hands-on technical involvement, not only for the students, but also for NASA.

Bruce A. Banks
ELECTRO-PHYSICS BRANCH CHIEF (RETIRED),
NASA GLENN RESEARCH CENTER;
18-YEAR HB SREP MENTOR