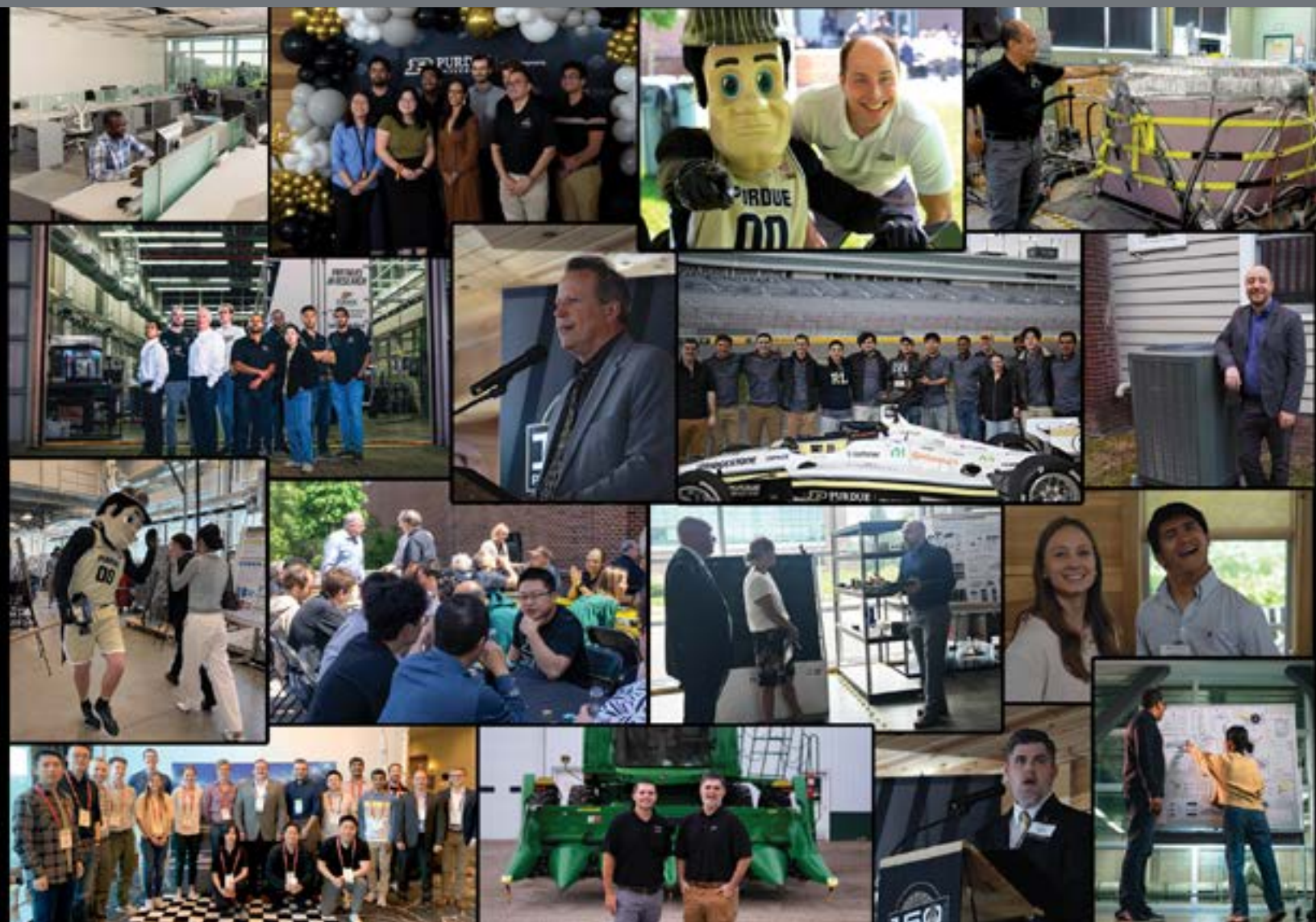


2025

JULY 1, 2024 - JUNE 30, 2025

ANNUAL REPORT

RAY W. HERRICK LABORATORIES



Ray W. Herrick Laboratories

HOME OF THE CENTER FOR HIGH PERFORMANCE BUILDINGS

HERRICK LABS

2025 ANNUAL REPORT

TABLE OF CONTENTS

OVERVIEW

At A Glance	1
Ray W. Herrick Laboratories 2025 Highlights	2
2025 Herrick Demographics Breakdown	3
2025 Herrick Federal & Industrial Contributions	4

SUCCESS STORIES

Student Awards & Successes	5
Faculty Success Stories & Awards	10
Staff Success Stories & Awards	16
Herrick Success Stories & Highlights	18

CENTER UPDATES

2025 Herrick Center Updates	33
------------------------------------	----

RESEARCH FACILITIES

Ray W. Herrick Laboratories Overview	36
---	----

HERRICK FACULTY

2025 Herrick Faculty Members	40
-------------------------------------	----

HERRICK STAFF

2025 Herrick Staff Members	50
2025 Herrick Post-Doc Associates	51

GRADUATES

2024 - 2025 Herrick Graduates	52
--------------------------------------	----

DIRECTOR'S INTRODUCTION



GREG SHAVER

It has been another tremendous year at the **Ray W. Herrick Laboratories!** Our impact and student numbers continue to increase. Research expenditures are up 7% year-over-year -- even with some headwinds with the economy and federal funding landscape.

I am super proud of the tenacious spirit of our students, staff, and faculty to get on with the research and learning that is our hallmark.

Let me also take this opportunity to give special thanks to our industrial partners. Nearly one-third of Herrick's research funding comes from industry partners, and most of our research projects include participation by industry partners. As a specific example, and as Cummins CEO Jennifer Rumsey indicated in her Herrick Homecoming remarks, in just the last 10 years Cummins has supported (via either direct funding or collaboration on DOE grants) no less than 55 graduate students at the **Herrick Labs**. In that same time, no fewer than 25 of our Herrick graduate students have gone to work at Cummins full time.

As another example, consider the Center for High Performance Buildings (CHPB) – for which this year we are celebrating its 10 year anniversary. Time flies when you are having fun and getting things done! The projects that are selected and funded by the CHPB member companies often lead to larger projects funded by federal agencies or industry. We are very thankful to the 14 companies that are members of the CHPB, and to the CHPB for being an engine for collaboration and innovation.

We are all looking forward to what next year holds for the Herrick Labs Research Community. **Boiler up!**

Greg Shaver
Reilly Professor of Mechanical Engineering
Director, Ray W. Herrick Laboratories
Director, Smart Crossroads Consortium
Purdue University
Fellow ASME, Fellow SAE

RAY W. HERRICK LABORATORIES

AT A GLANCE

The Ray Herrick Laboratories, founded in 1957, is part of the School of Mechanical Engineering. The 44 Mechanical, Civil, and Electrical Engineering faculty who do research here collaborate on interdisciplinary research projects with faculty in the other Schools of Engineering and also with faculty in the College of Science, College of Health and Human Sciences, and the Purdue Polytechnic Institute. There are five main technical areas of research with some overarching themes related to energy utilization and efficiency, reduction of pollutants in the environment, quality of life, and sustainability and safety.

The educational experience at Herrick combines the traditional training of aspiring researchers with exposure to industrial, governmental, and societal needs. Nearly 1,000 Masters and Ph.D. candidates have graduated from the Ray W. Herrick Laboratories.

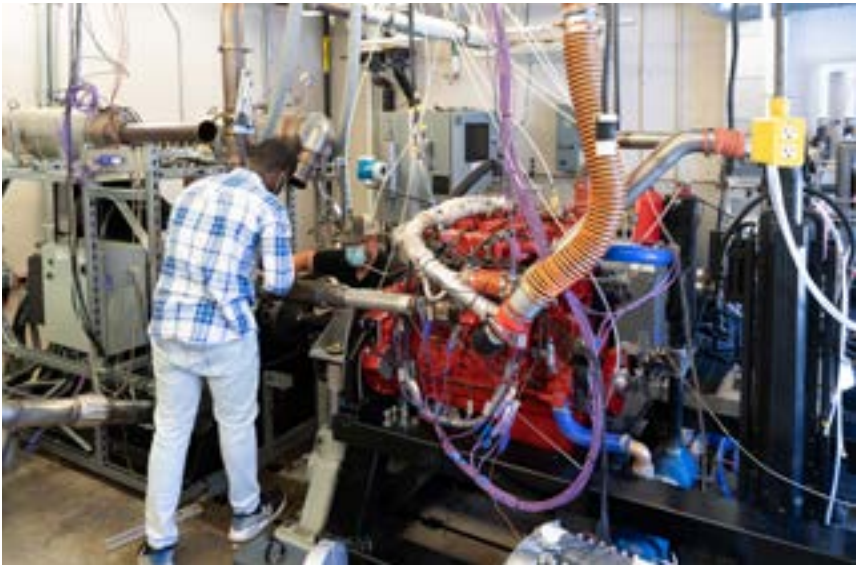
Technology transfer to industry partners and disseminating through peer-reviewed publications, conferences, and short courses is an integral part of a majority of the research programs at Herrick Labs. The researchers are also widely published across the spectrum of publications from academic journals to the popular press.

MISSION
An institution dedicated to graduate education through engineering research with an emphasis on technology transfer.

VISION
To overcome the barriers between knowledge creation, transfer, and utilization for the advancement of society.

- GOALS**
1. Grow educational outreach activities, including fundamental, applied, and experimental short courses;
 2. Build on research excellence in the following research areas: Noise and vibration control, integrated thermal and power systems, the built environment, and structural mechanics;
 3. Provide the educational environment of the labs so that its graduate students are multi-disciplinary engineers who rate as the top engineering graduates in the country;
 4. Recognize and promote the value of Herrick through effective brand management (internally and externally);
 5. Efficiently use our facilities;
 6. Continue recruiting top faculty, grad students, and staff to ensure long term stability and growth. Maintain world-class facilities.

- THE MAIN TECHNICAL AREAS ARE:**
- High Performance Buildings, Thermal Systems, Air Quality, and Clean Water
 - Noise and Vibration Control, which includes research on Acoustics, Dynamics, and Structural Vibrations
 - Electromechanical Systems and Advanced Engines: Controls, Signal Processing, Sensing, Estimation, Diagnostics, and Prognostics
 - Perception-Based Engineering: Modeling of Human Response for Machine and System Optimization
 - Manufacturing and Advanced Materials



FY 2024 - FY2025 HIGHLIGHTS

RESEARCH - FISCAL YEAR	FY2024	FY2025
Research Expenditures	\$14,211,901	\$15,227,044
STUDENTS		
Graduate Student Researchers	234	242
MS	72	85
Ph.D.	162	157
Undergraduate Student Researchers	85	170
Post-Doctoral Researchers	13	11
STUDENTS GRADUATED		
MS	12	7
Ph.D. / Post Doc	16	15
VISITING RESEARCHERS		
Visiting Research Assistants	13	23

PURDUE DAY OF GIVING

Thanks to the incredible generosity of Purdue alumni, faculty, staff, retirees, students, parents, and friends, the University is positioned to help our students pursue their goals like never before. During the 2025 Day of Giving the University raised a record \$105,071,882 from over 36,000 gifts!

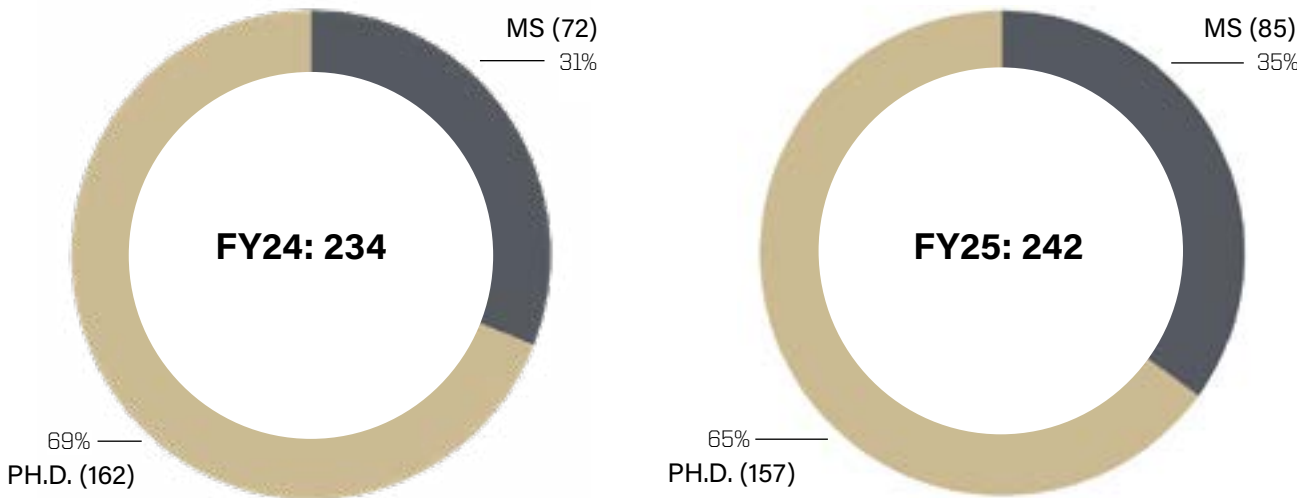


HERRICK PROGRAMS & DEMOGRAPHICS

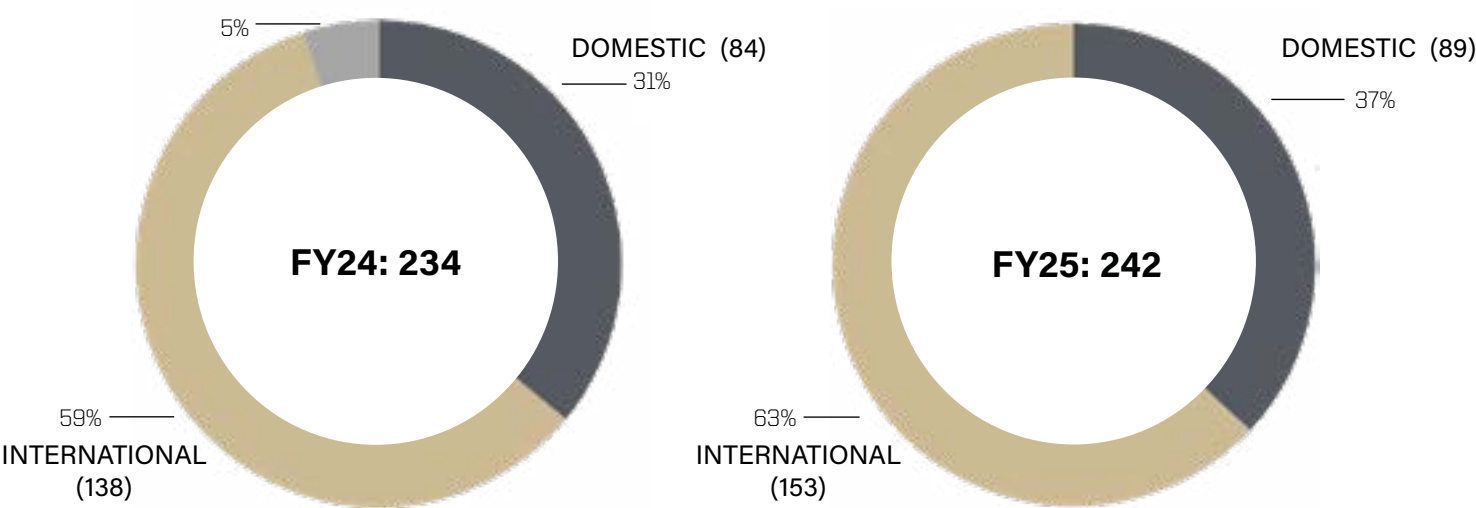
The primary educational mission at Herrick is thesis-based graduate programs and studies. We believe that the experiential learning, the open-ended, and integrative nature of thesis-based research is an outstanding preparation for both academic and industrial careers. To complement the student/advisor relationship, Herrick offers a learning community to the student. This community includes an outstanding cohort of graduate students, as well as a staff prepared to support and teach. In many cases, the student's research is sponsored. Sponsor representatives also participate in educational activities with the student. There are also opportunities for students to do internships in industry or government laboratories. In total, Herrick provides an outstanding educational opportunity for our graduate students.

HERRICK PROGRAMS & DEMOGRAPHICS

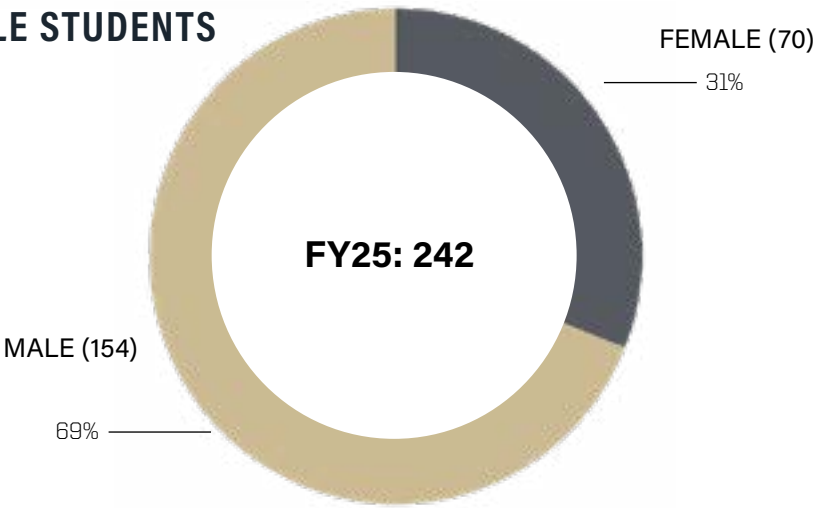
MASTERS & PH.D. STUDENTS



DOMESTIC & INTERNATIONAL



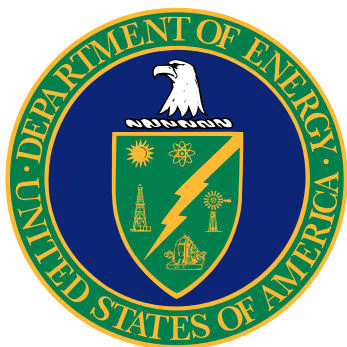
MALE & FEMALE STUDENTS



HERRICK SPONSORS

TOP FEDERAL SPONSORS

2025



TOP 4 INDUSTRIAL SPONSORS

2025



In FY 2025, 30% of the research funds came from industry partners. The top 4 industrial sponsors are shown above.

HERRICK STUDENT AWARDS

AND SUCCESSES



FROM LEFT TO RIGHT:
NADAH AL THEEB, JOHN HUBY, PANAGIOTIS PAPAGEORGIOU,
PRIYADARSHAN

A team of four Herrick students was awarded 1st Place at the 2024-2025 Jump Into STEM Challenge. The objective of the

2024-2025 challenge is to reduce peak power demands in residential, commercial, new, and existing U.S. buildings.

Student teams are charged with developing innovative solutions that will lead to significant reductions in carbon emissions and remain accessible to low and moderate income level communities.

The annual student competition is sponsored by Oak Ridge National Laboratory (ORNL), National Renewable Energy Laboratory (NREL), Pacific Northwest National Laboratory (PNNL), and the U.S. Department of Energy's (DOE's) Building Technologies Office.

Herrick's team, comprised of **Nadah Al Theeb, John Huby, Panagiotis Papageorgiou, and Priyadarshan**, while working under Professor **Davide Ziviani**, received 1st place with their project titled, "Reducing Peak Demand and Advancing Energy Equity for Low-Moderate Income (LMI) Communities Across the United States." The solution addresses two major challenges: grid strain during peak demand and excessive energy costs faced by low-to-moderate income communities through the primary focus of retrofitting existing and/or new heat pumps with integrated battery storage and modulating electric heating elements all controlled by a smart energy system. The goal of the project is to lower household energy costs, stabilize grid loads, and improve thermal comfort while reducing the reliance on fossil fuels. Ultimately, the project utilizes sustainable technology that aligns with environmental standards to achieve net-zero emissions by 2050, ultimately ensuring the benefits of cleaner energy and greater energy efficiency to vulnerable communities across the United States.

HERRICK STUDENT AWARDS

AND SUCCESSES



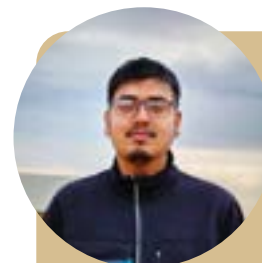
GULEWICZ

Congratulations to **Demetrius Gulewicz**, advised by **Neera Jain**, who has been awarded the Herrick Assistantship. Demetrius's research primarily focuses on design and control of thermo-fluid systems for different cooling applications

Jacob Hunter received the Dr. Anil K. Bajaj Outstanding Service Scholarship. The scholarship recognizes mechanical engineering graduate students who provide outstanding service to the mechanical engineering graduate student community. Jacob is a PhD student who works with **Neera Jain** on human-machine interaction.



HUNTER



RAHMAN

David Warsinger's PhD Student, **Md Ashiqur Rahman**, received a Ben M. Hillberry Graduate Scholarship. This scholarship is sponsored by the students and friends of Professor Ben M. Hillberry in honor of his years of dedication to the School of Mechanical Engineering and is awarded to Mechanical Engineering graduate students with a preference for those studying in biomechanics or materials.

Pritam Ghoshal, graduate research assistant in Advanced Dynamics and Mechanics Lab with **James Gibert**, received the David Tree Graduate Scholarship, funded by the David Tree Graduate Support Fund in Mechanical Engineering to honor Dr. David R. Tree's legacy. This scholarship supports ME graduate students in acoustics, noise, and vibration area.



GHOSHAL

HERRICK STUDENT AWARDS

AND SUCCESSES



YUH

Madeleine Yuh (Jain) was a recipient of the 2024 Hommert Engineering Excellence Fellowship. The fellowship goes to outstanding female graduate students enrolled in Mechanical Engineering who has provided excellent service to the School or Purdue community. This fellowship is funded from the estate of Paul and Elizabeth Hommert; Dr. Hommert is a Mechanical Engineering Outstanding Alumnus and Director Emeritus of Sandia National Laboratories.

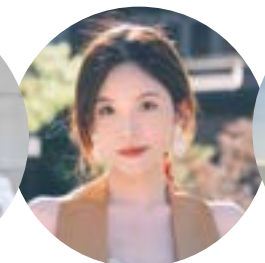
HERRICK FELLOWSHIPS

The William E. Fontaine Memorial Fellowship

was established in memory of **Bill Fontaine**, the founding Director of the Ray W. Herrick Laboratories, for the purpose of providing support



AL THEEB



LI



RAHMAN

for graduate student research to attract the nation's most promising students. To receive these prestigious awards, a student must be doing, or intending to do, thesis-based research on a problem of interest to industry exclusively at the Ray W. Herrick Laboratories. The applicant may be a candidate for the M.S. or Ph.D. degree. The three recipients for the Fontaine Fellowship in 2025 were **Nadah Al Theeb (Kircher)**, **Ruxin Li (Li)**, and **Ashiqur Rahman (Warsinger)**.



ZHU

The William Uffman Graduate Student Fellowship in Mechanical Engineering was established by **William Uffman** to provide support for graduate students doing research through the Herrick Laboratories.

To receive this prestigious awards, a student must be doing, or intending to do, thesis-based research on a problem of interest to industry exclusively at the Ray W. Herrick Laboratories. The applicant may be a candidate for the M.S. or Ph.D. degree. The recipient of the Uffman Fellowship for 2025 was **Zhu Zhu (Ciez)**.

HERRICK STUDENT AWARDS

AND SUCCESSES



2025 ASHRAE GRANT-IN-AID AWARD WINNERS

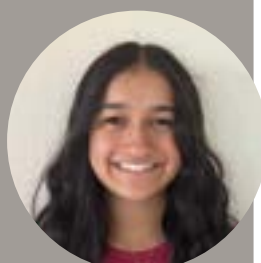
The ASHRAE Grant-in-Aid award is a prestigious \$10,000 award given to outstanding graduate students performing research in the High Performance Buildings or HVAC&R fields. These grants encourage advanced studies in HVAC&R and will help winners explore innovative energy solutions.



LU

Sichen Lu (Tzempelikos) Civil Engineering and Herrick Labs PhD student, received the 2024-2025 Grant-in-Aid award for her research focused on daylight and human-centered building operation and indoor environmental quality assessment. The objective of Sichen's work is to employ smart non-intrusive sensing and deep learning techniques, such as conditional generative adversarial networks, to enable human-preference-based environmental control in buildings.

Aveena Rawal, an undergraduate researcher, received the Frank M. Coda Scholarship, which is part of the ASHRAE Society Scholarships.



RAWAL



ISSA

Abd Alrhman Bani Issa (Ziviani/Groll) received the Top Student Paper Award (Doctoral Level) at the 2025 ASHRAE Annual Conference in Phoenix. His paper was entitled "Navigating Long-Term Use of Refrigerant Blends in Unitary Air-Source Heat Pumps for Colder Climates."

Aaron Farha (Kircher/Groll), a PhD student working on the DC Nanogrid House with a focus on the thermal storage systems, received the Raymond Viskanta Graduate Student Scholarship. The scholarship supports Mechanical Engineering graduate students doing graduate studies related to thermal sciences.



FARHA

HERRICK STUDENT AWARDS

AND SUCCESSES

Clark Addis, PhD (Arrieta) with co-authors **Dimitrios Michalaros, Jhonatan Rincon, Chelsea Tinsley, Kendal Tinsley, and Maria Pundik**, with Professors **Andres Arrieta and Salvador Rojas**, had their paper titled, "Stiffening multistable origami-inspired deployable structures from embeddable bistable units" published in the Materials & Design Journal.



ADDIS

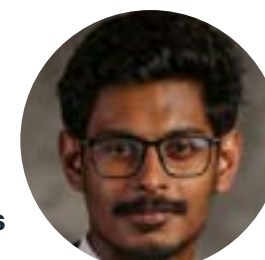


LU

MAH

Civil Engineering and Herrick Labs PhD student **Sichen Lu** won the Best Paper Award at the 8th International High Performance Buildings Conference, organized at Purdue in July 2024. The award includes a \$1,000 prize. The award-winning paper, "Enabling Human-Centered Daylighting Operation using Non-Intrusive Luminance Monitoring and Deep Learning," was co-authored by **Dongjun Mah**, also a PhD student of Civil Engineering and Herrick Labs, and Professor. **Thanos Tzempelikos**.

Pritam Ghoshal, PhD student, was honored with the Best Paper Award at the Nonlinear Dynamics Conference (NODYCON). Pritam's paper, "Exploiting Bistability and Viscoelasticity in Reservoir Computing," was co-authored with his advisors, **James Gibert**, Associate Professor of Mechanical Engineering and **Anil Bajaj**, Alpha P. Jamison Professor of Mechanical Engineering.



GHOSHAL

After graduating from Purdue in 2025 with his Ph.D. in Civil Engineering, **Satya S. Patra**, former student of **Brandon E. Boor**, has gone on to pursue his career in academia. Dr. Patra is now an Assistant Professor at The University of Alabama in the Department of Civil, Construction and Environmental Engineering. His research interests lie broadly within aerosol science and engineering, with a particular focus on improving indoor air quality.



PATRA

FACULTY SUCCESS STORIES

AND AWARDS



GROLL

Eckhard Groll was promoted to Reilly Distinguished Professor in Mechanical Engineering. He is the William E. and Florence E. Perry Head of Mechanical Engineering. Dr. Groll's research interests focus on the fundamental thermal sciences as applied to advanced energy conversion systems, components and their working fluids. He is a world-renowned expert in positive displacement compressors and expanders and has served on multiple editorial boards, including those for the International Journal of Refrigeration, Journal of International Engineering Education and more.

The Purdue University Board of Trustees ratified **Gregory Shaver** as the Reilly Professor of Mechanical Engineering. Dr. Shaver currently serves as the director of the Herrick Labs and the Smart Crossroads Consortium. His research program is dedicated to clean, safe and efficient commercial vehicles via advanced diesel, natural gas, hydrogen, ethanol and biodiesel engine systems and controls, powertrain electrification, and heavy vehicle automation. He is a fellow of SAE International and the ASME.



SHAYER

Shirley Dyke has been named as the Donald A. and Patricia A. Coates Professor of Innovation in Mechanical Engineering by the Purdue University Board of Trustees. Dr. Dyke's research focuses on the development and implementation of "intelligent" structures, and encompass structural control technologies, structural health monitoring, real-time hybrid simulation, and machine learning and computer vision for structural damage assessment. Dr. Dyke is the director of the NASA-funded Resilient ExtraTerrestrial Habitat Institute (RETHi) and the director of Purdue's Intelligent Infrastructure Systems Lab at Bowen Lab.



DYKE

FACULTY SUCCESS STORIES

AND AWARDS



ARRIETA

Andres Arrieta has been named the Doug and Cathy Field Rising Star Associate Professor of Mechanical Engineering. Dr. Arrieta leads the Programmable Structures Laboratory with his research focusing on investigating the interrelation between shape-property-function of material systems and structures with a focus on exploiting nonlinearity to generating multifunctional systems.

Chris Goldenstein has been named the Avrum and Joyce Gray Rising Star Professor in Entrepreneurship and Innovation in Mechanical Engineering and the School of Aeronautics and Astronautics (by courtesy). His research focuses on the development and application of optical diagnostics for studying non-equilibrium gases, hypersonic flows, combustion, and a variety of energy, propulsion, and defense applications.



GOLDENSTEIN



BOOR

Brandon E. Boor has been named the Dr. Margery E. Hoffman Associate Professor in Civil Engineering. This professorship has a 5-year term that will extend through Fall 2029. Dr. Boor has established an innovative research and education program at Purdue focused on air pollution in the built environment. His work is advancing our understanding of indoor air pollution sources, their effects on human health, and strategies to improve air quality. By integrating cutting-edge experimental methods with mathematical modeling, Dr. Boor's research examines the dynamics of airborne contaminants, including nanoparticle formation, volatile chemical emissions, and dust resuspension.

Davide Ziviani was named associate editor of the Elsevier journal Energy, specializing in Geothermal and Organic Rankine Cycle.



ZIVIANI

FACULTY SUCCESS STORIES

AND AWARDS

Four Ray W. Herrick Laboratories faculty members received a promotion during the past year.

Andres Arrieta was promoted to full professor of mechanical engineering as well as receiving the Rising Star Associate Professorship; **Chris Goldenstein** was promoted to full professor of mechanical engineering as well as receiving the Rising Star Associate Professorship; **Tian Li** was promoted to associate professor of mechanical engineering; **David Warsinger** was promoted to associate professor of engineering



ARRIETA

GOLDENSTEIN

LI

WARSINGER



CIEZ

Assistant Professor **Rebecca Ciez** was recognized for her advancement of the fields of Environmental Science/Environmental Engineering as one of American Academy of Environmental Engineers & Scientists' 40 Under 40. Dr. Ciez's research combines methods from engineering, quantitative policy analysis, and economics to consider the economic and environmental impacts of energy systems and technologies. Nonprofits, national laboratories, and academic institutions have sought Dr. Ciez's contributions to policy framing and she has participated in energy transition policy workshops hosted by the Clean Air Task Force, NREL, and University of Calgary's Net Zero Electricity Research Initiative. Her lab's research has been supported by the Alfred P. Sloan Foundation, US Department of Energy, Purdue's Center for High Performance Buildings, and NSF.

2025 AWARDS OF EXCELLENCE from the College of Engineering were awarded to two Herrick Faculty members. **Ilias Bilonis**, Professor of Mechanical Engineering received the award for Online Education, and **David Warsinger**, Associate Professor of Mechanical Engineering, the award for Early Career Teaching.



BILONIS

WARSINGER

FACULTY SUCCESS STORIES

AND AWARDS



CAI

Associate Professor **Jie Cai** received a National Science Foundation (NSF) Faculty Early Career Development Program Award for his project: CAS- Climate: An altruistic game theoretic framework to characterize environmental responsiveness of residential electricity consumption. This award provides a grant to early-career faculty who have the potential to serve as academic role models in research and education and to lead advances in the mission of their department or organization.

Greg Shaver, Director of Herrick Laboratories, has been chosen as a Big Ten Academic Alliance Academic Leadership Program Fellow for the 2025-2026 academic year.

The Big Ten Academic Alliance Academic Leadership Program (BTAA-ALP) is a year-long extensive leadership development program that is designed to expand the leadership and managerial skills of faculty who have demonstrated exceptional ability and administrative promise. It is specifically oriented to prepare faculty members to meet the challenges of academic administration at major research universities in the 21st century. The Big Ten Academic Alliance is an academic consortium of Big Ten universities.



SHAYER



ARRIETA

Andres Arrieta, Rising Star Associate Professor, and his co-authors' article titled "Roadmap on embodying mechano-intelligence and computing in functional materials and structures" published in Smart Materials and Structures (IOP Publishing).

Davide Ziviani and co-writers was among the Avram Bar-Cohen Best Paper Runner-Up Awardees for their paper titled, "Development of a Reduced-Order Nodal Reliability Framework for Data Center Applications."



ZIVIANI

FACULTY SUCCESS STORIES

AND AWARDS



WARSINGER

David Warsinger, assistant professor, developed the concept of batch reverse osmosis in 2015. His research indicated that batch and semi-batch reverse osmosis are the key to reducing energy consumption in the desalination process. After applying findings to real-world desalination sites, a recent publication stated, they evaluated 39 seawater reverse osmosis facilities by finding the average energy consumption with efficiency metrics across different technologies and operating conditions.

From their evaluation, Warsinger and team were able to confidently suggest the use of batch and semi-batch reverse osmosis technology to reduce energy levels. Although energy hasn't decreased much in past years, these technologies offer substantial improvement, when many thought there was no room for improvement left. Semi-batch proves to be a viable commercial option, as it could cut excess energy levels by 69%; where full batch could cut 82% of excess energy with future technologies. Their next step is to test these findings.

Warsinger's lab received a \$1.67 million grant from the U.S. Department of Energy in 2023 to start a small pilot project. This year, another test site is being built at the Colorado School of Mines that is 40 times bigger than the previous model. Here, semi-batch, batch, and continuous configurations will be tested head-to-head to verify their findings and indicate which energy-efficient desalination process should be pursued in the future.

Shirley Dyke, was invited to the National Academies to the Space Science Committee during Space Week. Dr. Dyke shared her presentation titled, "Human-Centered Autonomous Resilient Space Habitats."

Space Science Week, National Academies of Science, Washington DC April 1, 2025.



DYKE

FACULTY SUCCESS STORIES

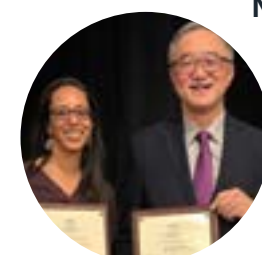
AND AWARDS



GONZALEZ

Marcial Gonzalez was inducted to the University Teaching Academy. Candidates were identified by their individual department/college/school based upon evidence of excellence in teaching, innovation in teaching methodology, teaching-related service, and scholarship in teaching and learning. Marcial is one of only two engineering faculty to be inducted in 2025, out of 14 across all colleges and units.

Marcial Gonzalez has been chosen as a Purdue Insights Fellow. Purdue Insights is a leadership forum hosted by the Office of the Provost intended to support faculty who are interested in exploring leadership at a university, increase the pool of potential leaders at Purdue, and expand our capacity for leadership programming beyond the Big 10 Academic Alliance Academic Leadership Programs.



JAIN & CHIU

Neera Jain and **George Chiu** have each been recognized by the American Society of Mechanical Engineers (ASME) at the 2024 Modeling, Estimation, and Control Conference. **George Chiu**, professor of mechanical engineering, received the Michael J. Rabins Leadership Award. This award is given every other year by the Dynamic Systems and Control Division (DSCD) of ASME to a member who has demonstrated sustained outstanding leadership contributions to the DSCD, to ASME, and to related fields of interest. **Neera Jain**, associate professor of mechanical engineering, received the Rudolf Kalman Best Paper Award. This award is given annually by the DSCD to the authors of the best paper published in the ASME Journal of Dynamic Systems Measurement and Control during the preceding year. Jain's paper was entitled "Design and Validation of a State-Dependent Riccati Equation Filter for State of Charge Estimation in a Latent Thermal Storage Device," by Michael Shanks, Uduak Inyang-Udoh, and Neera Jain.

STAFF SUCCESS STORIES

AND AWARDS

Two Herrick family members received Awards of Excellence for engineering staff and were recognized in the 23rd annual Staff Awards Banquet in December, 2024.



GREATHOUSE & RAMAN

Lea Greathouse, Managing Director, received the Management & Professional New Employee Award from Dean Arvind Raman. Lea was recognized for her exceptional leadership and innovation in fostering community engagement and an inclusive environment.

Vivian Scott, Sr. Administrative Assistant, was nominated for demonstrating outstanding initiative, leadership, and a commitment to excellence, fostering an environment of collaboration, growth, and student success. Congratulations to Vivian for received the Support & Service New Employee Award.



SCOTT & RAMAN



LOPEZ ROMERO

Purdue School of Mechanical Engineering recognizes staff members who have gone above and beyond with special recognition. Herrick's **Jose Lopez Romero**, Laboratory Operations Specialist, received a Staff Award of Excellence for Outstanding Customer Service. Jose consistently demonstrates his dedication to the lab and the students through his willingness to assist with a professional and positive attitude.

Lea Greathouse, Managing Director, has been chosen to represent Herrick Laboratories leadership team in the Purdue Engineering Staff Leadership Academy (PESLA) Cohort 5.0. PESLA encourages thinking beyond a staff member's own administrative area, and develops leadership techniques that support larger institutional objectives. PESLA provides the tools and insight to think more strategically, balance competing demands on your time, and engage in more forward - thinking leadership.



GREATHOUSE

STAFF SUCCESS STORIES

AND AWARDS

STUDY ABROAD: STAFF JOINS STUDENTS ON INTERNATIONAL TRIPS

Jose Lopez Romero, Laboratory Operations Specialist, was chosen as the staff member to travel to Argentina. Jose is fluent in Spanish and provided translation at restaurants, stores and between Purdue students and students at the UTN.BA. With his experience at Herrick, he was also able to assist in lectures and other hands-on projects. "Being able to help translate greatly helped the students," said Lopez. "I could tell they were more comfortable and confident in their interactions, and I was happy to help." Jose adds, "As a co-leader of the



AFTER ARRIVING IN BUENOS AIRES, ARGENTINA, STUDENTS POSE FOR A PHOTO.

study abroad program in Argentina, I worked closely with the professor and Teaching Assistants as we traveled with the students to ensure they were safe and supported throughout the trip. I helped manage travel logistics, daily activities, and handled any issues that arose along the way. I also assisted with academic activities, where students collaborated with local peers on renewable energy solutions projects such as solar and biodigesters."

(The staff study abroad program allows staff members from any ME department to apply to one of 5 ME Short Term Engineering Programs (STEP), which typically includes a faculty member, 20-30 students, and a 3-4 week trip embarking during the "Maymester" month immediately after spring semester ends.)



WITH STUDENTS ATTENDING A SOCCER MATCH BETWEEN BOCA JUNIORS AND INDEPENDIENTE IN BUENOS AIRES



HERRICK SUCCESS STORIES

AND HIGHLIGHTS



HERRICK'S "LIVING LABS" ARE WHERE INNOVATION LIVES

You don't typically think of your home or workplace as a "laboratory" (unless you are a scientist!). But have you ever wondered about the brightness of the lights, or the temperature settings in your workplace, and why they were determined to be ideal? Behind the scenes, researchers are studying what keeps us comfortable and safe while we are indoors – from the heating and air-conditioning systems, to airborne particulates, to the best place to sit in the room. All of these are studied at a one-of-a-kind facility at Purdue University's Ray W. Herrick Laboratories.

A LIVING LABORATORY LIKE NO OTHER

Launched in 2013, the Herrick Living Labs were designed from the ground up to function as real, occupied environments that double as precision-controlled experimental testbeds. Located inside Herrick's LEED-Gold certified building, the four side-by-side open-plan offices house students and researchers as full-time occupants, who simultaneously serve as test subjects. The goal? To study how humans interact with their environment under authentic, day-to-day working conditions—something rarely achievable in most laboratory settings.

HERRICK SUCCESS STORIES

AND HIGHLIGHTS

"We are conducting research with human subjects under real working conditions, which is hard to find—and this is the strength of these labs," says **Thanos Tzempelikos**, Professor of Civil and Construction Engineering. These four labs, each roughly 1,300 square feet, feature completely independent and customizable controls for temperature, humidity, lighting, air distribution (via ceiling, walls, or floor), acoustics, and envelope characteristics. From adjustable curtain walls for natural ventilation studies to dimmable electric lighting and automated window shades, the labs allow for fine-grained environmental manipulation while collecting massive amounts of data—more than 1,000 sensors continuously monitor occupant comfort, building performance, and energy use.



TZEMPELIKOS

WHAT MAKES HERRICK'S LIVING LABS UNIQUE

Kevin J. Kircher, Assistant Professor and researcher for the Center for High Performance Buildings notes the unique qualities our labs offer, "The four living labs present unique opportunities to test equipment and software simultaneously in nearly identical spaces. This enables rigorous A/B testing that is difficult to arrange in most buildings, where testing is typically done sequentially in the same space but under potentially different weather and occupancy conditions. The living labs are also occupied by enthusiastic and knowledgeable students, which enables uniquely participatory, occupant-centric approaches to controlling the indoor environment."



KIRCHER

Capability	Herrick Living Labs	Typical University Lab
Real-time research with occupants	+	✗ (often unoccupied or simulated use)
4 parallel, mirrored test chambers	+	✗ (single-zone or limited comparative setups)
Fully customizable airflow and façade	+	
High-resolution VDC, O, and CO monitoring	+	
Integration of thermal, acoustic, lighting, and IAQ control	+	
Dynamic envelope studies (windows, daylight, ventilation)	+	

HERRICK SUCCESS STORIES

AND HIGHLIGHTS

Herrick's labs are not just test environments—they are flexible ecosystems for interdisciplinary collaboration, bringing together mechanical engineers, civil engineers, psychologists, public health researchers, and data scientists. Whether studying thermal comfort, virus-laden aerosols, or productivity under dynamic lighting, the labs provide an unparalleled experimental platform.

A TRACK RECORD OF RESEARCH EXCELLENCE

Since 2013, the Living Labs have become central to Purdue's national and international leadership in sustainable and intelligent building design. The labs have supported over a dozen major grant-funded projects, including: NSF (National Science Foundation), DOE (U.S. Department of Energy), CHPB (Center for High Performance Buildings), Lutron Electronics and Arconic Inc., among others.

"The world-class features of the Living Labs helped us secure three large NSF grants on cyber-physical systems for buildings and additional industry support totaling more than \$4M," adds

Panagiota Karava, Professor of Civil and Construction Engineering.

This support underscores the labs' value in enabling translational research—transforming experimental findings into practical design guidelines, smart HVAC controls, and next-generation building systems.

WHERE THE RESEARCH IS HEADING

Purdue's Living Labs enable new research collaborations across engineering and social science schools and have been the testbed for more than 15 highly cited research papers being published, as indicated by Dr. Karava. The labs are further evolving by focusing on:

- Autonomous building diagnostics and fault detection
- Smart energy storage integration with HVAC systems
- Human-centric lighting and acoustics
- Aerosol tracking for disease transmission studies
- Design principles for modular, deployable space habitats
- Adaptive, occupant-specific thermal systems



EXTERIOR VIEW OF LIVING LABS



KARAVA

HERRICK SUCCESS STORIES

AND HIGHLIGHTS

Research conducted in the Living Labs by **Thanos Tzempelikos**, Professor of Civil and Construction Engineering, **James E. Braun**, Professor of Mechanical Engineering, and Janghyun Kim, explored the energy savings potential of a passive chilled beam model versus air systems in various US climatic zones. The unique set up of the labs would allow the researchers to conduct parallel studies, one using passive chilled beams and the other in an adjacent identical office space equipped with an air system and then compare the resulting energy consumption of the two.

Essentially, the results of the study would support the impacts retrofitting existing spaces new technology. "I think it would be interesting to develop and test technologies that allow thermal control to be tailored more specifically to individual preferences, such as small, modular, AI-controlled heat or cooling sources at the level of a desk space or even a chair," adds Kevin J. Kircher, Assistant Professor of Mechanical Engineering. These advancements are not speculative—they are being implemented in projects across the U.S. and beyond. The labs are informing the design of net-zero office buildings and modular healthcare environments, while also influencing how we think about comfort and energy use on Earth and in space. Dr. Karava shares, "A new software tool AI-enabled building energy expert for small to medium size commercial building is being validated using the Living Labs and a patent is in preparation with interest from several industry partners."



BRAUN

THE FUTURE OF BUILT ENVIRONMENTS NOW

Purdue's Herrick Living Labs are more than just research spaces—they're living, breathing ecosystems that simulate and shape the future of human interaction with the built environment. Their realism, flexibility, and precision offer a rare trifecta in building science. By bridging engineering, architecture, health, and sustainability, the Living Labs are transforming not only how we study buildings, but how we design them to serve people better.



DR. KARAVA AND TEAM ANALYZE DATA

HERRICK SUCCESS STORIES

AND HIGHLIGHTS



BOILERMAKERS CAME TOGETHER TO CELEBRATE THE PAST, PRESENT, AND FUTURE OF HERRICK LABS DURING HERRICK HOMECOMING

The first ever Herrick Homecoming demonstrated the spirit of a Boilermaker. Just as we had hoped, the event brought us together to celebrate the past, the present, and the future of Herrick Laboratories.

As guests arrived during the morning hours, student guides were on deck to lead them through both HLAB and the Legacy Building spaces, giving attendees got a glimpse into cutting-edge research happening at Herrick every day. **Greg Shaver**, Director of Herrick Labs, shared an exciting vision for a potential “Herrick 3.0” building showcasing the future of our expansion while also reflecting on the 150 years of Purdue Engineering. No one went away hungry! Our grill masters whipped up a delicious cookout meal for all to enjoy on the patio. If there was ever an event to incorporate the past, present, and future, this was it!



RUMSEY

As the evening unfolded, a special recognition dinner was held where we celebrated the retirements of distinguished faculty members **J. Stuart Bolton**, **Jim Braun**, **Patricia Davies**, **Peter Meckl**, as well as Lead Shop Technician, **Frank Lee**. Sponsors **Jennifer Rumsey** (Cummins) and **Adam Finney** (Carrier) joined us for this incredible night.

HERRICK SUCCESS STORIES

AND HIGHLIGHTS



BOLTON



BRAUN



DAVIES



MECKL



LEE

Arvind Raman, John A. Edwardson Dean of the College of Engineering, paid tribute to Purdue Engineering’s 150th anniversary and **Eckhard Groll**, William E. and Florence E. Perry Head of Mechanical Engineering, left us with inspiring closing remarks.

Alumni, faculty, staff, students, and friends came together to make this a truly memorable experience for the entire Herrick Community.

STORY BY KIMBERLY DALY



HORTON, KARAVA, ZIVIANI, BRAUN

NEXTHOUSE: CREATING THE NEXT GENERATION OF FACTORY-BUILT HOUSING

“Many of the construction techniques used to build housing in the U.S. haven’t changed since the Industrial Revolution,” said **James E. Braun**, Herrick Professor of Engineering and director of the Center for High Performance Buildings at Purdue University. “We don’t just need more homes — we need

better homes that prioritize affordability, sustainability, and resilience. The only way to do that is to change our paradigm of how homes are built.”

The NextHouse team’s initiative is a moonshot, aiming to harness the expertise of industry and academia to create a revitalized, fully-automated, and scaled-up factory-built housing industry.

The team received \$1 million from the National Science Foundation (NSF) to develop the NextHouse ecosystem. The regional ecosystem includes partnerships with the University of Michigan, Notre Dame, Michigan State, Ivy Tech, and Lansing Community College. The NextHouse leadership team includes **Travis Horton**, professor of civil engineering; and **Panagiota Karava**, professor of civil engineering.

STORY BY JARED PIKE

HERRICK SUCCESS STORIES

AND HIGHLIGHTS



JAMES GIBERT AND HIS TEAM OF PURDUE FACULTY AND STUDENTS COLLABORATE WITH WABASH ENGINEERS ON THE ENERGY-HARVESTING TRAILER IN HERRICK LABS.
(PURDUE UNIVERSITY PHOTO/REBECCA ROBIÑOS)

INNOVATIVE COLLABORATION SPARKS GAME CHANGER FOR SUSTAINABILITY – AN ENERGY RECAPTURING TRAILER

The transportation sector is one of the leading contributors to greenhouse gas emissions in the U.S. according to the EPA. **Brent Yeagy** (BS environmental engineering science '94, MS safety engineering '98), president and CEO of Wabash, wants to change that. So, he's partnering with Purdue.

Wabash — one of the largest trailer manufacturers in the nation — will spend the next three years collaborating with Purdue on an R&D project resulting in a device that enables trailers to recapture their own electricity from vibrations, heat and airflow.

Such an energy-harvesting machine could transform the industry. And Yeagy credits Purdue with accelerating and driving this innovation. "Purdue brings world-class expertise in engineering and research that complements Wabash's deep industry knowledge," he says. "Through this partnership, we can explore groundbreaking ideas and push the boundaries of what's possible. Purdue's state-of-the-art facilities and talent pool accelerate our ability to innovate, making what might seem impossible, achievable."



YEAGY

HERRICK SUCCESS STORIES

AND HIGHLIGHTS

As the transportation industry moves toward decarbonization and electrification, projects like the energy recapturing trailer are critical to achieving clean energy goals.

A key deliverable in this project is data. Through retrofitting the Wabash trailer with displacement sensors, accelerometers, anemometers, pressure gauges and many other measurement tools, the research team will measure how much energy is wasted and how much of it can be recaptured. Principal investigator **James Gibert**, an associate professor of mechanical engineering at Purdue, says that when the project is complete, Purdue will have fully studied and characterized the Wabash trailer. "We will know where the sources of energy are in the trailer," Gibert says. "And we will be able to share that knowledge with Wabash. This information will pave the way for commercially developing devices that can offset some of the load that the trailer sees."

Gibert leads a team of three colleagues and six graduate students through this multiphase work. Senior Wabash engineers are involved too, meeting biweekly with the Purdue team and accompanying them on experimental runs. Work on the data acquisition system is being driven by Purdue students like Karthik Boddapati, a fifth-year PhD student in mechanical engineering. Measuring how vibrations can be harvested is a crucial aspect of the research project, with mechanical engineering doctoral students Yeongeun Ki analyzing the truck bed and truck wall and Karsten Hilgarth exploring the side panels. Eric Williamson, a second-year doctoral student in mechanical engineering, who also has a BS and MS in aeronautical and astronautical engineering from Purdue, primarily focuses on the suspension and the analysis of experimental data.

This confluence of creativity makes Purdue an especially attractive research partner for companies like Wabash. "We have a talent pool of ideas and a fresh set of eyes," Gibert says. He also points out that an advantage to working with Purdue is that the university operates with a different set of constraints than industry partners.:

STORY BY JULIE BECKWITH



WORK ON THE ENERGY HARVESTING TRAILER IS DONE AT PURDUE'S HERRICK LABS. (PURDUE UNIVERSITY PHOTO/REBECCA ROBIÑOS)

HERRICK SUCCESS STORIES

AND HIGHLIGHTS



EVANS & SHAVER (PHOTO BY ANDREW GRISWOLD)

HARVESTING IN SYNC: PURDUE AND JOHN DEERE DEVELOP AUTOMATED UNLOADING TECHNOLOGY

One of the most intricate maneuvers on the field is unloading grain from a combine into a grain cart while both vehicles are moving. It's a task that requires near-perfect synchronization between the combine operator and the tractor driver pulling the grain cart.

That same kind of close collaboration recently played out in a project between Purdue University and John Deere. Combining industry experience with research expertise, the two organizations developed an initial demonstration of Auto Unload, a precision technology that improves productivity, reduces operator fatigue, and saves valuable time during harvest. It's a partnership that mirrors the technology itself: two parts moving in sync toward a shared goal.

During harvest, efficiency is everything. Unloading grain on the go can improve combine productivity by as much as 23 percent, but it's a complicated procedure that demands tight focus and coordination between the combine and tractor operators again and again. "It's like landing an aircraft," explained Corwin Puryk, staff engineer and John Deere's principal investigator for the project. "Farmers face intense pressure to align the machines with precision – sometimes up to ten times per hour over a twelve-hour workday."

HERRICK SUCCESS STORIES

AND HIGHLIGHTS

John Deere's existing Machine Sync system already offered a partial solution to keep the vehicles aligned during unloading. But it still required constant attention and manual adjustments from the combine operator to distribute grain evenly across the cart.

Purdue University and John Deere had been discussing opportunities to collaborate, and the development of an automated unloading system was the perfect chance to combine forces.

"Purdue and John Deere have a long history and this is a great example of what we can do together," explained Eric Woods, Executive Director of Industry Partnerships at Purdue University. "They came to us with a complex problem, and we had the research capabilities to find a solution."

Greg Shaver, professor of mechanical engineering and the director of Herrick Labs, served as the university's principal investigator. He assembled a team of faculty and students across disciplines: Aerospace Engineering, Agricultural and Biological Engineering (ABE), Agronomy, and Mechanical Engineering.

Shaver's expertise in vehicle automation was complemented by **John Evans**, assistant professor of agricultural and biological engineering, who contributed firsthand farming experience as well as a background in agriculture robotics. Mechanical engineering PhD candidates Ziping Liu, Chufan Jiang and Shveta Dhamankar also played a significant role in creating the automation system models and algorithms. "I knew going in that Purdue could help," Shaver said. "This was a challenging, unique opportunity to work with John Deere on a multi-year effort – and, ultimately, it was successful."

Much like the machines themselves, the people behind the project had to work in tandem. Shaver and Evans, together with Purdue colleagues Daniel DeLaurentis and Tony Vyn, guided graduate and PhD students in developing and testing the technology.

At John Deere, the efforts were equally cross-departmental. Puryk, an engineer in Crop Harvesting Advanced Engineering, worked closely with Ryan White, Brandon McDonald and other colleagues in the Intelligent Solutions Group to ensure Purdue's upgrades were compatible with existing hardware.

"I was impressed by the caliber of work and breath of fresh air Purdue brought to the project," noted Puryk. "The students were always eager, full of questions, and willing to learn."

HERRICK SUCCESS STORIES

AND HIGHLIGHTS

After two years of development, Purdue delivered a working prototype at the end of 2020. A variant of the vehicle automated unloading system was officially granted a U.S. patent in 2023 and a fully integrated solution with the latest hardware architecture will be available to customers as a John Deere Precision Upgrade beginning in late 2025 and as a factory option in 2026.

But the bigger achievement was the partnership itself – one that benefited John Deere, Purdue and, most importantly, the farmers who stand to gain from the technology. “Seeing this have an impact on farmers is one of my proudest achievements,” said Evans. “They have enough on their plate already. This takes one more thing off their hands.”

For John Deere, the project reaffirmed the value of working closely with a university partner who brought fresh ideas and cutting-edge research capabilities. For Purdue, it gave students hands-on experience solving real problems facing modern farmers, from theory to implementation. “We’re delighted to have made a positive impact on John Deere and its customers,” Shaver added. “Having the work we do with our students and industry partners implemented in the real world is the ultimate satisfaction.”

“With our strategic alliance, John Deere and Purdue are able to accomplish more than either organization could alone,” said Woods. “This project was another step towards our shared goal: to help the feed the planet and change people’s lives.”

As labor, scale, and budget demands on agriculture continue to rise, developing new technologies to ease the pressure on farmers will be increasingly important. It’s a challenge the engineers and researchers at Purdue and John Deere are eager to take on.

Collaboration between the two organizations opened the doors for an automated solution that makes one of the most complicated harvest tasks more efficient, reliable, and less stressful for the people behind the wheel.

“There’s more grain harvested. There’s less grain on the ground. And when the farmer goes home at the end of the day, they’re going to be happier and less exhausted,” Shaver explained.

It’s an example of how Purdue University excels at working with industry partners to develop novel solutions to practical problems – while helping ensure the people feeding the world have the tools they need to succeed.

STORY BY ANNA O’NEILL ALEXANDER

HERRICK SUCCESS STORIES

AND HIGHLIGHTS



KIRCHER NEXT TO HEAT PUMP OUTSIDE
PURDUE’S DC NANOGRIID HOUSE
(PHOTO: PURDUE UNIVERSITY/JARED PIKE)

RURAL COMMUNITIES TO BENEFIT FROM \$5.9 MILLION SMART ELECTRIFICATION PROJECT

A new project from Purdue University and the U.S. Department of Energy plans to bring state-of-the-art energy innovations to rural electric co-operatives. **Kevin Kircher**, assistant professor of mechanical engineering, and principal investigator of the project states rural communities must not get left behind in smart controls and energy innovations.

To implement changes in a rural setting, Kircher is focusing on rural electric co-ops — nonprofit organizations that bring electrical utilities to rural areas. Kircher said. “This project will pave the way for electric co-ops nationwide to engage rural communities in grass-roots climate mitigation and adaptation.”

Kircher’s team will work with Tipmont, an electric co-op in west central Indiana, to deploy new technologies into at least 250 buildings, mostly detached single-family homes, installing electric heat pumps to replace propane, fuel oil, and electric resistance heat, reducing costs and emissions associated with heating and cooling by at least 30%. They will also negotiate bulk discounts on new solar and battery installations. Finally, they will install smart energy management systems to balance the electrical load of both individual homes and power grids. The \$5.9 million project is funded by the Department of Energy’s Office of Energy Efficiency and Renewable Energy, as part of their Connected Communities initiative. Co-principal investigators of the team include **Jie Cai**, associate professor of mechanical engineering; **Panagiota Karava**, professor of civil engineering; **Vassilis Kekatos**, associate professor of electrical and computer engineering; **Xiaonan Lu**, associate professor of electrical engineering technology; and **Davide Ziviani**, associate professor of mechanical engineering.

HERRICK SUCCESS STORIES

AND HIGHLIGHTS



PURDUE AI RACING FINISHES AS TOP US TEAM AT IAC RACE IN CALIFORNIA

Purdue AI Racing delivered a standout performance in the July 24 Indy Autonomous Challenge (IAC) race at WeatherTech Raceway Laguna Seca (Monterey, Calif.): second place, second-fastest lap, flawless execution on a demanding track and a triumphant chapter in their autonomous racing journey.

In a thrilling neck-and-neck finish, the Purdue car reached speeds of 143 kph+ and crossed the finish line a fraction of a second behind the No. 1 team, Politecnico di Milano. The race was part of the IAC kickoff event that opened the NTT IndyCar Grand Prix weekend.

The team's Dallara vehicle expertly maneuvered through the circuit — a 2.238-mile, 11-turn road course with its infamous "Corkscrew" drop. During the day, the car consistently logged clean laps, maintaining ideal racing lines through the Corkscrew's blind precipitous descent and beautifully navigating every elevation change.

Yuchen Song, a PhD student at Herrick Laboratories, is the vehicle dynamics and control team lead. Through his study of dynamics and development of control algorithms, he is pushing the team's racecar to its speed and handling limits. The commentators described Purdue as having an "outstanding engineering program," adding, "I am very impressed with the poise and maturity of this young team."

INDUSTRIAL ADVISORY COMMITTEE



2025 INDUSTRIAL ADVISORY COMMITTEE MEMBERS WITH HERRICK FACULTY, STAFF, STUDENTS (PHOTO: PURDUE UNIVERSITY/JARED PIKE)

The Industrial Advisory Committee is comprised of high level executives and managers from a variety of industries that have close ties to Herrick Labs. Since 1958, the Industrial Advisory Committee (IAC) has met with Herrick Laboratories at least once a year to review the Lab's previous year's operations and advises the faculty and Director on future plans. This is also the opportunity for the committee to facilitate research partnerships between industry and the Laboratories.

The annual IAC Meeting also provides an opportunity for IAC Members to interact with Herrick students during the poster show. Students are able to showcase their research and discuss it with their peers as well as IAC Members, gaining valuable feedback.

Industrial Advisory Committee Members:

Marcus Bianchi - National Renewable Energy Laboratory

Neil Herring - RTX

Steve Sorenson - Toyota

Jason LeRoy - Trane Technologies

John Nalevanko - Ford Motor Company

Todd Rossi - Rutgers University

Paul Gloeckner - Cummins, Inc.

Jim McCarthy - Eaton

Ajay Iyengar - Lennox International, Inc.

Jon Douglas - Johnson Controls

Dan Conrad - Hussmann Corp.

Rudy Chervil

Doug Hansel - Allison Transmissions, Inc.

Don Ufford - U.S. Department of Commerce

Brian Joyal - Veridiam

Danan Dou - John Deere

Mark Ehrlich - Wabash

David Frohberg - Caterpillar, Inc.

Kevin Mercer - Rheem

Paul Alexander - General Motors

Larry Burns - Carrier

Beat Stocker - Whirlpool

Michael Perevozchik - Copeland

Chad Bowers - Daikin



FY2025 CHPB MEMBERSHIPS & PROJECT FUNDING

During the academic year 2024/25, the CHPB continued to grow the membership, support educational activities, and pursue large scale federal funding opportunities.

2025 CHPB MEMBERS



14

COMPANY MEMBERS

15

PROJECTS

18

FACULTY PI/CO-PIs

30+

STUDENTS

CENTER FOR HIGH PERFORMANCE BUILDINGS

During 2024, the Center continued to grow the membership, support educational activities, and pursue large-scale federal funding opportunities.

At the beginning of 2023, the CHPB membership included a total of 15 companies with a mix of equipment manufacturers and utilities. While Regal Rexnord did not renew the membership, GEA/Haier and Honeywell joined the Center. Moreover, Bosch also became CHPB member after the 2023 CHPB Spring Meeting bringing the membership to 16 companies. As part of the 2022 CHPB Fall meeting (hosted as a hybrid event), 13 regular projects were selected along with 3 seed-funded projects. A total of 16 faculty PI/Co-PIs and 30 students (undergraduate/graduate students) were involved in CHPB-related activities during 2023. Notably, 2 First Year Engineering (FYE) students and a Bottomley Scholar (Undergraduate Research Scholarship from the School of Mechanical Engineering, Purdue University) have engaged in research activities.

Since Spring 2022, the CHPB has been participating in a Center Leadership Council (CLC) that coordinates research and educational efforts across complimentary centers that include CEEE at the University of Maryland, ACRC at the University of Urbana-Champaign, and CIBS at Oklahoma State University. Since then, the CLC has met regularly at ASHRAE Winter and Annual events. Student exchange programs are being discussed along with large-scale research opportunities.

Among the various CHPB activities, it is worthwhile mentioning key research and educational endeavors. Starting with research, CHPB led a \$160M proposal to a new NSF Reginal Innovation Engine¹ program, which was shortlisted among the top 34 semifinalists. While not selected for a Type-II award, the “NextHouse” Engine was selected for a \$1M Type-I development grant award to develop an ecosystem to support next-generation, factory-built housing in the region. Moreover, CHPB-related projects yielded 5 major federal grants from the U.S. Department of Energy BTO/AMO/IEDO, ARPA-E, and the U.S. Department of Defense.

With respect to education, the CHPB has supported graduate students to travel to ASHRAE Winter and Annual Conferences as well as participation to an International Short Course on Refrigeration and Compressors (IRCC). In addition, a team of students led by Prof. Ziviani competed in the “JUMP into STEM” program supported by the U.S. DOE BTO, and three national labs (ORNL, NREL and PNNL). The team was selected to participate in the final competition at NREL in January 2023, and was awarded three summer internships at NREL and ORNL.

Learn more about the Center for High Performance Buildings by visiting their website: <https://chpb.engineering.purdue.edu/>

HERRICK CENTER UPDATES

RESILIENT EXTRA-TERRESTRIAL HABITAT INSTITUTE

The Resilient ExtraTerrestrial Habitats Institute (RETHi), originally funded by NASA through an STRI grant, has now transitioned into a Purdue center focused on advancing design of safe, autonomous and resilient habitat systems. The centerpiece of the institute is the Human-Centered Autonomous Resilient Space Habitats (HARSH), a cyber-physical testbed developed at Purdue to study aspects of resilience, autonomy, situational awareness, decision-making, and systems health management for deep space habitats. By taking advantage of multi-physics real-time hybrid simulation (RTHS), HARSH enables reconfigurability for experimentation on autonomous decision-making under complex and confounding disruptions (unknown unknowns). This unique platform integrates a scaled physical habitat with real-time simulation and control instances, high-performance data acquisition, and realistic health management systems, creating a new paradigm for lower-cost, reconfigurable testing of cyber-physical systems.



The center builds on RETHi's legacy as a successful NASA research institute. Two Herrick faculty members serve in leadership roles: **Prof. Shirley Dyke, as the Center Director, and Prof. Ilias Bilonis, as the Awareness Team Leader.** Additional Herrick faculty and staff include **Davide Ziviani, Julio Ramirez, George Chiu, David Cappelleri, Jie Ma, and Christian Silva.**

Learn more on the institute's website: (<https://www.purdue.edu/rethi/>)

INTERNET OF THINGS 4 PRECISION AGRICULTURE



IoT4Ag was established on September 1, 2020. In Year 5, the Center has continued the excellent growth and execution of its programs and activities that deliver on the IoT4Ag strategic plan across the

four foundational components: convergent research, engineering workforce development, diversity and culture of inclusion, and innovation ecosystem.

HERRICK CENTER UPDATES

IoT4Ag has five participating universities: Purdue University, University of Pennsylvania, University of California Merced, University of Florida, and Arizona State University. The annual retreat was held this year at the University of Pennsylvania. Attendees had a chance to visit and learn about South Mills Champs Mushroom Farms, who proudly supplies over 140 million pounds of fresh, frozen, and minimally processed mushrooms throughout North America each year.

Herrick Lab Mechanical Engineering PhD students Aarya Deb and Kitae Kim are working on an agricultural robotics project for IoT4Ag under Prof. David J. Cappelleri. Purdue's Agronomy Center for Research and Education (ACRE) is one of three IoT4Ag real-world testbeds, and the only one that focuses on row crops such as corn and sorghum plants. Kitae and Aarya have been testing the Purdue Agricultural Robot (P-AgBot) at ACRE for in-row and under-canopy crop monitoring and physical sampling. P-AgBot is designed for autonomous localization, mapping, and navigation in the corn fields without relying on any GPS signals, which are not available or are unreliable under the crop canopies. P-AgBot also uses deep learning algorithms to identify leaf locations and orientations for physical sampling and then samples them with the on-board robotic arm for analysis. The team has also created a robotic trailer for the autonomous transport and deployment of a fleet of P-AgBots for parallel field operations.

Learn more about this project and other exciting research at IoT4Ag by visiting the website: <https://iot4ag.us/>



P-AgBot in Purdue's ACRE fields.

MAJOR RESEARCH FACILITIES



THE WILLIS CARRIER THERMAL SYSTEMS LABORATORIES

These areas are where the HVAC and Refrigeration component-level and system-level technology research is conducted, as well as research on Air Quality. Three pairs of psychrometric chambers: each 7,000 cubic feet, with 5-ton testing capacity and precise temperature and humidity control. Designed to accommodate ASHRAE/ARI test procedures. Sixteen geothermal bores: 300 feet deep, with variable flow rates and numerous temperature sensors. A 90-ton centrifugal chiller and ice storage test facility; computer-controlled compressor load stands; psychrometric wind tunnel with dust injection system. There are two indoor air quality (IAQ) laboratories that can simulate indoor and outdoor conditions. Instrumentation includes ultrasonic anemometers, omni-directional anemometers, tracer-gas sampler and analyzer, and particle generators and analyzers.

THE GERALD HINES SUSTAINABLE BUILDINGS TECHNOLOGY LABORATORY

Herrick Laboratories is a living laboratory where the built environment is being studied. It includes a 16 bore geothermal field and plug-and-play heat rejection for experiments in the engines and thermal sciences laboratories. Four, almost-identical 34' x 37' office spaces for human-building interaction and building technology studies; completely customizable temperature, humidity, airflow patterns, and acoustic treatments; reconfigurable indoor lighting, daylighting/shading controls, mechanical cooling and ventilation controls, and more; thermal delivery by ceiling, floor or side walls, including radiant-floor heating and radiant-chilled beam cooling; replaceable south-facing building envelopes. The normal temperature range is 65° F to 75° F but this can be extended to 55° F to 85° F. Relative humidity can be varied from 20% to 80%. Three of the units have double skin facades with different options for ventilation and energy recovery. All of the offices spaces have separate equipment for providing space conditioning that are well instrumented to allow direct energy comparisons.



MAJOR RESEARCH FACILITIES



THE CUMMINS POWER LABORATORY

There are four test cells that are home to engine and hybrid systems controls research that is focused on improving efficiency, reducing engine emissions and developing efficient and environmentally friendly systems for using alternative fuels. The four test cells support 670, 350, 150 and 150 HP engine testing, respectively. A hydraulic variable valve actuation system capable of controlling 12 valves, a single cylinder rig for testing piezoelectric valve actuation, and an AC dynamometer and several eddy-current engine dynamometers, as well as emissions sensing systems.

ROGER B. GATEWOOD HIGH-BAY FLEXIBLE LABORATORY & SMALL-SCALE VIBRATIONS LABORATORY

These spaces house electro-mechanical systems, additive manufacturing, and vibrations research. This is comprised of two parts: an open 36 by 87 ft. high-bay area with segmented floors for vibration isolation between experiments, and a smaller laboratory for smaller scale experiments. The high-bay area has high ceilings to accommodate large systems for testing. It can house large shakers, such as a 35 kN TIRA electrodynamic shaker that can be used to reproduce vibration profiles and has in-built hydraulic power supplies for hydraulic shakers. In this area, the vibration and dynamics of larger structures can be examined such as building components, vehicle suspension systems, wind turbine blades, road vehicle and aircraft and space structures. The 700 sq. ft. small-scale laboratory includes apparatus for the dynamic testing of materials and small structures to investigate nonlinear dynamic behavior and to identify structural and material parameters.



MAJOR RESEARCH FACILITIES



ACOUSTICS, NOISE AND VIBRATION RESEARCH AREA

In addition to the facilities in the High-Bay Flexible Laboratory and Perception-Based Engineering areas, these facilities include a 25 by 20 by 18 ft. reverberation room, an anechoic room with useful volume of 12 by 12 by 12 ft., a hemi anechoic room with useful volume of 41 by 27 by 18 ft. and an 8 by 8 ft. audiometric room for sound quality testing. The acoustical materials laboratory has several types of impedance tubes for standardized acoustic material testing. The reverberation room is configured for sound transmission testing of acoustical

systems. Additional facilities include a tire pavement test apparatus (TPTA) for testing tires on realistic pavements at speeds up to 50 km/hr, a two wheel chassis dynamometer with 67 inch rollers, an anechoic wind tunnel with 18 by 24 inch test section and flow velocity up 120 mph. Instrumentation includes a 64 microphone acoustical holography array and 90 channel data acquisition system, various microphones, accelerometers, shakers, laser vibrometers, and a high-speed camera.

FORD PERCEPTION-BASED ENGINEERING LABORATORY

Perception-Based Engineering (PBE) researchers study people’s perceptions of stimuli, their influence on satisfaction, comfort, annoyance and performance -- and the relationship between those outcomes and the system, design, and operational parameters. PBE faculty at Purdue work on projects related to lighting, touch interfaces, sound and vibration quality, image quality and depth perception, display design and graphics optimization, effects of noise on performance, thermal comfort, and human-computer interaction.

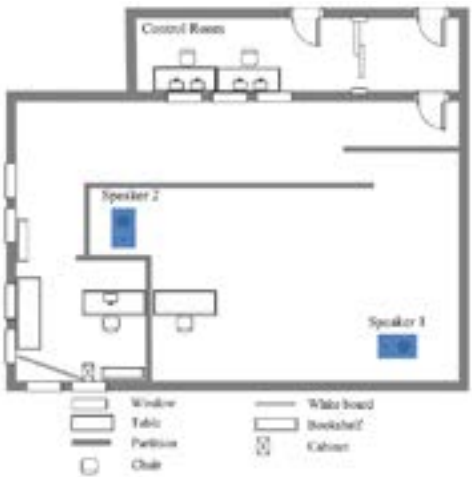


MAJOR RESEARCH FACILITIES

Understanding the dynamics of comfort, annoyance and performance as two or more environmental stimuli (e.g., noise/sound, lighting, vibration, temperature and humidity) and occupant expectations of a space vary over time is also of interest because those are the dynamic conditions in most occupied spaces. This laboratory allows us to study perception of these multi-dimensional, time-varying environments.

The Perception-Based Engineering Lab is uniquely designed to accommodate this work:

- 43’ by 28’ chamber, with adjacent observational control room
- 22’ tall ceilings
- TEAM 6 degree-of-freedom shaker, which can be covered when not in use making the laboratory flexible for many types of research projects
- Fine control of lighting, temperature (55°F-85°F), and humidity (20% to 80%)
- Acoustic treatments offer a sound-isolated environment
- Windows can be darkened or opened for natural light



- *Re-configurable as one or more smaller isolated rooms or one larger room
- *The Human Building Interaction Lab The PBE Lab currently houses this lab where different types of room heating, cooling, and lighting mechanisms and the impact on occupants can be studied.

2025 HERRICK FACULTY



ANDRES ARRIETA

DOUG AND CATHY FIELD RISING STAR PROFESSOR OF MECHANICAL ENGINEERING
PH.D., UNIVERSITY OF BRISTOL, UNITED KINGDOM, '10

RESEARCH INTERESTS:

Adaptive structures • Mechanical metamaterials • Soft Robotics • Programmable structures
• Multistable structures • Structural nonlinearity • Elastic instabilities • Structural dynamics
• Nonlinear vibrations



ANIL K. BAJAJ

ALPHA P. JAMISON PROFESSOR OF MECHANICAL ENGINEERING
PH.D., UNIVERSITY OF MINNESOTA, '81

RESEARCH INTERESTS:

Modeling of nonlinear systems • Structural dynamics and localization • Flow-induced vibrations •
Impacting systems • Bifurcations and chaos



RILEY BARTA

ASSISTANT PROFESSOR OF MECHANICAL ENGINEERING
B.S., PURDUE UNIVERSITY, '16, PH.D., PURDUE UNIVERSITY, '20

RESEARCH INTERESTS:

Modeling and Analysis of Thermal Systems • Heat Pumping, Air Conditioning and Refrigeration
Technologies • High Performance Buildings • Refrigerant and Lubricant Properties



ILIAS BILIONIS

PROFESSOR OF MECHANICAL ENGINEERING
PH.D., CORNELL UNIVERSITY, '13

RESEARCH INTERESTS:

Uncertainty propagation • Inverse problems • Propagation of information across scales
• Optimal learning • Materials by design



ERNEST BLATCHLEY

LEE A. RIETH PROFESSOR IN ENVIRONMENTAL ENGINEERING
B.S., PURDUE UNIVERSITY '81, M.S., UNIVERSITY OF CALIFORNIA, BERKELEY '83, PH.D., UNI-
VERSITY OF CALIFORNIA, BERKELEY '88

research interestS:

Design and analysis of ultraviolet (UV) systems for disinfection of indoor air; methods to quantify
and validate the performance of UV disinfection systems for indoor air.



J. STUART BOLTON

PROFESSOR EMERITUS OF MECHANICAL ENGINEERING
PH.D. SOUTHAMPTON, '84

RESEARCH INTERESTS:

Acoustics • Active and passive noise control • Sound field visualization • Structural
acoustics and wave propagation in structures • Noise control material modeling • Applied
signal processing



BRANDON E BOOR

DR. MARGERY E. HOFFMAN ASSOCIATE PROFESSOR IN CIVIL ENGINEERING
PH.D., THE UNIVERSITY OF TEXAS AT AUSTIN, '15

RESEARCH INTERESTS:

Indoor air quality (IAQ) • HVAC filtration • Human exposure assessment • Airborne nanoparti-
cles • Bioaerosols (fungi, bacteria, pollen, allergens) • Air quality in occupational workplaces •
Particle adhesion & resuspension • Early-life/infant exposures • Combustion aerosols & wood
smoke • New particle formation • Urban air pollution • Low-cost air quality monitoring • Health
effects of air pollution • Fate & transport of VOCs/SVOCs.

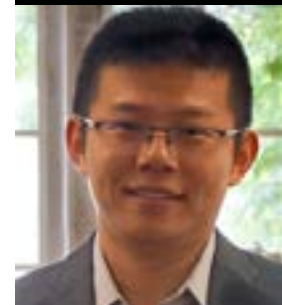


JAMES E. BRAUN

PROFESSOR EMERITUS OF MECHANICAL ENGINEERING
PH.D., UNIVERSITY OF WISCONSIN, '88

RESEARCH INTERESTS:

Modeling, analysis, and control of thermal systems



JEI CAI

ASSOCIATE PROFESSOR OF MECHANICAL ENGINEERING
PH.D., PURDUE UNIVERSITY, '15

RESEARCH INTERESTS:

Grid-Interactive Building Controls • Modeling and Control of Thermal/Energy Systems • HVAC
and Smart Buildings • Data-Driven Modeling • Intelligent Control Systems

2025 HERRICK FACULTY



DAVID J. CAPPELLERI

ASSISTANT VP FOR RESEARCH INNOVATION, PROFESSOR OF MECHANICAL ENGINEERING, PH.D., UNIVERSITY OF PENNSYLVANIA, '08

RESEARCH INTERESTS:

Multi-scale robotic manipulation and assembly, mobile microrobotics, unmanned aerial and ground vehicle design and control, agricultural robotics, mobile manipulation, medical robotics, and automation for the life sciences



JUN CHEN

ASSOCIATE HEAD FOR FACILITIES AND OPERATIONS, PROFESSOR OF MECHANICAL ENGINEERING PH.D., JOHNS HOPKINS UNIVERSITY, '04

RESEARCH INTERESTS:

Experimental fluid dynamics • Development of flow diagnostic techniques • Flow dynamics in stratified environment • Turbulent flow measurements and modeling



GEORGE T. C. CHIU

PROFESSOR OF MECHANICAL ENGINEERING, COURTESY APPOINTMENTS IN ELECTRICAL AND COMPUTER ENGINEERING AND PSYCHOLOGICAL SCIENCES PH.D., UNIVERSITY OF CALIFORNIA-BERKELEY, '94

RESEARCH INTERESTS:

Dynamic systems and control • Mechatronics • Digital and functional printing and fabrication
• Motion and vibration control and perception • Embedded systems and real-time control



REBECCA CIEZ

ASSISTANT PROFESSOR OF MECHANICAL ENGINEERING, AND ENVIRONMENTAL AND ECOLOGICAL ENGINEERING PH.D., CARNEGIE MELLON UNIVERSITY, '18

RESEARCH INTERESTS:

Energy technologies • Economics • Decision-making processes • Decarbonized energy systems



PATRICIA DAVIES

PROFESSOR EMERITA OF MECHANICAL ENGINEERING PH.D., SOUTHAMPTON, '85

RESEARCH INTERESTS:

Sound quality • Signal processing • Data analysis • System modeling and identification • Condition monitoring of machinery • Perception-based engineering • Seat-occupant modeling



SHIRLEY J. DYKE

DONALD A. AND PATRICIA A. COATES PROFESSOR OF INNOVATION IN MECHANICAL ENGINEERING AND CIVIL ENGINEERING PH.D., UNIVERSITY OF NOTRE DAME, '96

RESEARCH INTERESTS:

Structural dynamics and control • Cyber-physical systems • Machine vision • Real-time hybrid simulation • Damage detection and structural condition monitoring • Cyberinfrastructure development



JOHN T. EVANS IV

ASSISTANT PROFESSOR OF AGRICULTURAL AND BIOLOGICAL ENGINEERING, COURTESY APPOINTMENT IN MECHANICAL ENGINEERING B.S., UNIVERSITY OF KENTUCKY, '13, M.S., UNIVERSITY OF KENTUCKY, '15, PH.D., UNIVERSITY OF NEBRASKA, '18

RESEARCH INTERESTS:

Automation and Autonomy • Machine Logistics • Cropping Systems Technologies • Vehicle Simulation and Testing



JAMES GIBERT

ASSOCIATE PROFESSOR OF MECHANICAL ENGINEERING PH.D., CLEMSON UNIVERSITY, '09

RESEARCH INTERESTS:

Vibrations and nonlinear dynamics • Smart material systems • Non-pneumatic tires • Optimization of mechanical systems • Additive manufacturing



CHRISTOPHER GOLDERNSTEIN

AVRUM AND JOYCE GRAY RISING STAR PROFESSOR IN ENTREPRENEURSHIP AND INNOVATION PH.D., STANFORD UNIVERSITY, '14

RESEARCH INTERESTS:

Laser-absorption spectroscopy, laser-induced fluorescence, & IR imaging sensors for gas temperature, pressure, velocity, and chemical species • Molecular spectroscopy, photophysics, & energy transfer in gases • Energetic materials (e.g., explosives & propellants) detection & combustion • Combustion and propulsion systems (small and large scale) • Biomedical sensing

2025 HERRICK FACULTY



MARCIAL GONZALEZ

ASSOCIATE PROFESSOR OF MECHANICAL ENGINEERING
PH.D., CALIFORNIA INSTITUTE OF TECHNOLOGY, '11

RESEARCH INTERESTS:

Predictive, multi-scale modeling and simulation of microstructure evolution in confined granular systems, with an emphasis in manufacturing processes and the relationship between product fabrication and performance • Particulate products and processes • Continuous manufacturing • Performance of pharmaceutical solid products



ECKHARD A. GROLL

WILLIAM E. AND FLORENCE E. PERRY HEAD OF MECHANICAL ENGINEERING
REILLY PROFESSOR OF MECHANICAL ENGINEERING
"DOKTOR-INGENIEUR" (DOCTOR OF ENGINEERING), UNIVERSITY OF HANNOVER, '94

RESEARCH INTERESTS:

Thermal sciences as applied to HVAC&R systems and equipment



SOGAND MOHAMMAD HASANZADEH

ASSISTANT PROFESSOR OF CIVIL ENGINEERING
PH.D., VIRGINIA TECH, '20

RESEARCH INTERESTS:

Digital Twins • Thermal Stress and Human Factors • Wearable Technologies • Human-Robot Teaming • Smart Safety and Advanced Sensing



ERIC HOLLOWAY

PROFESSOR OF ENGINEERING PRACTICE, COURTESY FACULTY OF ENGINEERING
EDUCATION
PH.D., PURDUE UNIVERSITY, '20

RESEARCH INTERESTS:

Engine testbed and facilities, and students' professional development



W. TRAVIS HORTON

PROFESSOR OF CIVIL ENGINEERING
PH.D., PURDUE UNIVERSITY, '02

RESEARCH INTERESTS:

Advanced thermal energy conversion systems • Energy utilization in buildings, and the interactions between a building and its environment • Development of advanced, highly integrated, heating, ventilating, air conditioning, and refrigeration systems



MOHAMMAD REZA JAHANSHAH

ASSOCIATE PROFESSOR OF CIVIL ENGINEERING
PH.D., UNIVERSITY OF SOUTHERN CALIFORNIA, '11

RESEARCH INTERESTS:

Autonomous sensing • Data interpretation • Intelligent condition assessment of structures

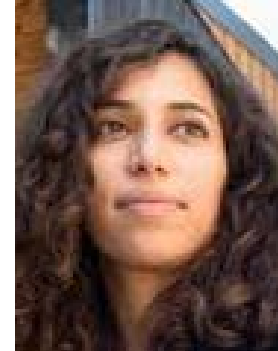


NEERA JAIN

ASSOCIATE PROFESSOR OF MECHANICAL ENGINEERING
PH.D., UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN, '13

RESEARCH INTERESTS:

Dynamic modeling and optimal control • Model predictive control • Decentralized control • Thermodynamics-based optimization • Entropy generation minimization • Exergy analysis • Integrated energy management and storage in distributed energy systems • Building systems



NUSRAT JUNG

ASSISTANT PROFESSOR OF CIVIL ENGINEERING
D.Sc. AALTO UNIVERSITY, ESPOO, FINLAND, '18

RESEARCH INTERESTS:

Architectural engineering • Environmental sensing of the built environment • Indoor air quality

2025 HERRICK FACULTY



PANAGIOTA KARAVA

JACK AND KAY HOCKEMA PROFESSOR OF CIVIL ENGINEERING
PH.D., CONCORDIA UNIVERSITY, '08

RESEARCH INTERESTS:

Smart buildings, intelligent building operation, system identification, model predictive control
• Human-building interactions, personalized control, self-tuned environments • Smart and connected energy-aware residential communities • Energy efficient and mixed-mode buildings, innovative energy and comfort delivery systems • Solar technology integration in building operation



KEVIN KIRCHER

ASSISTANT PROFESSOR OF MECHANICAL ENGINEERING
PH.D., CORNELL UNIVERSITY, '19

RESEARCH INTERESTS:

Control, optimization, and machine learning methods for energy systems in buildings, focusing on their interactions with the power grid • New technologies for efficient electric heating • Validation methods through field experiments • Collaboration with campus building operators.

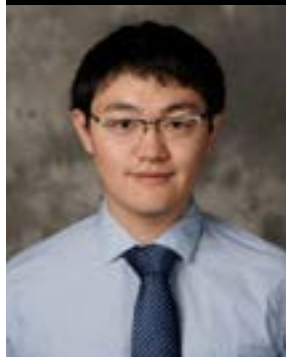


CHARLES M. KROUSGRILL

150TH ANNIVERSARY PROFESSOR OF MECHANICAL ENGINEERING
PH.D., CALIFORNIA INSTITUTE OF TECHNOLOGY, '80

RESEARCH INTERESTS:

Dynamics • Nonlinear vibration of continuous systems • Stability analysis

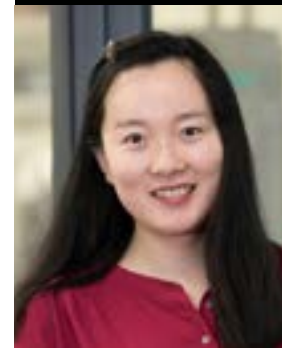


JUNFEI LI

ASSISTANT PROFESSOR OF MECHANICAL ENGINEERING

RESEARCH INTERESTS:

Acoustic tweezers • acoustofluidics • ultrasound imaging • acoustic metamaterials
• noise control



TIAN LI

ASSOCIATE PROFESSOR OF MECHANICAL ENGINEERING
PH.D. UNIVERSITY OF MARYLAND, '15

RESEARCH INTERESTS:

Naturally nanostructured materials • Energy, water, and wearable technology • Manufacturing



YANGFAN LIU

ASSISTANT PROFESSOR OF MECHANICAL ENGINEERING
PH.D., PURDUE UNIVERSITY, '16

RESEARCH INTERESTS:

Acoustic Source Modeling and sound field reconstruction • Active noise control • Room acoustics simulation and auralization • Noise control treatments • Human perception of noise



MONIQUE MCCLAIN

ASSISTANT PROFESSOR OF MECHANICAL ENGINEERING
PH.D., PURDUE UNIVERSITY

RESEARCH INTERESTS:

Dissimilar material 3D printing • Additive manufacturing of energetic materials • Additive manufacturing of materials for high temperature applications • Quality control in additive manufacturing



MING QU

PROFESSOR OF CIVIL ENGINEERING
PH.D., CARNEGIE MELLON UNIVERSITY, '08

RESEARCH INTERESTS:

Solar cooling and heating systems • Building heat transfer • Building energy supply systems • Building controls and operations • Building and building system modeling & simulation • Sustainable building design and analysis • Building system integration dedicated to sustainable and healthy built environments

2025 HERRICK FACULTY



PETER H. MECKL

PROFESSOR EMERITUS OF MECHANICAL ENGINEERING
PH.D., MASSACHUSETTS INSTITUTE OF TECHNOLOGY, '88

RESEARCH INTERESTS:

Motion and vibration control • Adaptive control • Intelligent control using fuzzy logic and neural networks • Engine and emissions diagnostics • Robotics



JULIO A. RAMIREZ

KARL H. KETTELHUT PROFESSOR OF CIVIL ENGINEERING
NHERI-NCO CENTER DIRECTOR
PH.D., UNIVERSITY OF TEXAS AT AUSTIN, '83

RESEARCH INTERESTS:

Structural analysis and design of reinforced and prestressed concrete structures, with emphasis on seismic performance of concrete buildings and infrastructure • Structural models and experimental methods • Design codes for structural concrete

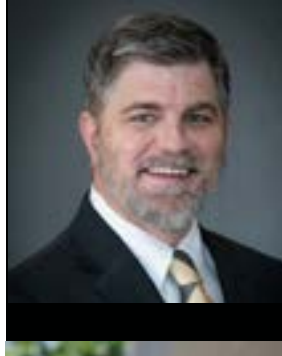


FABIO SEMPERLOTTI

PROFESSOR OF MECHANICAL ENGINEERING
PH.D., THE PENNSYLVANIA STATE UNIVERSITY, '09

RESEARCH INTERESTS:

Structural health monitoring • Wave propagation • Structural dynamics and vibration control • Adaptive structures • Periodic structures and acoustic metamaterials • Energy harvesting • Thermoacoustics



GREGORY M. SHAVER

REILLY PROFESSOR OF MECHANICAL ENGINEERING
PH.D., STANFORD UNIVERSITY, '05

RESEARCH INTERESTS:

Model-based system and control design of commercial vehicle power trains • Connected and automated commercial vehicles • Internal combustion engine & after-treatment system design and controls • Flexible valve actuation in diesel and natural gas engines

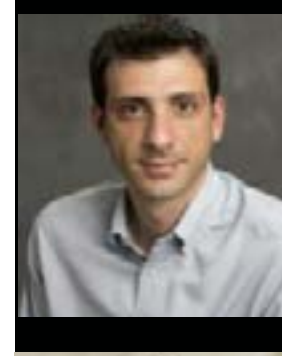


SHREYAS SUNDARAM

MARIE GORDON PROFESSOR, ELMORE FAMILY SCHOOL OF ELECTRICAL AND COMPUTER ENGINEERING AND CO-DIRECTOR, INSTITUTE FOR CONTROL, OPTIMIZATION AND NETWORKS
PH.D., UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN, '09

RESEARCH INTERESTS:

Network science • control • communications • distributed algorithms



ATHANASIOS (THANOS) TZEMPELIKOS

PROFESSOR OF CIVIL ENGINEERING
PH.D., CONCORDIA UNIVERSITY, '05

RESEARCH INTERESTS:

Design, operation and optimization of high performance buildings • Daylighting, design and control of dynamic facade and shading systems • Indoor environmental (thermal and visual) quality and comfort • Occupant preferences and interaction with building systems • Radiant building systems • Solar energy applications in buildings • Building energy modeling and simulation



DAVID WARSINGER

ASSOCIATE PROFESSOR OF MECHANICAL ENGINEERING
PH.D., MASSACHUSETTS INSTITUTE OF TECHNOLOGY

RESEARCH INTERESTS:

Desalination & Water Treatment • Water-Food-Energy Nexus • Thermofluids Nanotechnology Membrane Science



DANIEL WILLIAMS

PROFESSOR OF ENGINEERING PRACTICE
PH.D., FLORIDA INSTITUTE OF TECHNOLOGY, '95

RESEARCH INTERESTS:

Vehicle Chassis Control Systems Vehicle Dynamics Autonomous Vehicles Human Driver Dynamics



BIN YAO

PROFESSOR OF MECHANICAL ENGINEERING
PH.D., UNIVERSITY OF CALIFORNIA-BERKELEY, '96

RESEARCH INTERESTS:

Adaptive and robust control • Nonlinear control • Precision control of mechanical systems • Vehicle control • Robotics



DAVIDE ZIVIANI

ASSOCIATE PROFESSOR OF MECHANICAL ENGINEERING
ASSOCIATE DIRECTOR OF THE CENTER FOR HIGH PERFORMANCE BUILDINGS
PH.D., GHENT UNIVERSITY (BELGIUM), '17

RESEARCH INTERESTS:

Advanced heat pumping/heat engine technologies and their equipment • Positive displacement compressors and expanders • High performance buildings • Thermal management systems

2025 HERRICK STAFF

2025 HERRICK POST DOC RESEARCH ASSOC.



KIMBERLY DALY
MKTG. & COMM.
SPEC.



VICKY DEARDURFF
CUSTODIAL
SERVICES



HEMANTH DEVARAPALLI
CHPB SR. RESEARCH
SUPPORT ANALYST



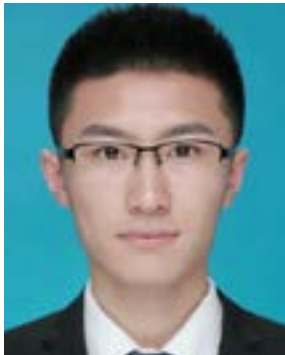
LEA GREATHOUSE
MANAGING
DIRECTOR



MOHSEN AZIMI



JUAN CAMILO
OSORIO PINZON



QILONG CHENG



SUMAN DEBNATH



JOSE LOPEZ ROMERO
LABORATORY
OPERATIONS SPEC.



JIE MA
SENIOR RESEARCH
ASSOCIATE



VIVIAN SCOTT
SR. ADMINISTRATIVE
ASSISTANT



CHRISTIAN SILVA
RESEARCH
SCIENTIST



ANTONIO
ESQUIVEL PUENTES



HUIJEONG KIM



JINWOO OH



HYUNJIN PARK

MEET OUR NEW TECHNICAL STAFF



C. KYLE BAER
LABORATORY
OPERATIONS MGR.



JOSHUA BUDREAU
LABORATORY
OPERATIONS SPEC.



JORDAN NECHKASH
LABORATORY
OPERATIONS SPEC.



YANPEI TIAN



YUN ZHANG

WINTER 2024 HERRICK GRADUATES



ANDREW BOK

DEGREE: M.S. **PROFESSOR:** MONIQUE MCCLAIN

THESIS: VIBRATION-CONTROLLED DRY POWDER DEPOSITION FOR MANUFACTURING OF SURROGATE ENERGETIC MATERIALS



CHENGBO DU

DEGREE: Ph.D. **PROFESSOR:** QINGYAN CHEN

THESIS: ANALYSES OF STATIC AND DYNAMIC AIRFLOW AND CONTAMINANT DISPERSION IN ELEVATOR ENVIRONMENTS



JUHYUNG KIM

DEGREE: M.S. **PROFESSOR:** YANGFAN LIU

THESIS: REMOTE MICROPHONE SOUND FIELD VIRTUAL SENSING METHOD USING NEURAL NETWORK FOR ACTIVE NOISE CONTROL SYSTEM



CHANGKUAN LIANG

DEGREE: Ph.D **PROFESSOR:** DAVIDE ZIVIANI - JAMES BRAUN

THESIS: DEVELOPMENT OF A HIGH-PERFORMANCE DOMESTIC REFRIGERATOR/FREEZER WITH R600A UTILIZING ADVANCED CYCLE ARCHITECTURE AND VAPOR-INJECTED RECIPROCATING COMPRESSOR



DONGJUN MAH

DEGREE: Ph.D. **PROFESSOR:** THANOS TZEMPELIKOS

THESIS: INFERRING PERSONAL VISUAL PREFERENCES AND HEAT GAIN ESTIMATION IN BUILDINGS USING HDRI AND DEEP LEARNING TECHNIQUES



DIMITRIOS MICHALAROS

DEGREE: M.S. **PROFESSOR:** ANDRES ARRIETA

THESIS: DESIGN & AEROELASTIC ANALYSIS OF MULTISTABLE RADially FOLDABLE THIN WING



HERTA MONTOYA

DEGREE: Ph.D. **PROFESSOR:** SHIRLEY DYKE

THESIS: THERMOMECHANICAL REAL-TIME HYBRID SIMULATION: DEVELOPMENT AND EXECUTION FOR LUNAR HABITATS



SIDDHARTH NAIR

DEGREE: M.S. **PROFESSOR:** FABIO SEMPERLOTTI

THESIS: SCIENTIFIC MACHINE LEARNING FOR FORWARD SIMULATION AND INVERSE DESIGN IN ACOUSTICS AND STRUCTURAL MECHANICS



BHARATH NATARAJAN

DEGREE: M.S. **PROFESSOR:** GREGORY SHAVER

THESIS: TOWARDS IMPROVING THE PERFORMANCE AND RESILIENCY OF POWERTRAIN SYSTEMS



PANDU DEWANATHA PARIKESIT

DEGREE: M.S. **PROFESSOR:** NEERA JAIN

THESIS: SYSTEMS MODELING OF THERMAL MANAGEMENT SYSTEM FOR BATTERY ELECTRIC VEHICLES.



ELIAS PERGANTIS

DEGREE: Ph.D. **PROFESSOR:** DAVIDE ZIVIANI - KEVIN KIRCHER

THESIS: FIELD DEMONSTRATION OF PREDICTIVE HOME ENERGY MANAGEMENT



JISELLE LEE THORNBY

DEGREE: Ph.D. **PROFESSOR:** JAMES GIBERT

THESIS: FROM DUST TO DEPOSITION: DEVELOPMENT AND CHARACTERIZATION OF 3D-PRINTED SURROGATE ENERGETIC MATERIALS



FENG WU

DEGREE: Ph.D. **PROFESSOR:** PANAGIOTA KARAVA

THESIS: THERMAL COMFORT AND ENERGY EVALUATION OF AIR SOURCE AND WALL-EMBEDDED RADIANT HEAT PUMPS FOR HEATING APPLICATION

SPRING 2025 HERRICK GRADUATES



SULTAN ALNAJDI

DEGREE: Ph.D. **PROFESSOR:** DAVID WARSINGER

THESIS: TOWARDS EFFICIENT DESALINATION: MODELING, PILOTING, AND FOULING CONTROL IN BATCH REVERSE OSMOSIS SYSTEMS



KARTHIK BODDAPATI

DEGREE: Ph.D. **PROFESSOR:** ANDRES ARRIETA

THESIS: MODELING AND DESIGN OF CANTILEVERED MULTISTABLE LAMINATES UNDER ELASTIC LOADING



WEIGANG HOU

DEGREE: Ph.D. **PROFESSOR:** JAMES BRAUN - DAVIDE ZIVIANI

THESIS: HEAT EXCHANGER OPTIMIZATION FOR NEXT-GENERATION AIR-SOURCE HEAT PUMPS USING LOW-GWP, HIGH-GLIDE ZEOTROPIC MIXTURES



MARCO NANNI

DEGREE: M.S. **PROFESSOR:** JAMES CANINO - DAVIDE ZIVIANI

THESIS: A RESILIENCE-ORIENTED FRAMEWORK TO ASSESS THE PERFORMANCE AND REUSABILITY OF AEROSPACE ROCKET ENGINE THERMAL MANAGEMENT SYSTEMS



MARIE SHELLY

DEGREE: Ph.D. **PROFESSOR:** DAVIDE ZIVIANI - JUSTIN WEIBEL

THESIS: HOLISTIC INVESTIGATIONS OF THERMAL MANAGEMENT SOLUTIONS FOR ELECTRIFIED TRANSPORT APPLICATIONS



KAILIN YANG

DEGREE: UG **PROFESSOR:** JUNFEI LI

THESIS: NA

READ FULL STORIES ONLINE

HERRICK’S “LIVING LABS” ARE WHERE INNOVATION LIVES PAGES 18 - 21



BOILERMAKERS CAME TOGETHER TO CELEBRATE THE PAST, PRESENT, AND FUTURE OF HERRICK LABS DURING HERRICK HOMECOMING PAGES 22 - 23



NEXTHOUSE: CREATING THE NEXT GENERATION OF FACTORY-BUILT HOUSING PAGE 23



INNOVATIVE COLLABORATION SPARKS GAME CHANGER FOR SUSTAINABILITY – AN ENERGY RE-CAPTURING TRAILER PAGES 24 - 25



HARVESTING IN SYNC: PURDUE AND JOHN DEERE DEVELOP AUTOMATED UPLOADING TECHNOLOGY PAGES 26 - 28



RURAL COMMUNITIES TO BENEFIT FROM \$5.9 MILLION SMART ELECTRIFICATION PROJECT PAGE 29



PURDUE AI RACING FINISHES AS TOP US TEAM AT IAC RACE IN CALIFORNIA PAGE 30





*RAY W. HERRICK LABORATORIES
177 S. RUSSELL STREET
WEST LAFAYETTE, IN 47907
765.494.2132*

engineering.purdue.edu/Herrick

An equal access/equal opportunity university.



Ray W. Herrick Laboratories