Herrick Labs Newsletter

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RAY W. HERRICK LABORATORIES

CHPB CENTER FOR HIGH PERFORMANCE BUILDINGS AT PURDUE

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CHPB Meeting

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IAC Meeting

July 12, 2020
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July 13-16, 2020
Compressor, Refrigeration & Building Conferences

his Issue

Herrick Laboratories Building, 1912**
From the J.C. Allen Collection, courtesy of Purdue University Libraries, Archives & Special Collections

New Ray W. Herrick Laboratories Building, opened November 2013

2018 Purdue Conf

Summary of 2018 Purdue Conferences
Editorial by Eckhard A. Groll:

The 2018 Purdue Conferences took place at Purdue University in West Lafayette, Indiana, USA, from July 9 to 12, 2018. The conferences included the 24th International Compressor Engineering Conference, the 17th International Refrigeration and Air Conditioning Conference, and the 5th International High Performance Buildings Conference. The opening session started at 9:30 am on Monday with a welcome address by Dr. Eckhard A. Groll, Reilly Professor of Mechanical Engineering and Associate Dean for Undergraduate and Graduate Education in the College of Engineering as well as general chair of the conferences.

Dr. Eckhard Groll, General Conference Chair

According to his remarks, a total of 800 people from 30 countries attended this year conferences. The Organizing Committee received 622 abstracts and accepted 472 papers for publication. Dr. Groll outlined that every effort was made to include papers of current engineering and scientific interest. On behalf of the Organizing Committee, he thanked the authors for having chosen these conferences to present their work and for all their efforts in preparing and submitting papers. Thanks to the authors, the Organizing Committee was able to present a conference program that was exciting and informative.

After expressing his gratitude to all parties concerned, Dr. Groll introduced the keynote speaker, Dr. Andy Pearson, Group Managing Director, Star Refrigeration Ltd., who delivered the keynote speech on the topic of "Innovation in Refrigeration and Air Conditioning." According to Dr. Pearson, the amount spent on research and development in the refrigeration and air-conditioning sectors seems to have reached unprecedented heights in the last 3 decades, driven mainly by the phase out of traditional refrigerants and their replacement by a variety of solutions including new fluids, which have similar performance but are less harmful to the environment than those that they replace, new ways to use even older substances, such as ammonia, carbon dioxide, water and air, and new ways of achieving cooling without using the conventional vapor compression cycle. Despite this massive effort, Dr. Pearson stated that the core technology used to provide refrigeration in residential, commercial and industrial systems has not changed much. It is in fact pretty much the same as in was 60 years ago. In his wide-ranging and thought-provoking review of innovation in refrigeration and air-conditioning, Dr. Pearson elaborated why this might be. He provided a basic explanation of what innovation is and looked at some examples of good innovation from other fields. He explained what defines someone as an innovator and whether these characteristics are innate or can be learned. Using practical examples he encouraged the audience to think like an innovator and then looked at

Dr. Andy Pearson

some of the areas in which innovation has flourished over 30 years.

Additional plenary presentations were held on Tuesday, Wednesday, and Thursday starting at 8:30 am each day. The Tuesday presentation was given by Dr. Ed Arens, Director of the Center for the Built Environment at the University of California, Berkeley on the topic of "personal comfort system research." Dr. Arens outlined that the engineered indoor environment consists almost entirely of systems in which temperature and humidity are controlled while air movement and other asymmetrical influences are minimized. Such systems are simple to visualize, design, and control. They are, however, inherently electricity-intensive, and consume in aggregate a large fraction of the world's energy. They also leave at least 20% of their occupancies dissatisfied. Dr. Arens stipulated that future buildings will save energy and improve satisfaction by using personal comfort systems (PCS) having the ability to offset a widened range of indoor temperatures while also overcoming the variability in occupant individual preferences. Per occupant, PCS require two orders of magnitude less energy than central systems, while delivering equivalent or better comfort. In addition, they can address the significant metabolic transients experienced by people in the workplace. Furthermore, PCS enable inherently efficient passive and radiant building systems to respond more quickly and be viable outside their normal climatic ranges.

Dr. Ed Arens

The Wednesday presentation was given by Dr. Jack Elson, who is retired from Emerson Climate Technologies, on the topic of "The Past, Present & Future of Reciprocating Compressors." According to Dr. Elson, reciprocating compressor technology has offered a unique contribution to the gas compression needs of humankind as we progressed from the earliest efforts to pressurize air to the multiple applications seen today, such as refrigeration and air conditioning. Dr. Elson outlined that both reciprocating compressor design technologies and the vapor compression cycle in which the compressors were used were necessary inventions to lead the way to a practical solution for modern food preservation and desired indoor environmental comfort. In his review, he outlined the evolution of reciprocating compressors and the various technology challenges and developments required to improve both durability and performance as the product type evolved from external drive, to semi-hermetic, to hermetic design variations. He concluded that these reciprocating compressor product improvements were achieved based on the instrumentation and analytical tools developed at the same time and that this trend continue today.

Dr. Jack Elson

The Thursday presentation was given by Dr. Reinhard Radermacher, Minta Martin Professor of Mechanical Engineering and Director of the Center for Environmental Energy Engineering at the University of Maryland, on the topic of "Future Perspectives of AC/R/HP." Dr. Radermacher explored opportunities to increase energy efficiency in buildings in general and in the HVAC&R industry in particular with respect to technology development in general and challenges facing our society at large. He placed emphasis on vapor compression technologies, refrigerant choice, and included a brief discussion of non-vapor compression systems and their components. He concluded his presentation with examples of the potential contributions resulting from a systematic approach to component and system optimization.

Dr. Reinhard Radermacher

Each day, the keynote/plenary presentations were followed by up to seven parallel technical sessions, in which each of the 472 presenting authors had the opportunity to orally present their paper. Overall, 80 technical session, typically 2 hours in duration, were scheduled over the four-day duration. Engineers and researchers presented their work and held subsequent discussions on topics including alternative refrigerants and their technologies, heat transfer and heat exchanger, building controls, building design issues and optimization, various conventional and novel positive displacement compressors, and performance comparisons of refrigerants with low global warming potential, to name a few. It has been a tradition at the Purdue Conferences that no poster sessions are scheduled and each paper is presented orally. All papers presented will be available free-of-charge through the Purdue e-pubs later this fall. Proceedings of the previous proceedings can be found at:

https://docs.lib.purdue.edu/me/.

2018 Industrial Advisory Committee Meeting, October 25 - 26

The 66th Annual Industrial Advisory Committee (IAC) meeting was held at the Laboratories Thursday, October 25- Friday, October 26. Terry Manon, IAC Chairman, welcomed and introduced the members and guests. Patricia Davies followed with feedback from last year's IAC meetings and the breakout sessions. Our newest faculty member, Yangfan Liu, was introduced and gave a presentation on his research interests - Acoustics and Noise Control.

Anil Bajaj, the William E. and Florence E. Perry Head of Mechanical Engineering, gave an update on the School of Mechanical Engineering. Herrick Labs' three newest staff members - Charles Baxter, Ryan Thayer, and Brian Barrett - were also introduced. Patricia and the faculty were commended for their successful effort on the continued growth of the lab projects and resources.

The work day ended with brief overviews of several research initiatives headed by Herrick faculty and a brainstorming session on critical technical needs of the IAC's companies. One of the many themes arising from the session is the need for low price and reliable sensors to make intelligent systems viable.

Friday afternoon was the Student Poster show, but with changes from years past. A Student Poster Show Revamp Committee was formed last year to come up with a new format. The traditional abstracts were replaced with quad charts, which were used to create their posters. IAC members were assigned to certain posters to provide feedback regarding their work and presentation. The IAC commented that the overall quality and content of both the posters and the presentations were the best that they've seen.

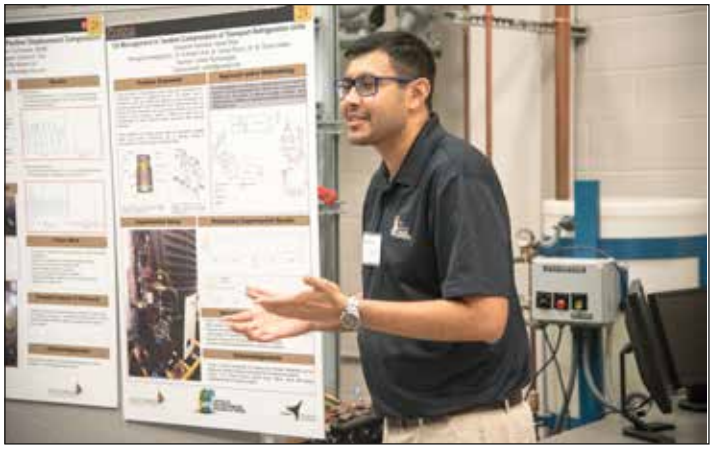
Part of the revamp was a new social event hosted at the Lafayette Brewing Company.

After the poster show and wonderful lunch, Gerry McCartney, Purdue's Executive Vice President and Chief Information Officer, gave a presentation on Purdue's On-Line Education Vision and Impact. It was both interesting and informative.

In the afternoon, three breakout sessions were held on the following topics: (1) First-Year Graduate Student Mentoring, led by IAC member Terry Manon, Prof. Neera Jain, and student Allison Murray; (2) Soon-To-Graduate Student Mentoring, led by IAC member John Galbraith, Profs. Yan Chen and Thanos Tzempelikos, and student Domenique Lumpkin; and (3) Young Faculty and Post-docs Getting to Know the IAC Better and Vice Versa, led by IAC member Rob Comparin, Profs. Greg Shaver and Donghun Kim, and Post Doc, Davide Ziviani.

Overall, it was another successful IAC meeting with lots of useful suggestions and great comments. Here are several pictures taken throughout the IAC meeting and Student Poster Show. Thanks to our students Haitian Liu and John Foster for being our photographers.

Leon Brendel (above center) presents his research on refrigeration for zero gravity environments. Although the vapor compression cycle is utilized in almost all air-conditioning and refrigeration applications on earth due to its superior electrical efficiency, the cycle, like most two phase cycles, is still poorly understood in a zero-gravity environment. Difficulties are predicting the fluid dynamics in the cycle and realizing a safe start up and shut down procedure at zero gravity. However, the biggest challenge for Leon is to get his hands on zero-gravity testing opportunities.



Vatsal Shah (above) presents his research on oil management in HVAC-R systems running vapor compression cycle. With the increasing development of variable speed systems as well as future use of newer refrigerants, there is a need in the industry to develop tools that help to design systems which consider the effects of oil.

NEXT INDUSTRIAL ADVISORY COMMITTEE MEETING: OCTOBER 24-26 2019

Herrick Labs students and IAC members enjoying a delicious lunch

IAC member, Mike Moaveni (standing), addressing one of the breakout sessions

Trevor Bird (left with back to camera) discusses research on combined plant and control design for thermal management systems. Both static and transient constraints exist on thermal system design. By considering control design at the system design state, we can improve the thermal capabilities and robustness of thermal management systems.

Tony Xue (right) presented to Dr. Fred Vance (left) and Dr. John Grace (center) about his research on "Modeling and Design of Multi-functional Acoustical-Damping Materials", based on which sound packages involving lightweight porous media could be developed for vehicles or aircrafts to reduce cabin noises as well as to save weight.

Riley Barta (right) discusses his research, which the focus is the design and assembly of a multi-state trans-critical Carbon Dioxide refrigeration system that can be used to explore and compare methods of expansion work recovery along with other cycle modifications. The potential impact is to develop and validate technologies that can increase the efficiency of refrigeration systems utilizing natural refrigerants to make them more competitive with HFC systems in use today.

Conor Pyles (right) discusses the dynamics of a system of 16 coupled electromechanical resonators with different parameter distributions under varying coupling conditions and the potential applications of this type of system in the fields of resonant mass sensing and energy harvesting.

Alumni Reflections

Margaret Mathison, Ph.D. 2011

I learned more than I ever expected at Purdue – and not just about mechanical engineering. I started my college experience at Iowa State University, in my hometown of Ames, IA, and decided to pursue a graduate degree at Purdue on the advice of two of my favorite professors, who also happened to be Herrick graduates (Greg Maxwell and Mike Pate). I was offered a position working with Jim Braun and Eckhard Groll on a compressor modeling project for LG Electronics.

As most of you would probably agree, one of Herrick's greatest strengths is the network of support between graduate students. In my case, Miguel Jovane was tasked with introducing me to the basics of compressor modeling. Those of you who know Miguel also know that he is a great joker, so when he told me that I would be served tuna fish eyeballs on my visit to South Korea to present my research, I couldn't decide if he was teasing me for my Midwestern aversion to seafood or telling the truth. Fortunately I had time to get over my culture shock before the trip, and the elaborate tuna dinner that we were treated to in South Korea was the cultural highlight of my trip.

Margaret with her parents (and Neil Armstrong) on graduation day

Another defining moment of my time at Purdue came in my third year, when my mother received the news that she needed a lung transplant. While the transplant was necessary to save her life, there was no guarantee that she would receive a lung and, if she did, it carried many risks. In addition, she would need a caregiver to stay with her at the lung transplant clinic in Minneapolis for three months while she recovered from the surgery. Needless to say, it was a stressful time. In the emotion of the moment, I contemplated leaving graduate school to help her through the process, but Jim and Eckhard reassured me that I could take the family time that I needed without giving up my studies. With their support, I was able to fly to Minnesota when my mom got "the call" and remain there for three months to care for her. I don't imagine many advisors would make this kind of accommodation, but their support made a world of difference for our family. We just celebrated the ten year anniversary of the lung transplant with my mom this August!

My fourth year at Purdue brought a different kind of challenge. I received one of the newly-created Lambert Teaching Fellowships, which offers graduate students the opportunity to shadow a master teacher for one semester and then teach a course independently the following semester. I had served as a TA for a few semesters and attended many of the teaching seminars offered by the Center for Instructional Excellence, but this opportunity to lead my own section of thermodynamics – surrounded by mentors like Jim, Eckhard, and Patricia Davies – was invaluable. I drew on this experience when I graduated with my Ph.D. in 2011 and joined the faculty at Marquette University. In 2015, I returned to Iowa State, where I serve as a senior lecturer and teach the HVAC fundamentals and design courses, among others. I continue to enjoy exploring new methods to improve the effectiveness of my teaching. This past summer I faced the challenge of teaching a thermodynamics course that met 1.5 hours per day, five days per week for six weeks. To help the students keep up with the fast pace of the course, I incorporated elements of team-based learning, which uses teams to hold students accountable and increase engagement in a "flipped" classroom format. While my teaching style continues to evolve, it was my experiences at Purdue that laid the foundation for my career in the classroom.

Margaret (far right) with the Marquette chapter of SWE, which she advised for several years, following a tour of the chillers at the Pettit National ice Center, one of two speed skating ovals in the U.S.

I also had the opportunity to attend several ASHRAE conferences as a graduate student, which helped me to grasp the scope of the HVAC industry and ASHRAE's role within the industry. Those experiences encouraged me to get involved in ASHRAE, leading to stints chairing a technical committee and a standard revision committee, and I now advise our student chapter at Iowa State. I also appreciate the opportunities that ASHRAE has afforded to stay connected with many Herrick lab alumni, and hope to see some of you soon in Atlanta!

I will always feel blessed for my time at Purdue, which made all of these things possible. Thank you to each person who was a part of that journey!

P.S. – Tis the season for giving, and my family never forgets that my mom is alive because of another family's incredible gift. For those of us impacted by donation, it's an easy decision to register as an organ donor. Please consider looking up the registration process in your state and discussing your preference with your family.

Dr. Monika Ivantysynova

December 11, 1955 - August 11, 2018

Dr. Monika Ivantysynova

Purdue's College of Engineering lost an exceptional faculty member on August 11 when Dr. Ivantysynova lost her 4-month battle with cancer. Initially, she kept her health condition private until the rapid decay required her constant stay in the hospital for the last few weeks of her life. Monika was extremely active in the international fluid power research community, and her passion for the subject inspired researchers and engineers all over the world. She was the Maha Named Professor in Fluid Power Systems for Mechanical Engineering and Agricultural and Biological Engineering.

Monika Ivantysynova was born on December 11, 1955 in Polenz, Germany. She earned her M.S. and Ph.D. from Slovak Technical University of Bratislava. After completing her Ph.D. in 1983, she worked for seven years in industry, gaining expertise in hydraulic systems and component design, modeling and system simulation, and in the development of hydraulic pumps and motors. In 1990 she returned to academia, where she researched hydraulic actuation systems and control for aircraft applications at the Technical University of Hamburg-Harburg. In 1996 she took up the Chair in Hydraulic Systems and Control at the University of Duisburg, returning to TUHH as Professor of Mechatronic System Design three years later, establishing a comprehensive fluid power research laboratory. In 2004 Monika was appointed MAHA Professor of Fluid Power Systems at Purdue University to lead the newly-created Maha Fluid Power Research Center. In 2008, the center moved to its current location on Kepner Drive in Lafayette, IN: a 15,000 square-foot research laboratory for the hydraulic pumps and motors, for which Dr. Ivantysynova was the director.

Her research focused on fluid power system design, modeling, multi-domain simulations, energy saving actuators, advanced transmission concepts, drive line control, computer based optimization of positive displacement pumps and motors, smart structures, and optimization of tribological systems by surface modification in micro- and nanoscale. Her research work has generated 18 patents. As well as being a dedicated leader of her own research team, she energetically engaged with fluid power researchers throughout the world, traveling to the major conferences on all continents. Her presence – questioning, cajoling, encouraging – always enlivened proceedings and forced us all to think deeply about the subject. She was founder and editor-in-chief of the International Journal of Fluid Power published by Taylor & Francis - the only international journal dedicated to fluid power. She was also an initiator and scientific board member of the first virtual network of fluid power research and education centers world wide, the Fluid Power Net International (FPNI). As well as her seminal book "Hydrostatic Pumps and Motors" published in German and English, she also has published more than 200 papers in technical journals and at international conferences. She was a pivotal figure in the multi-university Centre for Compact and Efficient Fluid Power, creating a renaissance in fluid power research and education in the USA.

She was more than just a researcher – she taught research method. She taught effective teamwork, appreciation of diversity, and how to face even the most difficult research challenges. She cared deeply for every member of her lab, knowing and appreciating the important and sometimes delicate balance between personal life and everyday work. She was a positive impact on the lives of many, including, but not limited to, the members of her research team.

Her accolades were many. Dr. Ivantysynova's work has been recognized with several awards, including the 2016 Morrill Award, ASME Fellow, the Purdue Innovator Hall of Fame, SAE Fellow in 2014, and Backe Medal in 2012. She received both pre-eminent international awards for fluid power: the 2009 Joseph Bramah Medal from the United Kingdom's Institution of Mechanical Engineers, and the 2015 Robert E. Koski medal from the American Society of Mechanical Engineers. She was awarded two honorary doctorates, and too many Best Paper prizes to list.

Monika is survived by her husband, Jaroslav and two children.

This obituary was created using content from the Schools of Mechanical Engineering and Agricultural & Biological Engineering.

Below is a listing for a faculty position opening in the College of Engineering - Fluid Power Systems. For a complete list of Engineering faculty openings, visit the College of Engineering website: https://engineering.purdue.edu/Engr/InfoFor/Employment.

College of Engineering

Faculty Position Opening

POSITION: Assistant/Associate Professor of Agricultural and Biological Engineering with a joint appointment in Mechanical Engineering, academic year, tenure track

RESPONSIBILITIES: The successful candidate is expected to develop an internationally recognized program in fluid power research and education. The Purdue Maha Fluid Power Research Center provides a state-of-the-art facility for collaboration with other colleagues in a highly interdisciplinary effort to address needs and provide innovative solutions in fluid power. The individual will engage local, state, national and international government, and non-government agencies, industry, and other stakeholders to address their fluid power research needs, and contribute to Purdue's research and teaching efforts focused largely on fluid power related disciplines.

Applicants must have expertise in fluid power and in one or more fields specified below:

1. Modeling and design of hydrostatic transmissions and hydraulic hybrid systems, including electro-hydraulic hybrids;
2. Distributed sensing, controls, acoustics and diagnostics for complex fluid power systems;
3. Modeling, design and control of hydraulically driven flexible robots, wearable power assist devices and/or portable robots;
4. Functional fluids, ER fluids and/or tribological systems;
5. Modeling, design and control of pneumatic systems;
6. Analysis, modeling and simulation of multi-domain systems;
7. Design and motion control of water hydraulic systems;
8. Modeling and control of micro fluid power systems;

Teaching in undergraduate and/or graduate-level Agricultural Engineering and Mechanical Engineering majors is expected. The individual will also develop a successful externally funded research program.

This is an academic year, tenure track, research and teaching position. The successful candidate will build a renowned program in this area that is inclusive of an international dimension.

QUALIFICATIONS: Applicants must have a PhD degree in agricultural engineering, mechanical engineering or related discipline. Applicants should have industry experience or demonstrated research funding from industry or government agencies. Candidates with a multi-disciplinary research focus are particularly encouraged. Faculty candidates should have exceptional potential for world-class research, and a commitment to both undergraduate and graduate education. Excellent communication and grant writing skills are required.

THE COLLEGES: The Department of Agricultural and Biological Engineering is part of the Colleges of Agriculture and Engineering and the School of Mechanical Engineering is part of the College of Engineering. Purdue University and these units are deeply committed to the three land-grant missions (teaching, research, and extension), to international activities and perspectives that span all missions, and to excellence in all we do. The College of Agriculture is one of the world's leading colleges of agricultural, food, life, and natural resource sciences and ranked ninth globally in the 2018 QS World University Rankings. The College has 11 academic departments and includes 313 faculty, 2803 undergraduate students, and 672 graduate students. The College of Engineering has 13 academic units and includes 452 faculty, more than 8918 undergraduate students, and nearly 3,550 graduate students. The College of Engineering is ranked number 8 for undergraduate programs and number 7 for graduate programs by U.S. News and World Report. The Colleges' strategic plans can be accessed at:

https://ag.purdue.edu/plan/Pages/default.aspx and https://engineering.purdue.edu/Engr/AboutUs/MeetDean/Pinnacle/index_html

College of Engineering

Faculty Position Opening Cont.

OPPORTUNITIES FOR COLLABORATION: Numerous opportunities for collaborations throughout Purdue University exist. The Purdue Moves Plant Science Initiative is a major investment in plant production and utilization that presents opportunities for collaboration (https://ag.purdue.edu/plantsciences). Collaborators may be found in Discovery Park (http://www.purdue.edu/discoverypark), in the Mechanical Engineering Research Labs (Herrick Labs, Zucrow Labs, Birk Nanotechnology Center), Purdue Agricultural Centers, Center for Commercial Agriculture, and Laboratory for Applications of Remote Sensing.

CLOSING DATE FOR APPLICATIONS: Review of applications will begin **January 15, 2019** and will continue until the position is filled.

APPLICATION MATERIALS: Letter of interest, resume, official academic transcripts, statement of teaching and research philosophies, and names, addresses and phone numbers of three references. Applications should be submitted electronically to abejob@ecn.purdue.edu. A background check is required for employment in this position.

The Department, School and Colleges are committed to advancing diversity in all areas of faculty effort, including scholarship, instruction, and engagement. Candidates should address at least one of these areas in their cover letter, indicating their past experiences, current interests or activities, and/or future goals to promote a climate that values diversity and inclusion. Purdue is an ADVANCE institution – https://www.purdue.edu/advance-purdue).

CONTACT: Address inquiries to: Dr. Andrea Vacca, Department of Agricultural & Biological Engineering, School of Mechanical Engineering, Purdue University. avacca@purdue.edu; (765) 430-0081.

For additional information see http://www.purdue.edu/ABE

Purdue University is an EOE/AA employer. All individuals, including minorities, women, individuals with disabilities, and veterans are encouraged to apply.

Maha Fluid Power

RESEARCH CENTER

Purdue Students Team Up with German Students to Study Refrigeration

Graduate students from Purdue University (USA) collaborated with students from the Technical University of Dresden (Germany) to complete an international course in refrigeration and compressors. They spent one week at the Technical University of Dresden, collaborated long-distance over the summer, and then convened for one week at Purdue's Herrick Labs to present their final projects.

The collaboration started in 2016. "Our goal was to create a master's level course in refrigeration and compressors," said Eckhard Groll, Reilly Professor of Mechanical Engineering. "But in the 21st century, all engineering is done on a global basis. So it's important that Purdue students are exposed to engineers from other cultures."

Eckhard found a perfect partner in Ullrich Hesse, the Bitzer Professor of Refrigeration, Cryogenic, and Compressor Technology at the Technical University of Dresden. "Purdue is a perfect place to do this," said Hesse, "because they are well-known in the industry for compressor research. And I only hire people who have backgrounds in international communication. So this course was perfect." They received funding from the Schaufler Foundation, established by Peter Schaufler -- former CEO of Bitzer, a German company that manufactures refrigeration compressors.

Purdue students traveled to Dresden, Germany in May, and spent a week touring the country, including visits to the Bitzer manufacturing plant. "Then we teamed up the students, one from Purdue, and one from Dresden," said Groll. "We assigned them a summer project to design a complete refrigeration system. Some were tasked with building a refrigerated truck to keep food fresh, and others had to design an ice-skating rink that would function in Dubai."

Collaboration might seem difficult when team members are on different continents, but the everyday tools of 21st century life actually made it quite easy. "The students used Skype, WhatsApp, Dropbox, and even Facebook," said Hesse. "I was impressed by how quickly they came together, and how well they were able to work together."

The class culminated with a week-long visit from the Dresden students to Purdue's Herrick Labs, the largest academic HVAC lab in the world. Teams put the finishing touches on their projects, and offered their final presentations to the class.

"We're thrilled to be able to foster this international exchange of learning," said Groll. "It was fascinating to see the students observe how engineers from Germany might tackle problems differently than engineers from the USA. We can all learn from each other."

New Herrick Staff

CHARLIE BAXTER

Technical Services Supervisor

Charles (Charlie) Baxter joined the Labs as the Technical Services Supervisor on June 4, 2018. Charlie received his Bachelor's degree in Aeronautical Engineering Technology from Purdue University in 2012. Prior to Herrick Labs, he worked for Med Institute, Inc. as a Research Engineer for Aortic Intervention Products. Some of the products he worked on while there are: stent grafts, transcatheter delivery systems, graft treatment accessories, and custom devices.

His intellectual property includes: 5 granted US patents, 4 pending US patent applications, and 5 European patents. In his spare time, he mentors the Harrison High School FIRST Robotics Team and helps educate high school students about STEM fields and the engineering process. Charlie and his wife, Elizabeth, who works in the Purdue Conferences Division, live in West Lafayette.

RYAN THAYER

Engine Test Cell & Lab Technician

Ryan Thayer joined the Labs as the Engine Test Cell and Lab Technician on March 27, 2018. He also works in the shop, as needed. Prior to joining the labs, Ryan worked for a small design engineering firm called Design and Analysis, Inc. in Hope, IN where he also contracted into Cummins, Inc. in Seymour, IN. He has also worked for Kauffman Engineering as a manufacturing engineer in Junction City, Kansas.

Ryan received his Bachelor's degree in MET and TEE from Indiana State University in 2014. In his spare time, Ryan enjoys helping on the family farm in Hope, IN. He also enjoys working out at Purdue's Recreation and Wellness Center. Ryan and his wife, Morgan, who is a Ph.D. student in Animal Sciences focusing on swine nutrition, live in Lafayette.

BRIAN BARRETT

Conference Coordinator

Brian Barrett joins Herrick Labs as the new Conference Coordinator. Brian has a diverse background in design and event management, and is a 1999 graduate of Purdue University, with a B.S. in Computer Graphics Technology.

Since 2003, has built a background in design, event production and event management. Since 2013, Brian served as the marketing designer and event production manager for 317 Events.

Brian has had the privilege to produce events all over the world, including notable local events such as the Rolling Stone Super Bowl party, the Downtown Indy NYE Car Drop, INDYpendence Day Concert for Cancer (with bands such as AWOLNATION, Fuel, Filter, Blue October and Panic! at the Disco) and the Lucas Oil Stadium Grand Opening.

Brian is the father of two daughters: Emerson, age 12 and Harper, age 9.

Our People

People News

Where are They Now?

Angela Barbee

Angela Barbee (MSME 1998) has been appointed Vice President of Engineering and New Product Development, Global Faucets, with Kohler Company. She is responsible for crafting and executing the Global Faucets product vision to increase profitable growth in both existing and new markets across all regions. Angela joined Kohler Co. from General Motors, where she most recently served as Director of Global Design Operations, overseeing five business units.

Faculty Honors & News

Thanos Tzempelikos (right) receives the award from Prof. Rao Govingaraju, Bowen Engineering Head of Civil Engineering

Prof. Thanos Tzempelikos recently received the 2018 Roy E. & Myma G. Wansik Research Award from the School of Civil Engineering. This award is presented annually to an outstanding professor in the School of Civil Engineering at Purdue for excellence in research

Panagiota Karava

Prof. Panagiota Karava has been appointed as the Jack and Kay Hockema Associate Professor in Civil Engineering. This is the first "Rising Star" professorship designed to recognize faculty members in the early stages of their career. Prof. Karava teaches architectural engineering and is a member of Purdue's Center for High Performance Buildings at Herrick Labs. Her research interests are broadly related to smart building technology and sustainable energy systems.

Dr. Karava has built collaborative initiatives and partnerships to pursue interdisciplinary research with significant impact. One of her most recent projects funded by the National Science Foundation involves sociotechnical research to foster energy-aware communities enabled by new smart technology and cloud data accessibility.

Andres Arrieta with students Katie Riley (L) and Matt Boston (R)

Prof. Andres Arrieta (center) received the ASME Gary Anderson Early Achievement for "notable contributions of a young researcher in his or her ascendancy whose work has already had an impact on the fields of Adaptive Structures and Material Systems." Katherine Riley (left) and Karl Ang (not pictured) received the Best Student Paper award for the paper entitled: Switchable Bistability i 3D Printed Shells with Bio-inspired Architectures and Spatially Distributed Pre-stress, authored by: K. Ang, K. Riley, J. Faber, and A. Arrieta. This work is the result of Katie's MS thesis for Andres and Karl's undergraduate research as a Bottomley Scholar. Andres studies Materials, Structures, and Functionality in his Programmable Structures Lab at Herrick Labs.

On another note, Andres Arrieta's article on the Origami folds of earwig wings, (see Summer 2018 Herrick Labs' newsletter) was published November 13 in the National Geographic magazine. See link below for full story.

https://www.nationalgeographic.com/animals/2018/11/earwig-origami-wings-how-they-work-insect-flight/

Bin Yao

Prof. Bin Yao was selected as one of the recipients to receive the 4th Nagamori Award through the Nagamori Foundation in Japan. The Nagamori Foundation created these awards to bring vitality to technological research of motors, and related fields, such as generators and actuators, and also to support the researchers and development engineers who have made outstanding achievements in these fields. The fundamental contributions of Bin's main research cited for the award is: "Theory and Applications of Adaptive Robust Controls to Integrated Design of Intelligent and High-Performance Mechatronic Systems".

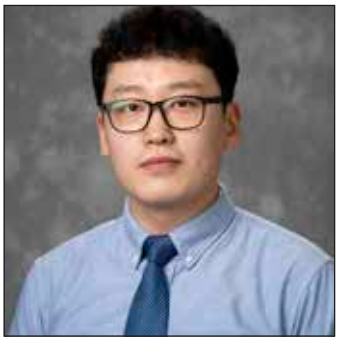
People News

Iason Konstantzos

Iason Konstantzos (Ph.D. '16) started as a tenure-track assistant professor in the Durham School of Architectural Engineering and Construction at the University of Nebraska-Lincoln on Aug. 13, 2018.

Iason was a PhD student in the Architectural Engineering emphasis area of CE and graduated in December 2016. From January 2017-June 2018 he was a post-doctoral fellow in the School of Civil Engineering and in the Center for High Performance Buildings at Herrick Labs. During his Ph.D. and post-doc terms, Iason was advised by Prof. Thanos Tzempelikos.

Student Honors & Awards



Tony Xue

Yutong (Tony) Xue, a current Ph.D. student advised by Prof. Stuart Bolton received the Best Paper by a Young Presenter Award in Noise for his paper Fibrous material microstructure design for optimal structural damping. Tony presented his paper at the Spring meeting of the Acoustical Society of America in Minneapolis.

Hejia Zhang

Hejia Zhang, Ph.D. student in CE and Herrick Labs advised by Prof. Thanos Tzempelikos received the 2018 Ross Fellowship. This highly competitive and prestigious graduate fellowship is awarded every year to the most deserving Ph.D. candidates in the School of Civil Engineering.

Xinye Zhang

Xinye Zhang, a Ph.D. student advised by Eckhard Groll, won 1st place in the student paper competition for his paper titled "Experimental Validation and Analysis of a Dynamic Model for Linear Compressors" during the 2018 International Compressor Engineering Conference.

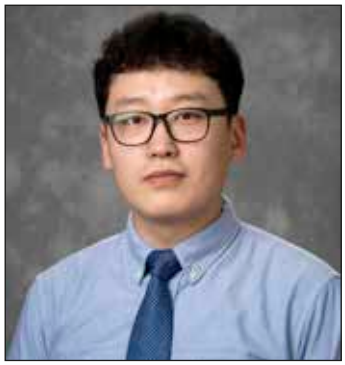
Inter-Noise 2018, the annual conference organized by the Institute of Control Engineering (INCE-USA), was held in Chicago in August. Herrick Labs is proud to announce that three of our students won awards at the conference. They are:

Yiming Wang

Yiming Wang, a current Ph.D. student advised by Kai Ming Li received the Leo Beranek Student Medal, recognizing excellence in the study of Noise Control Engineering among graduate-level students.

Weonchan Sung

Weonchan Sung, a Ph.D. student studying under Patricia Davies, received the Classic Papers in Noise Control Student Presentation Award, given to a student who presents a review of a classic or seminal paper in Noise Control Engineering. Weonchan gave an overview of Broner's 1978 paper on: The Effect of Low Frequency Noise on People and More Recent Research on the Effects of Low Frequency Noise. Purdue students have won this award 7 out of the last 8 years.



Tony Xue

Yutong (Tony) Xue, a Ph.D. student studying under Stuart Bolton, was a winner of the Student Paper Competition. His paper was: A Comparison Between Glass Fibers and Polymeric Fibers when Serving as a Structural Damping Medium for Fuselage-like Structures.

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Staff Awards

Charles (Charlie) Baxter (Technical Services Supervisor) was awarded one of the ME Staff Recognition Awards on December 12. The nomination entry by Patricia Davies states that: Charlie started in June 2018 and has been amazingly productive from Day 1. He works very well with staff, faculty and students at Herrick and is very productive, moving projects forward and interfacing with other entities at Purdue. He has excellent judgment and a keen eye for safety and good work practices. He has initiated the long overdue inventory upgrade and has led the clean-up and reorganization of the shop. He has clearly demonstrated both his strong technical expertise and his excellent leadership skills. Charlie has put forward a number of excellent suggestions to streamline checklists for safe operation of complicated rigs, and to help students create better check lists. He is also developing a plan for replacement, updating and improving the shop equipment. He is always looking at ways to improve operations and has a very strong customer service approach to his job.

Graduations

Akash, Kumar (MSME 2018) A Closed-Loop Framework for Increasing Trust in Human-Machine Interactions. Kumar is staying at the Labs for his Ph.D. studies.

Boston, Matt (MSAAE 2018) Demonstrator for Selectively Compliant Morphing Systems with Multi-Stable Structures. Matt is staying at the Labs for his Ph.D. studies.

Chowgule, Revati (MSME 2018) Characterization of the Dynamics of CONFOR Foam Undergoing Impulsive Excitation. Revati is working for Cummins, Inc. in Stoughton, WI.

Gosala, Dheeraj (Ph.D. 2018) Fuel-Efficient Emissions Reductions from Diesel Engines via Advanced Gas-Exchange Management. Dheeraj took a position with Cummins, Inc. in Columbus, IN

Hahn, Jaesik (Ph.D.2018) How Heat Affects Human Hair: Thermal Characterization and Predictive Modeling of Flat Ironing Results. Jaesik is working for Cymer in San Diego, CA.

Hoshing, Vaidehi (Ph.D. 2018 Augmented Framework for Economic Viability-based Powertrain Design and Emissions Analysis of Medium/Heavy-duty Plug-in Hybrid Electric Vehicles. Vaidehi took a position with Cummins, Inc. in Columbus, IN.

Hurkat, Yash (MSME 2018) Modelling of the ReNEWW House. Yash's employment is unknown at this time.

Inamdar, Harshad (Ph.D. 2018) Performance of Finned Heat Exchangers After Air-Side Fouling and Cleaning. Harshad is working for Rheem Mfg., Ft. Smith, AR.

Jaramillo, Rita (Ph.D. 2018) A Multi-Agent Control Approach for Optimization of Central Cooling Plants. Rita is a faculty member at Universidad Autonoma del Caribe, Barranquilla, Colombia.

Joe, Jaewan (Ph.D. 2018) Agent-Based Approach for System Identification and Optimal Control of High Performance Buildings. Jaewan is working for Oak Ridge National Lab, Tennessee.

Odstrcil, Troy (MSME 2018) Variable Valve Actuation Strategies for Improving Aftertreatment System Efficiency in Modern Diesel Engines over the Heavy-Duty Federal Test Procedure Certification Cycle. Troy's employment is unknown at this time.

Panicker, Malavika (MSME 2018) Control of an Adaptive Refrigeration Cycle. Malavika's employment is unknown.

Ramesh, Aswin (Ph.D. 2018) Utilization of Variable Valve Actuation to Improve Fuel Efficiency and Aftertreatment Thermal Management in Diesel Engies. Aswin is working for Cummins Inc. in Columbus, IN.

Son, Forrest (MSME 2018) Piezoelectric Inkjet Printed Aluminum Bismuth (III) Oxide: The Effects of Printing Parameters on Burning Rate. Forrest is working at Sandia National Labs in Albuquerque, NM.

Tam, Aaron (MSME 2018) Optimal Design and Control of Residential Air Conditioning Equipment with Integrated Thermal Storage. Aaron is working for the Electric Power Research Institute (EPRI), Palo Alto, CA.

Taylor, Alex (Ph.D. 2018) Air Handling Strategies for Fuel Efficient Aftertreatment Thermal Management & Connected and Automated Class 8 Trucks. Alex is working for a small start-up company in Ann Arbor, MI.

Wagner, Danielle (MSME 2018) Dynamics of Fine and Ultrafine Particulate Matter in Biomass Burning Kitchens in Western Kenya: Field Sampling Methodology and Modeling Framework. Danielle is staying at the Labs for her Ph.D. studies.

Yeum, Chul Min (Ph.D. 2018) Computer Vision Based Structural Ass Exploring Large Volume of Image. Chul Min took a faculty position at University of Waterloo, Ontario, Canada.

You, Ruoyu (Ph.D. 2018) Investigating Airflow Distribution and Contaminant Transport in Commercial Aircraft Cabins. Ruoyu took a position at the Hong Kong Polytechnic University.

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Engagements

Rui Cao (Ph.D. 2017) and Laura Zhang got engaged in September at the Banff National Parks in Canada. They are pictured here in front of the Lake Louise in the national park. Rui is working at Aearo Technologies in Indianapolis and Laura is doing her graduate studies in Business information Systems at Depaul University in Chicago.

John Hollkamp (current Ph.D. student) and Katherine Kummeth got engaged on November 2 and planning a Summer of 2020 wedding. Katherine is a high school math teacher.

Trevor Fleck (current Ph.D. student) and Valarie Skaggs are engaged and planning a September 1, 2019 wedding. Valarie graduated from Purdue's School of Nursing in May 2018 and now works as a nurse at the University Hospital in downtown Indianapolis.

Vaidehi Hoshing (Ph.D. 2018) and **Dheeraj Gosala** (Ph.D. 2018) got engaged on November 18 during their engagement ceremony in Nasik, India.

Births

Andy Hjortland (Ph.D.) and wife Nicole welcomed their first child, a son named Henry on August 16, 2018. Henry weighed 8 lb. 5 oz. at birth.

Vince Badagnani (MSME 2005) and wife, Wina Wichienwidhtaya, welcomed a son, Hugo, on January 24, 2018.

Vince also has changed jobs and is now working at Amazon Lab126 in Audio Software Quality Assur

Student Participates in Turkey Trot

For most folks, Thanksgiving Day is about family, friends, football and food. But for **Weimin Thor**, a current MSME student working with Stuart Bolton, it's about fitness too. Thor and friends, joined by more than 7,200 other people, participated in the annual Turkey Trot 5K in Naperville, IL on Thanksgiving Day. The race has been held every year for the last 21 years. Way to go, Thor!

For the full story about the Turkey Trot 5K, which was published in the Chicago Tribune, here's the link:

https://www.chicagotribune.com/suburbs/naperville-sun/news/ct-nvs-naperville-turkey-trot-st-1123-story.html

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Donate to Herrick Labs

Donations to the Labs are always welcomed and appreciated. If you're interested in making a donation, below is some helpful information for you. For all of you who have contributed in the past: my sincere thanks. Your gifts help to create groundbreaking research and set a wonderful path to the future. Thank you for coming on board!

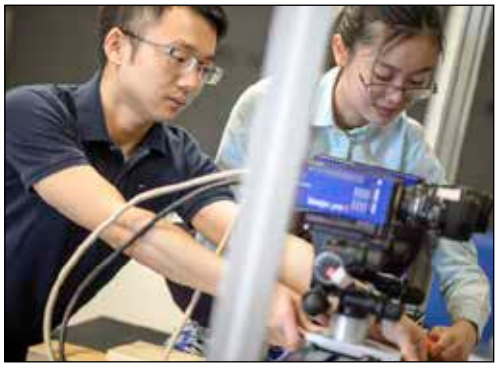
Be sure you specify your gift is for Herrick Labs. You are also welcome to support a specific professor's research, or support a few established funds:

- Herrick Laboratories Building Fund
- Ray Cohen Excellence in Thermal Systems Fund
- Herrick Laboratories General Operations
- William E. Fontaine Student Fellowship Fund

Giving by mail? Send your check to the address on back page of this newsletter, payable to the Purdue Research Foundation, with "Herrick Labs" and any additional designation on the memo line. Want to make an online gift? You can find details at the website:

https://engineering.purdue.edu/ME/Giving/GivingGuide.

Specific questions about giving? (stock options, estate planning, deferred gifts, etc.) Purdue has philanthropy experts solely assigned to Mechanical Engineering who can help you! Contact the Director of Development, Scott Banfield at (765) 494-5629 or visit Mechanical Engineering's website at: **https://engineering.purdue.edu/ME/Giving/index_html.**



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Ever True Campaign

Below is a message from President Mitchell E. Daniels, Jr. concerning the Ever True Campaign for Purdue University

Together, We Are Purdue!

Ever True: The Campaign for Purdue University is an invitation to the Purdue family to join together, through private giving and personal involvement, to boldly advance our University as a national and global leader that continues to move the world forward.

With a goal of $2.019 billion, Ever True is the largest fundraising effort in Purdue history. The campaign spans July 1, 2012, through June 30, 2019, concluding in the University's 150th anniversary year.

This campaign will propel the Purdue Moves initiatives—Affordability & Accessibility, STEM Leadership, World-Changing Research, and Transformative Education—and reinforce the University's overarching commitment to keep a rigorous college education within students' financial reach.

To learn more about this campaign, visit:

https://securelb.imodules.com/s/1461/campaign/start.aspx?sid=1461&gid=1010&pgid=3082

PURDUE UNIVERSITY

RAY W. HERRICK LABORATORIES

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News about You and Address Changes

We are always interested in hearing your news, like weddings, births, and job promotions, and we want to be kept up-to-date on current addresses. Please send notes to Donna Cackley or to the e-mail address below. Don't hesitate to let us know of other alums that have moved or changed jobs. Photos are always welcomed and encouraged.

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If you would prefer to receive a digital copy instead of the printed newsletter, please email Cindy Cory at coryc@purdue.edu

Donate to support Herrick activities:
https://engineering.purdue.edu/Herrick/Giving/index.html
for more information, or, just send a check written to "Purdue Foundation" marked "For Herrick Labs" and send to Patricia Davies at the above address.

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