newsletter

Ray W. Herrick Laboratories

Purdue University, West Lafayette, IN 47907-2031

https://engineering.purdue.edu/Herrick

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New Building Update

An unusually warm winter with little snow fall has provided optimal working conditions for construction on the new building. The building's footprint is complete with the majority of the concrete poured. According to the contractor, the project is basically on schedule.

The structure is beginning to take shape and is too large for the entire building to fit in the camera frame. You can see the old Grounds Building and Lilly Hall in the background.

The building should be completed by late summer 2013.

Shown to the right are photos taken by Gil Gordon. See page 13 for more photos.

Looking at construction from the Grounds Building, the walls of the engine test cells are visible.

The building is moving along and will soon be fully enclosed. View from the east side of the building with the Perception-based Engineering Lab to the left.

Gil Gordon, head of technical services for the shop, takes a moment or two out of almost every work day to photograph the construction progress. Once the photos are taken, Donna Cackley, our Herrick secretary, loads them on our Web site at https://engineering.purdue.edu/Herrick/Construction.

Conferences are this Summer

The biannual short courses and conferences will held this summer from July 14-20. Like the 2010 conferences, three conferences will be held concurrently: the 21st International Compressor Engineering Conference, the 14th International Refrigeration and Air Conditioning Conference, and the 2nd International High Performance Buildings Conference.

There will be a slight change in the short courses because a fourth short course is scheduled at the end of the conferences from July 19-20 entitled, "Design of Net-Zero Energy Homes." This hands-on short course will present a strategy for planning affordable net zero energy homes. Attendees will learn about software tools in the public domain that can be used for optimizing the building envelope, selecting appliances and other systems inside the home, and evaluating renewable energy options to reach net zero.

There will be a student paper competition again this year. Both undergraduate and graduate students may participate in the best paper award competition. Students must be the first authors on the papers and must present the research work at the conference.

Obviously, the best reason to attend is for information, from fundamentals to cutting-edge research, not to mention anticipated trends. You can also receive two continuing education units for attending the conferences, and one continuing education unit for attending a short course.

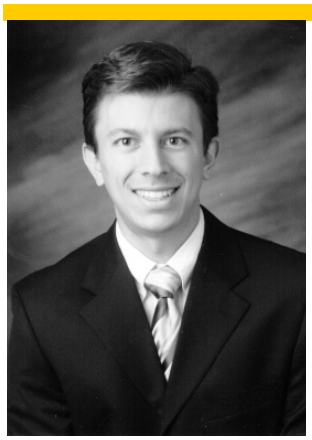
This event continues to grow each year. The last event was attended by over 500 people representing more than 30 different countries. This year, construction on the new building may be of special interest to some.

Students behind the Scenes of the Conferences

Craig Bradshaw

Craig has just successfully defended his Ph.D. He worked with Prof. Eckhard Groll on miniature-scale linear compressor analysis for electronics cooling.

Craig's main job is working with the software that is used to manage the conference, ConfTool (http://www.conftoolnet). Whenever the conference administrative assistant has problems, Craig is the go-to person. The software not only lets people upload their abstracts and papers, it also allows you to structure sessions and download information in a format that makes it easy to put conference technical programs together. Craig also helps the conference attendees when they are having trouble with the website.



Brandon Woodland

Brandon is working on his Ph.D. with Professors Braun, Horton and Groll on an organic rankine cycle with a solution circuit for waste heat recovery.

Brandon will be helping Professor Groll and Braun assign session vice-chairs. Graduate students usually do this job because they are familiar with the equipment and the facilities leaving the Session Chair free to look after the speakers and manage the Q&A, while they take care of the logistics. Brandon is also coordinating the audio-visual equipment and making sure that all the presentations are loaded (and work) prior to the session.

Abhinav Krishna

Abhinav is working on his Master's degree, also working with Professor Groll on organic rankine cycle with solution circuit for low-grade heat recovery.

Abhinav created this year's conference web site and keeps it up to date. So the hardest part of his job was at the start of the organization for the conferences, but he still has to make sure he updates the site quickly when new information is available. This is not always easy doing classes and research.



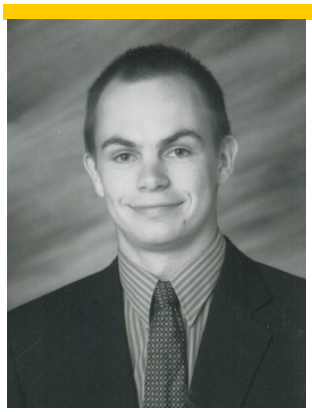
From impressive keynote speakers like James Rogers, Chairman, President and Chief Executive Officer of Duke Energy; to opportunities for learning and sharing; to fun at the picnic; or simply reuniting with long-time friends; the Conferences are the place to be.

Students behind the Scenes of the Conferences

Howard Cheung

Howard is working with Professor Braun on his Master's degree which is focused on modeling and testing of ductless heat pumps.

Howard is helping out with the conference proceedings, putting together the conference DVD and also making sure that paper copies are available during the conference (yes people still like to have paper copies of papers that are of particular interest to them). Attendees, of course, get the DVD, but they can also get up to 20 copies of papers as part of their registration, and can buy more (at $1.00 each) if they want them.



Ian Bell

Ian graduated last year (2011) and is spending a year traveling the world. His Ph.D. research was with Professors Groll and Braun on theoretical and experimental analysis of liquid flooded compression in scroll compressors.

While completing his Ph.D., Ian worked with the Purdue libraries to make electronic copies of all the past conference proceedings available on the Web in .pdf format http://docs.lib.purdue.edu/me/.

Students and professors are also able to upload their technical papers on the libraries e-pubs site (subject to copyright approvals) http://docs.lib.purdue.edu/herrick/.

Due to his work with the Purdue libraries, Ian Bell received the second annual Open Access award for his outstanding contributions to broadening the reach of the Herrick Laboratories conference series.

Christian Bach
Refrigeration & Air conditioning Conference

Seth Holloway
Compressor Engineering Conference

Hui Shen
High Performance Buildings Conference

Christian, Seth and Hui are helping out Professors Braun, Horton and Tzempelikos, the Chairs of the three conferences, on the paper reviews. They are very busy with approximately 400 papers having been received so far.

Christian is working on his Ph.D. with Professor Groll on optimizing refrigerant distribution in evaporators. Seth is working on his Master's with Professor Horton on annual performance comparison of fixed speed, variable speed and mini-split A/C systems. Hui is working on her Ph.D. with Professor Tzempelikos on daylight and energy analysis of offices with automated interior roller shades.

Many more of the students at the Laboratories also help out during the conference, as session vice-chairs, organizing and helping out with tours, and helping Ginny Freeman, the conference administrative assistant, runs the information desk at the conference. Professor Groll is this year's General Chair, Professor Ming Qu (Arch Eng. Program, Civil Engineering) is the Short Course Chair and Professor Panagiota Karava is the Student Paper Competition Chair. For more information, see https://engineering.purdue.edu/Herrick/Events/2012Conf/

Without the students it would not be possible to make the conferences a success. We hope they enjoy the experience, too.

David Tree Moves to Utah

In 1963, a young man named David Tree arrived at Purdue as a graduate student working on his doctorate. In 1966 when he completed his Ph.D. degree, he accepted a position as a faculty member at the Herrick Laboratories.

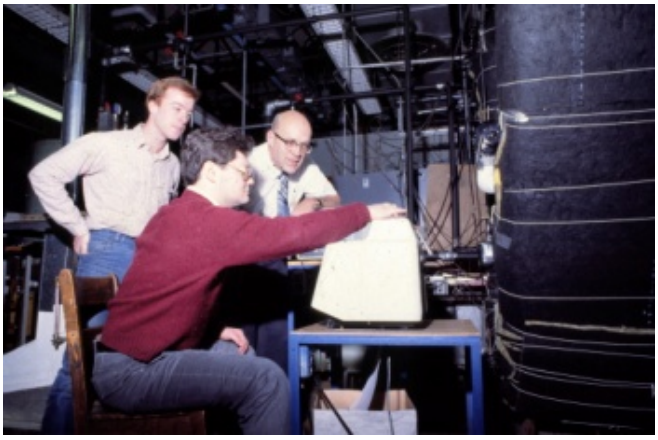
A photo of David Tree working outside the psychrometric rooms. Notice the state-of-the-art computers and printers.

On July 1, 1989, he assumed additional responsibilities as Assistant Director of Industrial Research Administration for the Division of Sponsored Programs. Until he retired in 2010, he maintained his responsibilities at the Division of Sponsored Programs and at the Herrick Laboratories. During his time at Purdue, he was the faculty advisor or co-advisor for 45 graduate students.

Some things never change! It doesn't matter what year it is, you can always find David Tree doing research outside the psychrometric rooms.

Dave was a member of several professional organizations including, but not limited to, the American Society of Mechanical Engineering, The American Society of Heating, Refrigeration, and Air Conditioning Engineers, The American Society of Engineering Education, the Institute of Noise Control Engineering, and the International Institute of Refrigeration. He was also an honorary member of Sigma Xi, Pi Tau Sigma, and Tau Beta Pi.

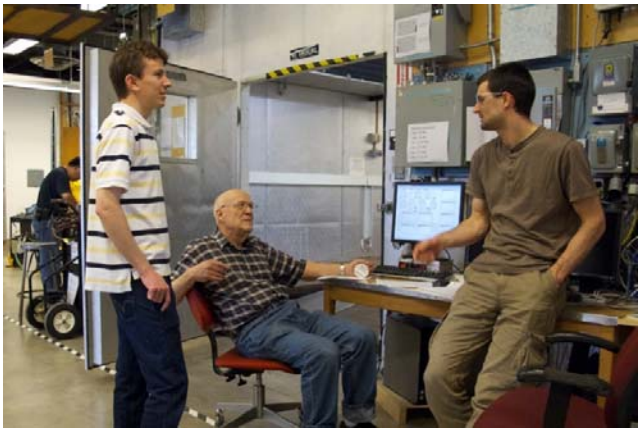
Bill Fontaine, the first Director of the Herrick Laboratories wrote in a recommendation letter on October 20, 1978, "Dr. Tree has an excellent personality; friendly, outgoing, and he relates well to people. He is very successful in the areas of teaching and research." Those comments still describe David Tree.



Steve Idem (Ph.D. 1986) is seated and behind him are Robert Banduric (MSME 1986) and David Tree.

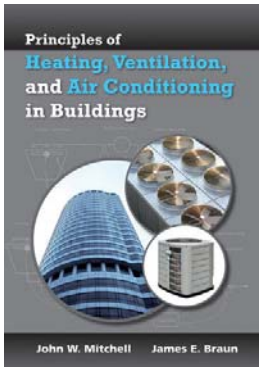
He and his wife, Roberta, recently sold their home in West Lafayette, IN and moved to West Jordan, UT, a suburb of Salt Lake City. Utah is not new to them. David was born in Wanship, UT, and he received his Bachelor's and Master's degrees from Brigham Young University. He also worked in Salt Lake City, Provo, and Orem, UT during his college years.

David and Roberta are excited about the move because they are going back home and will closer to their children and grandchildren. We wish them the very best in their new home and will definitely miss them.



Dave Tree on a visit to the labs just before he left talking to graduate students Brandon Woodland (left) and Christian Bach (right).

Jim Braun Co-authors a New Book



Jim Braun and John W. Mitchell, a professor at the University of Wisconsin at Madison, have co-authored a new text book entitled, *Principles of Heating, Ventilation, and Air Conditioning in Buildings*. It is the intent of this book to provide a fundamental basis for launching or enhancing careers in the HVAC field. Our goal is to provide the foundational knowledge for the behavior and analysis of HVAC-related devices and processes. The approach we have taken is to present the development of performance relations from fundamental thermodynamics, fluid dynamics, and heat transfer principles. The HVAC field is broad, and we have attempted, first, to cover most of the processes that an engineer might come in contact with, and second, to provide tools that allow the engineer to design or evaluate a new device, system, or process. The book is intended first as the text for students in an HVAC or thermal systems course, and second as a reference book for practicing engineers who wish to extend or update their knowledge.

This book is unique in that it integrates physical and mathematical descriptions with a general purpose software program that allows performance to be directly calculated. The physical description of each device or system is developed from the basic engineering equations and carried through to performance. Our approach is to have students formulate their own solutions rather than use existing design programs. In this manner they will learn the underlying physics. We have built the problems and examples around the program EES (Engineering Equation Solver), which is a general-purpose nonlinear equation solver. An important feature of EES is that thermodynamic and transport properties are directly integrated into EES, which facilitates the calculation of energy transfers that involve fluids such as moist air, water, and refrigerants. EES is an interpretive programming language and the program statements are essentially conventional mathematical statements, which reduces the problems of learning a new language. Powerful solution techniques are built into EES; this allows the engineer to focus on the physical description of the problem and not on how to obtain a numerical solution. By employing EES, much more realistic and complex problems can be formulated and solved than with hand calculations.

We have found that the discipline required to formulate a program in EES, debug it, obtain a solution, and interpret the results carries over into the use of other programs. Although in practice an engineer may use a program designed for a specific design purpose, the same steps are present. The engineer still needs to understand the basic ideas and limits of the program being employed.

We have divided the book into four sections that cover the application of engineering principles to HVAC equipment and systems. The first section, entitled Fundamentals, comprises seven chapters that present the use of EES, review the relevant thermodynamics, fluid flow, and heat transfer principles, provide an in-depth study of psychrometrics, cover different types of HVAC systems and components, and present the criteria for comfort and air quality. The three chapters in the Building Heating and Cooling Loads section cover weather data processing and the procedures used to determine the design heating and cooling loads for a building. The section on Equipment covers systems that transfer energy: air and water distribution systems, heating and cooling coils, cooling towers, and equipment that supply heating or cooling. The last section on Design and Control of HVAC Systems covers the seasonal energy use of buildings and equipment, control techniques, and supervisory control of building operation. The last chapter in the book describes the HVAC design process and presents the rules of thumb often used in design. Several design problems typical of those that an engineer might face are included. Our experience is that this broad coverage coupled with detailed analysis provides a foundation for students entering the HVAC profession.

—Jim Braun

In addition to the text material, we have developed online chapters (termed Supplemental Material, SM) on a number of topics that relate to HVAC buildings and equipment but that are not central to the design of a typical HVAC system. This additional material includes the development of the basic heat and mass exchange relations as applicable to cooling coils, cooling towers, and similar equipment in which moisture is removed or added, mechanisms of ice formation in thermal stores, heat transfer relations for condenser and evaporators, models that yield insight into the performance of compressors and refrigeration systems, absorption systems, and combustion heating equipment. This material is included to allow an instructor or a student to explore in depth topics that are not covered in the text.

If you would like a copy of the book, the ISBN is 978-0-470-62457-9. It has a 2013 copyright and retails for $171.95. More information is available on the Wiley Web site at http://www.wiley.com/WileyCDA/WileyTitle/productCd-EHEP002028.html

Jim Braun holding a scroll compressor used in his research projects.

Yan Chen, Reilly Professor of Mechanical Engineering

On Friday, February 3, Yan Chan, a Professor since 2002, was honored with an investiture ceremony as the Reilly Professor of Mechanical Engineering. The Reilly Professorship was established to honor the late Vincent P. Reilly (BSME 1922) who was founder of the Illinois Gear and machine Company. The Reilly Professorship promotes excellence in engineering education and honors the College of Engineering's most accomplished faculty members.

Quinyan Chen with his wife, Rong Zheng, at the investiture ceremony.

Yan's research in the thermo-fluid aspect of mechanical engineering works toward achieving world-class environments and energy-efficient, healthy, and sustainable building design and analysis. He is Editor-in-Chief of *Building and Environment*, an international journal, and has published two books. He has received numerous awards including the Distinguished and Exceptional Service Award from the American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE) and the Career Award from the Science Foundation. He is a fellow of ASHRAE and International Society of Indoor Air Quality. Yan has received the Willis J. Whitfield Award from the Institute of Environmental Sciences and Technology and the John Rydberg Gold Medal from the Scandinavian Federation of Heating, Ventilating and Sanitary Engineering Associations for his outstanding contribution to the advancement of modeling and measurement of ventilation and air distribution in buildings. Yan has also been named as a "Special Expert" by the City of Tianjin, China with a population of more than 13 million.

His investiture ceremony began with a reception in the Anniversary Drawing room of the Purdue Memorial Union. Anil Bajaj, Head of the School of Mechanical Engineering, was the master of ceremonies. He introduced Vince Bralts; Associate Dean of Engineering for Resource Planning and Management, and Professor of Agricultural and Biological Engineering, who brought Dean Leah Jamison's heartfelt regret that she could not attend. Vincent Bralts stated, "Candidates for endowed professorships are leaders who bring national visibility and recognition to the University, attract superior students, and facilitate opportunities for external research funding. A named professorship is among the highest honor that Purdue can bestow upon its faculty."

The ceremony ended with an official photo session with Yan Chen and his wife, Rong Zheng. A photo was also taken with Yan and his current graduate students.

Yan Chen and Rong Zheng with Yan's current students. Left to right are Yan Xue, Wei Liu, Haojie Wang, Rong Zheng, Yan Chen, Mingang Jin, and Chun Chen.

The endowed professorship will be used to enhance Yan's research is related to building environments and energy. He is currently conducting research related to building energy efficiency sponsored by the U.S. Department of Energy and ASHRAE, and airliner cabin environment sponsored by the U.S. Federal Aviation Administration, Boeing Commercial Airplanes Group, and China's Ministry of Science and Technology. The fund from the Reilly Professorship will also facilitate collaborations across the university fostering new research, ideas and projects.

By collaborating with Tianjin University of China, Yan is able to use this MD-92 airplane to conduct measurements of airliner cabin environment

Purdue Center for Systems Integrity Defense Research Summit

"The Institute is made up of multiple centers of excellence with expertise that meet specific needs of the Departments of Defense and Home Land Security"

The Purdue Center for Systems Integrity (PCSI) resulted from the research of Doug Adams, who is the Kenninger Professor of Renewable Energy and Power Systems. Doug was at the Herrick Laboratories doing research for several years before launching PCSI to accommodate the increased space requirements for his research in vibrations, reliability, and prognostics that now occupies over 35,000 sq ft of laboratory space. Many of these research programs, such as the Multi University Research Initiative involving explosives detection, are collaborations between PCSI and Herrick faculty so there is a strong connection between the two facilities.

The mission of PCSI is to revolutionize the performance and sustainment of materials and machines in a wide range of applications, including automotive, aerospace, wind power, and other military and civilian platforms. PCSI graduates the most sought after engineers in the field of structural health monitoring and prognostics by training students in the use of advanced structural dynamic modeling and experimental techniques. New methods have been developed by PCSI graduate students and faculty to sense, predict, and control the health of engineered systems at all scales of the system and in all stages of the lifecycle. Research in embedded sensing for wind turbines, integrated health management of composite materials for military and civilian aircraft, and other areas is being pursued.

Applications from the research from the Purdue Center for System Integrity.

For the last 5 years, PCSI has hosted a defense technology summit. This year the PCSI partnered with the Institute for Defense Innovation (IDI) at Purdue and the summit was sponsored by both organizations. The defense research summit was held from April 30 to May 3 in the South Ballroom of the Purdue Memorial Union.

The primary objective of the IDI is the development of large and sustained programs of research and development funded by federal and state agencies charged with the defense of United States citizens. The IDI is made up of multiple centers of excellence with expertise that meet the specific needs of the Departments of Defense and Home Land Security. The PCSI is one of those centers.

At the defense summit this year, April 30 to May 3, there were several speakers from outside the Purdue University. The opening keynote speaker on Monday afternoon was Dr. John Miller. He is the Director of the Army Research Laboratory, and he spoke on "Defense Research Issues and Trends."

There were many speakers from Purdue and elsewhere. Some of the keynote speakers were:

- Lieutenant Colonel Reid Vander Schaaf, Missile Defense Command and Control, Battle Management and Communications, Program Manager, "Enhanced C2BMC, Ballistic Missile Defense System."
- Dr. Hal Aldridge, Director of Engineering at Sypris Electronics, LLC, "Securing Defense Systems against Cyber-Physical Threats."
- Colonel Jay Montgomery, Director, Logistics Capabilities Center, U.S. Marine Corps, "Reducing the Weight of the U.S. Marine Corps"
- Mark Derriso, ISHM Lead, Air Force Research Laboratory, "Integrated Systems Health management Architecture for Self-Situational Awareness"
- Gene Wiggs, Consulting Engineer, Military Propulsion, GE Aviation, "PHM at GE: Data and Model Fusion"

People attending the summit were able to tour the PCSI facility at the Kepner building and the Maurice J. Zucrow Laboratories. The summit also included a student poster show. Students were available to discuss their posters during the morning breaks and during the continental breakfast on Tuesday. The poster show was also a time when the attendees could spend time networking.

The summit is open to everyone, and this year there were 82 people registered. Details for the next summit are in the planning stages. Normally, the summit is held during the spring so look for information in 2013. Check the PCSI Web site for the latest information on the summit http://www.purdue.edu/research/vpr/idi/pcsi/

PCSI
PURDUE Center for Systems Integrity

Doug Adams Receives Federal Funding

Doug Adams, Kenninger Professor of Renewable Energy and Power Systems, and Director, Purdue Center for System Integrity.

A team of Purdue University researchers will use a $1.6 million federal grant to advance sensor technology and computer simulation tools for tracking and improving the performance and reliability of "smart" wind turbines and wind farms.

Computer science professors Jan Vitek, Ananth Grama and Suresh Jagannathan, and mechanical engineering professor Douglas Adams received the three-year grant from the National Science Foundation's Division of Computer and Network Systems (CNS).

The team's goal is to increase the performance of wind turbines by reducing downtime, improving the predictability of maintenance and enhancing the safety in operational environments.

"Improvements in the productivity and longevity of wind energy—the fastest growing source of clean, renewable domestically produced energy—even by a few percentage points will have significant impact on the overall energy landscape and decision making," said Vitek, the project's principal investigator. "Mitigating failures and enhancing safety will go a long way toward shaping popular perceptions of wind farms and accelerating broader acceptance within local communities."

The project builds on years of research by Adams, who is developing "smart" turbine blades that use sensors and computational software to improve energy capture by adjusting for changing wind conditions. Adams developed these sensing techniques working with Sandia National Laboratories.

Sensor data in a smart system also could be used to better control turbine reliability by automatically adjusting the blade pitch and rotor yaw to reduce damaging operating conditions while also commanding the generator to take corrective steps.

Adams, the Kenninger Professor of Renewable Energy and Power Systems, said no high-tech tools currently exist for tracking and analyzing the coordinated behavior of wind farms. This project will marry those technological advances with a robust computer simulation network, emphasizing programmability, robustness, longevity and assurance of integrated wind farms.

—Emil Venere, Purdue University News Service

But all of these new capabilities rely on accurate measurements. "It's like the adage: 'If you measure it, then you can control it,' " he said.

A wind turbine's major components include rotor blades, a gearbox and generator. The wind turbine blades are made primarily of fiberglass and balsa wood, and researchers now are strengthening them with carbon fiber.

As the wind turbine blade is being manufactured, engineers can embed sensors called uniaxial and triaxial accelerometers. Research findings show that using a trio of sensors and "estimator model" software reveals how much force is being exerted on the blades.

The Purdue system, which has received support from Purdue's Energy Center in Discovery Park, may help improve wind turbine reliability by providing critical real-time information to the control system to prevent catastrophic wind turbine damage from high winds or other weather event.

Such sensors also might be instrumental in future turbine blades that have "control surfaces" and simple flaps like those on an airplane's wings to change the aerodynamic characteristics of the blades for better control. Because these flaps would be changed in real time to respond to changing winds, constant sensor data would be critical.

"We believe we can have a huge impact by essentially taking small steps to control how these wind turbines operate," Adams said. "For example, a 2-degree error in the pitch of a single turbine blade can cause a 12 percent reduction in power."

Grama said the scale and complexity of these wind power systems pose a challenge for computer scientists. Turbines in a typical wind farm would require as many as 3,000 sensors, all generating real-time data that must be captured and analyzed.

"It's a tremendously sophisticated problem, requiring a comprehensive computational infrastructure for distributed real-time control," Grama said. "Given the relative infancy of 'smart' wind farms, however, the potential of the project cannot be overstated."

Indiana, which has gone from no turbines to more than 1,100 in three years, ranks as the third fastest-growing state for wind power in the country, the American Wind Energy Association reports. The association places Indiana 13th for most installed wind power capacity in the country.

EcoCAR 2

The Purdue University Team includes faculty members from Herrick Laboratories, Galen King, Peter Meckl and Greg Shaver. Two Herrick students are also in the photo Whitney Belt and Ashish Vora. The remaining engineers in the photo are from other engineering areas on campus.

The EcoCAR2 program was designed by the U.S. Department of Energy and General Motors. The program is a three-year collegiate engineering competition. Only 15 universities from the U.S. were selected to participate in the program in 2011, and Purdue was selected to be one of them. Herrick Labs' Professors Peter Meckl and Greg Shaver are working on this project along with Vahid Motevalli and Henry Zhang from Mechanical Engineering Technology, Oleg Wasynczuk and Maryam Saeedifard from Electrical and Computer Engineering, and Galen King from Mechanical Engineering.

The competition is a three-year program. In the first year of EcoCAR 2, student teams received $25,000 in seed money to begin developing their vehicle designs. Year One built an essential foundation for establishing a successful vehicle by emphasizing the use of math-based design tools—like Argonne's Autonomie or similar vehicle models—and the development of software-in-the-loop (SIL) and hardware-in-the-loop (HIL) simulation techniques.

After researching, comparing and selecting advanced technologies that meet the competition and team goals, students will procure hardware to develop and test their powertrain and other subsystems. The emphasis is on optimizing a practical, realizable solution that will meet the goals of the competition. By broadening the technical focus of the competition to include more aspects of the entire vehicle development process, the university teams will have a greater opportunity to expand their learning and refine their vehicle solutions. Teams that successfully complete the first year of EcoCAR 2 will earn a key to a new Chevrolet Malibu and a place in the second phase of the competition. The first-year competition was held in Los Angeles from May 18 to May 23, 2012.

The Purdue team's EcoCAR awards included:

- First in the Winter Workshop's Hardware In the Loop (HIL) Evaluation
- Second in Controls Presentation
- Second in Freescale Innovation Award
- Third in the Year One HIL Evaluation
- Third in the dSpace Embedded Success Award for demonstrating the most effective use of dSPACE Hardware In the Loop equipment
- First in the Women In Engineering Award

During the second and third years of the competition, students will build the vehicle and continue to refine, test, and improve vehicle operation. At the end of Years Two and Three, the re-engineered student vehicle prototypes will compete in a week-long competition of engineering tests. These tests are similar to the tests GM conducts to determine a prototype's readiness for production. The Greenhouse gas, Regulated Emissions, and Energy in Transportation (GREET) model, developed at Argonne National Laboratory, will be used to assess a well to wheel analysis of the greenhouse gas impacts of each technology approach the teams select.

During the week-long competition, student teams will demonstrate the vehicles so when compared to the production gasoline vehicle they meet or exceed the following goals:

- Incorporate technologies that reduce petroleum energy consumption on the basis of a total fuel cycle analysis;
- Reduce fuel consumption;
- Reduce well to wheel greenhouse gas (GHG) emissions;
- Reduce criteria tailpipe emissions;
- Maintain consumer acceptability in the areas of performance, utility and safety.

The Purdue team is comprised of engineers from a wide range of majors at Purdue, including, but not limited to, Electrical and Computer Engineering, Mechanical Engineering Technology, and Mechanical Engineering. They have one common goal in this project, to make an impact on the automotive industry and to better the environment.

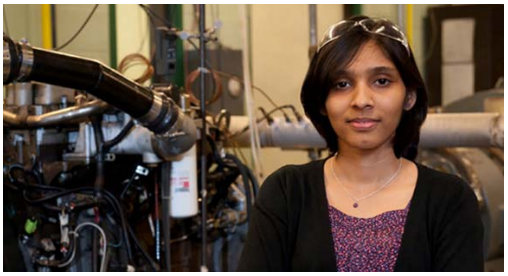
If you would like more information on the program, there are several good Web sites. Check out the EcoCAR2 Web site at http://www.ecocar2.org/. There are several videos on YouTube about the EcoCAR2 project. This first site was done by General Motors and is geared for faculty, department heads and Deans http://www.youtube.com/watch?v=kydJKaGQplU&context=C4d613edADvjVQa1PpcFPdW8cK_AiPAivHRu8mwyKKEJ_0ZDFXCvE=. General Motors did a second video which is slightly shorter because the video is geared more toward students http://www.youtube.com/watch?v=jORDQuI-AXY&context=C4cb1831ADvjVQa1PpcFPdW8cK_AiPApcZFF3XAn1CedZJBSiql-A=

Purdue University has its own video on YouTube about the EcoCAR2 project, and our Whitney Belt, current graduate student, talks about the value of the program to him. It's a short video, only 1:30 minutes. You can find it at http://www.youtube.com/watch?v=WW28bWvBLJk&feature=related


In the last video above produced by Purdue and placed on YouTube, Whitney Belt, a current graduate student working with Peter Meckl, is featured. He talks about the impact of the EcoCAR2 project on his personal professional development. He is a member of the EcoCAR2 project.

Gayatri Adi Follows in Father's Footsteps

While Gayatri Adi was a graduate student at Herrick, she had an internship with Cummins and the relationship worked well for both for both of them. Cummins offered her a position when she completed her degree, and she accepted. Greg Shaver, her faculty advisor, accidentally found the following story on the Cummins' Web site. It was written while Gayatri was a student and with Cummins' permission we are reproducing it here.



The diesel engine laboratory at Purdue University became a second home for Gayatri Adi. She is the first graduate of the Cummins College of Engineering for Women in Pune, India to get her PhD at Purdue in West Lafayette, Ind. She comes from a family of engineers.

Growing up, Gayatri Adi loved watching her father fix things around their home in Pune, India.

"I used to repair little things and Gayatri would watch me," Hemant Adi remembers. "She always wanted to know how things worked."

Little did father and daughter know those moments would lead Gayatri on a journey thousands of miles from home to the middle of the United States.

Gayatri Adi is the first graduate from the Cummins College of Engineering for Women (CCEW) in Pune to get her PhD at Purdue University in West Lafayette, Ind. through a partnership established by Cummins, Purdue and CCEW.

After she finishes her work at Purdue this spring, Gayatri will start work in June for Cummins' Advanced Engine Controls Team in Columbus, Ind. She will be following in her father's footsteps, working for the same company where he has been a mechanical engineer for more than 30 years.

"It is a little surprising that I'm going to be working in the same company as dad because when I was an undergraduate, I was studying instrumentation and control engineering so my focus wasn't really on engines," Gayatri says.

"But after coming to Purdue I found out that control theory can be used for very interesting applications related to engines and that's how I ended up working in the same field as my dad."

Hemant Adi says he was not surprised his daughter became an engineer. Her older sister, Ketaki, got her undergraduate degree in electronics and telecommunications engineering in India and has a master's in computer science from the University of Texas at Dallas.

"I was sure she would not just follow my footsteps into engineering," he said of Gayatri, "but would surpass me."

It doesn't take long to see that Gayatri Adi is at home around the six-cylinder diesel engine she works on in Associate Professor Greg Shaver's laboratory at Purdue. For much of the past five years, she has spent between eight and 10 hours a day in the lab, five or more days a week.

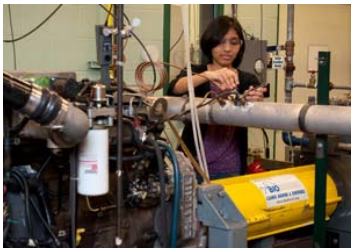
Shaver and his team of 13 graduate students (including Gayatri) are studying ways to modify diesel engine control systems with technology that would significantly reduce fuel consumption and emissions, and increase engine efficiency.

Gayatri's research for her doctorate focused on the use of electronic controls to enable an engine to detect the percentage of biofuel being used and how the engine can most efficiently work with it. Such controls could be critical with the use of fuels made from renewable sources like corn, soybeans, sugar cane, algae and even waste cooking oil.

While Gayatri doesn't see herself as a trailblazer, her success is a significant milestone for Cummins College of Engineering for Women. Established in 1991 with a grant from the Cummins India Foundation, the college has given more than 4,000 women in India the opportunity to pursue careers in the male-dominated world of engineering.

Gayatri said she believes there are many more opportunities for women who want to study engineering today than when CCEW opened 20 years ago. She chose the college simply because she wanted to go to a good school close to home.

Since 2003, Cummins, CCEW and Purdue have been working together to provide CCEW graduates the opportunity to apply to continue their studies in West Lafayette. Twenty-five college graduates have gone on to become Cummins Fellows at Purdue, receiving financial support through the Cummins India Foundation for one year until they join a professor's research team to pursue their master's degrees.



Gayatri said the fellowship funded by the Cummins India Foundation was critical because unlike many graduate students she didn't have to worry about funding for her first year at Purdue. (Watch a short video of Gayatri talking about her time at Purdue) She had the luxury to look for a project that aligned with her interests, ultimately joining Shaver's team.

Meanwhile, members of the partnership between CCEW and Purdue say they continue to be pleased with the way the initiative is working.

"It is an honor to see the program that (Cummins Vice President and Chief Technical Officer) John Wall and I started continue to thrive including graduating Dr. Adi this year," said Jay P. Gore, founding and former director of the Energy Center in Purdue's Discovery Park and the Reilly University Chair Professor of Mechanical Engineering.

"Gayatri has worked hard," he added, "and always with a smile."

Phyllis Hurst

Some of you may remember Phyllis Hurst. She worked as an administrative assistant at Purdue University from 1989 to 1997. When she retired from Purdue in 1997, she was the Administrative Assistant for the Herrick Conferences.

We were saddened to learn that she passed away at 10:25 a.m. on Monday December 26, 2011 at the IU Health Arnett Hospital. She was 81. Her husband, Robert N. Hurst, a professor emeritus in biological science at Purdue, survives. If you wish to send condolences to her family, please use the Herrick Laboratories address on the outside back cover, and we'll gladly forward them.

Where Are They Now?

Ian Bell (PhD 2011) is rewarding himself with approximately a year of international travel to exotic places like Asia, the Philippines, Turkey, the Middle East, Africa, Egypt, Cairo, Asia, and Bangladesh. He'll be seeing some of North America, too. If you're interested in where he's been and what he's been doing, photos of his trip and his comments are on the Web at http://www.travelblog.org/Bloggers/flyinghaggis/.

Marcus Bianchi (former IAC member) is Building Science Program Lead for Owens Corning. He's been with them since October and is working in Building Science with a current focus on Latin America. He continues to live in the Denver metro area.

Jitendra Gupta (PhD 2010) is doing well and has settled in India for good. He's working with General Electric India center and is working on getting married soon.

Richard Lowery (PhD 1961) sent an e-mail to his faculty advisor, Ray Cohen. Here are excerpts from that message. "I retired completely in 2009. I haven't been doing much professionally for the last few years…mainly helping students with design or vibration problems, and doing some pro-bono acoustical projects for churches, etc. I work around our church taking care of physical plant problems, sound, lights, and gardening. The last student group I was helping was trying to find a way to use four cows (in Africa) to generate electricity. So, they needed a transmission to convert the 2 rpm treadmill to an 800 rpm alternator. My younger colleagues readily give the students my name when they come to these off-the-wall projects." Anne and I are enjoying good health. We've taken a few nice trips such as the float trip from Basel to Amsterdam last year, and several Canadian junkets, as well."

Faye McQuiston (PhD 1970) and his wife, Helen, have retired. They live in Stillwater, OK where they moved from a large older home to a new garden home. Faye is still consulting, but it's more like advising locals relative to efficient home heating and cooling systems. As he puts it, "freely given and usually taken the same." If you remember Faye, I'm sure he'd love to hear from you. His e-mail is fcmcquiston@gmail.com.

Maurice Wildin (MSME 1959) lives in New Mexico and is reading the newsletter carefully. He pointed out that the Cimarron Boy Scout Camp is in New Mexico, not Arizona. He added, "I recognize that to those living east of the Mississippi, everything west of that river sort of runs together. (Ha!)"

Faculty Honors

Jun Chen was awarded a 3M non-tenured Faculty Grant. He is the first professor in the over twenty-five year history of this award to receive it based on his work in acoustics and noise control.

Eckhard Groll was selected to serve as the Interim Assistant Dean for Research in the College of Engineering. He will work with Melba Crawford, Associate Dean of Engineering for Research, who recently assumed responsibilities as Interim Head of Civil Engineering. His appointment was effective January 13, 2012. He will continue his responsibilities as the Director of the Office of Professional Practice and his association with the Herrick Laboratories.

Charles Krousgrill was the recipient of the 2012 A.A. Potter Teaching Award. *The A.A. Potter award honors faculty members for outstanding teaching performance in all phases of the College of Engineering's undergraduate instruction on the West Lafayette campus. An outstanding undergraduate teacher is one who demonstrates superior ability in communicating the chosen material to the students and stimulates their desire to master the material. The teacher will also recognize that his/her teaching responsibility to students does not stop at the classroom door, and therefore, will be ready to aid and motivate them in a counseling and advisory capacity, either formally or informally.*

On April 13, at Purdue University's Board of Trustees meeting, **Jeffrey Rhoads** was promoted from Assistant Professor to Associate Professor. The promotion will be effective in August.

Student Honors

Tyler Dare received the 2012 International Noise Control Engineering (INCE) Leo Beranek student medal for excellence in noise control studies. This special Medal was established by the Board of Directors of INCE/USA on October 24, 2010 to recognize excellence in the study of noise control by undergraduate and graduate students at academic

institutions in North America that have courses in, or related to, noise control engineering including practical applications. Tyler will be invited to attend a NOISE-CON conference or an INTER-NOISE Congress in North America and will be recognized in an issue of Noise/News International.

Carrie Hall received the Lambert Fellowship for Spring 2012 for students who have a strong potential and desire for an academic career. The Ward A. Lambert Graduate Teaching Fellowship in Mechanical Engineering was established in memory of Ward Lambert who was a legendary Purdue baseball and basketball coach. With the endowment to the School of Mechanical Engineering, students develop knowledge in pedagogy and modern effective teaching techniques, as well as provide meaningful in-class teaching experience under the guidance of "master teachers." Carrie's mentors are Doug Adams and Chuck Krousgrill, and they will work with her for one-year.

Brett Seward received a Fulbright Scholarship for the 2012-2013 academic year. He writes of his plans, "My project proposes to investigate pipe organ acoustics in Gothenburg, Sweden at Chalmers University of Technology in conjunction with the Gothenburg Organ Art Center. This research will quantify the science behind the art of organ building and tuning by comparing recordings of pipe organs from different positions and perspectives within a room. Methods of minimizing a given room's contribution to the organ's tonal qualities will also be studied through the use of digital signal processing." As an undergraduate, Brett worked with Professor Kai Ming Li at the Labs.

Graduations

Gayatri Adi (Ph.D. 2012), Closed Loop Control for Biodiesel Blends in Mixing-Controlled Combustion. Gayatri will start working at Cummins Inc. in June.

Craig Bradshaw (Ph.D. 2012), A Miniature-Scale Linear Compressor for Electronics Cooling.

Yiyuan Chen (MSME 2011), Modeling and Precise Control of an Electro-Hydraulic System with Energy-Recovering via Valve and Accumulator Reconfiguration. Yiyuan is working for LHP Software in Columbus, IN.

Nicholas Kim (MSME 2011), Numerical Modeling of Microperforated Acoustical Materials. Nicholas is continuing with his Ph.D. studies with Prof. Stuart Bolton.

Sheng Liu (Ph.D. 2011), The Propagation of Sound from a Monopole and Directional Source near a Layered Ground. Sheng's employment is not known at this time.

Yangfan Liu (MSME 2011), Sound Field Reconstruction and its Application in Loudspeaker Sound radiation Prediction. Yangfan is continuing with his Ph.D. studies with Prof. Patricia Davies and Prof. Stuart Bolton.

Andrew Marshall (Ph.D. 2012), Development of a Model of Startle Resulting from Exposure to Sonic Booms. Andrew accepted a position with Southwest Research Institute in San Antonio, TX.

Sarah McGuire (Ph.D. 2012), Modeling Aircraft Noise Induced Sleep Disturbance. Sarah will be a Post-Doc working with Dr. Patricia Davies at Purdue University and with Dr. Mathias Basner at University of Pennsylvania.

Rick Meyer (Ph.D. 2012), Robust Hybrid Model Predictive Power Management of a Fuel Cell-Battery Vehicle.

Guangqing Xue (MSME 2011), Design Tool for Under-Floor Air Distribution System. Guangqing is employed at Transsolar Inc. in New York.

Bryce Shaffer (Ph.D. 2012), Performance Analysis of Non-Metallic Dry Running Scroll Compressors. Bryce is working for Air Squared in Denver, CO.

Karla Stricker (Ph.D. 2012), Turbocharger Map Reduction and Estimation of Effective Compression Ratio in a Modern Diesel Engine Utilizing Flexible Intake Valve Actuation. Karla will start her employment with Cummins Inc. in October.

Births

Garrett Thorne (Research Engineer at the Purdue Center for System Integrity) welcomed a new arrival on February 2 at 11:59 p.m. His name is Parker Garrett Thorne (left). He weighed 7 lbs. 15 oz. and was 19.5 inches long. Parker is super active, and it was hard to keep him still with his eyes open.

Dan VanAlstine (current PhD student) and his wife, Cassie, welcomed their first child at 4:26 a.m. on Friday, February 3. She was 20 inches long, with long legs, a full head of strawberry

blonde hair, and beautiful blue eyes. The family came home on Sunday, February 5. Violet is modeling an outfit made by Cassie's mother.

Do You Remember Helen Glick?

—Judy Hanks

I spoke with Helen Glick in a social setting over a year ago, and she mentioned that she had worked at the Herrick Laboratories. I kept that in the back of my mind because I'd never heard her name mentioned, and I thought that was odd. It seems that once you're part of Herrick, you're always part of Herrick. Then, as I was going through the photo archives for this issue, I found it—three photos of Helen. From the notes with the photos, she worked here approximately 40 years ago in the early 1970's. She was our conference secretary, and she did everything, including the proceedings. She worked with several of the international participants who assisted her with information, ideas, and support.

Pictured left to right above are Helen Glick, Marlene Hodge, Sandy Stephens, and Jo Johnson. (A special thank you to Marlene Hodge for helping us identify the people in the photo).

So, what is Helen up to these days? She retired as the Graduate Secretary from Agricultural and Biological Engineering at Purdue approximately 10 years ago. She's living in Lafayette, IN and is active with Habitat for Humanity. She is enjoying retirement with her husband, Lavern.

A new Boilermaker Special logo was recently announced. It is strictly for athletic use and will be on a limited selection of Nike merchandise. The train is popular on polo shirts and other apparel. The change was more of a Nike initiative rather than a Purdue initiative because, with the original logos, the smoke didn't work well on hats and other apparel.

Continued from Page 1.

Steel structures on the High Bay area and the Thermal Sciences Wing. View on the West Side.

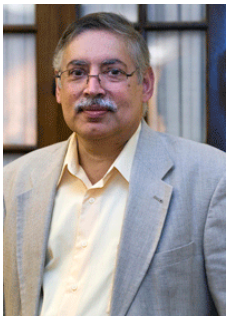
Concrete blocks are going up and wall studs are being placed. View on the east side

Insulation goes up on the Perception-based Engineering Lab. Vidw for the Southeast.

Weather protection is seen over the insulation in the Mechanical Room. The West Wall of the Living Laboratory is on the Third Floor above other administrative space. View from the West.

Herrick Campaign

A Letter from Anil K. Bajaj



The School of Mechanical Engineering is committed to recruiting the best and brightest students from around the world to learn from world-class faculty in state of the art facilities. We have a proven track record for educating top mechanical engineering students and providing discovery through delivery with our research programs.

Before I became the William E. and Florence E. Perry Head of the School of Mechanical Engineering, I served for nine years as the Associate Head for Research and Graduate Education. In that capacity, I saw first hand the positive impact that students have on our research endeavors and the tools it takes for them to succeed.

One of the most important tools for achieving these successes is providing cutting edge facilities. The Ray W. Herrick Laboratories is a graduate research facility that will significantly impact resources available for graduate student learning, helping us to continue to attract and retain the best faculty and students, strengthen the School's capacity to generate innovative research that leads to increases in technology transfer and business development, and help us to expand Purdue's Mechanical Engineering curriculum.

To inspire new contributions to this project, the School of Mechanical Engineering is pleased to announce a $2,000,000 challenge match fund devoted to increasing resources for ME capital projects. The challenge match is currently in progress and will remain available until funds are depleted with gifts to our Herrick Labs Renovation/ME Facilities Fund.

Please take a few minutes to review the information below and consider taking advantage of this unique opportunity to make a substantial and on-going difference in the quality of education and research at Purdue. Best wishes in all that you do.

Inspiration. Innovation. Impact.

The designation of a room within the Ray W. Herrick Laboratories is a lasting honor bestowed upon a donor or a company. It is the School of Mechanical Engineering's wish to commemorate you, or the person or entity of your choosing, for your loyal and generous support of the School and our projects with our Herrick Labs Renovation/ME Facilities Fund.

How it works: outright cash gifts, multi-year pledges and gifts of securities will be matched 1:1 to provide facilities support for the School of Mechanical Engineering- up to $2 million total; pledges can be payable over 5 years and funds will be reserved from the matching pool until future payments are received; employer matching gift programs are also eligible for the challenge match. The power of this match will help us complete the next wave of scientific and engineering innovations.

Gifts of $25,000 or more qualify you for lifetime membership in the President's Council (Gateway Level). The President's Council recognizes the University's most generous benefactors. Additional information and benefits of the President's council can be found online at www.purdue.edu/giving/pc. Gifts of $5,000 or more may be acknowledged through a permanent naming opportunity in Herrick as space is available.

To view floor plans and available naming opportunities for administrative spaces, offices, conference rooms, open and interactive areas, and laboratories in Herrick, go to https://engineering.purdue.edu/ME/Giving/Herrick_Naming/index.html or contact Laura Edwards in the School of Mechanical Engineering Development Office.

Contact Information

Laura Edwards
Senior Director of Development
School of Mechanical Engineering
583 Purdue Mall
West Lafayette, IN 47907-2088

lme@purdue.edu
765-494-5629 (land line)

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We are always interested in hearing your news, and we want to be kept up-to-date on current addresses. Please send notes to Judy Hanks or to the e-mail address below. Don't hesitate to let us know of other alums that have moved. Photos are always welcome.

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