newsletter

Ray W. Herrick Laboratories

Purdue University, West Lafayette, IN 47907-2031

https://engineering.purdue.edu/Herrick

Autumn 2011
Volume 20, Number 2

New Building Construction Underway

There is a buzz of excitement in the air. Construction on the new building is finally underway! The Purdue University Board of Trustees approved the Kettelhut Construction's construct bid on Friday, September 30. The contract was signed on October 10. Fences marking the construction zone were placed around the perimeter on October 17, and storage sheds and shrubbery started coming down within a few days. In fact, the Industrial Advisory Committee members and guests witnessed some of the demolition first-hand during the Oct. 21-22 meeting.

19th October, 2011 – Demolition of the former Grounds Services' sheds and greenhouse. Picture is facing east. In the background are the greenhouses behind Lily Hall of Life Sciences. (This and all photos on this page are by Gilbert Gordon, Head of Herrick Laboratories Technical Services)

During October and November, there was a great deal of digging and dump trucks standing in line to haul away the dirt from the construction site.

Gil Gordon

8th November, 2011 – Hauling away dirt from the big hole getting ready to do the basement foundations. Picture facing northwest with the current Herrick Labs. building in the background.

Gil Gordon

11th November, 2011 – Wooden forms in place for pouring of the basement walls. The photograph is facing north east with the former Grounds Pavilion in the background.

Gil Gordon

By December 15, 2011 poured walls were visible and part of the basement was waterproofed—a big change since the end of October.

Information on the whole rebuilding and expansion project (Phases I, II and III) and photos of the construction project are available on our web site at https://engineering.purdue.edu/Herrick/HomepageFeatures/OverviewofNewHerrickBuilding. Thanks to Herrick Staff Gil Gordon and Donna Cackley, with help from Brian Brinegar of ECN, new construction photos are posted almost every day.

As you can imagine, there is still quite a bit of fundraising to do, not only for Phase I but for Phases II & III. If you are able to donate to the building fund, see options for donations at: https://engineering.purdue.edu/Herrick/Giving/Index.html.

There are a number of naming opportunities available and currently the University is doing a one-for-one match on those naming donations.

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Upcoming Deadlines for Conferences and Short Courses

January 15, 2012: Abstract acceptance notification and instructions to authors for manuscript preparation.

March 30, 2012: Manuscript submission deadline; the presenting author must be registered for the conferences at this time.

April 27, 2012: Notification of presenting authors of acceptance or rejection of manuscripts; if paper is rejected, the presenting author registration fee is reimbursed in full.

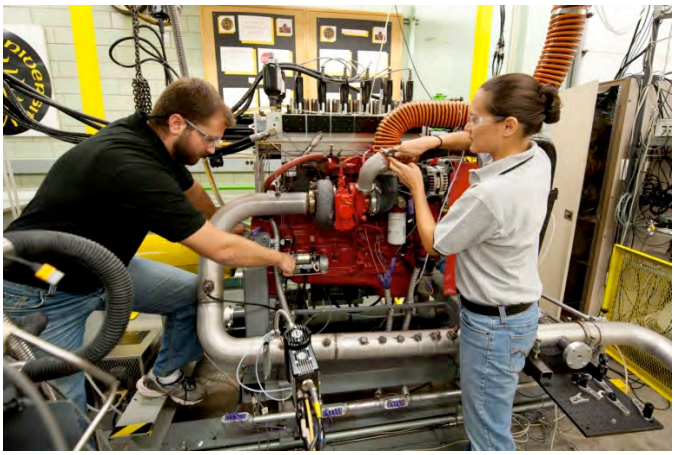
May 25, 2012: Pre-registration for the conference ends. Final version of the papers must be uploaded at this time or the Final Paper will not be published in the proceedings.

July 16-19, 2012: Conferences and short courses held at Purdue.

Hybrid Trucks, Buses Focus of New Purdue Center

—Adapted from an article by Emil Venere, Purdue University News Service

Herrick Laboratories is an integral part of a new effort lead by Purdue University aimed at cutting fuel consumption in half for commercial vehicles by perfecting hybrid technologies for the world's burgeoning bus and truck fleets. The new Hoosier Heavy Hybrid Center of Excellence (H3CoE) is funded with a $1 million grant from the U.S. Department of Energy's Graduate Automotive Technology Education initiative. The project, which falls under the umbrella of the Purdue Energy Center Advanced Ground Vehicle Power and Energy Storage initiatives, seeks to achieve a 50 percent reduction in commercial vehicle fuel consumption and greenhouse gas emissions. The five-year project began October 1.



Purdue doctoral students Dan Van Alstine and Karla Stricker work on a diesel-engine test platform. (Purdue University photo/Mark Simons)

According to Professor Greg Shaver, buses and trucks, particularly vehicles used to transport goods, represent a huge percentage of global fuel consumption and tailpipe emissions. Reducing fuel consumption for commercial vehicles by 50 percent would cut petroleum use by about 15 billion gallons per year, corresponding to a reduction of 155 million tons of carbon dioxide. Commercial vehicles consume far more fuel on a per vehicle basis than passenger cars, averaging 6.2 mpg and 74,000 miles per year, compared to 21.1 mpg and between 10,000 and 12,000 miles per year for light-duty automotive vehicles. Each commercial vehicle consumes an average of 11,900 gallons of fuel per year, whereas light-duty automotive vehicles consume an average of 570 gallons of fuel annually. The United States is the world's largest oil user, consuming nearly 20.7 million barrels per day. U.S. consumption is expected to grow moderately, but consumption in developing countries is expected to skyrocket in coming years. China consumes about 7.6 million barrels per day, and the rate is expected to grow at 9 percent annually. Growth in e-commerce is one phenomenon leading to significant increases in the number of trucks needed to transport goods. Annual e-commerce spending in the United States grew by nearly 100 percent in 2010.

The work will include industrial partners Cummins Inc., Delphi Automotive LLP, Ener1 Inc., Allison Transmission Inc. and the Energy Systems Network, an initiative of the Central Indiana Corporate Partnership focusing on clean-energy technologies in Indiana. The project management team also intends to reach out to additional prospective industry partners. Companies operating in Indiana, such as Cummins, Delphi and Allison, sell vehicle components globally, so solving technological challenges associated with medium- and heavy-duty hybrid vehicles could benefit the local economy.

Purdue is providing more than $500,000 toward the center - by way of tuition for up to eight H3CoE fellowships - to supplement DOE funds. The center is working with industry partners to co-fund research projects for these students as well as support a course-based certificate program. The program will include fellowships for up to eight students, an annual workshop, seminar series and the creation of a new course on medium- and heavy-duty electric hybrid vehicles. A new certificate program for graduate students in medium- and heavy-duty hybrids will be developed and will possibly begin in the spring semester.

Research challenges include learning how to better integrate the various components in the vehicles' power trains, encompassing the engine and transmission and other elements. Another challenge is to design heavy-duty "regenerative braking" systems, in which electric motors serve as generators while the vehicle is braking, producing power to recharge the battery pack. Researchers involved in the center also are developing regenerative braking systems that store energy by compressing hydraulic fluid in a tank-like "accumulator." High-pressure fluid in the accumulator would be used to drive a hydraulic motor, providing torque to the wheels and saving fuel. While regenerative braking is already used in hybrid cars, such systems are especially difficult to design for heavy vehicles. Another step needed to improve efficiency is recovering waste heat from the exhaust.

In addition to the research at the Ray W. Herrick Labs, research under this grant will be conducted at several laboratories at Purdue including the Maha Fluid Power Research Center (Prof. Monica Ivantysynova), the Electrical and Computer Engineering Energy Conversion Research and Energy Systems Simulation Laboratories (Prof. Maryam Saeedifard), and the Mechanical Engineering Tribology Laboratory (Prof. Farshid Sadeghi). *"This graduate student research and education grant, along with the Advanced Electric Drive Vehicle Education Program and EcoCar 2 Student Vehicle competition, are putting Purdue in a unique position to play a leading role in the emerging field of hybrid vehicles and power train electrification,"* said Prof. Vahid Motevalli, Head of Mechanical Engineering Technology at Purdue.

Energy Recovery with Hydraulic Accumulators

—Ned Troxel, Graduate Student

Hydraulic motors and cylinders have become indispensable elements for industrial machinery. Especially for mobile equipment, the high power to weight ratios of hydraulic actuators give them a distinct advantage over electric motors. With rising energy and fuel costs, there is a need for more efficient hydraulic systems. Energy recovery systems may be a part of the solution. This article presents a concept for an energy recovery system and a way to control the system for both high performance and energy efficiency.

The central component of the energy recovery system is a hydraulic accumulator. An accumulator is a pressurized vessel n which hydraulic fluid and gas are separated by a barrier, such as a piston, bladder, or flexible diaphragm. As fluid flows into the accumulator, it compresses the gas, storing energy. When the pressure at the accumulator port drops, fluid flows out of the accumulator under the force of the pressurized gas.

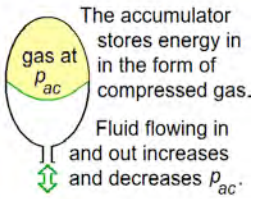


Figure 1.

Flow to and from the accumulator is controlled by two valves; each controls the flow to one side of an actuator. To make full use of the energy recovery system, it must also be possible to regulate the pressure on both sides of an actuator. This is easily done if four additional valves are used, two of which control flow from the pump and two control flow to the tank for each side. The disadvantages of such a system are the increased cost of control hardware, increased complexity of the control design and an increased possibility for component failure compared to systems where a single 4-way valve regulates the four flow rates simultaneously, without independent control of both pressures.

It is common in mobile hydraulic equipment for many actuators to be supplied by a single pump. For example, a backhoe could have six hydraulic cylinders and two hydraulic motors. When several of these actuators are used at once, some may require very high pressure while others require a much lower pressure. The pump supplies the highest required pressure and some energy is wasted by throttling the flow to the part-load actuators down to the actual pressure required.

When hydraulic fluid flows out of a cylinder to the tank, the remaining pressure is dissipated by the return valve. The power loss is the product of the flow and the pressure drop. If this flow could be directed into an accumulator instead of the tank, some of the energy could be saved, since the throttling loss involved is lower. In the following figure, these two situations are illustrated. The areas correspond to the power loss and power recovered for a flow rate Q.

High performance motion control of a hydraulic cylinder requires precise control of the net force on the piston (the load force), which is done by controlling the flow through the control valves. For a common double-acting cylinder, the load force is given by:

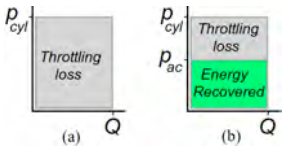


Figure 2.

where A_A is the area of the piston head side of the piston, A_B is the rod side area and p_A and p_B are the pressures acting on those areas. Since both pressures contribute to the force, it is possible to achieve a given load force with many different combinations of p_A and p_B. In general, the area A_A is much larger than A_B, so p_B can easily be greater than p_A for small load forces.

A scheme for controlling the pressures will be more efficient if the accumulator can store energy which would otherwise be wasted, and later reuse this energy. Two situations where the accumulator can benefit the system are explained below. The action of the energy recovery system will be illustrated by showing the hydraulic cylinder, the accumulator and its two control valves. The four remaining control valves are not shown.

The first situation is illustrated below in Figure 3. The piston rod is extending, and although the net force is positive, the pressure in the rod side (p_B) is higher than that in the head side (p_A). The accumulator pressure (p_{ac}) is between them. Flow is possible from the rod chamber into the accumulator and from the accumulator into the head side. Since A_A is larger than A_B, some additional flow from the accumulator makes up the difference. No flow from the pump is required, but the pressure in the accumulator will drop, since there is a net outward flow.

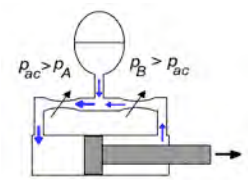


Figure 3

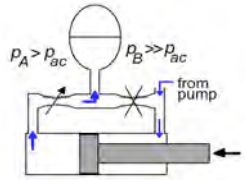


Figure 4

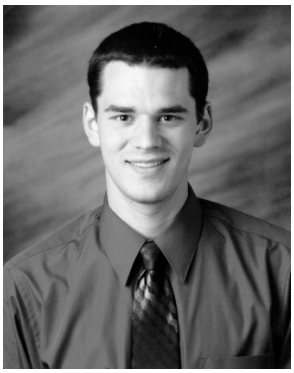
In the next situation, (Figure 4) the rod is retracting. The rod side pressure is very high so that the flow into the rod chamber must be supplied from the pump. The valve between the rod chamber and the accumulator is fully closed. The head side pressure is higher than the accumulator pressure so the flow out of the head chamber charges the accumulator.

A key point which must be kept in mind is that it will not always be possible to use the accumulator. One situation when it is very likely is when the required load force is opposed to the velocity. This happens when a heavy load is lowered for example. In such a case, the pressure of the outward flow provides a braking force and may be at a very high pressure. This outward flow can charge the accumulator. During such times, the other chamber pressure may be kept at a low level and the flow into the low pressure chamber may be supplied by the accumulator.

The required net force is often in the same direction as the

velocity, (e.g. lifting a load). If the accumulator is used in such a situation, only a low to moderate load force can be produced. If higher force is required, then the outward flow must be directed to the tank and the pump must supply the high pressure. The accumulator cannot be charged or used to power the system in this case. The task of the controller is to calculate the load force required and to control the pressures so that the system can use the accumulator whenever the required load force makes it possible to do so.

In conclusion, an energy recovery accumulator can increase the efficiency of systems where the available pump pressure is much greater than needed, as will certainly occur from time to time when multiple actuators are powered by a single pump. This type of energy recovery system would also be useful for systems which lift large loads. While the accumulator cannot provide the high pressure flow required for heavy lifting, it may be charged when loads are lowered and the stored potential energy may be used to supply other actuators. Although a hydraulic cylinder has been used to illustrate the functionality of the energy recovery accumulator, the system could also be used for rotary hydraulic motors. Using accumulators for energy recovery in hydraulic systems will be an important part of future fluid power research.



Pictured are Ned Troxe. (left) and Professor Bin Yao, his faculty advisor (right)

2011 Industrial Advisory Committee Meeting

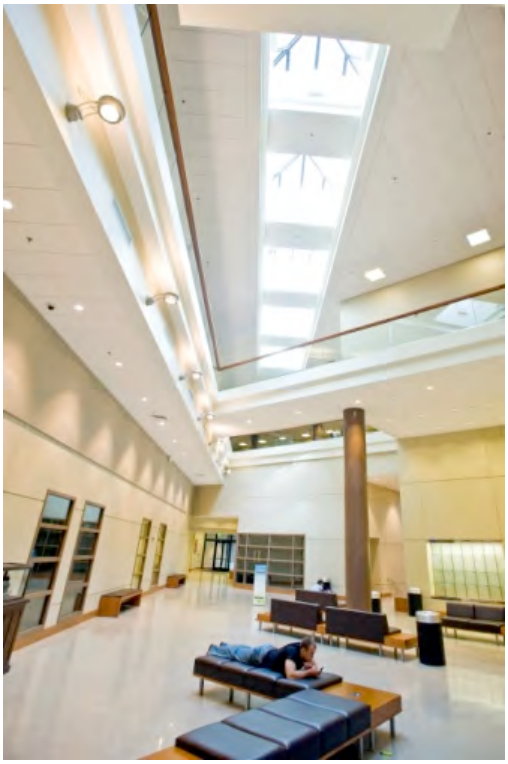
The opening session of the Industrial Advisory Committee meeting was held on October 20 at the Bowen Laboratories. The IAC which is comprised of over 20 representatives from a broad range of industries is chaired by Terry Manon, recently retired from the Trane Corporation. At the Bowen Labs, there were several presentations on Earthquake and Building Research by Professors Shirley Dyke (CE/ME), Jim Braun (ME), Thanos Tzempelikos (CE), Ming Qu (CE), Panagiota Karava (CE). This was followed by a tour of the Bowen facilities.

On Friday the meeting was at the Herrick Laboratories. Prof. Anil Bajaj (Head, ME) welcomed the committee and gave an update on ME and Prof. Jun Chen talked about his aeroacoustics research. Herrick Labs Director Patricia Davies reported on the State of the Laboratories and gave an update on the progress with the new Phase I building. This was followed by the Student Poster Show which included demonstrations.

After lunch, there were break-out sessions focused on strategic planning. The discussions were lively, interesting and very helpful.

Later in the afternoon, the group went to the Mechanical Engineering building for the Gatewood Wing Dedication. On Saturday, Purdue won the football game so, all in all, a productive and successful two days!

On the next page are some of the highlights of the Friday morning poster show.



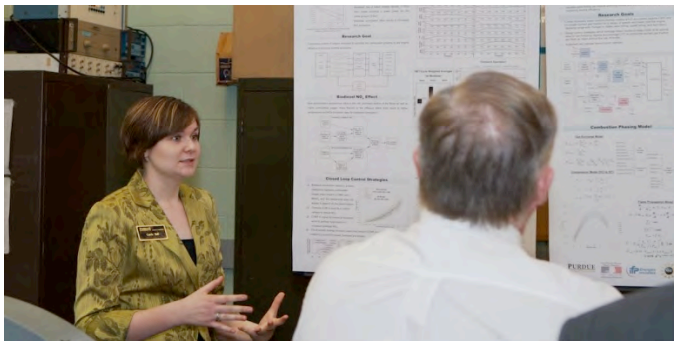
The Atrium the first floor of the new Gatewood wing which is attached to the southwest end of the ME building (to the right of what is shown in the photo). The door at the far end opens out to the fountain outside Hovde Hall. This is Purdue's first LEED certified building and it has a LEED Gold certification. Roger Gatewood has also made a very generous donation to the Herrick new building project. (Picture by Purdue CEC Photo and Digital Imaging.)

2011 Industrial Advisory Committee Meeting

Vaidy Sundaram explains the challenges of modeling of the behavior of viscoelastic materials and systems that incorporate them. He and Devon (an ME undergraduate who did research in the summer at Herrick) are developing models to predict the response of viscoelastic materials. (Photo by Andrew Jessop, Herrick Graduate Student.)

Bill Boley and Ray Cohen (2nd Director of the Ray W. Herrick Laboratories, 1971-1993) discuss research on the use of an in-house inkjet functionalization system for the fabrication of devices such as strain gages and biological sensors. (Photo by Andrew Jessop, Herrick Graduate Student)

Joe Gahaimer (Cummins) listens intently as Sarah Mcguire talks about the impact of aircraft noise and its disruption of sleep. Sarah is developing models to predict how noise changes sleep stage patterns.
(Photo by Andrew Jessop, Herrick Graduate Student)



Carrie Hall talks about her research work on biodiesel fuels and alternative fuels and new engine technologies such as variable valve timing to improve efficiency. (Photo by Andrew Jessop, Herrick Graduate Student)

David Yuill, who works with Professor Jim Braun on testing and evaluation of fault detection and diagnostics in packaged air conditioning equipment, talking about his own research and the research of his colleagues Howard Cheung and Woohyun Kim, who are also working on monitoring and diagnostic systems for HVAC equipment.

Terry Manon (left), John Galbraith (Carrier) and Jeff Moe (Ingersoll Rand) listen to Christian Bach describing his research on optimization of refrigerant distribution in evaporators.
(Photo by Andrew Jessop, Herrick Graduate Student.)

Visitor Acoustics at the Great Apes House at the National Zoo

Ryan Schultz, working with Professor Stuart Bolton, is helping out with acoustics issues at the National Zoo in Washington, DC. Working with the philanthropic arm of 3M, Ryan is applying some of his research on noise control systems to making visitor areas in the Great Apes House more pleasant. The animals are well protected behind thick glass panels, and their life is quiet (they can also escape outdoors if they want to), but for any visitors to the zoo, it's a different matter. With feet clicking on the floor, children crying, and people talking, it's a cacophony of sounds for the visitors. If you would like to learn more about the gorillas and orangutans at the National Zoo, follow this link: http://nationalzoo.si.edu/Animals/Primates/MeetPrimates/MeetGorillas/default.cfm

Kibibi a nearly 2 year old western lowland gorilla taking an interest in Ryan. Kibibi was born January 10th 2009 Her mother, Madara and father, Baraka, who is a silverback gorilla, are both at the National Zoo. Kibibi means "Little Lady".

Bonnie, a 35 year old female hybrid orangutan, keeping an eye on Ryan while learning about reverberation time measurements. Rumours that Bonnie has signed up for the ME413 Noise Control class in the spring apparently are not true.

This is Ryan's favorite shot of Bonnie having some down time. This acoustics testing is just so exhausting!

Juan de Bedout, 2011Outstanding Mechanical Engineer

Dr. Juan M. de Bedout was one of two Herrick Alumni to receive an Outstanding Mechanical Engineering Award this year. Juan received his BS in 1994, MS in1996, and his Ph.D. in 2000, all from Purdue. He was advised by Professor Franchek while he was at Herrick working on adaptive-passive noise control for his MS and on sequential multivariable feedback controller design for fault-tolerant applications for his Ph.D.

Juan de Bedout receiving his OME Award from ME Head, Professor Anil Bajaj.

Juan is currently the Global Technology Leader at GE's Global Research Center (GEGRC) for the Power Conversion Systems organization, a group devoted to developing advanced electric machines, power electronics, and power systems technologies for GE's Infrastructure businesses. General Electric promoted Juan in 2008 and he is now the youngest of 10 Global Technology Leaders at GE's Global Research operation.

This is a very exciting time for the power conversion systems organization at the GE-GRC. Under a $27 million partnership between GE-GRC and the National Renewable Energy Laboratory, GE Global is embarking on a 4-year Low Wind Speed Turbine Phase II Development program. The goal is to develop technologies for a multi-megawatt offshore wind turbine prototype with high reliability and availability at agreed cost goals. The outcomes of the program include innovative solutions for new foundation types, construction techniques, rotor design, drive train and electrical systems, while also optimizing the total lifecycle cost of offshore wind farms. Optimum turbine size is expected to be in the 5-7megawatt range and suitable for a water depth of more than 20 meters.

Juan with his family at the 2011 OME Awards Banquet. His grandfather (sitting) was a professor in Aeronautical Engineering at Purdue. His father, Juan Ernesto de Bedout (2nd from the right) is also a Purdue alumnus and a member of the Dean of Engineering's Advisory Council.

Ziqiang Hu, 2011Outstanding Mechanical Engineer

—J. Stuart Bolton, Cynthia Dalton and Patricia Davies

Although Ziqiang Hu was born and raised in Shanghai, his history sounds more like a classic American success story. He arrived in the United States with only $200 in his pocket, and now, a little more than 20 years later, is a Vice President of one of the world's most successful corporations.

Zi is here with his daughter, Katie. Katie was 5 years old when Ziqiang came to study at Herrick Labs. She is now in her final year qualifying to be a doctor. She lives in California.

Ziqiang Hu obtained both his BS and MS in Mechanical Engineering in Shanghai, although his education was interrupted by the Cultural Revolution, part of which he spent working in a bicycle factory. While at school in China, Ziqiang also played basketball at the State level: his skill as a basketball player certainly made him popular with his lab mates when he arrived at Purdue. While a Research Assistant at Herrick Labs, he worked with Prof. Stuart Bolton on an Active Noise Control project supported by the US Army Construction Engineering Research Labs.

Ph.D. advisor Stuart Bolton with Ziqiang at the OME Awards Ceremony.

On completion of his Ph.D. in 1992, Ziqiang worked for Noise Cancellation Technologies, where he developed one of the few industrial-scale active noise control solutions to be brought to market: a device for reducing the radiation of electrical transformer noise. Ziqiang then worked for General Electric (GE), for 11 years. He was a Team Leader at the Global Research Center in Schenectady, NY, for 6 years and was responsible for establishing both long-term and short-term strategies for the GE business units in the noise and vibration area. He worked on a wide range of noise control projects, involving many GE products from jet engines to refrigerators. However, his largest impact was in the appliance area, where, e.g., he led the team that developed GE's quietest side-by-side refrigerator.

Because of his demonstrated excellence in the appliance area, Ziqiang was recruited to work for GE Appliances in Louiville. As a manager, he led the team that developed the first GE prototypes for internet-connected appliances. Within a year at Louisville, Ziqiang was promoted to program manager. In that role, he developed GE's first variable speed compressor refrigerator, which proved to be the quietest refrigerator on the market, while at the same time earning an Energy Star rating. He then supervised the development of the ClimateKeeper2 Refrigerator, which ultimately earned a number one ranking from Consumers Union, and was a considerable commercial success. Finally, at GE, he led the development of the GE's first horizontal axis washers and dryers. In this project, he led a diverse international design and engineering team and developed manufacturing facilities and supply chains in both Canada and China. He completed this program on time, and $2.5 million below budget: and these appliances are now generating annual profits in excess of $40 million. During all of his tenure at GE, Ziqiang remained technically engaged, as reflected in the fact that he was awarded 15 patents during that time.

In 2005, Ziqiang was recruited by the Korean electronics giant Samsung to become a Vice President and Director of research and Development at their operation in Suzhou, China. There he leads a team of 350 engineers working in all areas of appliance technology. His first task was to transform the Center from one that only offered product support to a fully-fledged Global Development center with complete research and development capabilities. He has dramatically increased the number of international development projects run at the Center and has introduced design and quality control processes that have reduced product development time and cost, while at the same time reducing the number of service calls associated with Suzhou Samsung products by 60 percent within his first three years on the job. It is notable that all of this was achieved while increasing job satisfaction amongst the Center's engineers by 50 percent, and reducing the annual staff turnover rate from almost 20 percent to 5 percent. As a result of Ziqiang's leadership, the Samsung Suzhou operation has been "turned around" and in 2009 realized a net profit of more than $40 million.

Alumni Update - Bob Chanaud, Ph.D. 1967

During my time at Herrick Laboratories we emphasized in our noise control studies and industrial consulting work that the best solution was not boxing in a sound source but in understanding the basic sound generation mechanism. We then taught students to use that knowledge to reduce the sound output. The basic source types are monopole, dipole, and quadrupole and once the dominant type was identified, tools based on the key characteristics of speed and size can be used to determine how noise control can be accomplished. One aspect normally neglected is how these source types interact with resonant structures. When they do, either feedback can control the source resulting in narrow band sound generation, often of high level. The class notes of that time emphasized these aspects and were found useful on several research and consulting projects. I have recently updated them.

Since that time I found that one noise control method was almost never utilized. It is now called sound masking. Although applied mainly in open offices to reduce unwanted conversational interference, it can be applied as a noise control tool in more engineering circumstances. Sound is unwanted only if it rises above the background sound and is noticeable. The background sound in many environments is quite low in buildings and homes as well as outdoors in residential areas. By appropriately raising the background sound level, the source is no longer noticed. The beauty of this method is that it works on the ear of the listener and is independent of the possible multiplicity of paths sound may take in getting there. It does not necessarily require modification of the source. Sound masking has limitations in that it is intended to bring the background level up to an optimum, while normal noise control is intended to bring the sound down to the optimum. As a result, I wrote a manual on how it can be successfully applied both in usual environments, such as offices, homes, and hospitals, and in secure environments to inhibit the successful functioning of listening devices.

More recently, the increasing number of what might be called "noise-lovers" has given rise to environmental noise problems. Audio systems including "boom boxes" in vehicles and loud music festivals create significant noise events. Unmuffled street motorcycles and vehicles at racing events can create incredible levels of sound. Airboats, mostly in Florida, are another example. The federal Noise Control Act of 1972 was enacted to help with noise problems and has been particularly successful in reducing aircraft noise. Unfortunately, the federal government had decided that most noise problems are local and has abandoned any enforcement.

Many states and communities have statutes and ordinances that are not technically sound; they are not always aware of how the ordinances can be enforced economically. As a result they do not enforce them despite the complaints of citizens. I recently completed a lengthy document on methods to enact or modify and enforce defensible noise ordinances in the hope that more attention will be paid to this problem.

Robert Chanaud (Ph.D. 1967) has been active in the field of acoustics and fluid mechanics for over 52 years. A graduate of the US Coast Guard Academy; he served in the Coast Guard for 8 years. He was a researcher for

American Standard Corporation where he developed a flow meter that used frequency measurement to determine flow rate. He taught engineering acoustics at Purdue then architectural acoustics at the University of Colorado. He then was a consultant to IBM on noise problems as well as to the U.S. Environmental Protection Agency on community noise problems. With the advent of open offices, he found that one of the three important acoustical factors in creating speech privacy in those offices was missing: sound masking. He founded Dynasystems, a manufacturer dedicated to solving privacy problems with cost effective products. After leaving that company he became a consultant to Atlas Sound on masking product design and applications which resulted in the publication of the first book on sound masking. He also developed a number of software programs which permitted acoustical analysis of offices. These programs are available for download from the Atlas Sound website. Robert lives in Prescott, AZ

Horton to the Rescue

Travis Horton, (Ph.D. 2002 and current faculty member) went to a Boy Scout camp in Cimmaron, AZ as an adult supervisor with his son.

Travis was with a group of other supervisors and leaders when they heard an adult advisor on the other side of a ravine call out, "I think we have a problem."

"Why?" they replied. The adult advisor called back, "I've been bitten by a rattle snake."

It took the adults 4 hours to get him to a hospital where he received 6 doses of anti-venom at $9,000 a dose.

What's that Boy Scout motto? Always be prepared?

Where Are They Now?

Andrew Huang (MSME 2011) returned to West Lafayette on September 10 to attend a friend's wedding. After graduation, he spent three months in Taiwan studying Chinese, and is now beginning his job search in acoustical engineering. He is living in Ann Arbor, MI.

Yan-Fu Kuo (Ph.D. May 2011) is now an Assistant Professor at the National Taiwan University.

Kevin Mercer (MSME 2003) has changed companies. He's moved to a new role as Engineering Manager for Indoor Split System Products with Carrier Corporation in Indianapolis, IN. His new home is in Danville, IN.

Kyle Merrill (MSME 2003) Kyle went to work for Denison Hydraulics and then Parker Hannifin as a hydraulic pump design engineer. He was the team leader of the integrated digital electronic control of a variable displacement axial piston pump.

In January of 2009 he returned to Purdue University to pursue a Ph.D. He is working on the development of the digital pump/motor technology. His research is funded through the National Science Foundation Engineering Research Center for Compact and Efficient Fluid Power (CCEFP). The goal of this research is to develop a coupled dynamic model and prototype of a hydraulic pump/motor that incorporates actively controlled high-speed on/off valves connected to each cylinder.

These high-speed valves replace the valve plate of state-of-the-art pump/motors. Unit displacement is electronically controlled using the on/off valve timing and not by a swash plate or other typical means. Pump/motors of this design can realize increased efficiency due to reduction of friction, leakage, and compressibility losses. Additionally, the implementation of high-speed on/off valves will increase displacement control bandwidth.

Kyle Merrill with his wife and children

Bryan Song, (MSME 1997, Ph.D. 2001), was named Employee of the Month, July 2011 at the Kennedy Space Center.

Bryan has been working on Pegasus launch vehicle separation shock to the Interface Region Imaging Spectrograph (IRIS) spacecraft. Bryan worked closely with Orbital Sciences, California Space Authority Engineering and the IRIS spacecraft team during the shock study. After some early results from the shock study, Orbital and Spacecraft personnel suggested additional shock attenuation testing on the stage two-thirds separation event. This additional testing would be costly and cause delays that could potentially impact the critical design review of the spacecraft design. Bryan analyzed the shock data and concluded that no further testing was required. He promoted the findings of his technical analysis to the Launch Services Program Structural Dynamics Team and the Orbital Sciences contractor and presented his findings to the integrated IRIS team during a Mission Integration Team meeting. His technical rational was convincing enough to allay any of the concerns that lead to the suggestions for additional testing.

Bryan was also instrumental in the success of the recently concluded Engineering Review Board on the IRIS Shock Mitigation. Resolving the spacecraft component shock issue has been significant to the success of the IRIS mission.

Taewook Woo (MSME 2003, PhD 2008) is still living in the Greater Lafayette area. He works at E-A-R Acoustics, part of the 3M Company, in Indianapolis as an applications engineer in the truck group to reduce engine noise in semi-tractors.

Faculty Honors

Jim Braun was appointed the Herrick Professor of Engineering on Friday, August 26 at an investiture ceremony held in the Anniversary Drawing Room of the Purdue Memorial Union Building. Among his many accolades was the proposal for the new living laboratory, a major component of the new Phase I Herrick building.

Attending the festivities were his wife, Julie, and their three children, Timothy, Roger, and Emma. As you can see from the photo above, many of his university colleagues, including Eckhard Groll, Ray Viskanta and Doug Adams, attended along with many personal friends and family.

Doug Adams was elected a Fellow of the American Society of Mechanical Engineers (ASME).

Yan Chen received the John Rydberg Gold Medal from the Scandinavian Federation for Heating, Ventilating and Sanitary Engineering Associations in Denmark, Finland, Iceland, Norway and Sweden (SCANVAC).

He was also selected by the ASHRAE Chapter Technology Transfer Committee as an ASHRAE Distinguished Lecturer.

George Chiu is on sabbatical from 2011-2013 and working as Program Director at the National Science Foundation.

Eckhard Groll has been selected by the German Academic Exchange Service (DAAD) to serve as a Research Ambassador for study and research in Germany for the 2011-12 academic year.

Robert Lucht was elected a Fellow of the American Society of Mechanical Engineers (ASME).

Jeff Rhoads received the ASEE Ferdinand P. Beer and E. Russell Johnston, Jr., Outstanding New Mechanics Educator Award.

Greg Shaver received the 2011 Max Bentele Award for Engine Technology Innovation.

Student Honors

Gayatri Adi won a best paper presentation award for the second best overall paper (out of over 70 paper presentations), at the 2011 International Conference on Advances in Energy Research, held December 9-12, 2011 on the campus of IIT Bombay, for her presentation: "Closed-Loop Control of Fuel-Flexible Compression Ignition Engines." During this trip, Gayatri also gave a presentation summarizing both her work, and that of her colleagues, at Cummins Research and Technology India (CRTI) in Pune, India.

Ian Bell (Ph.D. 2011) received the second annual Open Access award for or his outstanding contributions to broadening the reach of the Herrick Laboratories' conference series through his significant investment of time, resources, energy, and forethought in the preparation of papers and descriptive, metadata information and deposit within Purdue e-Pubs. His service to Herrick Laboratories, to the School of Mechanical Engineering, the College of Engineering, Purdue University and to scholars around the world will serve to greatly enhance the transfer of knowledge from our university by building bridges to scholarship made available through the Libraries. This award is a sincere token of appreciation for the real-world application of such forward-thinking principles and actions.

To recognize the contribution, James L. Mullins, Dean of the Libraries and Professor of Library Sciences, hosted a luncheon to present the award for exploring means of continuing this important relationship between the Libraries and the Herrick Laboratories. The Scholarly Communication Committee, along with Libraries Dean James L. Mullins; Tim Sands, Purdue Provost; Anil Bajaj, Head of Mechanical Engineering; Patricia Davies, Director of Herrick Laboratories; and James Braun, Ian's advisor and Herrick Professor of Mechanical Engineering, were in attendance for the award presentation.

Craig Bradshaw was awarded the Ward A. Lambert Graduate Teaching Fellowship for 2011-2012.

Andy Jessop won the INCE student paper competition at NOISE-CON 2011 in Portland, OR with his paper titled "Calculation of Pressure Distribution of the Interior Acoustical Mode of Deformed Tires."

Ed Koeberlein (MS, 2011) received a best presentation award for his presentation at the 2011 American Control Conference in San Francisco, CA which was held June 29-July 1, 2011.

Abhinav Krishna was awarded the Cooling Technology Research Center (CTRC) poster award in May.

Sarah McGuire was awarded a Leo Beranek Student Medal for Excellence in the Study of Noise Control from the Institute of Noise Control Engineering.

James Mynderse was awarded the Magoon Award, which recognizes outstanding teaching assistants and instructors. The selection is made by both faculty and students to recognize those students who were exemplary in their work as teaching assistants or instructors.

Ryan Schultz was awarded the 2011 E-A-R Acoustic, Thermal and Shock Solutions Scholarship. The scholarship is designed to recognize high levels of achievement in the Acoustic Sciences, contributions to the profession and the intent to pursue careers in noise, vibration, harshness, shock and thermal engineering.

Karla Stricker (a 5th year direct PhD student on Greg Shaver's team working on the DOE/Cummins-sponsored SuperTruck project) was selected for the NSF-Sponsored ADVANCE Workshop on Negotiating the Ideal Faculty Position (A Workshop for Underrepresented Postdocs & Late Stage PhD students in Science, Engineering & Psychology). There were 44 applicants, and Karla was one of 6 selected!

Graduations

Nasir Bilal (Ph.D. August 2011), Design Optimization of the Suction Manifold of a Reciprocating Compressor Using Uncertainty and Sensitivity Analysis. Nasir is continuing his studies as a Post-Doc working with Doug Adams.

Charles Butner (MSME May 2011), Investigation of the Effects of Bolt Preload on the Dynamic Response of a Bolted Interface. Charles took a position with Damping Technologies, Inc. in Mishawaka, IN.

Won Hong Choi (MSME August 2011), Influence of the Cavity Mode on Tire Surface Vibration. Wong Hong returned to Korea and has a position with Samsung.

Tiffany DiPetta (MSME May 2011), Development and Verification of a Diagnostic Cleat for Detecting Faults in Military Wheeled Vehicles. Tiffany's employment information is unconfirmed.

Matt Houtteman (MSME 2011), Applications of Eigenmode Coupling to Damage Detection in Beams. Matt accepted a position with Munro & Associates, Inc. in Troy, MI.

Ed Koeberlein (MSME December 2011), Physics-Based Modeling and Estimation of Exhaust Manifold Filling Dynamics on a Diesel Engine Equipped with Flexible Intake Valve Actuation. Ed is working for Cummins in Columbus, IN.

Ki Sup Lee (Ph.D. December 2011), Air Distribution Effectiveness and Thermal Stratification with Stratified Air Distribution Systems. Ki Sup is working for Samsung Electronics in Korea.

Robert Leffler (MSME May 2011), Power Plant Waste Heat Rejection and Utilization Options. Robert took a position with Carrier Corporation in Syracuse, NY.

Margaret Mathison (Ph.D. August 2011), Modeling and Evaluation of Advanced Compression Techniques for Vapor Compression Equipment. Margaret is teaching at Marquette University in Milwaukee, WI.

Alan Meyer (MSME May 2011), Damage Identification for Healthy Monitoring of Ground Vehicle Through Active Probing of Vehicle Response. Alan is employed by Lawrence Livermore National Laboratory, Livermore, CA.

Ranjit More (MSME August 2011), Diagnostics of Advanced Diesel Fuel Injectors. Ranjit is working for Caterpillar in Lafayette, IN.

Tyler Robbins (MSME December 2011), Development and Verification of Data Analysis Strategies for Characterizing Military Helmet-Head Performance. Tyler's employment information is unconfirmed.

Hyun Jun Shin (MSME August 2011), The Use of Microperforated Materials as Duct Liners. Hyunjun is working for LG Electronics in Seoul, Korea.

Ned Troxel (MSME August 2011), Precision Motion Control of Electro-Hydraulic Systems with Energy Recovery. On August 1, Ned started working for Chrysler in Auburn Hills, Michigan as a product engineer.

Miao Wang (Ph.D. May 2011), Modeling Airflow and Contaminant Transport in Enclosed Environments with Advanced Models. Miao's employment information is unconfirmed.

Engagements

Frank Eberhardt (MSME 2011) is engaged to Michelle Ginna Murbach. He proposed to her on Friday, May 6th. The date and location for the wedding have not been arranged. Michelle graduated from Purdue in the College of Consumer and Family Sciences with a double major in apparel design and retail management in the fall of 2007. Frank is marrying his high school sweetheart, and the two moved into a home they built in Greenwood, Indiana.

Ravinda Kakade (MSME 2011) is engaged to Pradnya Bapat. They met trekking in the Himalayas during their sophomore year and have been dating since. Ravindra joined Cummins in January 2011 and Pradnya joined the company in July 2011. She was at Ohio State and did a Masters in Electrical Engineering. They live in Columbus, IN, and just bought a house together. They were engaged on January 1, 2011 and plan to marry on December 31, 2011 in Pune, India.

Karla Stricker (current student) ran a 10 K race with her boyfriend, Josh Fuhs, on September 12. After the race, they went to Panera for a bite to eat and then a walk on the pedestrian bridge. When they got to the sundial, Josh dropped to one knee and proposed, and Karla accepted. Karla has a beautiful three-stone diamond ring, made by Rogers & Hollands located at the Tippecanoe Mall. It is the perfect ring as far as Karla is concerned. No date is set for the wedding. Josh graduated from Purdue in 2004 with a B.S. degree majoring in computer science and is working in software development.

Weddings

Kang Hou (MSME 2009) married in his hometown of Weihai, China. The nuptials were held in June, and the happy couple is now living in Houston, TX where Weiwei works in the oil industry. Kang is looking for a position in the area.

S. Hales Swift (MSME 2009) and Megan Sewell were married October 8, 2011 in Nauvoo, IL. He is currently working with Prof. Lyrintzes and Prof. Blaisdell in the School of Aeronautics and Astronautics.

Births

Tanya Wulf Gramm (MSME 2009) and her husband, Taylor, welcomed a new addition to their family. Kyria Rose Gramm arrived at 6:36 a.m. on Saturday, May 14th, 2011. She weighed 7 pounds 15 ounces and Tanya writes "She has been a great baby! We love her!" Kyra is shown here at 3 months.

Brandon Woodland (current Ph.D. student) and his wife, Christine, welcomed a new arrival on June 17 at 1:49 a.m. The new baby girl, named Meilee Asaye, weighed 6 pounds 7 ounces and was 19.5 inches long. She came home on Father's Day and was welcomed by big brother, Raiden, who is 2.

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