



# Herrick Newsletter

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With the new building going up and a new phase in the Herrick Laboratories' story, it seems an ideal time to update our newsletter. The newsletter format has not changed significantly since 1996, and perhaps longer.

The logo in the upper right-hand corner with the cupola was designed by a recent graduate, Craig Bradshaw.

You can now receive your newsletter

electronically. Simply go to <https://engineering.purdue.edu/ECN/mailman/listinfo/herrick-newsletter> and fill out the quick form to subscribe. You will receive electronic notices telling you that a new copy of the newsletter is available for download to your computer or e-reader.

We will continue to send out hard copies of the newsletter if you prefer hard copies.

## Ginny Freeman Retires

After working at the Herrick Laboratories for 13 years, Ginny Freeman retired on December 31, 2012. A reception was held for her on Friday, December 14 to permit students to attend the reception before leaving for winter break.

As a strong supporter of local businesses, the majority of her gifts came from local entrepreneurs, including the cake shown left. Ginny received a beautiful sapphire necklace with a diamond at the top, a large tote bag, a small ceramic pine tree decorated with

birds, and a holiday ornament.

She hadn't decided what she was going to do after retirement. Several options were mentioned including a major cleaning of the house, a part-time job with plenty of people interaction, and volunteer work. Whatever she does, she will do well.

She will be missed at the laboratories. She was the face of the laboratories to the many people attending the bi-annual conferences and short courses.



The Herrick Laboratories cake. No one wanted to cut it so Ginny made the first cut. The cupola on the cake went home with her. This was a white cake; a chocolate sheet cake was also served.

## New President for Purdue

As you've probably heard by now, Purdue has a new President Elect in current Indiana Governor Mitch Daniels. Governor Daniels will complete his term as governor on December 31, 2012 and begin his new role as Purdue's 12th president on January 1, 2013.

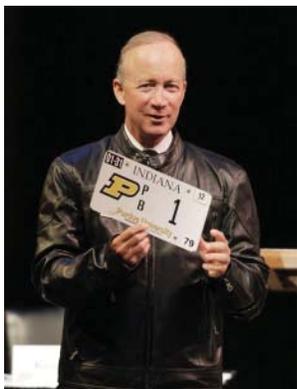
During his acceptance speech on June 21st, he wore a Purdue tie given to him by former Purdue President Martin Jischke. To welcome him to Purdue, the Purdue Board of Trustees gave him a Purdue license plate with the number "1" on it. He also received a black Harley-Davidson leather jacket with the official Purdue "P." The Governor enjoys riding his motorcycle

from time to time, and the Board of Trustees thought the jacket would be appropriate.

In his acceptance speech, he stated, "Purdue's research gives rise to the innovative new goods, services, and companies on which American and Hoosier prosperity must be built."

After his official acceptance comments, the president elect meet informally with students, staff, and faculty. The festivities were broadcast over the Web so almost everyone in the Purdue community could participate.

The 63-year old governor will serve a minimum of 5 years.



Governor Mitch Daniels posing with his new Purdue jacket and his license plate.

## Graduate Certificate in Hybrid Vehicles

—Emil Venere, University News Service

Purdue University has launched a new graduate engineering certificate program in hybrid vehicles, a specialty that is expected to grow in demand as hybrids become more common.

"This program is a great example of integrating research and education," said Leah H. Jamieson, the John A. Edwardson Dean of Engineering and Ransburg Distinguished Professor of Electrical and Computer Engineering. "The program gives students technical depth and also breadth, and is responsive to industry needs."



*Associate Professor Gregory Shaver*

The new certificate program is administered by the School of Mechanical Engineering but open to any graduate student in engineering.

"We expect the program to grow and become permanent at Purdue," said Professor Gregory Shaver, an associate professor of mechanical engineering. "After the program ramps up, we hope to issue 10 certificates per year and to have 30 students enrolled at any given time."

Participants will be required to take one course in each of three areas: the architecture, or the integrated layout of the powertrain, which consists of the engine, electric or hydraulic motor and generator, transmission and other components; energy storage and controls, with courses focused on batteries or the design of algorithms needed to control the system; and "prime movers," which refers to the design of engines, electric motors and generators, hydraulic motors and pumps, and systems that capture braking energy with flywheels. The systems use electric motors as generators while the vehicle is braking, producing power to recharge the battery pack.

The Hybrid Vehicle Systems Certificate program was developed through the Hoosier Heavy Hybrid Center of Excellence (H3CoE), which was formed last year and funded with a \$1

million grant from the U.S. Department of Energy's Graduate Automotive Technology Education initiative.

The center held a hybrid vehicles workshop at Purdue on September 12. Experts from industry and academia gathered to discuss the latest technologies and challenges for hybrid trucks and cars. Engineers from Cummins Inc., Allison Transmission Inc. and Navistar International Corporation, gave talks to address the promise and challenges facing widespread use of hybrid technologies in medium- and heavy-duty vehicles.

The center is leading an effort to cut fuel consumption and greenhouse gas emissions in half for commercial vehicles by perfecting hybrid technologies for the world's burgeoning bus and truck fleets. Buses and trucks, particularly vehicles used to transport goods, represent a huge percentage of global fuel consumption and tailpipe emissions, said Shaver, who co-directs the center with Maryam Saeedifard, an assistant professor of electrical and computer engineering.

The center falls under the umbrella of the Purdue Energy Center Advanced Ground Vehicle Power and Energy Storage initiatives. More information about the workshop is available by contacting Pankaj Sharma, managing director of the Energy Center, 765-496-7452, sharma@purdue.edu.

The Purdue center is one of seven "centers of excellence" at U.S. colleges, universities and research institutions formed through \$6.4 million in Department of Energy funding over the next five years.



Hybrid diesel engine. (Photo compliments of colourbox).

# Use of Virtual Methods to Detect Defects in Rooftop Air Conditioners

—Woohyun Kim



Woohyun Kim, graduate student researching heating, ventilation, air conditioning and refrigeration.

Woohyun Kim, a current Ph.D. student, is doing research on rooftop air conditioning units and virtual methods to detect defects. Below he describes his research.

About 60 percent of the total cooling requirements in the U.S. are met using a large number of relatively small packaged air conditioners. Furthermore, several studies have demonstrated that this type of equipment tends not

ported by the Department of Energy through the Energy Efficient Buildings Hub is focused on demonstrating a complete diagnostic implementation for a rooftop unit that is based on the use of virtual sensors. The work includes the development, implementation, and evaluation of the needed virtual sensors for fault detection and diagnostics and performance indices for decision support. The fault detection and diagnostics rooftop unit demonstration system will provide the following diagnostic outputs: 1) loss of compressor performance, 2) low or high refrigerant charge, 3) fouled condenser or evaporator filter, 4) faulty expansion device or liquid-line restriction, and 5) economizer faults.

Once faults are detected and the causes of the faults are identified, proper action should follow to fix the problems, adapt the control, or flag them for continued monitoring. An assessment of the severity of a fault is essential to the decision process and virtual sensors can be used as inputs for

to be well maintained and generally operates much less efficiently than originally intended as a result of faults. Automated fault detection and diagnostics has the potential for improving energy efficiency for packaged air conditioners along with reducing service costs and comfort complaints.

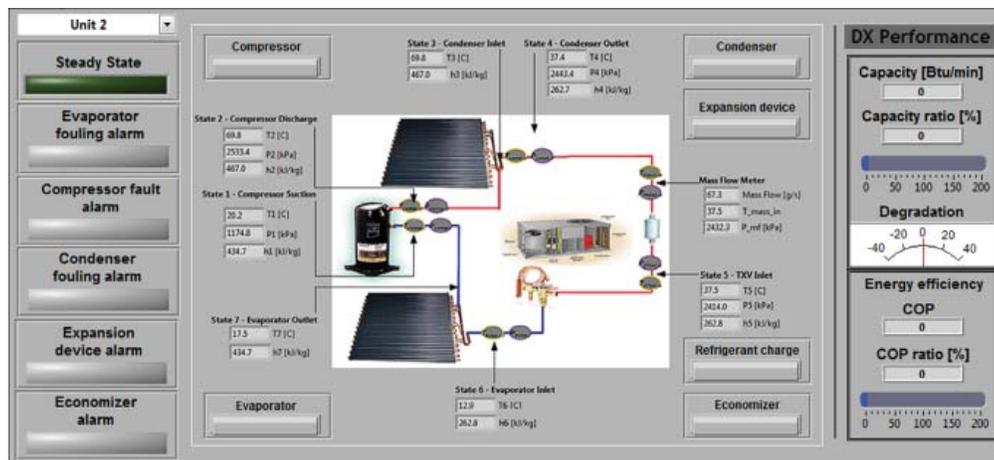
Recent fault detection diagnostics research on packaged air conditioners at Purdue has focused on the use of virtual sensors as a means of realizing a robust and low-cost approach to monitoring, detecting, and diagnosing faults. A virtual sensor estimates a quantity that would be expensive and/or difficult to measure directly. Various virtual sensors have been developed for vapor compression equipment. Virtual sensors can be embedded in a permanently installed control or monitoring system and used for early detection and diagnosis of faults.

Current research sup-

this analysis. If thresholds were set too close to normal conditions, the fault detection and diagnostics system would be too sensitive leading to false alarms. If thresholds were set too far from normal conditions, the system might

miss faults that significantly reduce system performance. Therefore, it is very important to define reasonable thresholds for appropriate fault detection.

Health and economic status reports for equipment can be generated using fault impact indices, such as system cooling capacity and efficiency. In particular, the fault impact indices can be used to assess the economics associated with servicing a unit if faults existed.



Demonstration of fault detection and diagnostics for rooftop units



The user interface of the virtual refrigerant charge sensor

# New Building Moving Forward

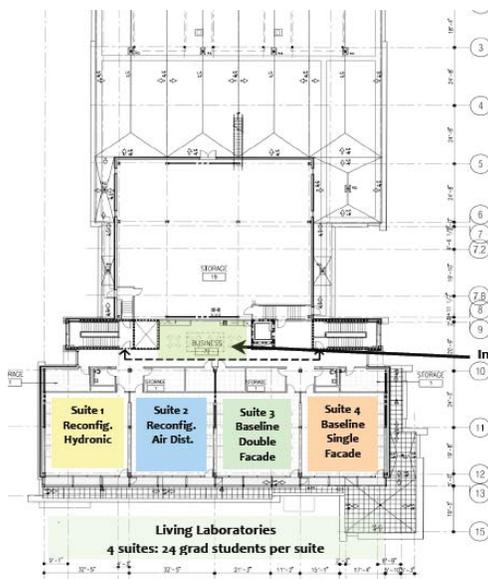
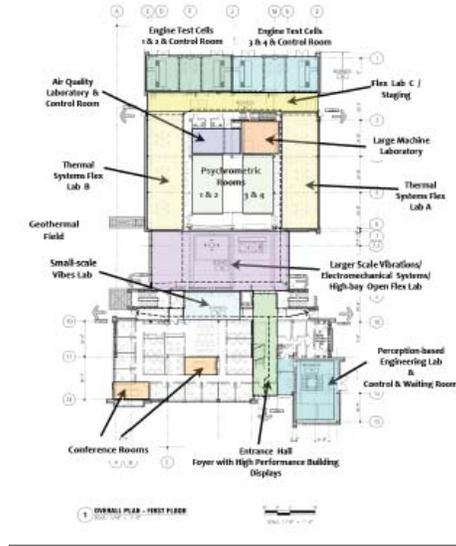
Construction is still on target for the building to be completed and occupied in the late summer or early fall of 2013.

In early November, construction workers were striving to complete the exterior before winter so they can work comfortably inside. Openings were covered with plastic sheeting until doors and windows arrived. Where doors were not available, plywood worked as temporary doors.

A rough coat of blacktop was laid around the building on November 8 showing the new delivery and parking area. A finish layer of blacktop will be added in the spring or summer when the weather is more conducive to laying blacktop.



On July 30, 2012 the steam pipes in the new building were tested. This photo is looking at the new building from the main entrance of the existing building.



On July 19, Jim Braun, Michael McQuade, and Travis Horton (pictured left to right) took a tour inside the new building. Michael McQuade's affiliation was the plenary speaker at the Herrick conferences on July 19.



One of the four engine test cells.



Perception-based engineering lab.



Sheet rock is in place and mud is applied.

# New Building Moving Forward (continued)



One of four new psychometric rooms.



A look into the high bay flexible lab space from the second floor offices.



One of four rooms that comprise the Living Labs on the third floor that will house the graduate student work areas.



A south facing faculty office.



The Director's new office on second floor.



The basement hallway.

## Industrial Advisory Committee Meeting in October 2012

The Industrial Advisory Committee (IAC) held its regular fall meetings on Thursday, October 4 and Friday, October 5. The meetings started with Advisory Committee members donning hard hats and safety glasses for a tour of the new building. Returning from the tour, the Industrial Advisory Committee members were excited by what they saw and were eager to see the completed project. The new building will increase the floor space and research capabilities of the laboratories.



*Yusuf Azizi shares his research with members of the Industrial Advisory Committee.*

One of the issues addressed in the Industrial Advisory Committee meeting was how to effectively and efficiently raise the \$5 million needed to complete the current building (Phase I) and the \$17 million needed for phases II and III. Money is also needed to purchase new furniture for the new building, especially in the student offices that will be a living laboratory. The student work areas should be the same so that air flow is consistent in the living laboratory.

There are still naming opportunities in the Phase I building, go to [https://engineering.purdue.edu/ME/Giving/Herrick\\_Naming/index.html](https://engineering.purdue.edu/ME/Giving/Herrick_Naming/index.html) to find out more.

On Friday morning, Anil Bajaj, the William E. and Florence E. Perry Head of Mechanical Engineering and the Alpha P. Jamison Professor of Mechanical Engineering, spoke about the importance of the national rankings of the School of Mechanical Engineering. One of his goals is to reduce the student-to-faculty ratio, and at the same time, increase publications. He also wants to increase the number of minorities and women on the faculty. With a higher enrollment in the School of Mechanical Engineering, the department will receive increased Purdue revenue to pay for new faculty hires.

Friday morning was the student poster show,



*Will Boley and Chenchao Shou share an in-depth explain of their research on functional printing with an ink jet to Bob Parrin, John Grace, and Mike Moaveni.*

which the Advisory Committee members enjoy. The Industrial Advisory Committee also stressed that the move to the new building is an ideal time to work rules, and routines or habits in the workplace. This will be a one-time opportunity that should not be missed. They want the labs to retain its current culture.



*Yangfan Liu presents his research work during the poster session.*



*The members of the Industrial Advisory Committee in the Hudelson Conference room eagerly waiting for the meeting to begin. Chair of the committee, Terry Manon, is seated in the first row, with the members of the committee seated behind him. Some of the Herrick faculty are seated in chairs at the back of the room.*

## Bi-annual Conferences Held this Past Summer

The bi-annual conferences were held this summer from Monday, July 16 through Thursday, July 19 in Stewart Center. The conferences draw over 600 people from more than 30 countries.

While there are three separate conferences (International Compressor Engineering Conference, the International Refrigeration and Air Conditioning Conference and the International High Performance Buildings Conference), people attending the conferences can attend any of the sessions, regardless of which conference is of the most interest to them.

This year the speaker for the welcome and the keynote address was Prof. Dr. Jean-Louis Scartezini of the Solar Energy and Building Physics Laboratory and the Swiss Federal Institute of Technology in Lausanne, Switzerland who spoke on "Toward Net Zero Energy Buildings: Here and Now."

Marcio Luiz Todescat, Research and Development Procurement Vice President, Embraco, Brazil spoke in the Tuesday plenary. The title of his presentation was "Domestic Refrigeration: Historical Aspects and Future Prospects."

Dr. Gerald Hines of Hines, Inc. from Houston, Texas spoke on "Future Buildings and Planning of Urban Communities" during the Tuesday, July 17 luncheon.

Gerald Hines graduated from Purdue's School of Mechanical Engineering in 1948 with a BSME.

Wednesday's speaker was Dr. Joost J. Brasz, Danfoss Turbocor Compressors, Inc. from Syracuse, New York. He spoke on "Past, Present and Future of Turbo Machinery in the heating ventilation air conditioning and refrigeration industry."

On Thursday Dr. J. Michael McQuade from United Technologies Corporation from Hartford, Connecticut was the plenary speaker. He talked about "Grand Challenges in Increasing Energy Efficiency in Buildings."

People also come to conference after conference to see friends and meet with



*Thomas "Tom" Watson, Life Member of ASHRAE and 2012-13 ASHRAE President, addresses the conference attendees.*

others that they usually only see every two years at the conferences.

The informal steak barbecue at the Trails in West Lafayette is a chance to relax, enjoy the outdoors, and converse with old friends and make new acquaintances.

The next conference is scheduled for July 14-17, 2014. Short courses will precede the conference on July 12-13, 2014. For more information visit our Web site <https://engineering.purdue.edu/Herrick/Events/2014Conf/index.html>.



Conference attendees listen intently to the keynote address in the Loeb Playhouse.

## Some Things Don't Change



*A photo of the lathe, drill press, and the band saw.*

The Herrick Technical Services “Shop” has a rich history of helping students. It’s physical appearance is similar to the way it looked back in the days of Art Smith, Avery Norfleet and, most recently, Fritz Peacock. Some of the equipment has been updated, but much of it continues to work and requires only minimal repairs. The equipment in the shop is upgraded when it is broken beyond repair, which is a general rule for everything at the laboratories. We all try to make things stretch as much as possible.

Phase III of the new building plan is a facility for technical services. We estimate this will cost around \$5-\$7 million. The shop is quite cramped with milling machines and parts taking up almost every nook and cranny. With the new building opening and space in the current building being vacated, they will be able to expand in the old building so they’re not as crowded. Phase III of the building plans call for the shop to have an integrated area where students can work with technical staff to construct research rigs.

Gilbert “Gil” Gordon is the shop coordinator since Fritz retired. In that capacity, he advises students on rig design and co-ordinates who helps them build it. He still does technical projects like the electrical wiring and making circuit boards. Currently, he is also helping out in the technical services in the Mechanical Engineering building, who are short staffed because there is a lot of extra work with the new Mechanical Engineering Gatewood Wing and

many undergraduate labs upgrades.

Bob Brown works on nearly all of the projects in the building and, he is also responsible for the building. Any lights that are out, room temperatures that need adjusting, ceiling tiles that need to be replaced, or other similar issues with the building are handled by Bob Brown. He is also responsible for safety issues and co-ordinates with the Engineering and University safety committees.

Kwokwai “Frank” Lee spends most of his day in the west wing working on heating, ventilation, air conditioning and refrigeration experimental set-ups. This area is very busy with many new projects and students.



*One of the milling machines in the Technical Services area is featured in the forefront.*

A major focus of everyone at the Herrick Laboratories is safety. Every new person receives safety training from the Shop, regardless of their job classification. Many of you will remember the safety checks. Students cannot run experimental set-ups without first proving that they know how to operate the equipment and how to handle any emergencies that could arise. They still must demonstrate to two faculty members, and at least one shop member, that they are prepared for the unexpected and can safely conduct their research work.

Anyone not following safe practices has their experiments stopped. Students learn quickly that safe practices are important and must be followed.

We also have a safety committee that meets at least four times a year that is both proactive, and on those rare occasions when it needs to be, reactive. It makes recommendations and modifies existing procedures as needed. The committee is co-chaired by Gil Gordon and Bob Brown.

One thing heard frequently from alumni is the importance of the “Shop.” The knowledge our students gain from working with the shop is one of their most valuable educational experiences. They will have to interface with technical and other support people when they work in the industrial sector or at a national lab, and their experiences at Herrick prepare them somewhat for this. One student who came back for a visit said he thought the shop personnel at Herrick were tough on him as a student. Now with a job in industry, the student realized how easy the shop was on him. He had to buy special safety glasses, steel-toed shoes, and hearing protection for his new job.

The technical support people at the Labs, i.e. Gil, Bob and Frank, all see part of their role is to help educate our students and help them to be successful in their research and after they leave the labs.



*Another view of the Technical Services. This photo shows another of the milling machines.*

## People News

### Faculty Honors

**Stuart Bolton** was named a Fellow of the Institute of Noise Control Engineering at the INTER-NOISE Conference 2012 in New York City. His citation reads: For service as a Director and officer of INCE/USA, and Chair and Proceedings Editor of INCE conferences. For teaching and mentoring students and professionals in noise control engineering, and research contributions to acoustic visualization mechanisms of sound absorption and tire/pavement noise generation.

**Patricia Davies**, Ray W. Herrick Director, was given a courtesy appointment in the Department of Psychological Sciences in the College of Health and Human Sciences for her perception-based engineering research. Her courtesy appointment was recommended by members in the Mathematical Computational Cognitive Science Psychology area.

**Qingyan (Yan) Chen** recently received two awards from China:

1. Overseas Chinese Contribution Award (Creative Talents) "for outstanding achievements in serving China", All-China Federation of Returned Overseas, 2012
2. Haihe Friendship Award Nominee "in recognition of foreign experts having made outstanding contributions in the city's economic and social development", Tianjin City, China, 2012.

**Jeffrey Rhoads** authored a

paper with Andrew Sabater, Vijay Kumar, and Amer Mahmood titled, "On the Nonlinear Dynamics of Electromagnetically-Transduced Microresonators," received the Best Paper Award at the 6th International Conference on Micro- and Nanosystems held in conjunction with IDETC/CIE 2012: The 2012 ASME International Design Engineering Technical Conferences.

**Greg Shaver** was quoted in a New York Times article entitled, "Cramming for Degrees in Hybrids." He received a letter from former Purdue President, France Córdova thanking him for his work and for helping to make Purdue a world-class university.

### Dick Chu Remembered

Richard "Dick" Chu passed away on September 8 from a very sudden heart attack. He was enjoying sailing with his wife at their lake house, and the sailboat capsized due to unusually strong winds. Some neighbors helped pull him out of the water while his wife was clinging to the sailboat. He passed away on the shore and first responders were unable to revive him.

Richard was an IBM fellow and served on the Herrick Laboratories' Industrial Advisory Committee from 1985 until 1997. He was also on the Mechanical Engineering Advisory Committee and helped Ray Cohen and Anil Bajaj as they transitioned into their positions as Herrick Laboratories Director and Head of Mechanical Engineering, respectively.

His passing is a great loss to the School of Mechanical Engineering. If you wish to send condolences to his son, Benjamin, his e-mail address is [benchu@sg.ibm.com](mailto:benchu@sg.ibm.com).

### Where are they now?

**Ed Green** (Ph.D. 1995), after 17 years working at Roush Anatrol in Livonia, Michigan, Ed has recently taken a position as Principal Staff Engineer and Quality Manager at Sound Answers, a Sound and Vibration consulting firm in Canton, Michigan.

**Wayne Helmer** (Ph.D. 1974) was honored with the E. K. Campbell Award for his outstanding achievements as an engineering educator by the ASHRAE Life Members Club. Helmer is currently a professor of mechanical engineering at Arkansas Tech University in Russellville, Arkansas. If you'd like to congratulate him, his e-mail address is [whelmer@atu.edu](mailto:whelmer@atu.edu).

**Ziqiang Hu** (Ph.D. 1992, Outstanding Mechanical Engineer 2011) has recently changed jobs. After six years running Samsung's Research and Development Center in Suzhou, China, he has joined Little Swan in Wuxi, China, as Vice President for Technology, and Director of their Research and Development Laboratory. Little Swan is part of the Midea Group, China's second largest domestic appliance manufacturer.

**Dennis O'Neal** (Ph.D. 1982) accepted the position

of Dean of Engineering and Computer Science at Baylor University. His appointment was effective August 6, 2012.



Dennis O'Neal

He did his research at Herrick Labs under the supervision of Professor Emeritus David Tree and has many fond memories of the long hours here with the other graduate students.

Prior to his new position, he was associate dean of research in the Dwight Look College of Engineering and deputy director for the Texas Engineering Experiment Station at Texas A&M University. He was one of four Herrick Lab graduates at Texas A&M: Dr. Yong-Joe Kim, Dr. Michael Pate, Dr. N. K. Anand, and himself.

If you'd like to drop him a congratulatory note, his new email address is [Dennis\\_Oneal@Baylor.edu](mailto:Dennis_Oneal@Baylor.edu)

### New Staff Member

Kimberly Stockment joined the Herrick Laboratories as the Conference Coordinator for the biannual compressor conferences on Monday, June 18. Kim comes to us from Purdue's conference division located in Stewart

## People News (Continued)

Center. She has an extensive background in conference planning, managing 65 plus conferences a year, as many as 10 at a time. She is charismatic and outgoing and enjoys meeting new people.



Kim Stockment

Kim grew up in Wolcott, Indiana on her family's farm. She was active in sports, 4-H and Future Farmer's of America. She attended Purdue University obtaining a Bachelor's degree in Agriculture Communication. Kim and her husband Jason live in Brookston, Indiana on his family's farm. They have two young children, a four-year-old son named Colton and a two-year-old daughter named Emmalyn. They enjoy being outside, camping with friends and "piddling" around the farm with their few head of cattle and pigs.

Kim is thankful that this position will allow her to continue to pursue a career in event management while finding a better work/life balance. When she is not working or taking care of family, she keeps busy helping on her parents' farm, taking fun outings with the kids, camping with friends and trying out new recipes in the kitchen.

Kim also volunteers her time with the White County 4-H fair, Make-A-Wish Foundation and her church, Blessed Sacrament.

Ginny Freeman is still here as conference coordinator to help with the transition. Ginny's last day at the laboratories was December 28 because the 30<sup>th</sup> and 31<sup>st</sup> were official university holidays. She plans to work part-time somewhere. (See article on front page).

### Student Honors

**Carrie Hall** and **Lyle Kocher**, both recent Herrick Ph.D. graduate students working with Professor Greg Shaver, received best paper in session awards at the American Control Conference held June 27-29 in Montreal, Canada.

Carrie's paper was on "Combustion Phasing Model for Control of a Gasoline-Ethanol Fueled SI Engine with Variable Valve Timing", in a 6-paper session entitled: "Modeling and Estimation in Automotive Powertrain Systems."

There were six papers in Lyle's session, too. His session was titled "Estimation in Diesel Engines and After-treatment Systems." His paper was titled "Oxygen Fraction Estimation for Diesel Engines Utilizing Variable Intake Valve Actuation."

**Ryan Schultz** and **Michael Hayward**, both current graduate students at the Herrick Laboratories, were named the winners of the

Old Meets New competition at INTER-NOISE 2012 in New York City. In this competition, students presented classic papers on noise control. Ryan Schultz presented and discussed a paper by L. L. Beranek and G. A. Work on sound transmission through fuselage structures dating from 1948, and Michael Hayward presented and discussed a paper by F. V. Hunt, L. L. Beranek and D. Y. Maa on sound decay in rooms from 1939. Ryan has just completed the requirements for an MSME degree at the laboratories under the supervision of Professor J. Stuart Bolton, and Michael is pursuing a MSME degree under the supervision of Professors Patricia Davies and J. Stuart Bolton.

### Graduations

**Bryan Wang** (MSME 2012), Kinematic Center of Gravity Estimation Method of Ground Vehicle Based on Dynamic Measurements. Bryan's employment is not known at this time.

**Hsu Chew Lee** (MSME 2012), A Study of Low Speed Flow Noise and Its Reduction by Numerical Simulations. Hsu Chew moved to California, but his employment is not known at this time.

**Ryan A. Schultz** (MSME 2012), Effect of Solid Phase Properties on the Acoustical Performance of Poroelastic Materials. Ryan took a position at the Sandia National Laboratory in New Mexico.

**James Mynderse** (Ph.D. 2012), Two Degree-of-Freedom Hysteresis Compensation for a Dynamic Mirror with Antagonistic Piezoelectric Stack Actuation. James accepted a faculty position with Lawrence Technological University in Southfield, Michigan.

**Bryan Whitney Belt** (MSME 2012), High Voltage Energy Storage System Design for a Parallel-Through-the-Road Plug-In Hybrid Electric Vehicle. Whitney is working for Ford Motor Company in Michigan.

**Tyler Dare** (Ph.D. 2012), Generation Mechanisms of Tire-Pavement Noise. Tyler is a Research Associate at the Applied Research Laboratory at Penn State University. Tyler is Bob Bernhard's last Purdue student.

**Pranav Bhalerao** (MSME 2012), Analysis and Compensation of Fuel Quantity Variation in Multipulse Fuel Injection. Pranav took a position at Mercedes Benz U.S. International in Alabama.

**Lyle Kocher** (Ph.D. 2012), Physically-Based Modeling, Estimation and Control of the Gas Exchange and Combustion Processes for Diesel Engines Utilizing Variable Intake Valve Actuation. Lyle is working for Cummins Inc., in Columbus, Indiana.

**Tom Faussett** (MSME 2012), Optimizing Refrigerant Distribution in a Evaporator of a Large Room Cooling System. Tom is working for Whirlpool Corp.

## People News (Continued)

in St. Joseph, Michigan.

**Nicholas Kincaid** (MSME 2012), Humidity Ratio Detection as a Means of Dryer Cycle Termination. Nicholas is working for Whirlpool Corporation in St. Joseph, Michigan.

**Sugirdhalakshmi (Sugi) Ramaraj** (MSME 2012), Vapor Compression Cycle Enhancements for Cold Climate Heat Pumps. Sugi took a position with Intel Corporation in Chandler, Arizona.

**Neha Ruikar**, (MSME 2012), FPGA Model Based Within-a-Cycle Estimation of Rate Shaping for a Piezoelectric Fuel Injector. Neha relocated to California.

**Jin Shen** (MSME 2012), Within-A-Cycle Flow Rate Estimation for Piezoelectric Fuel Injection. Jin is working for Cummins, Inc. in Columbus, Indiana.

### Weddings

**Frank Eberhardt** (MSME 2011) and Michelle Murbach exchanged wedding vows at St. Alphonsus Liguori Catholic Church in Prospect Heights, Illinois on September 14. The happy couple will live in Greenwood, Indiana where they purchased a home.

**Kwanwoo Hong** (Ph.D. 2009) married Yoon-joo Jang in Seoul on March 31, 2012. They had planned to honeymoon in Fiji, but because of serious flooding there, ended up going to Bali, which they enjoyed very much. Kwanwoo is currently a Senior Engineer

in the Advanced Research and Development Group of Samsung's Digital Appliance Division in Suwon, South Korea. Yoon-joo is also working as an engineer at Samsung.

**Karla Stricker** (Ph.D. 2012) married Joshua Fuhs in Lafayette, Indiana on September 22, 2012. The ceremony was at Holy Trinity Lutheran Church and reception was at The Trails. Karla is working for Cummins Inc. in Columbus, Indiana, and Josh graduated from Purdue in 2004 majoring in computer science and is working in software development.

### Births

**Tyler Dare**, (Ph.D. 2012) and his wife, Jennifer, welcomed their first child on August 19 at 7:03 a.m. Elizabeth Mae Dare weighed in at 6 pounds 13 ounces and was 19.25 inches long. Everyone is doing well.

**Seth Holloway** (MSME 2012) and his wife, Jessica, welcomed their third child on Saturday, June 23 at 11:30 a.m. Aaron Levi Holloway weighed 7 pounds 8 ounces and was 19 inches long. Big brother, Asher, and big sister, Lois, are very ex-

cited about the new arrival. **Andrew Marshall** (MS. 2007, Ph.D. 2012) and his wife, Jeanine, welcomed Genevieve Theresa Marshall on July 26 at 8:05 a.m. She was 8 pounds 15.5 ounces and 20.5 inches long. Genevieve has an older sister, Aislinn, who is three and, at the moment, seems fascinated by her new baby sister.



**Hales Swift** (MSME 2009) and his wife, Megan, were blessed with their first child on August 3, 2012. Lindy Evelyn Swift arrived weighing 10 pounds 2 ounces and was 20.5 inches long with lots of dark brown hair.



### Undergrad Makes a Splash

**Wyatt Hodges**, an undergraduate who worked at the laboratories and can still be seen in the labs from time to time, took a week off his work this past summer to participate in the Olympic swimming trials. He partic-

ipated in two competitions and was 5th in one heat. He finished 49th out of 140 plus competitors. Below are some photos of Wyatt in action.

Wyatt is a member of the Purdue University Swimming Team and spends many hours a day in the water perfecting his skills. When he returned to the labs, he said he enjoyed the experience of participating in the Olympic swimming competition.

The photos of Wyatt were taken by **Andrew Jessop**, a current Ph.D. student. When these photos were taken, Andy was a photographer for the Purdue *Exponent*.



Wyatt diving into the water at the beginning of the heat.



Wyatt pushes his way forward toward the finish line, and a first place finish.



The Seth Holloway family

**Address Service Requested**

## News about You

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

Ray W. Herrick Laboratories  
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*The south facing main entrance to the new building.*