newsletter

Ray W. Herrick Laboratories

Purdue University, West Lafayette, IN 47907-2031

https://engineering.purdue.edu/Herrick

Spring 2010
Volume 19, Number 1

Conferences July 12-15 2010

—Emil Venere, Purdue University News Service

A trio of conferences focusing on advances in air conditioning and refrigeration and high-performance buildings that are more energy efficient and environmentally friendly are drawing researchers from around 30 countries to Purdue University in July.

About 600 people are expected to attend the **13th International Refrigeration and Air Conditioning Conference**, the **20th International Compressor Engineering Conference** and the **1st International High Performance Buildings Conference** from July 12-15.

Researchers and industry executives from around the globe will present talks. The keynote speaker, James E. Rogers, chairman, president and CEO of Duke Energy Corp., will deliver a talk entitled "Repowering Our Economy by Balancing the Need to Deliver Affordable, Reliable and Clean Energy."

The conferences, held every two years, have drawn a record number of technical abstracts this year, largely because of the new high-performance buildings conference. The new conference comes after Purdue earlier this year announced the creation of a $23.5 million Center for High Performance Buildings based at the Herrick Laboratories. The center will concentrate on developing systems for future buildings that are more environmentally and user friendly, energy efficient, and safe.

Engineers will present findings on technologies such as more efficient heat pumps to provide heating and cooling for buildings and homes, systems that use hydrocarbon refrigerants with a far lower global warming potential than conventional coolants, and "heat recovery" technologies designed to harness energy ordinarily lost.

"For example, in large data centers the heat from computers and electronics is usually just dumped into the atmosphere, but you could use that heat for certain applications," Eckhard Groll said.

Sessions will cover many areas critical to industry, commerce and domestic air conditioning and refrigeration.

"The content of sessions and talks reflects a growing international focus on energy efficiency," said Jim Braun. "Air conditioning and refrigeration represent a huge part of the world's total energy consumption."

Some of the sessions will address the concept of "net zero" buildings that would operate more efficiently and generate some of their own electricity, ending up with a net consumption of no electricity.

Talks will delve into designs for modifying the fundamental vapor-compression cycle that has been used since the invention of air conditioning and refrigeration.

"We have pushed this cycle pretty much to the limit, in terms of energy efficiency," Eckhard said. "In order to reduce energy consumption further, we'll need to add compression stages and cool the refrigerant gas during the compression process to improve the compressor efficiency."

Eckhard and Jim co-authored a conference paper on one such proposed technology, called "multiport refrigerant injection." The paper, also co-authored by Margaret Mathison, a current Herrick student, will be presented during a conference session.

Other talks will focus on alternative designs for compressors that use a new refrigerant based on iodine that has about 1/500th the global warming potential of conventional refrigerants and "linear compressors" that are inherently more efficient than conventional technology.

Detailed information about the conferences and the approximately 410 technical abstracts to be presented can be found at **http://engineering.purdue.edu/Herrick/Events.**

The conferences are organized by faculty from the Ray W. Herrick Laboratories in cooperation with sponsoring and participating organizations, including the American Society of Heating, Air Conditioning, and Refrigerating Engineers and the International Institute of Refrigeration.

W. Travis Horton, an assistant professor of civil engineering, is chair of the compressor engineering conference, and Thanos Tzempelikos, an assistant professor of civil engineering, is chair of the high-performance buildings conference.

Other Upcoming Events

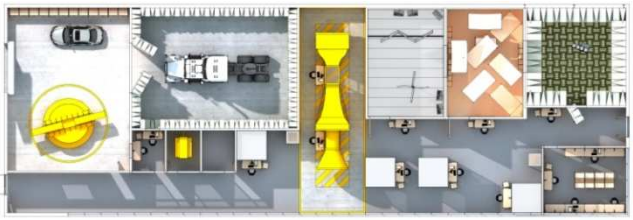
July 10-11, 2010: Three Short Courses
Introduction to Compressors (Compressors 101)
Supermarket Refrigeration
High Performance Building Technologies
https://engineering.purdue.edu/Herrick/Events/2010conf/about_shortcourse/

November 4-6, 2010: Industrial Advisory Committee Meeting

Plans for a New Acoustics Laboratory

We are happy to report that Phase I of the Herrick Labs reconstruction is now in progress, and we anticipate ground breaking in the Spring of 2011 with a completion date of Summer 2012. The Phase I project will include space for the Center for High Performance Buildings, the perception based engineering laboratory, engine tests cells as well as a number of other facilities, but it does not include provision for the Herrick acoustics facilities. So we are now developing a Phase II project that would entail moving the facilities currently housed in the Acoustics Wing, along with the Shop, to the new building. We have been working with the Engineering/Architectural firm that is designing the Phase I project (AEI/Flad from Madison, Wisconsin) to create complementary plans for the new acoustics suite, and have just submitted a proposal to NIST to fund the Phase II project. If the proposal were awarded, the Phase II project would be completed at the same time as the Phase I project.

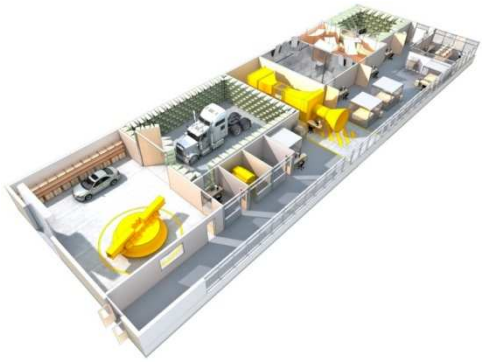
A schematic of the proposed layout is shown here. You will see that we are planning to expand the available flexible space, and also we will be providing a more permanent home for the tire-pavement test apparatus (to be housed in a staging area adjacent to the semi-anechoic chamber). The flexible space will house a number of IAC "quiet booths" suitable for psychoacoustic and physiological testing. The new facilities will also include climate-controlled materials testing room and space to house the quiet wind tunnel. Finally, there will be a suite of acoustics chambers consisting of two reverberation chambers and an anechoic chamber which will allow standardized sound transmission loss testing of barriers and building façade elements up to 10 feet by 10 feet in size. In all of these spaces, vibration and sound isolation will ensure very low ambient noise levels and will allow ambient temperature and humidity to be controlled to within 1 deg. C and 1 percent relative humidity.



Plan View of Proposed Acoustic Systems Laboratory

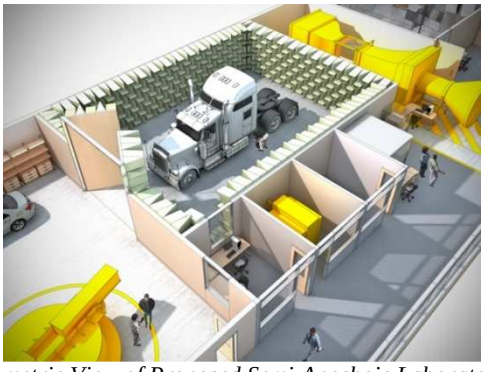
All of these rooms will be made substantially larger than our current chambers in order to enable us to work at much lower frequencies than before, so we will be able, for example, to address low frequency building and transportation noise issues. The reverberation room located between the anechoic chamber and the other reverberation room will be equipped with special-purpose refrigeration equipment so that the room temperature can be reduced to -40 C/-40 F to enable low temperature testing of materials and barrier systems (to simulate the conditions experienced by aircraft in flight, for example). The increased number of quiet rooms available for psychoacoustic and physiological testing will allow us to expand collaborations with our next door neighbors in Biomedical Engineering, and to further our long term relationships with Speech, Language and Hearing Sciences. It is our intention that these acoustics facilities would support the research of all faculty at Purdue that are performing acoustics and related work under the umbrella of the PHASE initiative (Purdue Hearing and Acoustics in Science and Engineering).

The price-tag for these ambitious new facilities is estimated to be around $12.5M. The result will be a truly state-of-the-art, world-class acoustics laboratory.



Isometric View of Proposed Acoustic Systems Laboratory

Isometric View of Proposed Anechoic Laboratory Suite



Isometric View of Proposed Semi-Anechoic Laboratory

Spring Picnic

It's the end of the semester, and at Herrick, that means a picnic. We were fortunate this year to have Andy Jessop, Exponent photographer, serve as our photographer. He took some fantastic photos. (You'll see another of Andy's shots later in the newsletter). Although the weather did not cooperate and the festivities were held inside, the evening was enjoyed by all.













Where Are They Now?

Terry M. Manon (MSME 1975) was named a 2010 Purdue University Distinguished Engineering Alumni in recognition of his global achievements as a leader in the HVAC industry. He is Retired Director, Trane Commercial Systems Air Handling Strategy and is the Chair of the Herrick Laboratories' Industrial Advisory Committee. Terry's academic advisor when working on his MSME was Wolfgang Leidenfrost.

Rudy Chervil (MSME 2005) will graduate in May with an MBA in Management from Johns Hopkins University but has already received his degree. He works for Johnson Controls International, and, as a result of his studies, he has been promoted. He is part of a Graduate Leadership Rotation Program comprised of operations, manufacturing, and strategy. He is currently in operations and will complete 18 months of training there before moving on to one of the other areas for 12 months each. Rudy and his wife, Sheila, live in San Antonio, Texas and have three wonderful children.

Pictured above from left to right are Rudy's children: Allan age 5, Zachary age 2, and daughter, Layla, who is 1.

Michael Moaveni (Ph.D. 1972) lives in Michigan and serves as a member of our Industrial Advisory Committee. He is an Executive Advisor and has been involved in introducing new and relevant regional programs and courses in engineering and eliminating obsolete research activities in response to the economic decline, especially in Michigan. He is also working on a strategic plan for the Schools of Engineering and Computer Sciences in a midsized university in Michigan.

His work does not stop there. He is also working on smart grid integration of new technologies and application of smart meters into the grid system with the infusion of stimulus money. Both Detroit Edison and Florida Power and Light received stimulus money for this project.

Finally, he is doing some work on a transition from serial processing of anesthesia and surgery into parallel processing. This new approach is now being pioneered in the medical field at Cleveland Clinic and Massachusetts General Hospital. This approach is to be used in the design and construction of future medical facilities.

Marehalli Prasad (Ph.D. 1980) received the "Bharat Gaurav Award" which translates into English as the "Pride of India Award." The selection of this award is by invitation from the India International Friendship Society in New Delhi, India. The award is given for people of Indian Origin who live around the world, as well as some people in India with exceptional achievements. The award is given annually, and this year it was given on January 7, 2010 in India Habitat Center in New Delhi. This year award was given to 30 people from different walks of life. Marehalli received it in the field of education for "meritorious services, outstanding performance and for a remarkable role in promoting global friendship."

Marehalli is a Professor and the Director of the Noise and Vibration Control Laboratory in the Department of Mechanical Engineering at Stevens Institute of Technology in Hoboken, New Jersey. He has worked at the Stevens Institute of Technology since August of 1980. He specializes in acoustics, noise control and vibration.

In the middle is Marehalli Prasad, on the left is His Excellency Mr. Iqbal Singh, Governor of Puducherry, India and on his right is the Honorable Mr. Mukul Wasnik, Minister of Social Justice and Empowerment, India.

Tarun Puri (MSME 2004) Graduated from Purdue and obtained an MBA from the University of Chicago in June 2009. He is currently employed with UBS Global Asset Management in Chicago, Illinois as an Associate Portfolio Manager. He uses a lot of the skills and knowledge that he learned at Herrick as a research assistant in his current job. The MATLAB skills that he developed at Herrick, the models he used for time series modeling of foam behavior and the DSP course (ARMA models) all have good applications in his present work in finance. He married Aashee on July, 04 2009 in Gurgaon, India.

Liangzhu "Leon" Wang (Ph.D. 2007) came back to the laboratories on February 25 as a seminar speaker for a class taught by Yan Chen. He is working as an engineer for NIST Building and Fire Research on Indoor Air Quality and Ventilation for the Building Environment Division in Gaithersburg, Maryland. He and his wife, Jinxia Liu, welcomed a daughter named Mingdi Wang to their family on July 26, 2008.

Martin "Marty" Stevenson (MSME 1969, Ph.D. 1972) was involved in a boating accident on May 1. After a week of searching, he had not been located and was presumed to have passed away. If you would like to send a card to his family, please send it to the address on the back of the newsletter, and we will gladly forward it to his wife, Paulette.

The photo right of Marty and Paulette was taken last year when they were passing through and stopped by to visit the laboratories.

Faculty Honors

The trustees ratified the appointment of **Douglas Adams** as the Kenninger Professor of Renewable Energy and Power Systems.

"Purdue University is fortunate to be in a position to recognize these three outstanding scholars with named and distinguished appointments," said Timothy Sands, executive vice president for academic affairs and provost. "Professors Sadeghi, Dudareva and Adams exploit the intertwined discovery, engagement and teaching missions of the university to the great benefit of our students and our stakeholders across Indiana and the globe."

Dan Hirleman, Head of the School of Mechanical Engineering commented on Adams' appointment, "Professor Adams is clearly among the very best of his generation worldwide. He is an outstanding mentor of graduate students and research contributions (by him) and his team have had a real impact on many venues."

Adams' current research interests focus on nonlinear dynamic system identification with applications in structural health monitoring and prognostics for wind turbines and other aerospace and automotive systems.

He has received numerous awards, including the DeMichele Award from the Society for Experimental Mechanics in 2009, the Purdue University Faculty Scholar Award in 2007, the Technical Medal of Achievement from the U.S. Army Stryker Combat Brigade in 2006, the Murphy Award for Excellence in Teaching from Purdue in 2004, and the Presidential Early Career Award for Scientists and Engineers from the Department of Defense in 2002.

Adams earned his bachelor's degree from the University of Cincinnati, his master's degree from Massachusetts Institute of Technology and a doctoral degree from the University of Cincinnati. He joined Purdue in 2000.

Anil Bajaj was named the Alpha P. Jamison Professor of Mechanical Engineering. The named professorship recognizes Anil as an internationally-recognized scholar in the area of nonlinear dynamics and vibration as well as in outstanding educator and mentor. He has made important fundamental contributions to the understanding of vibrations and stability of structures and machines ranging from offshore drilling platforms to robots and disc and drum brakes. His modeling work on mechanics of polyurethane foams has impacted the automotive industry through modeling and design of seating systems for passenger comfort.

George T. Chiu was honored by the College of Engineering with a Faculty Award of Excellence. He was nominated by Carolyn Percifield and received the Engagement and Service Award. The award was presented on Saturday evening, April 24 at the Shively Club in the Ross-Ade Pavilion. This is the 8th year the College of Engineering has honored selected faculty.

Eckhard Groll was among 46 fellows selected nationwide this year by the American Council on Education. His selection will bring the number of higher education leaders who have participated in the program since its inception in 1965 to 1,698. The program focuses on identifying and preparing fellows for senior leadership roles. More than 300 of the fellows have gone on to serve as chief executive officers of colleges and universities, and more than 1,100 have served as provosts, vice presidents or deans.

"Professor Groll was selected because of his terrific leadership talents," said Beverly Davenport Sypher, associate provost and the Susan Bulkeley Butler Chair for Leadership Excellence. "This is the first time in 20 years a Purdue faculty member has been named an ACE fellow. We are very proud to be participating in this prestigious program."

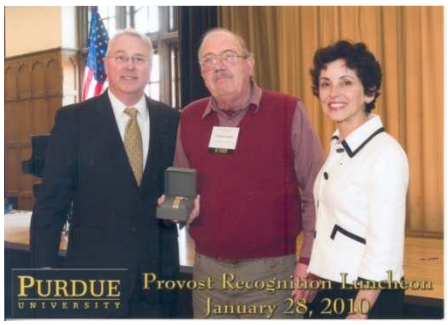
The ACE Fellows Program combines retreats, interactive learning opportunities, campus visits and placement at another higher education institution to condense years of on-the-job experience and skills development into a single semester or year.

Groll joined Purdue as an assistant professor in 1994, was promoted to associate professor in 2000, and to professor in 2005. He received a doctorate in mechanical engineering in 1994 from the University of Hannover, Germany. Groll's research interests focus on the fundamental thermal sciences applied to advanced heating, ventilation and air conditioning systems.

Staff Honors

Each year, 12 Purdue University seniors and 3 honorary advisors are selected to serve as part of a senior honor society known as Iron Key. The group looks to find way to give back to Purdue and the recognize staff members who keep the university running each and every day. This year **Cathy Edging**, who works diligently to keep our building neat and clean, was recognized.

In the last newsletter, we mentioned that **Ginny Freeman** was honored for 10 years of service to the University, and **Fritz Peacock** was honored for 25 years of service. Honorees are invited to attend a lunch in their honor and are permitted one guest. This year the lunch was on January 28 in the Purdue Memorial Union Ballrooms. After the lunch, awards are presented and Fritz received a gold watch with the Purdue griffin on the face and had his photo taken with Provost Randy Woodson and Purdue President France Córdova. After 25 years at Purdue, Fritz is planning to slow down a bit and is working half-time until full retirement.



Above are left to right, Randy Woodson, Executive Vice President for Academic Affairs and Provost; Fritz Peacock, Technical Director, Herrick Shop; and France Córdova, President, Purdue University.

Ginny Freeman chose not to attend the lunch but received a beautiful Waterford® "Quadrata" 8 inch vase with deep wedge cuts from the rim to the base. It also has a band of etched squares around the top.

The service anniversary awards are presented after 10 years of continuous service and every 5 years thereafter. Honorees select a gift from several options based on their years of service.

Student Honors

Tyler Dare (current Ph.D. student) received a Student Paper Prize Competition for Noise-Con 2010, the 2010 National Conference and Exposition on Noise Control Engineering, held in Baltimore, MD from April 19th to the 21st. His paper was entitled, "Noise generation in contraction joints in Portland cement concrete." A maximum of five prizes are awarded annually. Tyler received $1,000 plus an additional $500 if the paper is expanded and, after peer review, published in *Noise Control Engineering Journal*. Noise-Con 2010 was held in conjunction with the Acoustical Society of America (ASA) 159th Meeting. Only papers submitted to Noise-Con 2010 were considered in the Noise-Con 2010 student paper competition.

Tyler also received a Ward A. Lambert Graduate Teaching Fellowship in Mechanical Engineering which was established in memory of Ward Lambert who was a legendary Purdue baseball and basketball coach. The fellowship is funded by gifts solicited from the School of Mechanical Engineering alumni, and is for doctoral graduate students who have the potential and desire to pursue an academic career. The fellowship recipients are paired with master teachers from the School of Mechanical Engineering who serve as mentors during the one-year fellowship period.

Carrie Hall (current Ph.D. student) was awarded a 2010 NSF Graduate Research Fellowship. She was selected based on her outstanding abilities and accomplishments, as well as her potential to contribute to strengthening the vitality of the U.S. science and engineering enterprise. The NSF Graduate Research Fellowship Program (GRFP) helps ensure the vitality of the human resource base of science and engineering in the United States and reinforces its diversity. The program recognizes and supports outstanding graduate students in NSF-supported science, technology, engineering, and mathematics disciplines who are pursuing research-based master's and doctoral degrees in the United States and abroad.

Andy Jessop (current Ph.D. student) was selected as a USDOT FAA Centers of Excellence Outstanding Student of the Year in recognition of his work for PARTNER in structural acoustics and noise control. The honor came with a $1,000 award which was presented by Dr. Mohan Gupta, the acting FAA Chief Scientist for Environment and Energy, at the PARTNER Advisory Board meeting in Chapel Hill, NC on March 23-25.

Andy is also a Staff Photographer for the Purdue Exponent. His photo of football coach, Danny Hope, with the Old Oaken Bucket made the front page of the March 3, 2010 edition of the Exponent. He generously allowed us to reprint it here.

Margaret Mathison was one of two graduate students who earned a Bilsland Dissertation Fellowship. The fellowship provides support to outstanding Ph.D. candidates in their final year of doctoral degree completion. Bilsland Fellows are expected to devote full-time effort to the completion of all doctoral degree requirements and to receive the doctoral degree at the conclusion of the fellowship tenure. This award provides a stipend, Graduate Tuition Scholarships, payment of fees and a medical insurance supplement.

Margaret was also one of seven graduate students awarded this year's Magoon Award. The honor recognizes outstanding teaching assistants and instructors through the Estus H. and Vashti L. Magoon award. The selection is made by both faculty and students to recognize those students who were exemplary in their work as teaching assistants or instructors.

Herrick Laboratories' News

Graduations

Chaitanya Bhat (MSME May 2010), Influence of Electronic Injection Parameters on Combustion-Induced Noise in a Small Diesel Engine. Chaitanya is currently seeking employment in his hometown of Bangalore, India.

Josh Cummins (MSME May 2010), Center of Gravity Effects Using Forced Vibration Response Operational Data. Josh accepted a position with NAVAIR in Patuxent River, MD.

Yash Deshmukh (MSME May 2010), Measurement of Foam Properties and Modeling of Layered Foam Systems. Yash accepted a position with Hill-Rom in Batesville, IN.

Gauri Joshi (MSME May 2010), Planar Whole-Body Vibratory Response of a Nonlinear Multi-Body Model of a Seat-Occupant System with Polyurethane Foam. Gauri took a position with Lutron Electronics, Coopersburg, PA.

Vijay Kumar (MSME May 2010), Vibration Attenuation and Amplification. Vijay is continuing with his Ph.D. studies with Professor Jeff Rhoads.

Rajani Modiyani (MSME May 2010), Effect of Intake Valve Closure Timing on Effective Compression Ratio and Gas Exchange Process of a Modern Diesel Engine. Rajani is employed by Cummins Inc., Columbus, IN.

Yoon-Shik Shin (Ph.D. May 2010), Numerical and Experimental Investigation of Noise from Small Scale Axial Fans Focusing on Inflow Condition and Acoustic Source Type. Yoon-Shik is employed by Robert Bosch LLC, Waltham, MA.

Jonathan White (Ph.D. May 2010), Operational Monitoring of Horizontal Axis Wind Turbines with Inertial Measurements. Jon is employed by Sandia National Laboratories, Albuquerque, NM.

Wangda Zuo (Ph.D. May 2010), Advanced Simulations of Air Distributions in Buildings. Wangda took a position with a company in California.

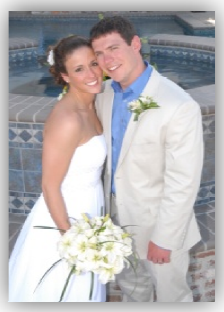
Brandon Zwink (MSME May 2010), Nondestructive Evaluation of Composite Material Damage Using Vibration Reciprocity Measurements. Brandon accepted a position with Sandia National Laboratories, Albuquerque, NM.

Engagements

Ethan Brush (MSME August 2009) and Amanda Scheinfeldt were engaged in November 2009. They are planning a late August 2010 wedding in Maine. Together they came to Purdue for grad school, and Amanda was awarded an MSEE degree in power engineering.

Weddings

Craig Bradshaw (current Ph.D. student) and Shawna Goekler were married in Sunshine, Louisiana near Baton Rouge on March 14. Shawna is a student in the School of Veterinary Medicine. When Craig proposed, he gave her a family heirloom—the diamond in her ring has been in the family for about 150 years, and the jeweler that set the stone is a family friend. Approximately 60 people from Lafayette and surrounding areas were in attendance. The happy couple will remain in the Lafayette area until both complete their studies and graduate.



Births

Jason Hugenroth (PhD. 2006) and wife Tracy are the proud parents of a baby girl, Sadie, born on August 4, 2009. Sadie has 2 older brothers, Thomas, age 9 and Dolph, age 4.

Greg Moebs (MSME 1997) and wife Larissa welcomed a son Micah on February 6, 2010. Big sister Sollis is excited to have a baby brother!

Yoon-Shik Shin (Ph.D. 2010) and wife Seungyeon Yoo welcomed their second son Minho on February 26. Minho weighed 7 pounds 4 ounces at birth. To help welcome him home was big brother, Hyunho, age 2½.

Historical Photos

The Spring 2009 issue of the Herrick Laboratories' newsletter, had an historical photo of the building with the question, "When was this taken?" There were two thoughts at that time, one was circa 1960 after the wings were added and the other was circa 1980 after the tile roof was removed.

Frank W. Chambers (Ph.D. 1977) submitted a photo (see back cover) which he thought might help. Frank's photo clearly shows a tree by the West Wing of the building and fully grown plants in the planters. The picture in the Spring 2009 newsletter had no vegetation so it must have been taken at the earlier date around 1960 using one foot of growth a year for conifers.

Frank found another photo while going through some slides prior to a trip to Ecuador. He thought we might enjoy a look back at the Spring 1971 picnic. Although the locations and people vary, the idea of the Herrick Laboratories getting together and relaxing and in a collegial family atmosphere hasn't changed over the years and is an integral part of the uniqueness of the Herrick Laboratories.

He is currently an Associate Professor in Mechanical and Aerospace Engineering at Oklahoma State University in Stillwater, Oklahoma. You can visit Frank on the Web at http://chambers.ceat.okstate.edu/chamb.html.

PURDUE
UNIVERSITY

Ray W. Herrick Laboratories
140 S. Martin Jischke Drive
West Lafayette, IN 47907-2031

Address Service Requested

First Class
Presort Mail
U.S. Postage
PAID
Lafayette, IN
Permit No. 221

Photo of Herrick Laboratories taken by Frank Chambers and processed in 1971. It's been forwarded to the Purdue University Archives as part of their permanent collection.

Above Bill Fontaine (seated left) is relaxing and chatting with Bill Cottingham (seated right). Photo by Frank Chambers.

Photo of Frank Chambers taken from his Web site.