

Greetings from the Department Head



Dear Alumni and Friends;

Summer is a season of construction here at Purdue. Strolls through the campus are interrupted by jackhammer noises and closed sidewalks. Roads are being repaired, parking garages cleaned and grand old buildings refurbished. In busy construction sites, new buildings are taking shape. On the south side of the engineering mall, the Gatewood addition to the mechanical engineering building is essentially complete. Two new buildings, Hanley Hall and Marriott Hall, are rising along State Street. The Recreational Sports Center is in mid-renovation, and you can almost imagine the new, windowed façade. (I bet we'll still call it the Co-Rec when the dust has settled!)

We're building here in IPPH, too, and we'll tell you about it in this newsletter. We're building our facilities by renovating labs. We're building our faculty through a search for a new assistant professor. We're building our programs by planning for the fall 2011 Peck Symposium. We're building research expertise in our graduate students; we'll tell you about one of them. And every day, we're building new knowledge and new ideas in research laboratories and classrooms, taking the pharmaceutical sciences "one brick higher". Amid the building, we'll take a minute to remember two of our faculty members who died this spring, Professor Stan Hem and Professor Emeritus Pat Belcastro. We celebrate their contributions to the foundation that we're all building upon.

We hope you enjoy this update on our various "building" projects. Stop by if you're in the area – and bring a hammer!

Liz Topp
Dane O. Kildsig Chair and Department Head

Inside this issue:

Greetings from the
Department Head

Faculty & Student
Highlights

New Assistant
Professor Position

Graduate Student
Spotlight

Research Spotlight

IPPH Lab
Renovations

In Memoriam

Upcoming Events:
Peck Symposium



Faculty and Student Highlights

Faculty Highlights

- **Dr. Lynne Taylor** was appointed a fellow of the Royal Society of Chemistry, the largest organization in Europe for advancing the chemical sciences (February).
- **Dr. Lynne Taylor** received a Purdue Faculty Fellowship for Study in a Second Discipline. She will spend the 2011-2012 academic year in Purdue's School of Materials Engineering (February).
- **Dr. Yoon Yeo** received an NSF CAREER award for her project "Osmolyte-guided nanoparticle transport for effective drug/gene delivery across the mucosal barriers" (March).

Faculty and Student Highlights (cont.)

- **Dr. Kinam Park** was named an outstanding cancer researcher at Purdue by the Lafayette Lions Club (May).
- **Dr. Ann Newman** joined the faculty as a limited term lecturer. Dr. Newman will teach Basic Pharmaceutics I (IPPH 362) in the fall of 2011 (May).

Graduate Student Highlights

- **Li Pan** (Knipp group) received a teaching assistant award from Purdue's Center for the Education of Teaching Assistants (April).
- **Stephanie Mowery** (Knipp group) was selected to participate in the May 2011 Applied Management Program through Purdue's Krannert Graduate School of Management. The course is often called the "mini-MBA" (April).
- **Wyatt Roth** (Knipp group) received a Lilly Endowment Gift Graduate Research Award from the College of Pharmacy for his proposal "Development and optimization of the manufacturability of orally disintegrating tablets (ODTs) of rifampicin for pediatric administration" (April).
- **Lori Karpes** (Knipp group) received a Purdue Research Foundation research grant for her proposal "The effects of DEHP exposure on fatty acid homeostasis across the immortalized human blood brain barrier cell line, hCMEC" (April).
- **Hillary Holback** (Yeo group) received a Migliaccio-Pfizer Graduate Fellowship from the College of Pharmacy for her proposal "Distribution of a pH-sensitive nanoparticle drug delivery system in a 3-dimensional tumor model" (April).
- **Basma Ibrahim** (Yeo group) received a second year of predoctoral funding from the Indiana Clinical and Translational Sciences Institute for her project "Development of inhalable gene delivery for treatment of cystic fibrosis" (May).

Staff Highlights

- **Judi Yost** retired after more than thirty years with Purdue. She has been involved in the Kildsig Center for Pharmaceutical Processing Research (CPPR) since its founding in 1995, most recently as Program Director (January).

Assistant Professor Position, Pharmaceutical Solids and Manufacturing

We're beginning a new search for an Assistant Professor in IPPH. We're looking for candidates with a research focus in the areas of pharmaceutical solids and manufacturing, building on these traditional strengths of our department. The new faculty member will participate in the multi-university NSF-funded Engineering Research Center (ERC) on Structured Organic Particulates (<http://ercforsops.org/>), providing outstanding opportunities for research collaboration. Candidates should have expertise in areas such as pharmaceutical materials science, solid state chemistry, process analytical technologies, particle technology, unit operations in pharmaceutical manufacturing and/or pharmaceutical engineering. A link to the complete advertisement and position description is posted on our website (<http://www.ipph.purdue.edu/>). For additional information, please contact Dr. Lynne Taylor (lstaylor@purdue.edu), Dr. Jim Litster (jlitster@purdue.edu) or Ms. Mary Ellen Hurt (mhurt@purdue.edu). We value your suggestions of well-qualified candidates.

Graduate Student Spotlight:

Grace Ilevbare

Grace Ilevbare is a third year graduate student in Dr. Lynne Taylor's group. Her research is concerned with stabilizing amorphous solids using polymeric additives, so that higher drug solubility can be achieved. Many of the most promising new drugs are BCS Class II compounds with high membrane permeability, but low aqueous solubility. Enhancing the solubility of these compounds can dramatically enhance their bioavailability. Grace is also investigating the effects of submicron drug particles on solution concentrations measured by UV fiber optic probes during dissolution testing. She and Dr. Taylor are developing novel methods to address this issue.

Grace grew up in Ibadan, Nigeria, a town near the equator and about 80 miles from the capital city of Lagos. Her father was a professor of classics at the local university; he retired after almost forty years as a professor. While he was still with the university, he took up farming as a hobby. Over the years, the hobby has grown into a family business, with palm oil, pork and fish as the major products.

Grace entered college in Ibadan early after taking extra classes and passing her O-level exams. As an outstanding track and field athlete, she was recruited by Elon University in North Carolina. She accepted a full athletic scholarship from Elon, graduating with a bachelor's degree in chemistry and a minor in mathematics. Graduate study in Industrial and Physical Pharmacy was a natural fit: several family members are pharmacists and had encouraged Grace's interest from a young age. After completing her Ph.D., Grace hopes to work in the pharmaceutical industry to continue to acquire skills and experience. Her long-term goal is to start her own business.



Biopharmaceutical Glasses

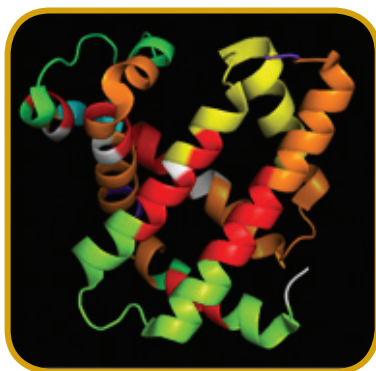
Protein drugs are one of the fastest growing sectors of the pharmaceutical industry. Though usually administered as solutions, protein drugs are often stored as solids to prolong shelf-life. Ensuring protein stability in the solid state usually requires that the native structure be maintained. The methods available to assess protein structure in solids are limited, however. Dr. Topp and her group are developing hydrogen/deuterium exchange (HDX), a method that has long been used to study proteins in solution, as a new method to study protein structure in solids. Adapting HDX to solids provides an exciting new window into the world of biopharmaceutical glasses.

In this method, a solid powder containing a protein is exposed to deuterium (D_2O) vapor. Hydrogen atoms in the sample exchange with deuterons in the vapor phase, so that the protein is deuterium labeled during the exchange period. Following exchange, the sample is quickly dissolved and analyzed by mass spectrometry (+ESI-MS) to determine the extent of deuterium incorporation. Peptide bonds that are exposed to D_2O are labeled with deuterium, while protected peptide bonds are not. Protection from exchange can be provided by protein structure (e.g., α -helix, β -sheet), or by interactions with the solid matrix. Digestion of the sample with pepsin prior to +ESI-MS allows uptake to be measured in small peptides, increasing resolution.

Recent studies led by Dr. Andreas Sophocleous, a postdoc in the group, have examined hydration of myoglobin in solid powders using HDX. Andreas successfully mapped exchange sites with increasing vapor pressure, providing a high resolution picture of protein hydration (see Figure). At increasing D_2O vapor pressure (i.e., relative humidity), deuterium uptake increased, as expected. The increase was not

Research Spotlight:

A New Window on

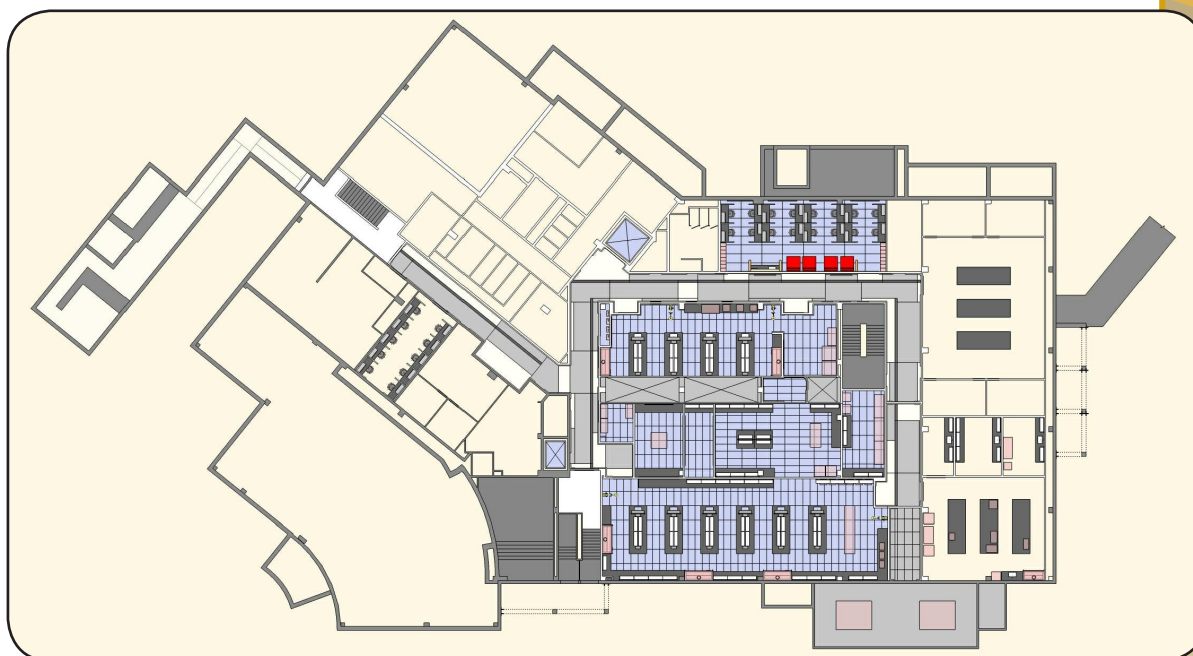


Deuterium uptake in lyophilized powders of myoglobin and sucrose (1:1 w/w, 43% RH, 5°C). ROYGBIV color scale indicates uptake from low (violet) to high (red).

IPPH Lab Renovations

Many of you are familiar with our labs in the ground floor of the Robert E. Heine Pharmacy Building. Perhaps you took our pharmaceutical manufacturing course as a student, or did your graduate research there. In any case, you'll be pleased to know that we're renovating the labs to upgrade and modernize them. The existing "closed" labs will be replaced with an open-concept lab design, with a climate-controlled area for solids processing, a chemical analysis area and a separate area for student seating. Mechanical upgrades will improve air handling, lighting, safety and security. The renovation will help position the department for the future, so that we can better serve the next generation of IPPH students and researchers.

We've received the necessary approvals for the project and are now in the design phase. BSA LifeStructures, an architecture and engineering firm based in Indianapolis, is working with us to design the space. We've included one of their preliminary drawings so you can get an idea of the project scope (see Figure). Initial engineering studies have been conducted, and address the project's particular HVAC and electrical needs, as well as tie-in to existing building systems. The current focus is schematic design, which will define the overall floor plan and the layout of the labs. BSA hopes to complete schematic design this summer and to wrap-up the final, detailed design by mid-fall. Construction is scheduled to begin in late 2011 or early 2012, to be completed in the fall of 2012. The estimated cost of the project is \$3.8 million, of which \$2.85 million has already been secured. We're grateful to the many alumni and friends of IPPH who have already provided input on the preliminary plans. Look for updates on our website or through LinkedIn postings as the renovation continues.



Concept image showing area for renovation (light blue) and preliminary layout. The south entrance to RHPH is at the lower center (gray).

(Design: BSA LifeStructures).





In Memoriam:

Professor Stanley L. Hem (1939-2011)

Dr. Stanley Lawrence Hem, 71, died unexpectedly on January 23, 2011. Stan was a Professor of Industrial and Physical Pharmacy and an internationally recognized expert in aluminum-containing vaccine adjuvants. Stan was born on October 5, 1939, in Brooklyn, New York. He received a B.S. in pharmacy with high honors from Rutgers University in 1961 and a Ph.D. in physical pharmacy from the University of Connecticut in 1965. Stan joined the faculty of Purdue University in 1969, where he served for more than forty years and was active until his death. Stan's early work addressed the properties of antacids, including aluminum hydroxide gels and pharmaceutical clays, as well as the chemical stability of penicillin and tetracycline antibiotics. Beginning in the mid-1980's, his research focused increasingly on aluminum salts as vaccine adjuvants. Together with Dr. Harm HogenEsch, a veterinary pathologist at Purdue, and others, Stan developed a mechanistic understanding of the antigen/adjuvant interactions and of their importance in eliciting an immune response. The work helped create a scientific basis for the selection of vaccine adjuvants and contributed directly to a number of commercial vaccines.

Stan authored more than 175 manuscripts and held four U.S. patents. He was a fellow of the American Pharmacists' Association (APhA) Academy of Pharmaceutical Sciences, and of the American Association of Pharmaceutical Scientists (AAPS). He received the AAPS Research Achievement Award from the Purdue School of Pharmacy in 2009. He was named a Distinguished Alumnus of the School of Pharmacy at the University of Connecticut in 2004. At Purdue, he served as Special Assistant to the Vice President for Research (1984-1985), as Associate Dean of the Graduate School (1985-1986) and as Assistant Vice President for Research (1986-1995). At the time of his death, he was a member of the University Senate, having served previously as its chair (1998-2000). A gifted and dedicated teacher, he was a multiple recipient of Purdue's Henry Heine Award for Excellence in Teaching. He received the Purdue University Outstanding Undergraduate Teaching Award in 2005, when his name was added to Purdue's Book of Great Teachers. The College of Pharmacy has created the Stan Hem Scholarship Endowment to honor his memory and his commitment to pharmacy students.

A version of this tribute will be published in a special issue of the journal, *Expert Review of Vaccines*, dedicated to vaccine adjuvants.



In Memoriam:

Professor Emeritus Patrick Belcastro (1920-2011)

Dr. Patrick F. Belcastro, 90, Professor Emeritus of Industrial and Physical Pharmacy, died on May 19, 2011 after a long battle with cancer. Born in Fiore, Italy on June 3, 1920, Pat moved with his family to Pittsburgh, Pennsylvania when he was seven. He earned a bachelor of science degree with a major in pharmacy from Duquesne University in 1942. During World War II, Pat served as a pharmacist with the 89th infantry division based in Camp Carson, Colorado, and with the 217th General Hospital in Fort Leonard Wood, Missouri and in Europe. During the battle of the Bulge in 1944, the 217th was among the first to dispense penicillin to wounded soldiers at the Hôpital de la Pitié in Paris. After the war, he was a community pharmacist for Walgreens in Pittsburgh and taught various courses for the School of Pharmacy at Duquesne.

Pat entered Purdue University as a graduate student in 1949, beginning an association that would last more than sixty years. He earned his master's degree in 1951 and his Ph.D. in 1953, both from Purdue's School of Pharmacy and Pharmacal Sciences. After graduation, he served on the faculty at Ohio State University for two years before returning to Purdue as a faculty member in 1954. Pat's research interests included the effects of ultrasound on drug stability, the sorption of drugs by polymers such as nylon, and, with Dr. H. George DeKay, the effects of x-rays on drug action. His forte was teaching, and he handled more than a dozen courses during his career. He was perhaps best known for his course on the history of pharmacy. Following his retirement in 1990, he continued to teach the course through 2006. Pat was a contributing editor for *International Pharmaceutical Abstracts* (1966-1993), served on the editorial advisory board for *Pharmaceutical Technology* (1977-2011) and was a member of the National Association Boards of Pharmacy's Licensure Examination Committee. He is listed in the latest issue of *Who's Who in America*. To recognize Pat's lifelong commitment to students, the College of Pharmacy has created the Patrick F. Belcastro Scholarship Endowment, which will provide scholarship support to students in the professional program.

In 2007, Dr. Belcastro was interviewed as part of the Purdue University Libraries Oral History Program. The recorded interview and a transcript are available on-line (<http://www.pharmacy.purdue.edu/125/belcastro.php>).

PURDUE

UNIVERSITY

Industrial & Physical Pharmacy
College of Pharmacy
575 Stadium Mall Drive
West Lafayette, IN 47907-2091

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

Visit us online at
www.ipph.purdue.edu

Upcoming Events:

Peck Symposium 2011

The department will host the Ninth Annual Garnet E. Peck Symposium on Thursday, October 20, 2011 on the West Lafayette campus. The Symposium honors Dr. Garnet Peck, professor emeritus of the department and a pioneer in industrial pharmacy. This year's Symposium focuses on pharmaceutical solids, with sessions on amorphous and crystalline materials. Speakers for the session on crystalline materials are Bernhardt Trout (MIT), Mike Zaworotko (University of South Florida), Harry Brittain (Center for Pharmaceutical Physics) and Rodo Pinal (IPPH). Speakers for session on amorphous materials are Marcus Brewster (Johnson & Johnson), Mike Pikal (University of Connecticut) Lian Yu (University of Wisconsin) and Lynne Taylor (IPPH). Our keynote speaker, Bob Lipper (Back Cove Pharma, LLC) will offer perspectives on the industry. Visit the symposium's websites (<http://www.ipph.purdue.edu/peck/> or <http://www.conf.purdue.edu/peck>) for additional information and to register.

Visit us on the web: <http://www.ipph.purdue.edu/>