

Greetings from the Department Head



Dear Alumni and Friends;

There's a 10 ft. replica of the moon outside the Materials and Electrical Engineering Building. It teeters slightly in the wind, threatening to roll toward the engineering fountain. Humans vs. Zombies gamers with Nerf guns and fluorescent headbands roam the campus. The football team beat Minnesota on a bright homecoming Saturday, though the rest of the season has been lackluster. In basketball, Robbie Hummel is out for the season – again. Professor Eiichi Negishi of the chemistry department won the Nobel Prize. A new ad campaign informs us that we are “Makers, all” with large banners on many campus buildings. Some have replied, “Thank you, but we are Boilermakers”.

It's Purdue in the fall. Where else could it be?

We hope you'll enjoy this update on our activities here in the Department of Industrial and Physical Pharmacy. Take a minute to read about the awards received by our students and faculty. Learn how to connect with us on LinkedIn. Meet a grad student from a farm in northern Indiana who's taught pharmaceutical manufacturing in Tanzania. Read about novel particles that penetrate mucus to deliver drugs to the lungs of cystic fibrosis patients. Celebrate Dr. Byrn's special issue of *J. Pharm. Sci.* and Dr. Peck's appointment as a distinguished alumnus of our college. Above all, accept our wishes for a joyous holiday season and a peaceful and prosperous new year.

We are Purdue. Boilermakers, all. Boiler up!

Liz Topp

Dane O. Kildsig Professor
and Department Head

Faculty and Student Highlights

Faculty Highlights

- Dr. Lynne Taylor's manuscript, "Role of polymer chemistry in influencing crystal growth rates from amorphous felodipine" appeared in an issue of *Crystal Engineering Communications (CrystEngComm)* dedicated to emerging talent (August). The article was coauthored by graduate student Umesh Kestur.
- Dr. Steve Byrn was honored with a dedicated issue of the *Journal of Pharmaceutical Sciences* (September); see the article in this newsletter for details.
- Dr. Garnet Peck was named a Distinguished Alumnus of the Purdue College of Pharmacy at an awards ceremony this fall (October).
- Dr. Liz Topp was named a Fellow of the American Association of Pharmaceutical Scientists at the annual meeting in New Orleans (November).

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Faculty and Student Highlights (cont.)

Graduate Student Highlights

- Ziyang Su (Byrn group) and Li Pan (Knipp group) received Bilsland Dissertation Fellowships from Purdue University (July, October).
- Hillary Holback (Yeo group) and Lori Karpes (Knipp group) received 2010-2011 Ronald W. Dollens Graduate Scholarships in the Life Sciences from Purdue University (August).
- Lori Karpes (Knipp group) received the Kienly award from the College of Pharmacy as the outstanding graduate student teaching assistant in IPPH (October).
- Jared Baird (Taylor group) received the Jenkins-Knevel award from the College of Pharmacy for outstanding graduate research (October).
- Zohreh Amoozgar (Yeo group) was selected by the faculty for the department's Chao Doctoral Fellowship (October).
- Andrew Otte (Park group) received the department's Lieberman award (October).
- Jared Baird (Taylor group) was selected to participate in the AAPS Graduate Student Symposium on Formulation Design and Development at the AAPS meeting, one of two students selected nationally (November).

Postdoc Highlights

- Dr. Bernard Van Eerdenbrugh (Taylor group) received the 2010 AAPS Postdoctoral Fellow Award, sponsored by FMC Biopolymer, to support his travel to the AAPS annual meeting (August).
- Dr. Kaho Kwok (Taylor group) was named a USP Fellow for 2010-2011, one of only two USP fellows selected nationally (September).

Special Edition of the *Journal of Pharmaceutical Sciences* honors Stephen R. Byrn



The September 2010 edition of the *Journal of Pharmaceutical Sciences* was dedicated to Dr. Steve Byrn in honor of his extensive and impactful contributions to the field of solid state chemistry. The special edition was edited by Dr. Lynne Taylor. This is only the fourth time that the Journal has prepared a special edition in honor of an eminent scientist. Steve's special edition contains a total of 40 articles, all of which have a connection with the solid state chemistry of drugs, providing 462 pages of exciting reading in solid state chemistry. More than 140 different scientists contributed to the articles. Steve is a coauthor on five of the articles, more than any other author, and 50% of the articles cite his work. Five additional articles were coauthored by current or former IPPH faculty members. Congratulations Steve on this outstanding recognition of your scientific accomplishments and lasting impact.



Graduate Student Spotlight: Wyatt Roth

Wyatt Roth is a third year graduate student in Dr. Greg Knipp's group. Wyatt's research addresses the effects of culture conditions on carrier-mediated transport in Caco-2 and HT29 cell lines. He and Dr. Knipp hypothesize that common excipients used in oral formulations can influence peptide transporters in the G.I.

tract, ultimately affecting drug absorption. Wyatt and Dr. Knipp contributed to a recent review on these effects (J. Goole et al., *Int. J. Pharm.*, 393:17-31, 2010).

Prior to graduate school Wyatt completed a summer internship with Mylan Pharmaceuticals (Morgantown, WV). During graduate school, Wyatt completed industrial internships with Eli Lilly (Indianapolis, IN) and Abbott

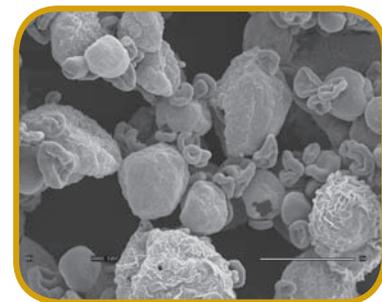
Laboratories (Abbott Park, IL) where he worked on projects related to pharmaceutical manufacturing and specialty formulations. He currently serves as the president of our AAPS student chapter. Wyatt has also served as a teaching assistant for the department's pharmaceutical manufacturing course (IPPH 562), assuming primary responsibility for the lab component. He accompanied Dr. Steve Byrn to Moshi, Tanzania to assist with teaching manufacturing in the Sustainable Medicines in Africa program. He was impressed with the genuine happiness and hospitality of the people in Moshi and with the students' eagerness to learn.

Wyatt grew up on a farm in Winamac, Indiana and studied engineering and pharmaceutical sciences at Purdue as an undergraduate student. He loves college football and basketball; he roots for Purdue and "whoever's playing Notre Dame". He plans to graduate early in 2012. After graduation, he hopes to find an industry position in formulation development, preferably one that links formulation properties to in vivo performance.

Research Spotlight: Drug delivery to cystic fibrosis lungs – a battle with a tough environment

Recent years have seen a growing interest in drug delivery technology as an enabling tool for complicated pharmacology. At the same time, this field has faced many challenges in translating novel ideas into clinical benefits. The Laboratory for Therapeutic Particles and Biomaterials Engineering, led by Dr. Yoon Yeo, has striven to identify the current challenges and find solutions via the rational design of new drug delivery systems and functional biomaterials. In particular, they recognize that the mucus layer on the lung epithelium is a significant biological barrier for pulmonary drug delivery, especially in the therapy of cystic fibrosis (CF) and obstructive lung diseases. With these challenges in mind, the Yeo Lab has developed an inhalable dry particle system co-delivering recombinant human deoxyribonucleotidase (DNase), a mucolytic, and ciprofloxacin, an antibiotic. The approach was based on the hypothesis that co-delivery of a mucolytic with an antibiotic would decrease the viscoelasticity of mucus and enhance trans-mucous delivery of the antibiotic. They recently reported in *Pharm. Res.* that spray-dried particles co-delivering ciprofloxacin and DNase (see Figure) decreased the viscoelasticity of the artificial mucus, which resembles CF mucus in chemical composition and rheological properties. Moreover, this particle system was able to kill the bacteria contained in the mucus more efficiently than particles containing ciprofloxacin alone. Ultimately, the Yeo Lab hopes to expand this principle to the delivery of

nucleic acid therapeutics to CF lungs to repair the genetic defects, the fundamental cause of this disease. In an attempt to deliver a gene-polymer complex through CF mucus using a similar principle, they are currently exploring alternative excipients that are compatible with nucleic acids, form inhalable particles, and have the ability to enhance gene-complex transport across the mucus.



Spray dried particles containing ciprofloxacin and DNase.

In addition to dry particles targeted to the CF lungs, the Yeo Lab has been developing polymeric nanoparticles that will deliver anti-cancer drugs in a tumor-specific manner. To this end, they take advantage of common microenvironmental features of many solid tumors such as pH or overexpressed enzymes to transform the nanoparticles into a cell-interactive form at the tumor site. For more information about current research projects in the Yeo Lab, visit http://yeo_lab.openwetware.org. Also see their article "Battling with environments: Drug delivery to target tissues with particles and functional biomaterials" in the December 2010 issue of *Therapeutic Delivery*.

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IPPH on LinkedIn

Reconnect with IPPH! An Industrial and Physical Pharmacy Group has been set-up on LinkedIn (www.linkedin.com). LinkedIn is a business-oriented social networking site on the internet. The Industrial and Physical Pharmacy Group is an opportunity for graduates, faculty, and friends of IPPH to connect and stay in contact with one another. On occasion, we'll post news related to the department and/or the College of Pharmacy that may be of interest to you. In addition, we hope that you'll contribute to the content by posting news or starting discussions. If you'd like to be added to the group, please request to join. It's easy: (1) go to the LinkedIn website (www.linkedin.com), (2) establish a personal profile by entering information about yourself, (3) click the "Groups" tab, (4) enter "Industrial & Physical Pharmacy" in the search box in the upper right hand corner, and (5) click "Join Group" and enter your preferences. Please send a brief message to the group manager (under "My Groups") describing your affiliation with the department. We'll then connect you with your IPPH colleagues.



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