

IPPH NEWSLETTER

June 2018



Dr. Stephen Byrn
Recipient of the 2018 Morrill Award



Dr. Elizabeth Topp,
Recipient of the 2018 Chaney Faculty Scholar Award



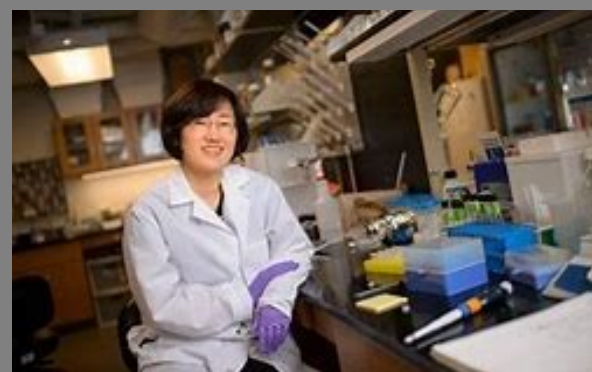
Dr. Qi (Tony) Zhou,
Recipient of the 2018 Chaney Family Early Faculty Scholar Award



Dana Moseson,
Recipient of a NSF Graduate Research Fellowship



Dr. Eric Munson
appointed IPPH
Department Head
beginning in the
Fall of 2018



Dr. Yoon Yeo promoted to Professor



GREETINGS FROM THE HEAD



The Spring finally came after a long winter and the semester seemed to go by like a breeze. Yet, we had so much to celebrate over the past few months. Professor Yoon Yeo was formally approved by the Board of Trustees to be promoted

to Full Professor with tenure for her excellence in discovery and research. Professor Steve Byrn was awarded the Morrill Award, the highest award bestowed to a faculty member at Purdue University. Professor Byrn was recognized for his synergy, leadership, and engagement throughout research, teaching, and outreach over the years. At the College's annual retreat in May, Professor Liz Topp and Professor Tony Zhou were recognized for their research contributions as respective Chaney Scholar and Chaney Junior Scholar. Professor Sandro Matosevic was awarded the Purdue Research Foundation (PRF) summer faculty award for his research project in cell-based cancer therapy. On behalf of IPPH, congratulations on your achievements, Drs. Yeo, Byrn, Topp, Zhou, and Matosevic.

Our graduate students have also made significant contributions and earned numerous awards. Among them, Dana Moseson particularly deserves our recognition for her NSF Graduate Research Fellowship, which is given by NSF nationally to those graduate students who demonstrate great potential in pursuing research distinction. We have also seen successful defense of their dissertations by Laura Mosquera-Giraldo, Joonyoung Park, Mitulkumar Patel and Jun Xu. We are proud of your excellence in research. Keep up the great work.

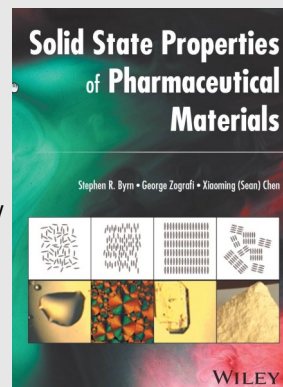
Last but not least, Professor Eric Munson has accepted the Department Head position for IPPH and will start this fall. We are looking forward to his leadership in advancing the Department to a new height. I would like to acknowledge our wonderful staff, Mary Ellen Hurt, Jen Gray and Nancy Cramer for their dedication and hard work. I have had my role as Interim Head largely taken care of by their help and support. I will continue my service to the department as a regular faculty member.

Dr. Stephen Byrn

After growing up in New Albany, Indiana, Steve attended DePauw University, receiving a BA degree in Chemistry/Mathematics. He then received his Ph.D. from the University of Illinois at Urbana-Champaign and completed a postdoctoral fellowship at UCLA.

In 1972, Dr. Byrn joined Purdue's College of Pharmacy Dept. of Medicinal Chemistry and Molecular Pharmacology. He was hired to develop solid state structural chemistry methods for Natural Medicinal products. He also taught quantitative medicinal analysis. Dr. Byrn, his wife Sally, and daughter Beth were excited to return to the Midwest after surviving the 1971 San Fernando Earthquake in the Los Angeles area.

Once at Purdue, Dr. Stephen R. Byrn set in motion the development of the field of Solid State Chemistry of Drugs with his books and papers on the subject, the first of which was published in the mid-1970's. In 2017, along with co-authors George Zografi and Xiaoming (Sean) Chen, Dr. Byrn published a new book entitled *Solid State Properties of Pharmaceutical Materials*. Solid State Chemistry is one of the fundamental bases of pharmaceuticals and Dr. Byrn has used this approach to elucidate the structure of medicines and their formulations. He has taught over 100 short courses and has educated over 50 Ph.D. students.

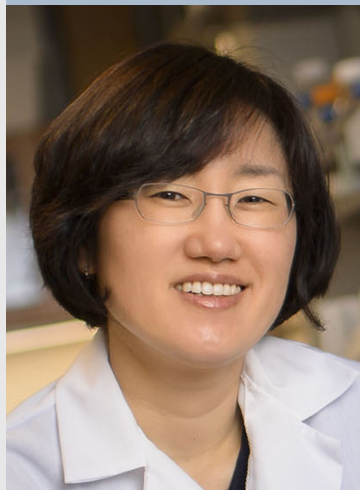


Dr. Byrn has had numerous grants including one of the first NIH Centers for AIDS Research. He is co-founder of Purdue's regulatory graduate program and co-founder of the Purdue-Kilimanjaro Sustainable Medicines in Africa Program. He has chaired several FDA and USP committees and is extensively involved in NIPTE. He is also co-founder of SSCI, Inc. (Solid State Chemistry information) a cGMP research and information company. Dr. Byrn has received several awards for his research and entrepreneurial activities including the first AAPS David Grant Award for Research Achievement in Physical Pharmacy and the Dale E. Wurster Award for Pharmaceutics. In September 2010, the *Journal of Pharmaceutical Sciences* dedicated a special issue to him. His current research interests include pharmaceuticals strategies for accelerated drug development and the use of synchrotron X-rays for pharmaceutical research. Just this spring, Dr. Byrn was named the Purdue Louis Stokes Alliance for Minority Participation (LSAMP) Faculty Mentor of the Year for 2018, the BSPS Teacher of the Year for 2018, and was awarded the 2018 Purdue Morrill Award. The Morrill Award is the highest career achievement recognition awarded to a faculty member at Purdue University. It honors Dr. Byrn's excellence and synergies as teacher, scholar and engaged professor.

Dr. Byrn enjoys spending time with his wife, Sally, 10 children and their spouses and 17 grandchildren. He is an avid Purdue sports fan, traveling to over 10 bowl games over the years. But one of his greatest passions is teaching in Africa. As the program co-founder, Sister Zita Ekeocha says, Steve is "the man who dared to say an unconditional YES," a mantra which seems to reflect all to which Dr. Byrn dedicates himself.

Faculty Focus

Dr. Yoon Yeo



Dr. Yoon Yeo, Associate Professor of Industrial and Physical Pharmacy and Associate Department Head at Purdue, grew up in Bucheon, South Korea. She received degrees in Pharmacy and Microbial Chemistry from Seoul National University, whereupon she spent 5 years as a Research Scientist for Samyang Co, a specialty pharmaceutical and foodstuff company in Korea. While working at Samyang, she

developed an interest in drug delivery and biomaterials, and decided to pursue a Ph.D. in the U.S. She joined the laboratory of Dr. Kinam Park, a world-renowned expert in drug delivery, as a graduate student in 1999. In 2003 she received her Ph.D. in Pharmaceutics from Purdue University. She obtained post-doctoral training at Massachusetts Institute of Technology and returned to Purdue to join the faculty in 2007.

Dr. Yeo's research focuses on developing new drug delivery systems and biomaterials enabling safe, efficient, and clinically viable delivery of drugs, genes and/or cells in a target-specific manner. In particular, Dr. Yeo is interested in developing drug formulations that will enhance site-specific drug distribution for therapy of cancer and other chronic diseases. To achieve this goal, Dr. Yeo and members of her laboratory develop Nano carrier systems that remain inert without releasing drugs in normal tissues but changes into a cell-interactive form by common features of tumor microenvironment. Recently, her

laboratory has discovered that polymeric nanoparticles decorated with sugar molecules interact with endothelial cells in the vasculature surrounding tumors and increase the delivery of anti-cancer drugs to achieve a safe and more efficient chemotherapy compared to existing formulations on the market. Her laboratory also develops microparticle formulations targeting macrophages for drug delivery and/or reprogramming to control proinflammatory diseases and cancer. Using these drug carriers, she aspires to find a way to control the immune environment of the disease target and facilitate the therapy.

She has authored 92 peer-reviewed papers and 9 book chapters, and received the NSF CAREER award, New Investigator Awards from the American Association of Pharmaceutical Scientists, and American Association of Colleges of Pharmacy. Her research program is funded by Lilly, NIH and NSF.

In April 2018, Dr. Yeo received notice that the Purdue Board of Trustees approved her promotion to Professor, commencing in the Fall of 2018.

Dr. Yeo enjoys music and movies of any sort. On weekends when she does not have grants due or upcoming class exams, you may see her wandering around downtown Chicago waiting for a concert at the Chicago Symphony Orchestra. This spring at CSO, she met Evgeny Kissin the pianist virtuoso in person and got his autograph!



Welcome to IPPH!

Dr. Eric Munson has been appointed as the Head of the Department of Industrial and Physical Pharmacy effective September 1, 2018.

Dr. Munson is currently the Patrick DeLuca Endowed Professor in Pharmaceutical Technology (with tenure) in the Department of Pharmaceutical Sciences, University of Kentucky College of Pharmacy. His expertise is in using solid-state NMR spectroscopy and other characterization techniques for the analysis of pharmaceutical formulations. He is currently a PI on two NSF grants, and is an international leader in pharmaceuticals. He has served twice as chair of the faculty committee for the National Institute for Pharmaceutical Technology and Education (NIPTE), of which Purdue is a member school, is active in the American Association of Pharmaceutical Scientists (AAPS), and serves on the Council of Experts for the United States Pharmacopeia (USP).



Faculty Updates

Dr. Stephen Byrn received the 2018 Morrill Award, Purdue's highest career achievement recognition for a faculty member. It recognizes excellence in all facets of the professoriate including powerful synergies among his roles as teacher, scholar and engaged professor whose work evidences impact on society. Dr. Byrn also had one of his recent publications selected as the College's Featured Publication. It is titled "Local Structure of Ion Pair Interaction in Lapatinib Amorphous Dispersions Characterized by Synchrotron X-Ray Diffraction and Pair Distribution Function Analysis" in *Scientific Reports* (DOI:10.1038/srep46367). Dr. Byrn also organized the Spring Pharmaceutical Synchrotron X-Ray Powder Diffraction Workshop at Purdue in May, 2018.

Dr. Gregory Knipp and his laboratory have discovered a novel co- and triculture direct contact, layered blood brain barrier model for drug candidate and dosage form screening utilizing a physiologically relevant cell configuration resembling of the human brain. A patent entitled: "Blood Brain Barrier Models and Methods to Generate and Use the Same" was submitted on September 7, 2017; Patent Application No. 15/697,699. [<https://patents.justia.com/patent/20180067103>]. An accompanying manuscript on the co-culture model was published in the *Journal of Pharmacy and Pharmacology* [69(12):1684-1696, 2017].

Dr. Tonglei Li took a dozen undergraduate and professional students to Shanghai, China, for a Study Abroad course in traditional Chinese medicine (TCM) over Spring Break. This was the third time he led this course, and it was well received by the students.

Dr. Sandro Matosevic was awarded a Faculty grant from the Purdue Research Foundation for his project entitled "Multi-functional Engineered Natural Killer Cells for Personalized Immunotherapy of Glioblastoma," to develop innovative immunotherapies for hard-to-treat solid cancers through improved tumor recognition and avoidance of immunometabolic suppression.

Dr. Kinam Park is a member of an interdisciplinary team of Purdue engineers, pharmacists, and veterinarians working to establish a predictive framework for rapidly screening and identifying effective and safe drug candidates and their delivery systems for treating cancers and other diseases. This effort focuses on developing computational modules, including pharmacokinetics and biodistribution of drug delivery systems, spatiotemporal distribution of drugs at major organs and tumors, transmembrane transport and intracellular distribution, and cellular signaling pathways and pharmacodynamics of drug molecules. The project is an extension of Purdue's global efforts behind the ambitious Digital Human for Drug Development (DHD2) project. Professor Park was chosen as the 2018 Travel Grant Honoree of the Controlled Release Society (CRS). The CRS is honoring Dr Park via funding allowing young scientists to attend the annual meeting in New York City from July 22-24, 2018.

Dr. Rodolfo Pinal is coordinating the transition of the group into the new AAPS Patient-Centric Community after serving as chair of the AAPS Patient-Centric Focus Group. Dr. Pinal also presented a talk on patient-centric dosage form design and manufacturing at the Peck Symposium, held on March 7, 2018.

Dr. Lynne Taylor gave a talk, "Amorphous Formulation of Essential Drugs", in March at the Bill and Melinda Gates Foundation Drug Development Partner CMC Forum in New York.

Dr. Elizabeth Topp received the 2018 Chaney Faculty Scholar Award, the highest research award given to faculty by the College of Pharmacy. Her current research efforts are focused on the translation of solid-state hydrogen deuterium exchange (ssHDX-MS) to industry settings and the development of strategies to stabilize fibrillation-prone peptides. With Dr. Alina Alexeenko (Purdue AERO), she continues to serve as Co-Director of LyoHUB, an industry-led consortium dedicated to advancing lyophilization technologies, now with sixteen member companies.

Dr. Yoon Yeo has been formally approved by the Purdue Board of Trustees for promotion to Professor.

Dr. Qi (Tony) Zhou is the recipient of the the 2018 Chaney Family Early Faculty Scholar Award. He also received a NIIMBL (National Institute for Innovation in Manufacturing Biopharmaceuticals) award together with Dr. Alina Alexeenko and Dr. Elizabeth Topp for a proposal titled, "The Atmospheric Spray Freeze Drying Project." Working with Merck and Genentech, this project will develop and evaluate a novel Atmospheric Spray Freeze Dryer for manufacturing of pharmaceutical biologics. Dr. Zhou was elected as an editorial board member for three pharmaceutical journals, *AAPS PharmSciTech*, *Drug Development and Industrial Pharmacy* and *Current Pharmaceutical Design*. Three provisional patent applications were filed: "Co-spray drying of Ciproflaxacin and Colistin and uses thereof", "Co-spray drying of Meropenem and Colistin and the uses thereof" and "Liposomal nano formulation of combinational antibiotics and the uses thereof".

Graduate Student Highlights

Lia Bersin (Topp group) was awarded the 2018 Teaching Academy Graduate Teaching Award.

Andrea Chambers (Matosevic group) has been awarded a 2018-2019 Cancer Prevention Interdisciplinary Education Program (CPIP) fellowship.

Eunbi (Iris) Cho (Topp group) won third place in the 2018 Peck Symposium 3 Minute Thesis Competition.

Monika Lavan (Knipp group) was nominated as one of the nominees from the College of Pharmacy for the Graduate School Excellence in Teaching Award.

Kelsey Lubin (Knipp group) received an IPPH travel award to attend GPEN in Singapore.

Dana Moseson (Taylor group) has been awarded a NSF Graduate Research Fellowship for her project, "Process Design of Hot Melt Extruded Pharmaceuticals for Optimized Manufacturability and Product Performance". This three-year national award is highly competitive, only given to those graduate students who demonstrate great potential in their pursuit of research distinction.

Laura Mosquera-Giraldo (Taylor group) received a 2017 American Association of Pharmaceutical Scientist (AAPS) Graduate Student Research Award in Formulation Design and Development.

Hwee Jee Ong (Pinal group) received a Purdue Graduate Student Government and Graduate School travel grant, as well as a Graduate Student Research Award for research quality, originality and significance in the field of pharmaceutical sciences from the American Association of Indian Pharmaceutical Scientists (AAiPS).

Mitulkumar Patel (Taylor group) received a Graduate Student Research Award for research quality, originality and significance in the field of pharmaceutical sciences from the American Association of Indian Pharmaceutical Scientists (AAiPS).

Harshil Renawala (Topp group) received an IPPH travel award to attend GPEN in Singapore.

Nivedita Shetty (Zhou group) won second place in the 2018 Peck Symposium 3 Minute Thesis Competition.

Maie Taha (Yeo group) received a Chaney Graduate Student Travel Award to attend the 2018 Gordon Research Conference (GRC): Drug Carriers in Medicine and Biology.

Rishabh Tukra (Topp group) was selected to receive funding from the Purdue College of Pharmacy for the 2018 Krannert Applied Management Principles (AMP) program.

Venecia Wilson (Taylor group) received a PhRMA Fellowship from the PhRMA Foundation.

Jun Xu (Yeo group) received an American Chinese Pharmaceutical Association Research Award (ACPA) and an AAPS Graduate Student Research Award in Biotechnology.

Graduate students present 3 minute thesis at 2018 Peck Symposium



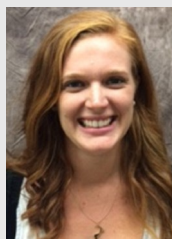
Congratulations to winners:

1st place: Yu Liu "Modeling granular material mixing and segregation using a multi-scale model"

2nd place: Nivedita Shetty, "Respiratory Infections: Meeting the tough microbial challenge"

3rd place: Eunbi (Iris) Cho, "Evaluation of Antibody-drug conjugates (ADCs) formulation using Hydrogen/Deuterium Exchange (HDX)"

Graduate Student Spotlight



Lia Bersin

Lia is in her 2nd year in the Topp Lab. She grew up on Cape Cod in Massachusetts in a “unique and beautiful” coastal vacation town

with engineering parents who encouraged an interest in math and science.

Upon completion of her undergraduate work, she joined a small biofuel startup. After deciding that environmental engineering was not what she wanted to pursue, she switched to the pharmaceutical industry. She developed an interest in formulation which brought her to Purdue with a goal of acquiring a stronger background in pharmaceutical sciences.

Her research focuses on the stability of proteins in the solid state, specifically, the chemical degradation pathways by trying to understand why these changes occur in the protein and what formulation strategies can be used to prevent them. “Proteins are such large and complex molecules that the challenges to make them into drug products can be really fascinating. The market for biologics is increasing so rapidly that there are always new challenges when it comes to formulating, so I knew this area would never get boring. It is very clear to see what opportunities lie ahead of us and that the things we learn have a direct application. I never have to think, ‘When am I ever going to use this?!’”

Lia is very involved on Purdue’s campus. She is an e-board member for IPPH’s AAPS Student Chapter and is active with Purdue’s Toastmasters club. Toastmasters is a club that focuses on improving communication, public speaking and leadership skills. Lia will serve as an officer for Toastmasters at Purdue in the upcoming year. She also enjoys biking with the Wabash River Cycle club, practicing yoga at Community Yoga, and dog sitting through Rover to help stuff her “travel piggy bank.”



Dana Moseson

A 2nd year student in the Taylor lab, Dana grew up in Bethlehem, PA with calculus as her favorite subject.

Dana became interested in pursuing pharmaceuticals at her first job as a pharmacy technician where she was fascinated with the technology behind medicine, especially smart tablets and inactive ingredients. During college at Penn State University, she interned in formulation and analytical R&D at McNeil Consumer and Specialty Pharmaceuticals, as well as Pfizer, solidifying her path into industrial pharmacy.

Prior to coming to Purdue, she worked at Emerson Resources in Norristown, PA as a formulation scientist and quality assurance professional, focusing on product development of phase I and II clinical trial materials. Although her career was established, she wanted to increase the depth of her knowledge and advance the fundamental science and engineering of drug formulation and manufacturing. Her specific interest is in unlocking the vast majority of new therapeutic molecules, which are poorly soluble. Fully realized, the direct impact of her research work is to overcome a critical technical barrier to new drugs reaching patients, making drug manufacture simpler and less expensive.

She chose to attend Purdue University due to its reputation for excellence and innovation in pharmaceutical manufacturing and physical pharmacy, distinguished faculty, and premier facilities. “I have especially enjoyed getting to know the IPPH faculty. They have been a tremendous support to me, both personally and professionally. In particular, without their support, I would not have been successful with my application for the NSF Graduate Research Fellowship.”

When not tackling these complex research efforts, she enjoys board games, watching TV, singing “like nobody is watching”, and hanging out with her children, Henry and Audrey.



Jun Xu

A PULSe graduate student with Professor Yoon Yeo, Jun has completed his 5th year and successfully defended his PhD thesis in

April of this year. The PULSe program at Purdue offers Ph.D. students the opportunity to access diverse research opportunities across multiple disciplines.

Jun grew up in Nanjing, Jiangsu, China where he dreamed of becoming a commercial airline pilot as a young boy. Yet, after a few internships at local pharmacy and pharmaceutical companies, he became interested in pursuing a career in the pharmaceutical industry. His mom is a cancer survivor. During her treatment, he noticed that her medications were imported. “I simply want to help our country to advance in the field of pharmaceuticals.” Thus, he started his undergraduate study at Purdue in 2009 with the B.S. in Pharmaceutical Sciences program and continued with graduate study in 2013. He had an interesting internship with Genentech, related to amorphous solid dispersion.

His research involved engineering nanoparticles for tumor-targeted drug delivery. “What distinguished my project from others is my nanoparticle formulation does not solely rely on enhanced permeability and retention (EPR) effect. During my hospital internship, I saw too many cancer patients suffering from chemotherapy’s side effects. There should be a way to improve that. Nanoparticle could alter the distribution profile of encapsulated drug cargo and reduce the severity of side effects.” He hopes that his work will result in a strategy to guide future nanoparticle design.

He enjoys the diversity in his lab and appreciates the quality of undergraduate/graduate teaching, and the flexibility exhibited by Dr. Yeo, “an amazing mentor and friend.”

Jun is a big fan of the Chinese tea ceremony, enjoys going to the gym and excels at studying finance. His ultimate goal is to have his own venture capital firm to help fund local bio start ups.

Alumni and Friends Focus

Dr. Renee Coffman



Dr. Renee Coffman serves as the President and Co-Founder of Roseman University of Health Sciences, a not-for-profit, independent University educating and training healthcare professionals in Henderson, Nevada. She and Dr. Harry Rosenberg founded Roseman in 1999 as the first PharmD granting institution in the state of Nevada. Since then, they have added the BS in Nursing Degree, an MBA for healthcare professionals, a DMD program, an orthodontics residency program and are pursuing graduate degrees in nursing, an MD program, and Master's of Science post-graduate degrees in pharmaceutical/biomedical sciences. In 2006, they added a second campus in South Jordan, Utah and in 2013 expanded to the Summerlin area of Las Vegas to launch a medical school. They now have over 500 employees and over 1600

students. "Teaching has been my passion. I still teach pharmacokinetics to first year pharmacy students and really enjoy being able to help students learn and grow. That feeling you get when you're able to help a student understand and be able to use new ideas and concepts for what ultimately will allow them to pursue their profession successfully is unmatched in anything else I've done."

Dr. Coffman attended Purdue from 1990-1995 in Dr. Kildsig's group. Some of her best memories of Purdue are stopping by Dane and Nancy Kildsig's famous tailgate on football game days and playing Trivial Pursuit at Steve and Lisa Nail's house. "I also gained my "nerd" street cred while at Purdue, with weekly "Dungeons and Dragons" sessions at Bill Mark's place along with Joe Rinella, John Heimlich, and Lee Mu-raoka."

She spends her free time attending her daughter Leili's high school soccer games and is a passionate hockey fan with the Las Vegas Golden Knights' inaugural year in Vegas!

"So many of the grad students I knew from Purdue have gone on to have successful careers in academia and over the years we would cross paths at AACP meetings or in other academic settings and it was fun to see them grow and advance over the years. Of course, you also grow to appreciate Purdue Pharmacy's reputation as the "Cradle of Deans" and when I was Dean at Roseman, being part of that tradition was pretty cool!"

Dr. Milton attended Purdue between 1984-89 (BS in Pharmacy) and 1991-95 (Ph.D. in IPPH in a faculty group consisting of Drs. Hem, Kildsig, Nail, Park and Peck).

Dr. Milton remembers his time at Purdue fondly. A favorite memory is playing basketball with Steve Nail, his advisor, and several other students at lunch time before the 1:00 pm Thursday seminar. When he graduated, his basketball buddies gave him a basketball with everyone's signature which he still has today.

He retired from Eli Lilly and Company on December 31, 2017 after 28 years of service as a Research Advisor in Biopharmaceutical Product Development. While at Lilly, his team supported the development and technology transfer of parenteral small molecules, large molecules, oncology, and insulin drug products. He enjoyed the diversity of projects but is thoroughly enjoying everything about retirement!

Dr. Milton's expertise is in freeze drying with other research pursuits influenced by business needs. "For example, because the team was responsible for developing novel insulin formulations, I had to learn about the stability and processes for insulins. When the business needed a way to evaluate multiple formulations in the clinic, I learned about USP <797> and proposed a process to use Sterile Compounded Preparations to enable early clinical studies. Fortunately, I was able to consult with other teams on the freeze drying related projects and topics." His goal for his

team was to do scientifically sound, hypothesis driven, "first principle" based research and development to enable the businesses, fully utilized knowledge, experience, and data to enable the making of medicines. "I think this is the best result I could have for my research."

Dr. Milton now enjoys spending a lot of time at the gym, walking Kobe, the family dog, and fixing things around the house. His wife, Charlotte, is a second-grade school teacher, so he has been volunteering as a chaperone on school field trips, too.

He will also teach an IPPH graduate course, Parenteral Drug Products Design and Development, in the Fall along with fellow Lilly retiree, Dinesh Mishra. "This is an opportunity to give back to the IPPH department and Purdue."

Dr. Nathaniel Milton



Alumni and Friends Focus

Senior Research Scientist in the Research and Development Department at Baxter Healthcare, Dr. Greg Sacha attended Purdue from 1994 to 1999. He was a member of Dr. Steve Nail's group and now works with Dr. Nail at Baxter in Bloomington, IN. Dr. Sacha leads a group in contract research and development of parenteral products. "It is wonderful to work with many different companies and develop formulations for a wide range of molecules," says Sacha. The research of the group is in formulation and process development with a focus on lyophilization which includes studying equipment performance, examining the flow of water vapor and organic solvent systems at low pressure, improving knowledge on the effects of cooling and ice nucleation, and exploring methods of predicting the stability of large molecules in different formulations. He hopes that this research will improve success of scaling up to commercial scale equipment at different sites, improve process efficiency, and improve understanding of the effects of formulation components and processing on the stability of large molecules.

Dr. Sacha shared several stories of his time in the labs here in IPPH:

"There were about 10 graduate students that took a graduate level course offered in IPPH on manufacturing. Part of the course was working with the equipment in the lab. One day we were working with a tablet press and were trying to put the equipment together. For some reason I decided to lean over the press and Tonglei accidentally dropped the hopper on my head.

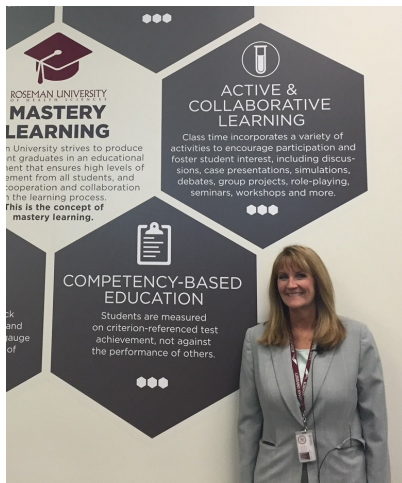
Our group used a lot of purified water that was supplied by an old still located behind Room 105 in the Pharmacy Building. You had to go through a door that lead to an area behind the walls of the rooms on the first floor. The still was quite finicky and you had to be careful when starting it and

with how much water was supplied to the equipment. I was the only person allowed by Garnet Peck to operate the still and that meant I had to often go behind the wall and fear that the still would explode as it clanked and rattled when it was started. Steve Nail moved his office to the 5th floor when I first started working with him and all of his new students had to help clean it before we could move ourselves and the equipment in. There was a refrigerator in the room that I had to empty and clean. The first time I opened the fridge there were jars of rabbit eye balls staring at me!"

Dr. Greg Sacha



Dr. Sacha enjoys playing with his dogs, gardening, and boating on Lake Monroe. He also enjoys sharing knowledge with others. For example, Dr. Sacha spent several days at Purdue last summer offering a Lyo101 course for IPPH graduate students. "I have greatly enjoyed our collaborations with Purdue. Our group is lucky to be members of the LyoHUB, to collaborate with Liz Topp's group, and to collaborate with Alina Alexeenko's group in the School of Aeronautics and Astronautics. The collaborations help me to continue learning and provide opportunities to meet many new people."



Above, Renee Coffman in front of classroom wall graphics about Roseman's Mastery Learning Model.



Above, Greg Sacha with wife (Margo) and fellow alum Andrew Shaw and wife, Patricia in Alaska

Left, Greg Sacha with wife, Margo and Steve & Lisa Nail at a Colts game.

15th Annual Garnet E. Peck Research Symposium



Dr. Ruben Carbonell,
NC State University



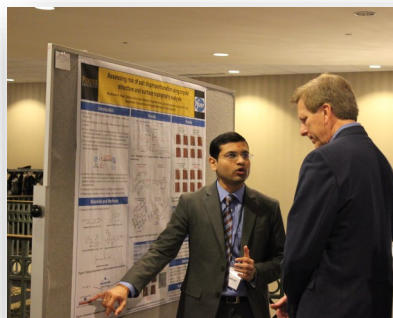
Dr. Robert Williams,
University of Texas at Austin

The 15th Annual Garnet E. Peck Research Symposium was held this year on Wednesday, March 7, 2018 at the Holiday-Inn Lafayette City Centre, and focused on pharmaceutical manufacturing, with presentations in both “large molecule” and “small molecule” manufacturing areas. Co-chaired by Drs. Topp and Zhou, the symposium’s goal was to **strengthen the pharmaceutical manufacturing community on the Purdue campus**, and to help connect that community to the broader pharmaceutical industry in the state and in the region. Speakers included Dr. Ruben Carbonell (Frank Hawkins Kenan Distinguished Professor of Chemical and Biomolecular Engineering, North Carolina State University), Dr. Robert Williams (Division Head and Professor of Molecular Pharmaceutics and Drug Delivery, University of Texas at Austin), Dr. Nithin Raghunathan (Birck Nanotechnology Center, Purdue), Dr. Ali Shakouri (Electrical & Computer Engineering, Purdue), Dr. Linda Nien-hwa Wang (Chemical Engineering, Purdue), Dr. Miko Cakmak (Materials Engineering, Purdue) Dr. Rodolfo Pinal (IPPH, Purdue), Dr. Tony Zhou (IPPH, Purdue) and Dr. Zoltan Nagy (Chemical Engineering, Purdue).



Poster sessions and three minute thesis presentations from graduate students spotlighted the tremendous work being done in Industrial and Physical Pharmacy at Purdue University.

Yu Liu, a graduate student from mechanical engineering, won the Three Minute Thesis Competition with his presentation, **Modeling granular material mixing and segregation using a multi-scale model**. Second place went to Nivedita Shetty, a graduate student from Dr. Zhou’s lab with her presentation, **Respiratory Infections: Meeting the tough microbial challenge**.



Dr. Topp’s graduate student Eunbi (Iris) Cho secured third place with her presentation, **Evaluation of Antibody-drug conjugates (ADCs) formulation using Hydrogen/Deuterium Exchange (HDX)**.

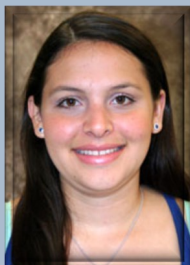
This annual symposium honors the late Garnet E. Peck, professor emeritus of industrial and physical pharmacy, and his contributions to the pharmaceutical sciences, including the development of latex-based tablet coatings that have been used in the industry for more than 35 years.

IPPH News and Events



CONGRATULATIONS IPPH MAY 2018 GRADUATES!

Laura Mosquera-Giraldo, PhD



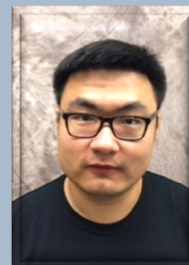
Joonyoung Park, PhD



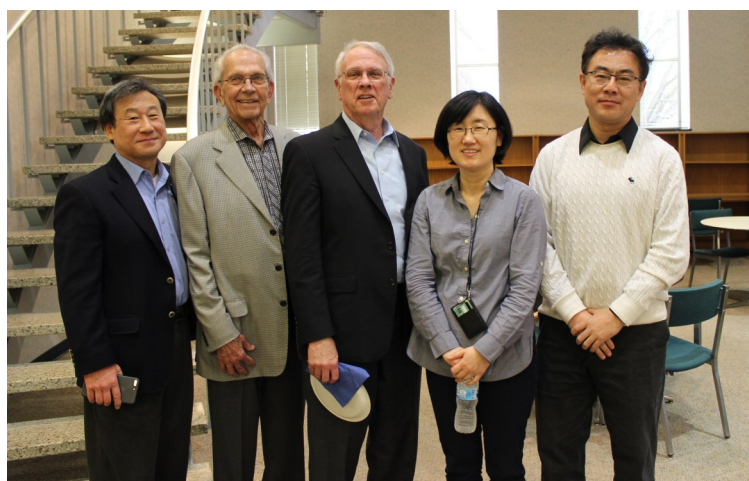
Mitulkumar Patel, PhD



Jun Xu, PhD



IPPH Year End Celebration 2018



IPPH STAFF HIGHLIGHTS

Nancy Cramer (*IPPH Secretary*) walked across the stage of Brigham Young University (BYU) -Idaho on April 13, 2018 with her son Logan, a special mother-son moment! Nancy will complete her BS in Applied Management with a Web Media Certificate from BYU on July 23, 2018. Her son, Logan, received his BS in Recreational Management and is working for the YMCA in Boise Idaho. In her own words, "...being around the IPPH faculty and graduate students has really motivated me to continue (my education). It was a very proud moment for me as a mother to graduate with my son. It was special to be able to share in the excitement of both of our accomplishments."

Purdue College of Pharmacy invites you to attend the **Alumni and Friends Reception at AAPS**
Monday, November 5, 2018, 6:30-9:00 pm
District Chop House (509 7th St NW, Washington, DC)
Register at <https://www.pharmacy.purdue.edu/events>



Dane O. Kildsig
CPPPR Center for
 Pharmaceutical
 Processing Research

CPPPR is currently funding two projects at Purdue University:

The project entitled **Advanced Surface Characterization Platform for Fundamental Understanding in Aerosol Performance of Dry Powder Inhaler Formulations**, led by Dr. Qi (Tony) Zhou, seeks to improve the quality of dry powder inhaler (DPI) formulations. The micronized fine powders used DPI formulations generally have poor flow and poor aerosolization properties, which are major challenges for formulation and manufacturing. The pharmaceutical industry has attempted to solve these problems by coating cohesive particles with anti-sticking materials such as magnesium stearate based on empirical experience. One of the key challenges in understanding coating quality and aerosol performance, is the accurate characterization of coating material on fine drug particles surfaces, which require both high surface sensitivity and spatial resolution. To address the critical issues of inhalation products, the CPPPR study will: (1) develop an accurate imaging platform to evaluate coating quality of the DPI formulations processed with pharmaceutical lubricants; (2) establish the correlations



The Industrial Advisory Board of CPPPR at the May 2018 meeting

between surface coating quality and aerosol performance. The study will also provide insight on how pharmaceutical lubrication impacts the quality of pharmaceutical solids and solid dosage forms.

The project entitled **Does Residual Oxygen Remain in the Freeze Dried Product? - Residual Gas Analyzer Measurements of Oxygen Concentration during Freeze-Drying**, led by Drs. Elizabeth Topp and Alina Alexeenko, seeks a better understanding of the impact of the process on therapeutic protein degradation during storage and procedures for monitoring and controlling oxygen concentration in prospective freeze-drying formulations, thereby accelerating development of robust lyophilized products. The project's objective is to quantify residual oxygen concentration in a lyophilized cake and how it varies as a function of different excipients and lyophilization process parameters, such as freezing, primary and secondary drying conditions.

LYOHUB HIGHLIGHTS

- LyoHUB welcomed their 14th and 15th new members, Bristol-Myers Squibb and Abbott, to the consortium and appreciate working with all of their industrial partners.
- LyoHUB became a member of the American Society for Testing and Materials (ASTM) International <https://www.astm.org/> in 2017 and led the initiative to establish the E55.05 sub-committee on Lyophilization. For the scope and more information about the sub-committee, visit <https://www.astm.org/COMMITTEE/E55.htm> The bi-annual meeting of ASTM E55 Committee on the Manufacture of Pharmaceuticals and Biopharmaceuticals will be held this year at Purdue from October 23-25, 2018. For more information on attending, please e-mail Jen Gray at gray160@purdue.edu.
- In March 2018, a proposal submitted by Drs. Topp (IPPH), Zhou (IPPH) and Alexeenko (AAE) to NIIMBL received a selection letter. The 18 month, \$1.6 million project, "**NIIMBL PC-1 RFP: The Atmospheric Spray Freeze Drying Project**", will be led by Purdue University in collaboration with LyoHUB member Roche Genentech, as well as Aerosol Therapeutics, Merck & Co. and Janis Research Company.
- LyoHUB will host Lyo Summer School at Purdue University from July 31-August 2, 2018. **Lyo Summer School** will cover Formulation and Process Development for Lyophilized Pharmaceutical Products, CFD for Lyophilization Equipment and Process Characterization and more. Contact Jen Gray (gray160@purdue.edu) for more information.



ASTM INTERNATIONAL



LyoHUB Annual Meeting participants in Chicago, April 2018



*You are
invited*

IPPH Homecoming Reception

Friday, September 21, 2018 from 4:00-6:00 PM

Another Broken Egg Restaurant

516 Northwestern Ave, West Lafayette

*Alumni and their guest are invited to celebrate
150 years of Giant Leaps as we recognize the many
achievements of Purdue's IPPH!*

**Beverages and appetizers will be served.
RSVP to Jen Gray at gray160@purdue.edu
by Tuesday, September 11, 2018**



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