

# Indispensable News MinneCeutics

University of Minnesota

Fall 2013

Department of Pharmaceutics

## PHARMACEUTICS FACULTY

William F. Elmquist  
Carolyn A. Fairbanks  
Karunya K. Kandimalla  
Jayanth Panyam  
Swayam Prabha  
Ronald J. Sawchuk  
(Emeritus)  
Henning Schroeder  
Ronald A. Siegel  
Changquan Calvin Sun  
Raj G. Suryanarayanan  
Timothy S. Wiedmann  
Cheryl L. Zimmerman

## AFFILIATE FACULTY

Walid M. Awni, AbbVie.  
Richard C. Brundage,  
Dept. of Experimental and  
Clinical Pharmacology,  
University of Minnesota.  
Lester R. Drewes, Dept. of  
Biochemistry and Molecular  
Biology, University of  
Minnesota-Duluth. Michael  
D. Karol, Synta  
Pharmaceuticals. David A.  
Largaespada, Dept. of  
Genetics, Cell Biology and  
Development, University of  
Minnesota. Z. Jane Li,  
Boehringer Ingelheim  
Pharmaceuticals, Inc.  
Theresa M. Reineke, Dept.  
of Chemistry, University of  
Minnesota. Jann N.  
Sarkaria, Dept. of Radiation  
Oncology, Mayo Clinic.  
Evgeniy Y. Shalaev,  
Allergan, Inc. Chun Wang,  
Dept. of Biomedical  
Engineering, University of  
Minnesota. Joseph A.  
Zasadzinski, Dept. of  
Chemical Engineering and  
Materials Science,  
University of Minnesota.

Dear Friends,

Greetings! I am pleased to report that the department has been active and productive in fulfilling its teaching, research and service missions.

Let me begin with some 'high level' information. The search for the Academic Health Center (AHC) VP of Health Sciences and Dean of Medical School is in full swing; several candidates have been interviewed. We've had some exciting developments in the professional education (Pharm.D.) front. The new Pharm.D. curriculum has been rolled out (class of 2017) with much emphasis on active and peer learning, and this is reflected in the redesigned classroom (Room 7-135 WDH). Students can work in small groups, and the state-of-the art AV technology is designed to facilitate active discussion in a large class (>150 students) and across the two campuses. The semester is longer now and we have worked hard to develop a comprehensive and highly integrated curriculum.

Inside the newsletter, you will find details about the new initiatives in the college led by Pharmaceutics faculty. The AeroCore services have been designed to bring together faculty and scientists interested in aerosol drug delivery systems and pulmonary drug delivery. The Center for Translational Drug Delivery (CTDD) has initiated several projects with pharmaceutical companies. The faculty members associated with the already established Brain Barriers Research Center have been active with several new grants and publications, and we recently had a BBRC-sponsored mini-symposium at the Duluth site.

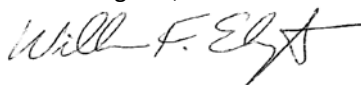
Dr. Swayam Prabha, our newest faculty member, has hit the ground running and has established an active, busy laboratory. Prabha joined our program after several years in the industrial sector. She is using her formulation and drug delivery experience for the pulmonary delivery of propofol in a federally supported (NIH/SAIC) contract. Prabha also has a leadership role in the CTDD.

The changing pharmaceutical industry landscape and the challenging funding situation (both federal and private sector) have led to a change in the composition of the 'student body'. While we have fewer graduate students, there is a healthy increase in the number of postdoctoral fellows and research associates. We also continue to fully fund all the graduate students during their entire tenure in the program. As you know, we have a long history of national recognition of our graduate students for their scholarship and research. I am happy to report that the tradition continues, and at the upcoming AAPS meeting our students will receive a total of seven awards (details inside).

I look forward to seeing many of you at the alumni breakfast at AAPS on Monday morning. Dean Marilyn Speedie will also be attending the breakfast and will provide an update about the college.

I wish you all a healthy and productive year ahead.

With kind regards,



William F. Elmquist, Pharm.D., Ph.D.  
Professor and Head, Dept. of Pharmaceutics



## Alumni News

### *Did you know . . .*

- the first Pharmaceutics graduate at the U of M was **Travis Neal Thomas Olson**, with a Ph.D. in 1960.
- the first M.S. graduate was **Morris D. Faiman**, in 1961.
- the first female graduate was **Barbara Ruth Wynkoop Fox**, with a M.S. in 1970.

**Sayantana Chatteraj, Ph.D.** [2012], became a Scientific Investigator in Global Formulation Development at GlaxoSmithKline Pharmaceuticals R&D (Upper Providence site near Philadelphia). He also accepted a 3-year appointment as Scientific Advisor to the Editors of the Journal of Pharmaceutical Sciences effective July 1, 2013.

**Alekha Dash, R.Ph., Ph.D.** [1990], was elected to fellowship in the American Association of Pharmaceutical Scientists (AAPS) in 2012. Election requires significant contributions to the pharmaceutical sciences literature. In addition to his duties at Creighton University, Dr. Dash is serving as a USAID consultant to Armenia. The objective of this activity is to work with Yerevan State Medical University (YSMU) to develop a tertiary education program to meet workforce needs in Armenia's pharmaceutical industry and assist with establishing linkages with similar universities in the United States. He will make several trips to Armenia from September to December 31, 2013.



*Dr. Dash (in glasses) meeting with Armenia's Drug Agency director and staff.*

**Prajakti Kothare, Ph.D.** [2001], joined Merck in 2011 and was selected to be Merck's Clinical PK/PD Scientific Lead in 2012. She is responsible for overall scientific strategy and is in a leadership role to increase innovation and develop scientific capabilities and strategy in working with PPDM scientific networks, scientific leads and key cross-functional partners. Prajakti compiled an exceptional record of accomplishment through direct clinical PK/PD support for development programs, most notably preladanant, and by significantly influencing many others through scientific supervision and her roles as a Clinical PK/PD franchise lead and disease area lead in the M&S Network. Prior to joining Merck, she was with Eli Lilly for 10 years where key accomplishments included PK/PD leadership for the development and global registration of Byetta® (exenatide twice

daily), Bydureon® (exenatide once weekly), and Zyprexa Relprevv® (Olanzapine IM depot).

**Stephen Pham, Ph.D.** [1999], was promoted in April 2012 to Senior Director of Product Development at Elevation Pharmaceuticals. In September of that year, Elevation Pharmaceuticals was acquired by Sunovion Pharmaceuticals for \$430 million. "After the acquisition I stayed on as a full-time product development consultant to help Sunovion with the transition. I also continue to oversee the device development activities and product characterization studies for the same project, and will for the next several years. My family size has not changed since the time I was in Minnesota. My wife and I still live in San Diego and just celebrated 24 years of marriage. Our son, Chris, is in his senior year at Berkeley studying biology and is starting to explore options for post-graduation."

**John Roberts, Ph.D.** [2007] is working as the Novartis Oncology Clinical Pharmacology representative for the marketed drug Sandostatin. He is contributing to pharmacological aspects of regulatory submissions, drug labeling updates and on integrating PK/PD analysis with formulation development. In 2013 he was a recipient of the *Novartis Passion, Quality, Speed Award* for excellence in a briefing book submitted to the FDA/EMA. John lives in northern New Jersey with his wife and 4-year-old old son.

**Tanmoy Sadhukha, Ph.D.** [2013], was a lecturer for the College of Pharmacy on the Duluth campus of the University of Minnesota during spring semester 2013. He is currently a postdoctoral associate for Prof. Swayam Prabha.

**Geoff G.Z. Zhang, Ph.D.** [1998], is a Senior Research Fellow and Head of Materials Science in the Global Pharmaceutical R&D Division at AbbVie, a research-based offshoot of Abbott Laboratories.

**Sagar Agarwal, Ph.D.** [2011], recently accepted a position in the Clinical Pharmacology Division at Vertex Pharmaceuticals in Cambridge, Massachusetts.

Do you have news to share? Please let us know at [pceuts@umn.edu](mailto:pceuts@umn.edu).

[www.pharmacy.umn.edu/pharmaceutics](http://www.pharmacy.umn.edu/pharmaceutics)

# From the Director of Graduate Studies

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Dear Alumni, Students, Colleagues and Friends,

Our graduate program, as part of the greater University of Minnesota, is converting to the metric system. This is not part of the failed effort initiated by the Carter administration to have the U.S. adopt metric units as a system for measurements, rather, it is an effort to use measures of the performance of graduate programs for the purpose of quality improvement. After spending several years discussing which measures are of value, the Graduate School is now favoring the use of time to degree, completion rate and placement. To ensure fairness, each program can use its own select measures with appropriate justification.



Setting aside my position on the matter, I have dutifully gathered and submitted the data, as financial support is tied to these measures. With a thorough review, I have concluded that we, and by that I mean our alumni, have done very well. Despite the onerous burdens (plentiful course work, arduous exams, demanding experiments to advance science, extensive preparation for seminars, exhaustive reading for readings, excoriating group meetings, etc.) placed on our students by program faculty, faculty advisors, and faculty committees, the time to degree has held steady at about 5 years for the last 15 years. This is a shorter time than most, indicating our program is good because it is short, but a longer time than some, indicating our program is good because it is rigorous.

Our completion rate for students in the last 15 years is near 100%. This is extremely good relative to most other programs. We do not have planned attrition, we ensure financial support, and our goal has always been to do (or maybe help the student do) what it takes for the degree. There have been a few who did not finish. In these cases, I have personally facilitated transfer of students to other programs because they were simply in the wrong discipline for their interests.

For placement, we also have done historically very well, because when graduation is imminent our students impress during their job interviews. You probably already realize this as you continue to meet your classmates at the annual AAPS breakfast. It is also easy to imagine on a comparative scale that we do well relative to other disciplines that place graduates only in academia where there are hundreds of applicants for a single position. In these cases, we would be remiss not to recognize how spending 5-10 years in a graduate program has enriched the quality of life for individuals who ultimately achieve employment in other areas.

With these high-quality metrics, we have an excellent chance to improve the quality of our program with receipt of additional financial support, perhaps exceeding \$20,000, pending an intermediate level of review and possible approval by the Office of the Associate Dean for Graduate Education and Research in College of Pharmacy. This should just be enough to support a graduate student for about two months as long as they don't spend any money in the lab. With this dismal portrayal of where the University is spending time, you should already know where the solution is, was and appears will always be: our students, alumni and friends. Thank you ever so much for all that you have done to make our program proud, and I thank you in advance for your future support.

A handwritten signature in black ink, appearing to read "Timothy S. Wiedmann". The signature is fluid and cursive, with a large initial "T" and "S".

Timothy S. Wiedmann, Ph.D.  
*Professor and Director of Graduate Studies*

# AeroCore

At the new AeroCore Center, College of Pharmacy researchers have partnered with colleagues from the U's Masonic Cancer Center, College of Science and Engineering, and Medical School to develop and test aerosol drug delivery for lung diseases such as lung cancer, cystic fibrosis, tuberculosis and more.

**AeroCore brings together U of M experts in drug delivery, aerosol generation and testing, lung science and health, and cancer to:**

- develop aerosol drug delivery systems
- administer the drug in a controlled environment
- test for toxicity
- measure the amount of drug delivered to the lungs.

AeroCore researchers are currently working on a better way to eradicate dangerous lung cancer cells through inhalation of nanoparticles and the use of hyperthermia, or the process of raising heat levels to a point that threatens cell survival, for help in killing cancerous cells that have formed in the lungs. By heating iron oxide nanoparticles to temperatures higher than 98.6 degrees Fahrenheit, researchers have been able to effectively kill cancer cells in preliminary mouse-model trials. This new drug delivery method also delivers the chemotherapeutic drugs directly to the lungs while reducing the harmful effects to other parts of the body.

**Co-Director, Jayanth Panyam, Ph.D.**

Dept. of Pharmaceutics, College of Pharmacy

*Professor Jayanth Panyam has interests in the research and development of polymeric-based drug delivery systems for targeted treatments of disease.*

**Co-Director, Frank G. Ondrey, M.D., Ph.D., FACS**

Dept. of Otolaryngology, School of Medicine

*Professor Frank Ondrey, a practicing physician, is actively involved in the prevention and treatment of respiratory and head and neck cancers. As part of his focus on translational medicine, he has specific expertise in the identification and validation of biomarkers.*

**Laboratory Manager, Timothy S. Wiedmann, Ph.D.**

Dept. of Pharmaceutics, College of Pharmacy  
612 - 624-5457 or wiedm001@umn.edu

*Professor Timothy Wiedmann has over 20 years of experience in providing technical support for the inhalation delivery of drugs, chemicals and particulate systems to rodent animal models using a wide array of aerosol generation devices.*

AeroCore is positioned strictly as a service facility, but the close connection to the academic-rich environment of the University with faculty in the College of Pharmacy, Cancer Center, Particle Technology Laboratory, and the Center for Lung Science and Health allow for independent, supportive research consultation and collaboration.

[www.pharmacy.umn.edu/aerocore](http://www.pharmacy.umn.edu/aerocore)

Save the Date

May 20-22, 2014

## David Grant Symposium

The David Grant Symposium focuses on the cutting edge developments in the field of solid-state pharmaceuticals. Speakers are leaders and active researchers from both academia and industry. The symposium will have three sections:

- ▶ amorphous pharmaceuticals
- ▶ crystalline pharmaceuticals
- ▶ materials science and technology in pharmaceutical powders

For more information please contact  
Dr. Changquan Calvin Sun at [sunx0053@umn.edu](mailto:sunx0053@umn.edu).

July 2014 (date TBA)

## Basic Pharmacokinetic Concepts for the Pharmaceutical Scientist

This live short course will present fundamental pharmacokinetic concepts in a manner that will allow participants without a specific pharmacokinetic background to subsequently apply these principles to their work. For more information and to register, visit

<http://ce.pharmacy.umn.edu/discover/basic/>

# Center For Translational Drug Delivery (CTDD)

## Coordinated Multidisciplinary Product Development Solutions

Pharmaceutical Development - Strategic Partnerships to help achieve flexibility, efficiency, and cost reductions. Our experts have several years of industry and academic experience in preformulation, formulation and process development to help you accelerate development and reduce time and cost.

Experts come under one roof to overcome the challenges in drug delivery. We have global infrastructure, therapeutic expertise and unmatched commitment to quality research and development. We have the expertise to solve complex development challenges, in small or large molecules, for both branded and generic pharmaceutical companies. Our experts have worked directly with FDA and USP, both in training scientists and in developing pharmacopoeial guidelines.

**MATERIAL SCIENCES** Science-driven Quality-by-Design (QbD) strategies, API-sparing techniques and platforms that can be easily adopted for expedited pharmaceutical development. **OVERCOMING TABLETING ISSUES** Designs that replace trial and error and improve the quality of results through clear understanding of flow and compaction properties of pharmaceutical drugs and excipients. **IMPROVED ORAL BIOAVAILABILITY** State-of-art nanotechnology platforms for improving the permeability and oral bioavailability of hydrophobic and poorly permeable drugs. **PHARMACOKINETICS** Modulating the biochemical and physiological determinants of drug absorption, distribution and elimination to improve targeted bioavailability. **STATE-OF-THE-ART ANALYTICAL SKILLS** Extensive and coordinated analytical capabilities encompassing physical, chemical and biological testing techniques. **MOLECULAR IMAGING** Preclinical in vivo imaging technologies for the pharmaceutical, diagnostic and medical device applications.

### DIRECTOR – Raj Suryanarayanan, Ph.D.

Professor and William & Mildred Peters Endowed Chair in the Department of Pharmaceutics, University of Minnesota

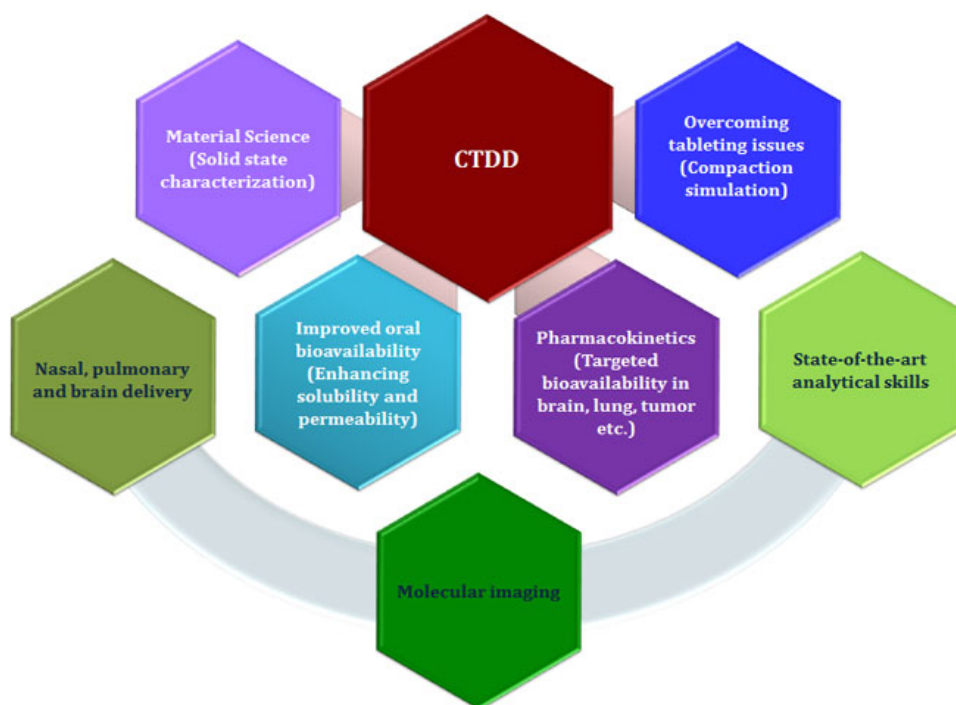
Research interests in the broad area of pharmaceutical materials science. Current research projects: • Characterization and stabilization of amorphous pharmaceuticals. Evaluate influence of molecular mobility on stability of amorphous drugs and dispersions. • Understand role of processing and storage induced phase transitions on properties of pharmaceutical dosage forms. • Develop novel applications of powder X-ray diffractometry for characterizing pharmaceutical dosage forms.

### ASSOCIATE DIRECTOR – Swayam Prabha, Ph.D., MBA

Assistant Professor of Pharmaceutics and Associate Director of Center for Translational Drug Delivery, College of Pharmacy, University of Minnesota

Over 10 years of pharmaceutical and biotech industrial experience. Prior to joining the University of Minnesota in 2012, served as Senior Manager for Formulation and Process Development, Valeant Pharmaceuticals. Primary expertise in dosage form design, formulation and process development, technical operations and technology transfer.

[www.pharmacy.umn.edu/ctdd](http://www.pharmacy.umn.edu/ctdd)



# Graduate Student News

## Degrees Earned

**Michael Robert Burcusa, M.S.** [2013] Thesis: *Excipient Phase Behavior in the Freeze-Concentrate*. Advisor: Prof. Raj Suryanarayanan

**Sayantana Chatteraj, Ph.D.** [2012] Thesis: *Structure-Property Relationships of Solids in Pharmaceutical Processing*. Advisor: Prof. Changquan Calvin Sun

**Tanmoy Sadhukha, Ph.D.** [2013] Thesis: *Targeted Magnetic Hyperthermia for Lung Cancer*. Advisor: Prof. Jayanth Panyam

**Ramola Sane, Ph.D.** [2012] Thesis: *Improving Delivery of Elacridar to Enhance Efficacy of Molecularly Targeted Agenda in Treatment of Glioma*. Advisor: Prof. William Elmquist

## 2013-2014 Graduate Fellowship Recipients

The **3M Fellowship in Science and Engineering** is awarded to a promising student with interests in drug development. The recipient is **Sampada Koranne**. (Advisor: Dr. Raj Suryanarayanan)

**AFPE Pre-Doctoral Fellowships** are awarded to outstanding pre-doctoral graduate students. **Karen Parrish** is this year's recipient. (Advisor: Dr. William Elmquist)

The University of Minnesota Graduate School awards the **Doctoral Dissertation Fellowship** to top U of M graduate students in their final year as they are preparing to defend their Ph.D. theses. For the first time, two Pharmaceutics students received these highly competitive fellowships in the same year. They are **Khushboo Kothari** (Advisor: Dr. Raj Suryanarayanan) and **Lin Niu** (Advisor: Dr. Jayanth Panyam). Khushboo's thesis research centers on stabilizing amorphous pharmaceuticals, and Lin's thesis research is focused on the application of nanoparticle formulation for cancer vaccines.

The **David J.W. Grant and Marilyn J. Grant Fellowship in Physical Pharmacy** is awarded to students whose research is focused in physical Pharmacy. **Frederick Osei-Yeboah** was this year's recipient. (Advisor: Dr. Calvin Sun)

The **Edward G. Rippie Fellowship in Pharmaceutics** is awarded to students with a consistent and outstanding academic record. It has been awarded to **Lin Niu**. (Advisor: Dr. Jayanth Panyam)

The **Ronald J. Sawchuk Fellowship in Pharmacokinetics** is awarded to a graduate student whose research is focused in pharmacokinetics. **Shruthi Vaidhyanathan** received the award. (Advisor: Dr. William Elmquist)

## Graduate Student Activities

**Ameya Kirtane** received the 2013 AAiPS Research Award from the American Association of Indian Pharmaceutical Scientists.

**Khushboo Kothari** received the 2013 AAPS Graduate Student Symposium Award in Physical Pharmacy and Biopharmaceutics and

will present her research at AAPS in November in San Antonio, TX. She received a 2013 AAiPS Research Award from the American Association of Indian Pharmaceutical Scientists.

**Mehak Mehta** received the 2013 IPEC Foundation Graduate Student Scholarship Award. This award recognizes excellence in research conducted in the field of excipients. In May 2013 she was an instructor in the BioCoR short course *Preservation of Molecular, Cellular and Tissue Biospecimens* at the University of Minnesota, Minneapolis, MN. Her presentation was entitled *Freeze-Drying*. She received the 2013 AAPS Graduate Student Symposium Award in Analysis and Pharmaceutical Quality and will present her research in a podium presentation on *Controlling the Physical Form of Mannitol in Freeze-dried Formulations* on Tuesday, November 12, 2013 from 8:00-11:00 am.

**Pinal Mistry** received a 2013 AAPS Travelship Award from the Physical Pharmacy and Biopharmaceutics (PPB) section sponsored by DFE Pharma. She will be presenting her poster entitled *Effect of Ionic Interactions on the Molecular Mobility and Physical Stability of Amorphous Solid Dispersions* at the upcoming AAPS annual meeting in San Antonio, TX (Poster # W5155, 1:30-4:30 PM session).

**Rajneet Oberoi** gave a podium presentation on her work on *Restricted Delivery of Sunitinib Malate into the Brain: Role of Efflux Transporters* at PGSRM 2013 at the University of Iowa. She received a 2013 AAPS-PPDM Travelship Award for her upcoming poster presentation entitled *Characterization of Brain Distribution of Sunitinib Using a Population-Based Approach in a Murine Serial Sacrifice Design*.

**Nidhi Sharda** gave a podium presentation at the June 2013 PGSRM at the University of Iowa titled *Disrupted Vesicular Trafficking Impairs Amyloid Clearance in Alzheimer's Disease*.

**Shruthi Vaidhyanathan** participated in a 2013 summer internship at Vertex Pharmaceuticals in Cambridge, MA under the guidance of Dr. Niresh Hariparsad and Jacqueline Lynch. Her research project involved optimization of the hepatocyte CYP induction assay and LS-180 intestinal induction assay for improving in vitro drug-drug interaction (DDI) prediction using SimCYP.

## Pharmaceutics welcomed new students in fall 2013

**Mr. Shao-Yu Chang** earned a B.S. in Materials Science & Engineering in 2007 from National Cheng Kung University in Tainan, Taiwan, followed by a M.S. in Materials Science & Engineering in 2012 from the University of Florida, Gainesville.

**Mr. Hyunjoon Kim** earned a B.Pharm. in 2009 and an M.Pharm. in Clinical Pharmacy in 2011 from Kyungsung University in Pusan, Korea.

**Ms. Sampada Koranne** earned a B.Pharm. in 2011 from the University of Pune in Nashik, India, and an M.Sc. in Drug Delivery/Pharmaceutics in 2012 from the University College of London, UK.



L to R: Hyunjoon Kim, Sampada Koranne, Shao-Yu Chang

## Graduate Student Organizations

### 2013-2014 Pharmaceutics Graduate Student Representatives

Nidhi Sharda and Michelle Fung



### 2013-2014 AAPS Student Chapter Officers

*Chair:* Mehak Mehta (Pharmaceutics)

*Chair-Elect:* Karen Parrish (Pharmaceutics)

*Secretary:* Frederick Osei-Yeboah (Pharmaceutics)

*Treasurer:* Garvey Liu (Pharmaceutics)

*Web Coordinator:* Chay Ngee Lim (Experimental and Clinical Pharmacology)

*Student Outreach Officer:* Youssef Roman (Experimental and Clinical Pharmacology)

The AAPS Student Chapter organized several educational activities in 2012-13. Career development workshops on various topics such as industrial job search strategies, creating 'sticky' presentations, conflict resolution, and work/life balance were organized for graduate students and postdoctoral associates. The Annual Kick-Off Meeting held in September 2013 welcomed new students to the Chapter, with a focus on developing strategies to enhance student diversity in the day-to-day operations of the Chapter. This year, the Chapter will introduce a t-shirt design contest with the goal of presenting a message that concisely illustrates interdisciplinary pharmacy (teamwork in pharmacy). The winning design could be used as honoraria for invited speakers. Workshops focusing on soft skill development such as networking, communication and interviewing skills will be organized throughout the academic year.

## People

### GPEN – Globalization of Pharmaceutics Education Network

Monash University in Melbourne, Australia hosted the November 2012 GPEN meeting. On behalf of our program, a podium presentation entitled *Mechanisms Limiting Distribution of Novel BRAF Inhibitors to the Brain: Implications in the Treatment of Melanoma Brain Metastases* was made by **Dr. Raj Mittapalli** (research associate, Elmquist lab), and **Mr. Ameya Kirtane** presented *Polymeric Nanoparticles for Tumor Targeted Delivery of Tylocrebrine* (graduate student, Panyam lab). **Professors William Elmquist** and **Raj Suryanarayanan** were the faculty representatives at this meeting.

**Dongfeng Cao, Ph.D.**, joined Prof. Ronald Sawchuk's lab as a postdoctoral associate in August 2013. Before joining the Dept. of Pharmaceutics she was an Assistant Program Director and Research Assistant Professor in the Dept. of Experimental and Clinical Pharmacology, College of Pharmacy, University of Minnesota. She grew up in Handan, a historical middle city in northern China and earned her Ph.D. degree in Chongqing, China.

**Ms. Kristen M. Jaruszewski**, a junior scientist in Dr. Karunya Kandimalla's research group at the Mayo Clinic College of Medicine in Rochester, MN, will graduate in fall 2013 from Florida A&M University with a Ph.D. in pharmaceutics and pharmacokinetics. She has been selected for the 2013 AAPS Graduate Symposium in Biotechnology at the AAPS Annual Meeting in November in San Antonio, TX.

**Mamta Kapoor, Ph.D.**, was selected to receive a Baxter Young Investigator Award. This award program was developed to stimulate and reward research that can be directly used for critical care therapies and the development of medical products that save and sustain patients' lives. Dr. Kapoor is a postdoctoral associate in Prof. Ronald Siegel's lab.

**Benyong Lou, Ph.D.** from Minjiang University in Fuzhou, China, joined Prof. Calvin Sun's lab as a visiting professor (Oct. 2013–Oct. 2014). His work involves crystal engineering and crystallization of drugs.

**Courtney Meeker** and Lucas Howell were wed on October 5, 2013 and honeymooned in Iceland. Courtney is assistant to Prof. Raj Suryanarayanan in the Peters Endowed Chair office.

**Raj Mittapalli, Ph.D.**, a research associate in Prof. William Elmquist's lab, accepted a position at AbbVie (a research-focused offshoot of Abbott Laboratories) as a Senior Clinical Pharmacokineticist in the Department of Clinical Pharmacology and Pharmacometrics.

**Siddharthya Mujumdar, Ph.D.**, a biomedical engineering graduate of Prof. Ronald Siegel's lab, moved lock, stock and barrel from Boehringer-Ingelheim in the USA to Novartis Pharma AG in Basel, Switzerland in February 2013. He is working as a Formulation Expert in the newly formed group, the Continuous Manufacturing Unit.

**Jeanene Noll, M.Ed.**, an alumna and long-time employee of the University of Minnesota, was honored for her volunteerism, along with other University volunteers, at an annual reception held September 19 at Eastcliff, home of the University's president. Jeanene is located in the departmental office.

**Eric Nuxoll, Ph.D.**, Assistant Professor of Chemical Engineering at the University of Iowa, announced the arrival of a new daughter, Cecilia. He was a postdoctoral associate in Prof. Ronald Siegel's lab.

**Naveen Thakral, Ph.D.**, a postdoctoral associate for Prof. Raj Suryanarayanan, is the recipient of a Lilly Innovation Fellowship Award (LIFA). The award, totaling over \$100,000, was created by Eli Lilly and Company with the goal of identifying and fostering exceptional postdoctoral scientists pursuing ground-breaking research projects. The program pairs the postdoctoral scientist with the academic mentor (Dr. Sury, University of Minnesota) and a Lilly scientist (Dr. Greg Stephenson) who serves as an industry mentor, to advance the research project entitled *Design Space of Manufacturing Processes – Potential for Phase Transformation and Development of Control Strategy*. The postdoctoral fellow will typically work at both the academic institution and at a Lilly research site, with access to Lilly scientists and technologies.

**Seema Thakral, Ph.D.**, joined Dr. Suryanarayanan's lab as postdoctoral associate in October 2013. She has ~12 years of teaching experience and is the recipient of a BOYSCAST fellowship by DST, Government of India. She plans to continue work on process-induced polymorphic

phase transformation in active pharmaceutical ingredients.

**Mr. Chenguang Wang**, a Ph.D. student from Huazhong University of Science and Technology in Wuhan, China, worked in Prof. Calvin Sun's lab from June to September, 2013. His project involved developing a three-point bending method for characterizing mechanical properties of ribbons.

**Xin Yao, Ph.D.**, an associate professor in the School of Chemistry and Chemical Engineering, Graduate University of Chinese Academy of Sciences (Shijingshan District) in Beijing, China, is spending a year in Prof. Timothy Wiedmann's lab to study the synthesis of rod-like magnetic iron nanoparticles ( $\gamma\text{Fe}_2\text{O}_3$ ), followed by coating with gold (Au) to obtain Au- $\gamma\text{Fe}_2\text{O}_3$  hybrid nanocomposites. The potential application of these particles in lung cancer is highly significant.

**Dr. Jianjun (Andrew) Zhang**, China Pharmaceutical University, is a visiting professor in Prof. Raj Sury's laboratory. Dr. Zhang's research interests are in the areas of drug delivery (both large and small molecules) and physical and industrial pharmacy. He worked in the Center for Drug Evaluation of China's State Food and Drug



Administration and in the last four years has published in the fields of polymorphism, cocrystals, amorphous materials, liquid crystal and nanocrystals and has several issued or pending patents. He has worked extensively in drug product development and has completed

work on more than 30 oral, topical and parenteral drug products. His wife Angela is also a professor at China Pharmaceutical University. They have a 15-year-old daughter, Athena.

## Faculty News and Activities

### *Pharmaceutics faculty are working to understand and develop . . .*

- drug delivery to the central nervous system to treat Alzheimer's, brain cancer, pain, addiction
- targeted drug delivery to treat cancers
- respiratory delivery methods to treat a variety of conditions including lung cancer
- delivery of drug to treat middle ear infections
- engineered nanoparticles to target drugs to the desired sites
- polymer drug delivery for infertility, diabetes, seizures
- behavior and movement of a drug to its intended destination in the body
- science and engineering of drug formulations
- strategies to enhance drug availability to the body

**PROFESSOR WILLIAM F. ELMQUIST** was invited to give the following talks this year:

- *The Many Ways the BBB Can Limit Drug Delivery to the CNS.* MD/PhD Program, U Minnesota, Minneapolis, MN, October 2012.
- *Impact of BBB Transporters on Delivery and Efficacy of Molecularly-Targeted Agents in Brain Tumors.* Joint ASCEPT-APSA Annual Meeting, Sydney, Australia, December 2012.
- *Targeted Delivery to Brain Tumors.* 9th Annual Mid-Winter Brain Tumor InterSPORE Workshop, Ross Bridge Renaissance Golf Resort and Spa, Birmingham, AL, February 2013.
- *Chemotherapy Distribution to the CNS: Problem of the Efflux Pump.* 19th Annual Oregon Health Sciences BBB Meeting, Skamania Lodge, Stevenson, WA, March 2013.
- *Improving Delivery of Molecularly-Targeted Agents To Invasive Glioma.* St. Jude Children's Hospital, Pharmaceutical Sciences, Memphis, TN, April 2013.
- *The Structure and Function of the Blood-Brain Barrier In Normal Brain and Brain Tumors – Limiting Treatment.* Mayo-UMn Brain Tumor Retreat, Rochester, MN, May 2013.
- *Delivery of Molecularly Targeted Agents to the Brain: Case Studies in Brain Tumor.* Roskamp Institute, Sarasota Florida, August 2013.
- *Mechanisms Limiting Delivery of Novel Molecularly Targeted Agents to Brain Tumors.* Pfizer Oncology and Drug Metabolism and Disposition, La Jolla, CA, September 2013.
- *Delivery of Targeted Agents to Primary and Secondary Brain Tumors.* Second Minnesota Neuro-Oncology Symposium, Minneapolis, MN, September 2013.

**PROFESSOR CAROLYN A. FAIRBANKS** and her research team continue to contribute their expertise in intrathecal and epidural drug delivery for translational research collaborations with industry and other academic groups (e.g., the University of Minnesota's Center for

Translational Medicine). Her research interests focus on targeted delivery of gene therapeutics to specific CNS neuronal subpopulations.

She and her team have been invited to contribute two articles in this particular area to a specialty section to the review journal *Frontiers in Neuroscience*. They also continue to investigate mechanisms underlying the development of addiction under conditions of chronic pain; an article summarizing these findings is in press at *PLoS One*. Her lab also continues to research endogenous mechanisms of spinal analgesia. Her research is supported in part by the National Center of Complementary and Alternative Medicine (NCCAM) to investigate endogenous mechanisms of electro-acupuncture-induced analgesia.

In 2013, Dr. Fairbanks received a U13 small conference grant from NCCAM to support a meeting entitled *CAM: Roles in Chronic Pain Management and Research*. She organized and implemented this symposium as a pre-conference to the 2013 American Pain Society (APS) meeting in New Orleans in May. A keynote speaker in this pre-conference was well-known scientific leader Dr. Candace Pert, whose significant contributions to neuropharmacological research included the discovery of the opioid receptors. Dr. Pert is also particularly known as a role model and mentor for women in science; Dr. Fairbanks and her graduate students will always treasure the time, knowledge, and encouragement Candace generously shared with them.

As University of Minnesota IACUC Vice Chair for Biomedical Sciences, Dr. Fairbanks continues to work with the new Vice President of Research, Dr. Brian Herman, with the unwavering goal of improving the research environment at the U. In March she gave a presentation at the annual *Public Responsibility in Medicine and Research* (PRIM&R) meeting in Baltimore on her visioning and development of the IACUC Faculty Liaison position and the impact it has had on improving the research environment at the University of Minnesota.



## Visit by U of M President Kaler



University of Minnesota President Eric Kaler visited the Dept. of Pharmaceutics on May 3, 2013 to meet the faculty and learn about their research, teaching and outreach. He received an overview of the Department's research centers — AeroCore, Center for Translational Drug Delivery, and the Brain Barriers Research Center — and toured the Weaver-Densford Hall research facilities.

**PROFESSOR KARUNYA KANDIMALLA** has been investigating the pathophysiological mechanisms driving toxic amyloid beta (A $\beta$ ) protein accumulation and cognitive decline in Alzheimer's disease (AD) brain. During the last year, Dr. Kandimalla's research group has elucidated the impact of insulin on A $\beta$  clearance from the AD brain and is working to isolate key molecular targets modulated by insulin to engender changes in A $\beta$  distribution between the brain and peripheral circulation. In addition, they continue to collaborate with investigators at the Mayo Clinic College of Medicine in Rochester, MN and at the National High Magnetic Field Laboratory in Tallahassee, FL to develop nanotheranostics for the diagnosis and treatment of AD and cerebral amyloid angiopathy. The Kandimalla group is also developing novel drug delivery systems to disrupt microbial biofilms and inhibit quorum-sensing circuitry, which promotes antibiotic resistance in bacterial biofilms.

Dr. Kandimalla was invited to give the following presentations:

- *Development of Multifunctional Nanovehicles for the Diagnosis and Treatment of Cerebral Amyloid Angiopathy*, Neurology Grand Rounds, University of Minnesota, Minneapolis. April 2013.
- *Novel Drug Delivery Approaches to Disrupt Bacterial Biofilms*, Upsher-Smith Pharmaceuticals, Maple Grove, MN, April 2013.

Dr. Kandimalla was conferred the title of Adjunct Associate Professor in Neurology title by the Mayo Clinic College of Medicine, Rochester, MN. He has also submitted a provisional patent for *Nanotheranostic Probe to Facilitate Diagnosis and Treatment of Cerebral Amyloid Angiopathy*.

**PROFESSOR JAYANTH PANYAM** was named a 2013-14 Academic Research Fellow by AACP. The year-long leadership program is designed to expand the capabilities of established faculty research scientists and administrators to cultivate collaborative team research and graduate education within and across institutions.

Dr. Panyam received a Minnesota Futures Grant for his research on *Targeting Metastatic Breast Cancer with Dual Specificity*. He was also invited to give presentations on:

- *Magnetic Hyperthermia For Lung Cancer, Nanotechnology and Nanomedicine*, 5th Annual IEM Symposium, Minneapolis, MN (August 2012).
- *Targeting Tumor-Initiating Cells*, NanoDDS '12, Atlantic City, NJ (December 2012).

Dr. Panyam participated in -- and finished -- the 2013 Twin Cities Marathon.

**PROFESSOR SWAYAM PRABHA** joined the Dept. of Pharmaceutics in 2012 as a Research Assistant Professor and is Associate Director for the Center for Translational Drug Delivery. Dr. Prabha received the College of Pharmacy's New Research Directions Grant for her project *Lipid Based Drug Delivery Systems to Enhance the Absorption of Poorly Bioavailable Drugs*.

Dr. Prabha is Co-Investigator on an NIH/SAIC-F grant to study the development and manufacturing of clinical formulations of propofol hemisuccinate for inhalation delivery.

**PROFESSOR RONALD A. SIEGEL** delivered invited lectures at the University of Belgrade in Serbia, at Chalmers University in Gothenburg, Sweden, and at the University of Tennessee Health Sciences Center in Memphis, as well as a keynote lecture at the CODIRECT conference in Sodertalje, Sweden. These lectures dealt with his work on remote glucose sensing by hydrogels and the micro- and nanofabrication techniques that are being used in sensing and drug delivery.

Dr. Siegel has been appointed to the Board of Advisors for SuMo, an academic-industrial consortium on soft biomaterials operating out of Chalmers University in Gothenburg. Dr. Siegel has also revived his research into nasal delivery of anti-epileptic drugs, and recently published a paper in *Molecular Pharmaceutics* regarding the co-delivery of water soluble prodrugs with their converting enzymes as a means of administering water insoluble drugs across mucosal membranes. Finally, Dr. Siegel remains as Program Director of the

Biomaterials and Pharmaceutical Materials program in IPRIME, an academic/industrial consortium at U of M, which is concerned with materials and interfacial engineering.

**PROFESSORS RAJ SURYANARAYANAN and CALVIN SUN** are among the members of NIPTE (the National Institute for Pharmaceutical Technology and Education) who received a Critical Path Manufacturing Sector Research Initiative (UO1) for their project *Evaluation of Polymorphic Changes in Tablet Manufacture and Storage Using Solid-State NMR Spectroscopy and X-Ray Diffraction*.

**PROFESSOR CHANGQUAN CALVIN SUN** was promoted with tenure to Associate Professor in July 2013. He was invited to give several presentations this year:

- *Materials Science Tetrahedron for Pharmaceutical Research*, St. John's University, Queens, NY (April 2013).
- Two lectures on *Effects of Water on Mechanical Properties of Pharmaceutical Powders* and *Particle Engineering for Enhanced Powder Manufacturability* at the 48th AAPS Arden Conference, USP Meeting Center, Rockville, MD (March 2013).
- *Powder Compaction – Physics, Characterization, and Industrial Applications*, Schlumberger, Sugarland, TX (March 2013).
- *Solubility and Solubilization of Drugs*, Institute for Therapeutics Discovery & Development, University of Minnesota, Minneapolis, MN (March 2013).
- *Materials Science and Engineering for Expedited Development of High Quality Tablet Products*, Zoetis, Kalamazoo, MI (February 2013).
- *Overcoming Pharmaceutical Powder Problems through Crystal and Particle Engineering*, New Jersey Institute of Technology, NJ (February 2013).
- *Critical Material Properties for Successful Manufacture of ASD Tablets*, 2nd Annual Enhancing Drug Bioavailability & Solubility Conference, Boston, MA (January 2013).

**PROFESSOR RAJ G. SURYANARAYANAN** was selected to receive the 2013 AAPS David J.W. Grant Research Award in Physical Pharmacy, and will receive it on November 10 at the AAPS Annual Meeting in San Antonio, TX. During the meeting he will also receive the PhRMA Foundation Award in Excellence in Pharmaceuticals. Dr. Sury was selected Professor of the Semester for Spring 2013 by the Pharm.D. class of 2016.

Dr. Suryanarayanan is a co-investigator on a Vanderbilt University grant for the project *Development of VUM4P1 as a Novel Approach to Treatment of Parkinson's Disease*. The project is funded by NCCR/NIH as a CTSA collaboration between Vanderbilt and the University of Minnesota.

Dr. Suryanarayanan gave several invited presentations in 2013:

- *Phase Behavior of Excipients in Lyophilized Formulations: Potential Implications on Product Performance*, Cambridge Healthtech Institute's 12<sup>th</sup> Annual Pep Talk, Palm Springs, CA, January 2013.
- *Frozen and Freeze-dried Systems – Materials Science Issues*, Chicagoland Pharmaceutical Discussion Group, March 2013.
- *Monitoring Phase Transitions in Frozen Systems and During Freeze drying: Potential Implications on Product Performance*, International Society of Lyophilization – Freeze Drying, Inc. Midwest Chapter Annual Meeting, April 2013.
- *Crystallization of Amorphous Phases- Characterization by Dielectric Spectroscopy and X-ray Diffractometry*, Pharmaceutical Powder X-ray Diffraction Symposium (PPXRD-12), Beijing, China, May 2013.

- *Applications of XRD in Preformulation and Formulation Studies*, Pharmaceutical Powder X-ray Diffraction Symposium (PPXRD-12), Beijing, China, May 2013.
- *Physical Form of API and Excipients – Importance in Oral and Parenteral Formulations*, Mitsubishi Tanabe Pharma, Osaka, Japan, May 2013.
- *Excipients – Role in Drug Product Performance*, 45<sup>th</sup> Annual Pharmaceutics Graduate Student Research Meeting, Iowa City, Iowa, June 2013.

**PROFESSOR TIMOTHY WIEDMANN** visited Shenyang Pharmaceutical University, China to discuss interactions between the pharmaceuticals disciplines at SPU and the University of Minnesota. SPU has a specific interest in developing collaborations in aerosol drug delivery with applications to lung cancer and a possible joint venture in clinical trials. Prof. Wiedmann is working with Dr. Xiang Kou on a strategy for expanding education opportunities for scientists in the China-based pharmaceutical industry.

Prof. Wiedmann was heavily involved in several Pharmacy committees this year:

- Graduate Education Policy Committee (GEPC) to develop policies and guidelines for the oversight of graduate programs by the College, and engage in early discussions in framing the College's constitution.
- Faculty Consultative Committee, which developed statements regarding Pharmacy's promotion of certain levels of faculty.
- redesigned the educational approach to the Pharm.D. biopharmaceutics course in which a "flipped" classroom was used. This relies on students to engage in self-learning of course materials to master the underlying physicochemical and physiological principles underlying drug delivery. Class time is used to demonstrate application of this principle to currently prescribed drug products.

Prof. Wiedmann served as a consultant to faculty/scientists in several academic and industrial institutions for the respiratory delivery of agents to target eosinophils in the lung, evaluation of toxicity of agents, lung aspiration of nasal fluids by cystic fibrotic patients, development of agent-conserving exposure systems for rodent animal models, development of novel approaches for the coadministration of agents, and design and preparation of ocular implants for eye disease of the retina.

**PROFESSOR CHERYL L. ZIMMERMAN** accompanied eight Pharm.D. students, two nurses and a physician on a medical mission to Haiti in March 2013. Dr. Zimmerman and another pharmacist functioned as the pharmacy preceptors in a rural primary care and immunization clinic, which the group set up in a church on the site of an elementary school. The team worked with Haitian physicians to treat the students, parents and people from the surrounding countryside. The four-day clinic treated almost 400 patients and dispensed approximately 1,200 prescriptions. The student-run organization, CARE For Haiti (Clinics and Relief Efforts For Haiti) is planning annual medical missions and will continue to treat the community of Chabin for acute conditions. The next trip is planned for March 2014, and Dr. Zimmerman will again accompany the team. Please see their Facebook page for more information and photos ([www.facebook.com/CareForHaitiClinicsAndReliefEfforts](http://www.facebook.com/CareForHaitiClinicsAndReliefEfforts)).

Dr. Zimmerman was selected Professor of the Semester for Fall 2012 by the Pharm.D. student class of 2015 for her course, *Pharmacokinetics*. She visited South Dakota State University in Brookings on May 10, 2013 as a guest of the SDSU Student Chapter of the AAPS and presented a talk entitled *A Pharmacokinetic Approach for Assessing Lung Cancer Risk in Smokers*.

# Recent Publications

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**San Antonio, TX**

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