

# Indispensable News

# MinneCeutics

University of Minnesota

Fall 2012

Department of Pharmaceutics

## PHARMACEUTICS FACULTY

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

## AFFILIATE FACULTY

**Walid M. Awni**, Abbott Laboratories. **Richard C. Brundage**, Dept. of Experimental and Clinical Pharmacology, University of Minnesota. **Belinda Cheung**, Graduate School, University of Minnesota. **Lester R. Drewes**, Dept. of Biochemistry and Molecular Biology, University of Minnesota-Duluth. **William H. Frey, II**, Alzheimer's Institute, Regions Hospital, St. Paul, Minnesota. **Michael D. Karol**, Synta Pharmaceuticals Corp. **Z. Jane Li**, Pfizer, Inc. **John R. Ohlfest**, Dept. of Neurosurgery and Pediatrics, University of Minnesota. **Theresa M. Reineke**, Dept. of Chemistry, University of Minnesota. **Jann N. Sarkaria**, Dept. of Radiation Oncology, Mayo Clinic. **Evgeniy Y. Shalaev**, Pfizer, Inc. **Timothy S. Tracy**, College of Pharmacy, University of Kentucky. **Chun Wang**, Dept. of Biomedical Engineering, University of Minnesota. **Joseph A. Zasadzinski**, Dept. of Chemical Engineering and Materials Science, University of Minnesota

## FROM THE DEPARTMENT HEAD

Dear Friends,

It is a pleasure for me to greet you again this year. The department remains active in all facets of the academic mission, including our teaching, service and of course, our scholarly and research efforts.

We have been an integral part of the College's efforts to revise the professional program curriculum, incorporating our innovative teaching techniques and our dedication to the fundamentals of pharmaceutical sciences. We thank all those involved, especially Tim Wiedmann.

The department faculty is producing exciting new knowledge in many diverse areas of pharmaceutics, such as solid state characterization, biopharmaceutics, targeted delivery, and pharmacokinetics-pharmacodynamics. As always, these cutting-edge contributions to the literature are made possible by our incredibly talented and hardworking graduate students and postdocs.

We have two new initiatives in the college, led by the pharmaceutics faculty. The AeroCore lab, with 2000 square feet of dedicated space, is a research facility with the capability to generate and characterize aerosols, expose rodents to aerosols then make appropriate in vivo evaluations. This facility is directed by Jayanth Panyam and Frank Ondrey (Medical School), and Tim Wiedmann, with his long and distinguished experience in this field, will provide the scientific and technical leadership. The next new initiative, the Center for Translational Drug Delivery (CTDD), led by Raj Suryanarayanan, is designed to develop collaborative relationships with pharmaceutical companies in drug delivery. For this purpose, the center will bring together faculty from the College of Pharmacy, Medical School and the College of Science and Engineering and leverage our comprehensive multidisciplinary expertise in drug delivery. Since we are looking for opportunities to develop collaborative relationships, please spread the word around. We will have a website developed soon for each of these initiatives.

Dr. Karunya Kandimalla has arrived and has hit the ground running. He has secured partnership funding with the Mayo Clinic for his work in Alzheimer's and has made significant progress in getting his blood brain barrier research underway here at Minnesota. Our Brain Barriers Research Center (BBRC) is flourishing with new exciting collaborations with the Mayo Clinic in brain tumor research. Also, Dr. Cheryl Zimmerman is establishing a Modeling and Simulation Core Laboratory that will help our graduate students and postdocs have access to a centralized facility for data analysis and modeling. These are just some of the exciting examples of the innovative work the department is doing to advance the science of pharmaceutics.

I personally would like to thank all of you, our friends and alumni, who have supported our fellowships and initiatives, and helped the department in many ways by being strong ambassadors of good will and through helping us with your time and talent.

This has been both a rewarding and challenging year. Best wishes to all for a safe and productive year ahead.

With kind regards,



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



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## ALUMNI NEWS

**Sagar Agarwal, Ph.D.** [2011], and Surekha Bansal married on June 29th 2012 in Pune, India. Nagdeep Giri and Martha Ruohoniemi represented Minnesota at the wedding. He received the University of Minnesota Graduate School's Best Dissertation Award in Biological and Medical Sciences in 2012.

**Sunny Bhardwaj, Ph.D.** [2012], accepted a position as Senior Scientist in the Basic Pharmaceutical Sciences Division of Merck and Co. in Rahway, New Jersey. Sunny received the 2012 AAPS Graduate Student Symposium Award in Physical Pharmacy and Biopharmaceutics sponsored by Bristol-Myers Squibb. The topic of his podium presentation at the upcoming October AAPS meeting in Chicago, IL is *Molecular mobility as an effective predictor of the physical stability of amorphous state*. He was invited to present *Molecular mobility in amorphous state: implications on physical stability* at Upsher-Smith Laboratories, Inc. in January 2011 in Minneapolis, MN.

**Paroma Chakravarty, Ph.D.** [2010], and her fiancé Sriram were married on October 23 in San Francisco and had a traditional wedding in Bangalore months later.

**Robert K. Schultz, Ph.D.** [1993] received the 2012 U of M Alumni Service Award on October 11, 2012. This award recognizes service as a volunteer to the University. Bob graduated from the U of M College of Pharmacy in 1979 and went on to earn his Ph.D. in Pharmaceutics in 1993. Following his work at 3M, he moved to California and is currently the President and Chief Operating Officer of REVA Medical, Inc., a company dedicated to developing minimally invasive medical devices.

**Shifeng Bill Wei, Ph.D.** [1991], started a company in Beijing, China late last year. The business model is to develop difficult to formulate generics and 505b2 products and out-license to pharma companies.

**Haijian Jim Zhu, Ph.D.** [1997], received the following patents:

- X. Liao, A. Grill, H Zhu: Solvate and Crystalline Forms of Carbamoyl-Cyclohexane Derivatives, Nov. 9, 2010, US Patent 7,829,569
- R. Sanghvi, A. Grill, R. Surana, H Zhu: Crystalline Form of Linaclotide, July 17, 2012, US Patent 8,222,201
- H. Higuera, A. Grill, H Zhu: Novel Crystalline Form of 2-[4-(4-Fluoro-Benzyl)-Piperidine-1-Yl]-2-Oxo-N-(2-Oxo-2,3-Dihydro-Benzox- Azol-6-Yl)-Acetamide, US Patent application: 20100010044

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## GRADUATE STUDENT ORGANIZATIONS

**2012-2032 Pharmaceutics Graduate Student Representatives:** Karen Reidl, Pinal Mistry

**2012-2013 AAPS Student Chapter Officers:**

- Chair: Khushboo Kothari (Pharmaceutics)
- Chair-Elect: Mehak Mehta (Pharmaceutics)
- Secretary: Kinjal Sanghavi (Experim. & Clin. Pharmacology)
- Treasurer: Karen Parrish (Pharmaceutics)
- Web Coordinator: Harrison Tam (Experim. & Clin. Pharmacology)
- Student Outreach Officer: Shruthi Vaidhyanathan (Pharmaceutics)

The AAPS Student Chapter organized several educational and social activities in 2011-12. Career Development workshops on Industrial Job Search Strategies were organized for graduate students and post-doctoral associates. A Pharmacy Research Day was held in May 2012 to provide a platform for inter-disciplinary interactions among various components of the College of Pharmacy. The Chapter has continued to be active in inviting outside speakers to meet with students and faculty members. In March 2012, Dr. Reinhard Gabathuler, Vice President of Research and Development at Bioasis Technologies in Vancouver, Canada, was invited to meet with students and faculty and talk about Development of New Peptide & Protein Vectors for the Delivery of Therapeutics to the Brain. A campus Bowling Nite was held in February at Goldy's Gameroom in Coffman Union, and everyone enjoyed an evening of bowling, pizza and conversation. The AAPS Annual Kick-off Meeting was held in September 2012 to welcome new students to the chapter, with a focus on developing strategies to enhance student diversity in the day-to-day operations of the Chapter.

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## FROM THE DIRECTOR OF GRADUATE STUDIES

Dear Alumni, Students, Colleagues, and Friends,

The most exciting news this year was the admission of five new graduate students. We continue to receive many requests for information and nearly 500 potential applicants fill out our “online prescreening tool” that provides guidance as to their prospects of admission. This is helpful to the students, who can learn how well their background matches to the students we admit before they pay an application fee, and of course, it is also helpful to us, since it significantly reduces the number of application packages that must be reviewed. Our goal is to have about 30 completed applications. This year we also conducted interviews by Skype for the top 10, from which we made our offers. A long process that has already begun for the Fall 2013 admission; but perhaps one of the most important things we do to ensure a high quality program.

We have also made a significant change in our graduate program requirements, particularly with regard to the number of required credits. We still have maintained our core with differential equations, physical chemistry, statistics, pharmacology, and pharmacokinetics, along with our advanced Pharmaceutics courses, Readings, and Seminars. However, the Graduate School no longer requires the Supporting Field or Collateral Fields (18 cr) but rather simply requires a total of 24 credits. The reduced credit requirement means that most of our students will complete the formal courses in 2 years rather than the 4+ years in the past.



In part, the world is changing. There is much more specialization, there is much more focus on research funding with grants and contracts, and most importantly, there is incredibly more access to information. Our students no longer have to trudge to the library, search through a card catalog for the appropriate book, check it out, and then bring it back to the lab to learn something about, say Flory-Huggins theory of polymer conformation. This is all but a click away. As such, we believe that the time gained will be beneficially used by the students to focus on the most relevant theories and scientific publications for their thesis research. This independent effort by the student, under the watchful tutelage of their advisor, perhaps is even better preparation for developing scientific leaders. Their efforts are also supplanted by more cooperative, interdisciplinary research projects, where committee members are often members of the research team and have a vested interest in having the student carry out sound research. This approach also forces the development of good communication skills in small group settings as opposed to the development of passive spectators that just sat a class room.

All in all, we believe our continued admission of high quality applicants and purposeful education structure and requirements will ensure that our graduates continue to garner the respect and achievement enjoyed by our illustrious alumni.

A handwritten signature in black ink, appearing to read "Timothy S. Wiedmann". The signature is fluid and cursive, with a large, stylized initial 'T'.

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

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## GRADUATE STUDENT NEWS

### DEGREES EARNED

**Sunny Bhardwaj, Ph.D. in Pharmaceutics, 2012.** *Thesis:* Molecular Mobility in Amorphous State: Implications on Physical Stability. (Advisor: Dr. Raj Suryanarayanan). He is Senior Scientist in the Basic Pharmaceutical Sciences Division of Merck and Co. in Rahway, New Jersey.

**Alex Grill, Ph.D. in Pharmaceutics, 2012.** *Thesis:* Examining and Improving the Chemopreventive Efficacy of Curcumin. (Advisor: Dr. Jayanth Panyam). He joined Dr. Lisa Peterson's lab as a Post-doctoral Associate in the Cancer Center, University of Minnesota on Sept 10th, 2012.

**Arum Kim** received her M.S. in Biomedical Engineering, working on glucose sensitive phenylboronic acid hydrogels.

**Jing Wang, Ph.D. in Pharmaceutics, 2012.** *Thesis:* Quantitation Of The Metabolic Activation Of Phenanthrene In Smokers: Potential Use In The Assessment Of Lung Cancer Susceptibility. (Advisor, Dr. Cheryl Zimmerman). Jing is currently working at Genentech, San Francisco.

### NEW GRADUATE STUDENTS

#### The Department welcomed these new students in fall 2012:

**Michelle Fung** received her B.A. in Chemistry in 2009 from Macalester College in St. Paul, Minnesota. After completing her bachelor's degree, she worked at Ecolab Inc. and Upsher-Smith Laboratories.

**Stephen Kalscheuer** received his B.S. in Biochemistry from the University of Minnesota in 2007 and his M.S. in Pharmacology from the University of Minnesota in 2011.

**Vidur Sarma** received his B.Tech. in Pharmaceutical Chemistry and Technology from the University of Mumbai in Mumbai, India in 2012.

**Nidhi Sharda** received her B.Pharm. in Pharmacy from Delhi Institute of Pharmaceutical Sciences and Research, India in 2009 and her M.S. in Pharmaceutical Sciences from University of Southern California, Los Angeles (2011).

**Mr. Wei-Jhe Sun,** received his B.S. in Pharmacy from Taipei Medical University, Taiwan in 2006 and his M.S. in Pharmaceutical Science from National Taiwan University Taipei, Taiwan.

### 2012-2013 FELLOWSHIPS AWARDED TO PHARMACEUTICS GRADUATE STUDENTS

The *David J.W. Grant and Marilyn J. Grant Fellowship in Physical Pharmacy* is awarded to students whose research is focused in physical pharmacy. **Mike Burcusa** received the award. (Advisor: Dr. Raj Suryanarayanan).

The *Edward G. Rippie Fellowship* 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. It was awarded to **Rajneet Oberoi.** (Advisor: Dr. William Elmquist).

### GRADUATE STUDENT ACTIVITIES AND AWARDS

**Khushboo Kothari** received the following awards:

- Baxter Young Investigator Award, which 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.
- AAPS Graduate Student Symposium Awards in Analysis and Pharmaceutical Quality. She will present her research at the 2012 AAPS Annual Meeting & Exposition at the Chicago McCormick Place Convention Center in Chicago, IL.
- The Council of Graduate Student Travel Award, which funded her trip to Argonne National Laboratory in Argonne, IL.

**Frederick Osei-Yeobah** participated in a summer internship in 2012 at Boeringer-Ingelhem in Connecticut under the guidance of Dr. Xiaorong He. His research involved developing techniques for guiding the scale up of high shear wet granulation process.

**Tanmoy Sadhukha** gave several research presentations: *Magnetic Hyperthermia as an Effective Approach to Kill Cancer Stem Cells*

- Annual AAPS Meeting & Exposition 2011, Washington D.C. (poster presentation)
- 7<sup>th</sup> Annual Minnesota Nanotechnology Workshop 2011, Minneapolis, Minnesota (poster presentation)
- Rho Chi Research Symposium 2012, Minneapolis, Minnesota (Poster presentation) *Acute Necrosis and Reactive Oxygen Species Generation by Magnetic Hyperthermia Leads to Effective Elimination of Cancer Stem Cells*
- 9<sup>th</sup> International Conference on the Scientific and Clinical Applications of Magnetic Carriers 2012, Minneapolis, Minnesota (poster presentation) *Iron Oxide Particle Size Determines the Anticancer Effectiveness of Magnetic Hyperthermia*
- IPRIME 2012, Minneapolis, Minnesota (oral presentation).

**Ramola Sane** received the AAPS Graduate Student Symposium Awards in Pharmacokinetics, Pharmacodynamic and Drug Metabolism (PPDM) . She will present her research at the 2012 AAPS Annual Meeting & Exposition at the Chicago McCormick Place Convention Center in Chicago, IL. She will be starting a post-doctoral fellowship in the Department of Pharmacology and Systems Therapeutics at Mount Sinai Medical School in early 2013 with Dr. James Gallo.

## GRADUATE STUDENT MISCELLANEOUS NEWS

**Mike Burcusa** and his wife welcomed their daughter, Rose Mae, on April 22, 2012.

**Karen Reidl** was married to Anthony Parrish on July 7, 2012 in St. Paul, Minnesota.

**Shruthi Vaidhyathan** was married to Sai Jayaraman on June 7, 2012 in Chennai, India.

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## SCHOLARS

**Kapil Arora, Ph.D.**, has accepted a position as Senior Scientist in the Drug Product Design/Material Science Division at Pfizer Worldwide in Groton, CT. Additionally, his manuscript entitled "Unintended Water Mediated Cocrystal Formation in Carbamazepine and Aspirin Tablets" has been selected for the **Outstanding Manuscript Award** in Analysis and Pharmaceutical Quality sponsored by Celgene. Kapil was a postdoctoral associate in Dr. Raj Suryanarayanan's lab.

**Dr. Mamta Kapoor** has joined Prof. Siegel's lab as a post doctoral associate. Mamta received her Ph.D. in Pharmaceutical Sciences from the University of Connecticut in 2012. She is working on enzyme mediated nasal delivery of diazepam prodrugs for the prevention and rapid response to epileptic seizure emergencies.

**Raj Mittapalli** was married on November 9, 2011 in India. His wife's name is Sindhura. Raj also served as a chair for the Gordon Research Seminar (Barriers of the CNS) which was held in New London, NH from June 16-17, 2012. He gave an oral presentation titled "New insights into treating melanoma brain metastases with novel BRAF inhibitors" at Brain Tumor Programme in March 2012.

**Sarat Mohapatra, Ph.D.**, joined Dr. Suryanarayanan's lab as a research associate in Summer 2012. Prior to coming to the University of Minnesota, he was a visiting scholar in the Dept. of Pharmaceutics at Creighton University in Omaha.

**Emilie Roger, Ph.D.**, who was a post doctoral scholar in Dr. Jayanth Panyam's lab, is now an Associate Professor at the University of Strasbourg in France.

**Dr. Naveen Thakral** joined Dr. Suryanarayanan's lab as a visiting research specialist in Spring 2012. He earned his Ph.D. from Centre for Biomedical Engineering, Indian Institute of Technology, Delhi and has around 18 years of Pharmaceutical manufacturing and research experience.

**Yongqiang Yang** joined Dr. Wiedmann's lab as a visiting Scholar who comes from the University of Florida.

**Hao Ye, M.S.**, from Shanghai Institute of Food and Drug Control (China) completed a three months visit to Prof. Sun's lab.

**Qun Zhou, Ph.D.**, of Huazhong University of Science and Technology in China completed a year-long visit to Dr. Changquan Sun's lab.

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## MISCELLANEOUS NEWS

**Erica Stapic** and her husband welcomed their son Luka James Stapic on May 23, 2012.

**Hee-Lim Lee**, an undergraduate Biomedical Engineering, was awarded an Undergraduate Research Opportunity Program (UROP) grant to work in Prof. Siegel's laboratory on glucose sensitive phenylboronic acid hydrogels.

**Allison Siehr**, a Chemistry major at Texas Pan American University in Edinburg, TX, worked in Prof. Siegel's laboratory as a Materials Research Science and Engineering Center (MRSEC) summer student, helping **Isha Koonar** synthesize block polymer micelles and hydrogels.

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## ANNOUNCEMENT

AeroCore has been established under the auspices of the College of Pharmacy. The purpose of this research service facility is to provide aerosol/vapor exposures to rodent animal models for the purpose of testing the safety and efficacy of inhaled materials. AeroCore has a specific focus on the treatment and prevention of lung cancer. This facility is co-directed by Professors Jayanth Panyam (Pharmaceutics) and Professor Frank Ondrey (Otolaryngology), who are also both members of the University of Minnesota Cancer Center.

The laboratory space in Lions Laboratory/Translational Research Building was originally designed and constructed to support the research of Professor Lee Wattenberg. Dr. Wattenberg is considered to be the father of chemoprevention, that is the administration of a drug to prevent cancer, and holds the title of Regents Professor at the University of Minnesota. His contributions to the scientific and medical fields are featured on the Scholars Walk at the U. Dr. Wiedmann had a long-standing collaboration with Dr. Wattenberg in which many compounds delivered as an aerosol were tested for chemoprevention of lung cancer. Dr. Ondrey, a practicing physician with research interests in lung and head and neck cancer also collaborated with Dr. Wattenberg as well. As a means to continue the

pioneering work, Drs Wiedmann, Ondrey, and Panyam sought and received Dean Speedie's financial support and administrative approval to create AeroCore.

Although there is an emphasis on lung cancer, AeroCore is positioned to assist faculty at the University of Minnesota that are seeking cures for other respiratory diseases (PAH, COPD, CF, Fibrotic lung disease secondary to transplants). In addition, there are U of MN faculty with interests in the toxicological evaluation of inhaled compounds and especially of nanoparticles. The Mechanical Engineering Department is the home of the internationally recognized Particle Technology Laboratory that has a focus on innovative aerosol generation and testing. It may be of interest to learn that faculty at the PTL played an important role in the development of the cascade impactor for aerosol size measurement. It is hoped that in the coming year, AeroCore will join synergistically with Particle Technology Laboratory to advance aerosol science and medical research. The U is also home to the Center for Lung Science and Health under the auspices of the School of Medicine. Here again, AeroCore can serve to facilitate testing of drug candidates for respiratory diseases.

In addition to supporting academic research, AeroCore has role in the University of Minnesota's Land Grant Mission to collaborating to advance knowledge benefiting communities, the state, and world. Minnesota has commercial enterprises with interests in aerosol technology and testing that span the range from start-ups that have reached a stable financial status.

AeroCore, with its strong leadership from Pharmaceutics, is an ideal position to help further the research goal of the College of Pharmacy: *Be the academic home of pre-eminent, internationally-recognized pharmacy research programs.*" We wish this venture every success.

For more information please contact: Timothy Wiedmann, Ph.D.  
phone: 612.624.5457 email: wiedm001@umn.edu

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## FACULTY NEWS AND ACTIVITIES

**PROFESSOR WILLIAM F. ELMQUIST** was invited to give the following research presentations:

- *Factors Influencing Drug Delivery to Brain Tumors: Multiple Mechanisms at Multiple Barriers*, Forbeck Foundation Focus Meeting, Drug Delivery to Brain Tumors Think Tank, Santa Monica, California, February 2012.
- *Failure: What can we learn from it?*, Neuro-Oncology Symposium: Basic Discovery Accelerating Groundbreaking Brain Tumor Therapy. Minneapolis, Minnesota, May 2012.
- *The Structure and Function of the Blood-Brain Barrier In Normal Brain and Brain Tumors*, Breaching the Castle Wall: The Blood-Brain Barrier, ASCO Annual Meeting, Chicago, IL, June 2012.
- *Targeted Delivery to Brain Tumors: Moving from the Magic Bullet to the Magic Shotgun*, 44th Annual PGSRM, UNMC, Omaha, NE, June 2012.
- *Targeted Delivery to Molecularly-Targeted Therapy to Brain Tumors: Role of Efflux Transporters in the BBB*, Creighton University, Omaha, NE, June 2012.
- *Molecularly-Targeted Therapy for Primary and Metastatic Brain Tumors*, Barriers of the CNS GRC, Bridging Barriers to Treat CNS Disease. Colby-Sawyer College, New London NH, June 2012.
- *Pharmacokinetic Assessment of CNS Drug Distribution*. AAPS Webinar, June 2012.
- *Drug-Mediated BBB Disruption: A Complex Problem of Drug Transport*, SCIDOT 2012, Society for CNS Interstitial Delivery of Therapeutics, Chicago, IL, October 2012.

**PROFESSOR CAROLYN A. FAIRBANKS** completed the 2011- 2012 AACP's Academic Leadership Fellows Program which is a year-long national program designed to prepare the next generation of leaders for Colleges of Pharmacy. Dean Marilyn Speedie and the U's Vice President for Research, Tim

Mulcahy, served as co-mentors for this program. Dr. Fairbanks presented her small collaborative group's research on Faculty Mentoring at the 2012 AACP conference in Kissimmee, Florida.

Dr. Fairbanks and her research team continue to focus on s targeted delivery of gene therapeutics to specific CNS neuronal ubpopulations and on delineating divergent and convergent mechanisms underlying the development of chronic pain and of addiction. Her lab also continues to research endogenous mechanisms of spinal analgesia. Along these lines she received an R21 grant award from the National Center of Complementary and Alternative Medicine to investigate endogenous mechanisms of electroacupuncture-induced analgesia.

In June 2012, Dr. Fairbanks traveled with her colleagues in the University of Minnesota's Center for Pain Research to the Karolinska Institute in Stockholm Sweden. There, together with Neuroscience colleagues at the Karolinska Institute, we offered a week long short course on pain mechanisms and management. Dr. Fairbanks provided the content on Experimental Sensory Assessment and Genomics of Pain and Analgesia.

In December 2011, Dr. Fairbanks served as an external examiner for a doctoral thesis at the University of Utrecht in The Netherlands. While there, she also gave a research seminar at The Rudolph Magnus Institute of Neurosciences.

Since January 2012, Dr. Fairbanks has served on the College of Pharmacy's Curriculum Revision Steering Committee representing the pharmacology discipline group and contributing substantially to the neurology therapeutic area, specifically the pain section. Dr. Fairbanks continues to work with the Office

(Professor Carolyn Fairbanks, continued)

of the VP of Research as IACUC Vice-Chair for Biomedical sciences with the unwavering goal of improving the research environment at the University of Minnesota. She contributed substantially to the 2012 AAALAC site visit. In May 2012 she concluded her activities as a Director of the Board of Directors of the American Pain Society but remains a liaison to the Basic Science Interest Group and the Complementary and Alternative Medicine Interest Group.

**PROFESSOR KARUNYA KANDIMALLA** has joined the Pharmaceutics faculty in the Spring 2012 and has established his lab on the 9<sup>th</sup> floor of Weaver-Densford Hall. Kandimalla Lab is currently investigating the pathophysiological pathways mediating cerebrovascular dysfunction in Alzheimer's disease and attempting to isolate molecular targets for the early detection and treatment of AD. Dr. Kandimalla, in collaboration with Dr. Joseph Poduslo at the Mayo Clinic, have engineered a theranostic nanovehicle (TNV) capable of targeting the earliest locations of toxic amyloid protein accumulation in the cerebral vasculature. By providing MRI/PET contrast and delivering immunosuppressants to the amyloid ridden cerebrovascular tissue, the TNVs are expected to aid in the early detection of AD and allow for the pre-symptomatic treatment. Recently, this collaborative team has secured University of Minnesota-Mayo Biotechnology Partnership Grant to investigate the TNV efficacy in AD transgenic animals and eventually in patients.

Another important research direction Kandimalla Lab pursuing is the development of nanotechnology methods to disrupt microbial quorum sensing, which is critical to the formation of antibiotic resistant bacterial biofilms.

Dr. Kandimalla gave the following invited presentations:

- *Accumulation of A $\beta$  protein in Alzheimer's disease brain: The Itinerary of an unwanted guest.* Department of Pharmaceutics, University of Minnesota, Minneapolis, MN, September 2011.
- *Traffic jam at the blood brain barrier promotes greater accumulation of Alzheimer's disease amyloid beta proteins in the cerebral vasculature, Barriers of the CNS GRC, Bridging Barriers to Treat CNS Disease.* Colby-Sawyer College, New London NH, June 2012.

**PROFESSOR JAYANTH PANYAM**, was invited to give the following presentations:

- *Cancer Chemoprevention and Treatment: A Drug Delivery Approach*, Indian Institute of Science, Bengaluru, India, March 2012.
- *Tumor Targeted Drug Delivery*, Indian Institute of Chemical Technology, Hyderabad, India, March 2012.
- *Magnetic Hyperthermia For Lung Cancer, Nanotechnology and Nanomedicine*, 5th Annual IEM Symposium, Minneapolis, MN, August 2012.

Dr. Panyam, along with Drs. Vadim Gurvich and Gunda Georg, received funding for their project "Polymeric nanoparticles for tumor targeted delivery of Tylocrebrine" from National Cancer Institute. The purpose of this grant is to utilize

targeted nanoparticles to reformulate tylocrebrine, a natural anticancer agent with potent anticancer activity but is limited by severe central nervous system side effects.

**PROFESSOR RONALD A. SIEGEL** serves as Director of the Biomaterials and Pharmaceutical Materials program in IPRIME (Industrial Partners for Research in Interfacial and Materials Engineering), an academic/industrial consortium at the University of Minnesota.

For the past three years, Dr. Siegel has participated in an NIH consortium grant, *Nanodiagnostics and Nanotherapeutics: Building Research Ethics and Oversight*, chaired by Prof. Susan M. Wolf in the Law School. This has led to a joint recommendations paper, plus an independent paper to be published in the *Journal of Law, Medicine, and Ethics*. This work deals with ethical issues surrounding clinical trials involving nanomedicines.

In collaboration with Prof. Chun Wang (Biomedical Engineering and Pharmaceutics graduate faculty), Dr. Siegel has developed a class of biodegradable surfaces that renewably secretes a "mucus" layer that prevents protein and cell adhesion.

Dr. Siegel gave the following invited presentations:

- *What is Unique About Nanomedicine? The Significance of the Mesoscale*, (with G. Khushf) Conference on Nanodiagnostics and Nanotherapeutics: Building Research Ethics and Oversight, University of Minnesota, September 2011.
- *Points of Intersection with Beibei Li's Thesis Work*, Department of Pharmaceutical Sciences, University of Toronto, November 2011.
- *Hydrogels and Microfabrication for Biosensing and Drug Delivery*, Department of Pharmaceutical Sciences, University of Kentucky, November 2011.
- *Swelling and Mechanical Relaxations in Hydrogels Containing Phenylboronic Acids*, Materials Research Society, Boston, MA, November 2011.
- *Gels, MEMS and Oscillators*, Department of Chemistry, Brandeis University, December 2011.
- *Swelling and Shrinking of Sugar-Sensitive Hydrogels: Experiments and Modeling*, Midwest Thermodynamics and Statistical Mechanics Conference, Minneapolis, MN, May 2012.
- *Models with Increasing Complexity for Hydrogel/Enzyme Feedback Oscillations*, Society for Industrial and Applied Mathematics, Minneapolis, MN, July 2012.

In late September and early October, Prof. Ron Siegel presented four lectures in Turkey, including two at Yeditepe University in Istanbul, one at Koc University in Istanbul, and one at Hacettepe University in Ankara.

**PROFESSOR CALVIN SUN** was invited to give the following presentations:

- *Pharmaceutical Powder Technology*, Upsher-Smith Laboratory, Maple Grove, Minnesota, July 2012.
- *Frontiers in Pharmaceutical Cocrystallization and Salt Formation*, Chinese University of Hong Kong, HK, May 2012.

(Professor Calvin Sun, continued)

- *Relationship between Structure and Mechanical Properties of Organic Crystals*, Institute of Chemical and Engineering Sciences, A\*STAR, Singapore, May 2012.
- *Solving Problems in Tablet Development by Crystal and Particle*, Pharmaceutical Technology Symposium 2012, National University of Singapore, Singapore, May 2012.
- *Powder Technology in Pharmaceutical Research*, The University of Western Ontario, Department of Chemical and Bioengineering, Ontario, Canada, February 2012.
- *Overcoming Powder Compaction Problems by Crystal Engineering*, Indo-US Bilateral Meeting on the Evolving Role of Solid State Chemistry in the Pharmaceutical Science, The Heritage Resort, Manesar, Delhi, February 2012.
- *Recent Progress in Particle Engineering for Superior Powder Manufacturability*, NIPER (AAPS Student Chapter), India, January 2012.
- *Roles of Solid-State Science in Product Quality*, Shanghai Institute of Food and Drug Control, Shanghai, China, January 2012.
- *Effects of Moisture on Density, Flow, and Compaction Properties of Microcrystalline Cellulose*, Cellulosic Materials Workshop Synthesis, Properties and Applications, University of Minnesota, Minneapolis, MN, January 2012.
- *Mechanical Properties of Acetaminophen, PVP/VA64 Dispersion System* (Pharmaceutical Applications of Hot Melt Extrusion Workshop), University of Minnesota, Minneapolis, MN, January 2012.
- *Expedited Development of High Quality Pharmaceutical Products*, Genentech, San Francisco, CA, December 2011.
- *Pharmaceutical Product Development Enabled by Materials Science and Engineering*, Huazhong University of Science & Technology, Wuhan, China, November 2011.

Dr. Sun also Co-Chaired an IPrime workshop entitled “Pharmaceutical Applications of Hot Melt Extrusion”, held at the University of Minnesota in January 2012, and he recently became a member of the Editorial Advisory Board of *Journal of Pharmaceutical Sciences*.

**PROFESSOR RAJ G. SURYANARAYANAN** was invited to give the following presentations:

- *Phase Transitions during Pharmaceutical Processing - Potential Implications on Product Performance*, Amneal Pharmaceuticals, Yaphank, NY, October 2011.
- *Monitoring Phase Transitions during Freeze-Drying - Potential Implications on Product Performance*, GlaxoSmithKline, King of Prussia, PA, October 2011.
- *Phase Behavior of Excipients in Lyophilized Formulations - Potential Implications on Product Performance*, 2<sup>nd</sup> World Lyophilization Summit, Boston, MA, May 2012.
- *Protein Stabilization lecture in Preservation of molecular, cellular and tissue biospecimens*, BioCoR short course, University of Minnesota, Minneapolis, MN, May 2012.

**PROFESSOR TIMOTHY WIEDMANN** was invited to give the following research presentation:

- *Toward the Development of a Theragnostic System for Lung Disease*, University of Minnesota-Duluth, Department of Chemistry (2011)

**PROFESSOR CHERYL L. ZIMMERMAN** accompanied six Pharm.D. students, two nurses and a nursing student on a medical mission to Haiti in March 2011. Dr. Zimmerman and another faculty colleague, Dr. Nicky Kulinsky, 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 over 350 patients and dispensed over 700 prescriptions. The student-run organization, REACH (Relief, Education, and Assistance for Community Health in Haiti), is planning annual medical missions with an eventual goal of building a free-standing clinic in the Chabin, Haiti area. The next trip is planned for March 2012, and Dr. Zimmerman will again accompany the team.

Dr. Zimmerman visited the University of Georgia in Athens, GA in October 2012 and presented a talk entitled *A Pharmacokinetic Approach for Assessing Lung Cancer Risk in Smokers*.

On October 11, 2012, Dr. Zimmerman was inducted into the Owen-Withee (Wisconsin) High School Hall of Fame. She graduated from OW in 1971 and is an inaugural inductee into the Hall.



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## RECENT PUBLICATIONS

Agarwal S, Mittapalli RK, Zellmer DM, Gallardo JL, Donelson R, Seiler C, Decker SA, Santacruz KS, Pokorny JL, Sarkaria JN, Elmquist WF, Ohlfest JR. Active efflux of dasatinib from the brain limits efficacy against murine glioblastoma: broad implications for the clinical use of molecularly-targeted agents. *Mol Cancer Ther.* 2012 Aug 13.

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Agarwal S, Uchida Y, Mittapalli RK, Sane R, Terasaki T, Elmquist WF. Quantitative Proteomics of Transporter Expression in Brain Capillary Endothelial Cells Isolated from P-Glycoprotein (P-gp), Breast Cancer Resistance Protein (Bcrp), and P-gp/Bcrp Knockout Mice. *Drug Metab Dispos.* 2012 Jun;40(6):1164-9. Epub 2012 Mar 8.

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Bhattacharya S, Suryanarayanan R, Molecular motions in sucrose-PVP and sucrose-sorbitol dispersions: I. Implications of global and local mobility on stability, *Pharm. Res.* 28:2191-2203(2011).

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Gülden O, Wiedmann TS. (2012) Deposition of aerosol particles in a model vitreous chamber. *Drug Dev Ind Pharm* 38(7):893-8.

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Perumalla SR, Shi L, and Sun CC. Improved mechanical properties of an ionized form of acetaminophen, *CrystEngComm.* 14:2389-2390 (*Cover Article*, 2012).

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