



Milwaukee Institute of Drug Discovery

One recent significant change in the Chemistry/Biochemistry department has been the development of the Milwaukee Institute of Drug Discovery (MIDD). MIDD is based on a robust interdisciplinary program and coordinates UWM research efforts to discover and develop new treatments and therapeutics for human diseases. Presently, MIDD is developing inter-departmental and inter-institutional programs in therapeutics focused on neurological disorders, cancer, and infectious diseases with an emphasis on multi-drug resistant infections and bioterrorism. It is anticipated that the Institute's fundamental and applied research will create novel technologies represented by new start-up companies that will contribute to economic development in the State. In addition, MIDD will work in cooperation with the newly created UWM Schools of Public Health and Freshwater Science. This consortium will serve the wider community in Wisconsin by investigating local biomedical needs and providing training and research opportunities to nurture future scholars for the benefit of the health of all state citizens.

The establishment of MIDD was proposed by UWM Chemistry/Biochemistry Professors James Cook, Gil Indig and David Petering, who submitted proposals to the UWM 2007-09 Budget Initiative to build interdisciplinary research clusters, and to the Wisconsin Institute for Biomedical and Health Technolo-

gies (WIBHT). WIBHT was created by Wisconsin Governor Jim Doyle, former UWM Chancellor Carlos E. Santiago, and Aurora Health Care President Ed Howe. The initiative combined non-profit and private research institutions under one roof to stimulate the economy of the state through biomedical research. Funding to establish research labs and to hire four faculty specializing in the field of drug discovery was provided by both WIBHT and the 2007-09 budget initiative.

Three assistant professors (Drs. Alexander Arnold, Xiaohua Peng, and Nicholas Silvaggi) whose research activities support the MIDD were hired in 2009. Their background in multiple aspects of drug discovery diversifies the department's teaching and research activities. The laboratories of the new faculty are state-of-the-art with modern instrumentation and are located on the 8th (Arnold), 6th (Peng) and 3rd (Silvaggi) floors of the UWM Chemistry Building.

Our new director of MIDD will coordinate institutional projects, funding, outreach, and relationships with the Medical College of Wisconsin and Marquette University. Dr. Douglas Stafford will be joining the team in January of 2011, and we will be profiling him in the next issue of the newsletter.



From the Chair's Desk



Dr. Kristine Surerus

It has been a challenging year spent developing plans to maintain our high standards of teaching and research with fewer resources due to Wisconsin, like most states, facing economic difficulties. The University remains committed to improving its research agenda and the quality of the undergraduate experience. The University has recently completed a master plan which includes building new integrated science facilities to meet the needs of engineering and natural science programs. The University already has state support for the first building in the Kenwood Integrated Science Complex. An architectural firm was recently hired and it is anticipated that we will break ground early 2012 with occupancy by fall 2014. The University also has an agreement to purchase the Columbia-St. Mary's site by the end of the year which will significantly help ease the space crunch on campus.

We continue growing our enrollment showing a 9% increase in graduate students and a doubling of undergraduate majors compared to five years ago. This steady increase has resulted in a record number of graduates with 38 bachelor, 6 MS and 12 PhD degrees granted last year. The department has also had a steady increase in the amount of grants received and last year we brought in just under \$3 million in extramural funds.

To those who donated to our program, Thank You. We appreciate your continuing willingness to help support our undergraduate and graduate students even in difficult financial times.

In closing, please drop us a line or email about what is new in your life, we always appreciate hearing from our alumni.



New Faculty Profiles



Carolyn Aita's research centers around design and growth of thin film

coatings based on nonmetallic nanostructures. Her work ranges from theoretical modeling and prediction of new nanostructured coatings, fabrication of these coatings by carefully controlled plasma deposition, and practical application of these new structures as multifunctional materials.

Aita's research group, AceLab, was the first to demonstrate the advantages of using nanolaminate architectures in ceramic films. Today, there is intense worldwide research and development in this area with applications in a wide range of industries – advanced materials manufacturing, optical products, and in-dwelling biomedical applications. The “smart” self-healing anti-corrosion coatings that Aita has developed and on which she holds two patents, are applied to metal surfaces in ultrathin layers. They adjust in response to a range of adverse environments, including basic washdown solutions used in the food industry, salt spray, and the human body's corrosive environment.

Aita held a faculty position in the College of Engineering & Applied Science from 1981 to May of 2010 when she joined Chemistry/Biochemistry. Since 1988, she has held a Wisconsin Distinguished Professorship – one of twenty in the UW System and the first to be awarded in science/engineering at UWM. She is one of the first fifty Fellows of the American Vacuum Society, an important professional society for thin film and surface science research, and has been included in the American Institute of Physics Emilio Serge Visual Web Archives: The Human Face of Science.



So many chemists have been inspired by a good high school teacher.

Alexander (Leggy) Arnold

is among them. A high school teacher challenged students to understand the chemistry of their daily lives, leading Arnold to sign up for chemistry and art as a senior. He stuck with chemistry, although art is still part of his daily life, as his wife Niki is an artist.



Arnold became involved in pharmaceutical chemistry in college and was nominated for the Organon prize in undergraduate research for the potential application of his research on the catalytic enantioselective 1,4-addition reaction towards the stereoselective synthesis of steroids. He synthesized chiral phosphoramidite ligands which, for the first time, gave full stereocontrol in this reaction. The accessible building blocks using this highly efficient reaction are precursors for the synthesis of steroids. Organon is one of Europe's biggest producers of steroids for contraception. Professor Arnold holds a Ph.D. from the University of Groningen in the Netherlands.



Professor **David Frick** received his Ph.D. in Biology from The Johns Hopkins University, Baltimore (1995). His thesis was titled “The Catalytic Core of the E.

coli MutT Enzyme.” Before coming to UWM, he was an associate professor, Biochemist and Molecular Biology, New York Medical College. The focus of most of Frick's daily research is “to help eradicate the world of the hepatitis C virus.” His interest in hepatitis C began in 1995, when he was diagnosed with the virus. He started his

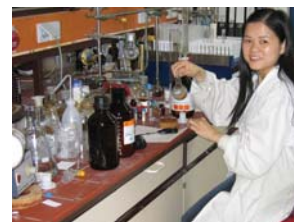
HCV research after he received a liver transplant and was cured of the virus in 1999.

He was a postdoctoral fellow in the Department of Biological Chemistry and Molecular Pharmacology at the Harvard Medical School and in the Department of Biology at Johns Hopkins University, and received a postdoctoral fellowship from the American Cancer Society. Other honors include the American Liver Foundation AASLD Liver Scholar Award and the PEW Research Fellowship. Frick has served as an ad hoc reviewer for a wide variety of scientific journals and grants. His invited talks include “New Methods to Identify and Analyze HCV Helicase Inhibitors” and “The Hepatitis C Virus NS3 Protein: A Model RNA Helicase and Possible New Drug Target.” His works have been cited more than 1,200 times in scientific literature.



As a six year old, **Xiahua Peng**

witnessed a friend's mother struggle



with cancer. She asked her parents what cancer was and why it could not be healed. They told her it was an incurable disease. Peng responded, “Mum, I will develop a drug for treating human cancers.” Since then, Peng has been on a steady path to a career in developing drugs to treat human diseases.

After receiving a Master's Degree from the Chengdu Institute of Organic Chemistry in China, Peng moved onto Fudan University where she engaged in new drug design and synthesis, such as an anti-HIV drug. She loved this cutting edge work, but decided she needed more education. She went

on to the University of Osnabrueck in Germany where Dr. Frank Seela's group was conducting research closely related to her research in China. While a Ph.D student she synthesized hundred of modified nucleotides as potential antiviral or anticancer drugs and some of them can be used in antisense technology. While there, she was one of only 18 students out of 30,000 to win the Chinese Government Award for Outstanding Self-financed Students Abroad.

Peng has been working in Dr. Marc M. Greenberg's group at Johns Hopkins University since 2006. This group uses the tools of synthetic and physical organic chemistry, as well as biochemistry, and molecular biology to study the mechanism of DNA damage and DNA lesion repair. This mechanism is crucial toward understanding the causes of genetic diseases such as cancers.

Her research work at UWM will focus on the chemistry of DNA damage with exogenous and endogenous carcinogens; DNA-DNA and DNA-protein cross-linking by antitumor drugs and bifunctional carcinogens; the use of modified oligonucleotides as potential therapeutic agents, such as siRNA, antisense DNA or RNA; and DNA/RNA recognition.



When a child gets their first aquarium, the thought of it leading to a career in drug design seems to be a little bit of a stretch. However, that is what started Dr. **Nicholas Silvaggi** on his journey towards a career in drug design.

With this early interest, he set his sights on becoming a marine biologist. Dr. Silvaggi originally attended Florida State to pursue this career but transferred to Rensselaer Polytechnic Institute as a Div. III football recruit. RPI is an engineering school, with little in the way of life sciences, so Silvaggi chose to major in biology, consequently, leading him to develop an interest in genetics. By the time he left RPI to attend the University of Connecticut as a graduate student, he wanted to work with transgenic plants and animals to improve the world's food supply.

As a graduate student, he introduced growth factor genes into fish and gathered tissue samples. This started his interest in enzymes, a curiosity that was further amplified when he took a class in protein structure and function with his future Ph.D. advisor Dr. Judith Kelly. He switched to work in the X-ray crystallography lab shortly thereafter, focused his graduate work on penicillin-binding proteins, and has been working in drug design ever since. For the past six years, Silvaggi was a postdoctoral fellow at Boston University, working on drugs to treat botulism.

Dr. Silvaggi's UWM research will consist of combining biophysical and biochemical methods to study enzyme structure and function. More specifically, he will be seeking a better understanding of enzymes involved in the biosynthesis of nonribosomal peptides, a class of medically important compounds. The nonribosomal peptide synthetases are enormous, modular multi-enzyme assembly lines, and as such, they offer a unique opportunity to study not only catalysis in the free-standing enzymes, but also the interplay of reactions in these closely associated complexes. The ultimate goal of this field is to exploit the modular nature of nonribosomal peptide synthetases in combinatorial biosynthetic strategies to alter existing nonribosomal peptides and to discover new therapeutic agents.

Comings & Goings

In addition to the new faculty profiled in this issue, the Department welcomed some new staff members and said good-bye to some old friends.

Erica Yewlett, our previous office manager, has left for a similar position across campus in Health Sciences. **Michael Conway** is our new Department Manager. He came to us in January 2009 from Children's Hospital of Wisconsin where he was the Director of Pulmonary and Transplant Services.

Sarah Johnson, our previous purchasing coordinator, left for Michigan where her husband is attending graduate school. **Shelley Harrington-Hagen** transferred from the Helen Bader School for Social Welfare to replace her. Previously, she was a Registrar for the Foster and Adoptive Parent Training Program.

Frank Laib retired in April and fills his spare time with sailing and fishing. **Dr. Zhi-jian (Mark) Wang** was recruited to join our Department as an Instrumentation Innovator-Research to directly supervise and operate the Mass Spectrometry facility.

Our Department has also seen some departures this past year. Professor **Mike Reddy**, who has been on a two-year leave working for the National Science Foundation in Washington D.C., has decided to pursue a new job at NASA.

Professor **Benjamin Feinberg** retired in June and is currently traveling and spending time with his wife and family.

Jackson Messner, who was our Grant and Web Coordinator, also left in August to pursue his musical career and to work on a business opportunity.

Awards Day

Our annual Student Awards Day was held on Friday, May 7, 2010. The day began with a lecture by alumna Dr. Sandy Haberichter (1998) from the Department of Pediatrics at the Medical College of Wisconsin. Her talk, "Mechanisms Causing Reduced Plasma Survival of von Willebrand Factor in Type 1 von Willebrand Disease" was followed by our research poster competition. This year we had a very nice showing of five undergraduate research posters and forty-four graduate posters. Our judges for the competition were Dr. Haberichter, Dr. Peter Kotvis (1991), Benz Oil Inc., and Dr. Scott Van Ornum (2009), Cedarburg Pharmaceutical. They had the tough job of interviewing the students and choosing the winners. Each research group was well represented in the competition. The Student Awards Day provides a wonderful opportunity to showcase the Department and to recognize our top students in academics as well as in research. Thank you to the alumni for your donations to the department which helps make Awards Day possible. Please contact Wendy Grober (wgrober@uwm.edu) to let us know if you would ever like to serve as a judge in future Awards Days or as a guest lecturer.

Graduate Poster Winners:

1st Place – Keith Hall Award for Excellence in Graduate Research to Octavio Furlong for "The Surface Chemistry of Dimethyl Disulfide on Copper". Advisor: Professor Tysoe.



Octavio Furlong

2nd Place – Keulks Award for Graduate Research to Sundari Rallapalli, for "Synthesis and Biological Evaluation of the Selective Inverse Agonist PWZ-029 for Alpha 5 BZR/GABAAERGIC Receptor Subtypes. This Ligand Enhances Cognition in Rhesus Monkeys". Advisor: Professor Cook.

3rd Place – McFarland Award to Cory Hawkins, "Fundamental Aspects of metal Ion Transfer Into Room-Temperature Ionic Liquids: Toward Improved Methods for the Determination of Radiostrontium in Bioassay Samples". Advisor: Professor Dietz.

4th Place – McFarland Award to Andrew Nowakowski, "Fluorescent Zn Sensor Chemical Biology-Paradigm Shift and Reexamination of the Reaction of N-ethylmaleimide with C6 Rat Glioma Cells". Advisor: Professor Schwabacher.

5th Place – McFarland Award to Karrie Anderson, "Assessing Students' Scale and Atomic Unitizing Perception to Develop Inquiry-Based Activities Using Live or Remote-Access Instrumentation". Advisor: Professor Murphy.

Undergraduate Poster Winners:

1st Place - McFarland Award to Lisa Mueller, "The Front End of Zinc Trafficking: Metabolically Active Zinc in Serum – A Proteomic Study". Advisor: Professor Petering.



Lisa Mueller

2nd Place – McFarland Award to Alexander Spence, "Baeyer Condensation Reactions in the Production of Dyes and Pigments". Advisor: Professor Indig.



Science Bag Schedule 2010-11

This year's Science Bag is celebrating its 38th year of performances that educates as it entertains. The Science Bag shows are every Friday at 8 p.m., with a 2 p.m. matinee one Sunday each month. The family friendly presentations are held in room 137 in the Physics Building, at the corner of Kenwood Boulevard and Cramer Street. This year, Dr. Alan Schwabacher will represent the Chemistry/Biochemistry Department with his presentation: "Hidden Colors Exposed" throughout the month of February. For more info, see www.uwm.edu/letsci/sciencebag/

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