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Chemistry & Biochemistry Newsletter

Chemistry & Biochemistry

Fall 2012

Chemistry & Biochemistry Newsletter

Department of Chemistry & Biochemistry, South Dakota State University

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The Avera Health and Science Center officially became the home of the SDSU's Department of Chemistry and Biochemistry on September 9, 2010.

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South Dakota State University

Chemistry & Biochemistry

Fall 2012



Hello from the Department!

This is normally the fall edition of the newsletter, but by the time you get it we will be very close to starting the spring 2013 semester. There are many reasons for this including extended searches to replace three of our four office staff (it turns out I'm not a very good secretary!), but after reading the newsletter I hope you'll agree that it's mostly because we've been incredibly busy doing the things that a department should be doing!

During the Fall 2012 semester we:

- purchased a 600 MHz NMR, the highest field instrument in the Dakotas(!)
- received more than \$2.3 million in new grant awards (just for the first quarter of FY 2013!)
- completed searches for two new tenure track biochemists associated with BCAAP
- received permission for two new (brand new!) tenure track positions we will be advertising in the next few weeks. These are the first new tenure track positions that the Department has been given since the Ph.D. program was reinstated in the late '80s.
- have a freshman class of 38 chemistry and biochemistry majors
- have fully subscribed MLS on-campus cohorts in years three and four of the program and a fully subscribed MLS Upward Mobility cohort
- added two more U.S. Department of Education GAANN Fellows (Graduate Assistants in Areas of National Need) to our PhD program. This brings the number of students supported with a \$30,000 stipend and \$14,000 cost of education allowance in the Department to 8. During the Fall semester the Department had 62 graduate students.
- obtained permission to propose as second Ph.D. program. This will be in biochemistry and formalize the biochemistry track that we currently have within the chemistry Ph.D. program. It is being developed in collaboration with Sanford Research and Avera Research institutes. We expect to present our proposal to the Regents for approval in late spring.

Since the last newsletter, we've added some great people to our staff.

- Dr. David Cartrette was appointed Assistant Department Head for Undergraduate Programs. He has responsibilities for the chemistry and biochemistry majors, program assessment, and student recruitment.
- Kari Fuks has joined the department as our program administrator, and she is responsible for the administrative "back office" functioning of the department.
- Sheryl Abbott has joined the department office as a senior secretary with responsibilities with the BCAAP Governor's Research Center that is housed in the Department and with graduate student recruiting for the department.
- By the time you read this I hope to have a new secretary on board serving as the Department's public point of contact with additional responsibilities for program support and student information management.

Wow!! That's just what we've gotten done since the last newsletter! Our faculty, staff and students continue to amaze me with all that we are accomplishing and contributing to the university. Your donations and gifts to the Department are very important to helping us realize these goals, and I hope the stories in this newsletter will convince you of the return that we provide on those investments. Please be aware that if you are considering a gift to SDSU you can designate it specifically to the Department and contribute to these activities. If you are interested in seeing how you can contribute to help us, or if there is a way that we can help you realize your vision of giving back to the Department and SDSU please don't hesitate to contact me.

Stay in touch.

Jim Rice

Jing wins Avera/SDSU Collaborative Research Funding

Linhong Jing, research assistant professor and director of the Core Campus Mass Spectrometry Facility in the Department and Karen Munger, project investigator for the Avera Research Institute, Basic Research Institute Department were awarded a 2012 Avera/SDSU Collaborative Research Grant.

The award is for \$20,000 to study the “Use of light-activated naphthalimides (NX) to repair and strengthen blood vessels.”

Development and use of substituted 1,8-naphthalimides for photochemical cross-linking of biomolecules has been the research focus of several departmental faculty members since the early 1990s.

Previous studies culminated in the central hypothesis that light-activated naphthalimide compounds can be used to cross-link matrix proteins to impart strength and integrity while providing improved function and healing of damaged or diseased tissue.

While previous studies have shown the effectiveness and the safety of the technology, the underlying mechanisms and their relationship to the structure of the NX molecule form the basis of this project.

Munger has worked as a small animal physiologist for more than 20 years with a background in renal physiology and hemodynamics, and is interested in how the NX compound interacts with the matrix, and how the vascular healing and function is impacted by treatment in rat models.

Teaching Assistants Complete Certification of Excellence Program

Teaching assistants George Gachumi and Ganesh Degam completed the SDSU Teaching Learning Center’s Teaching Assistant Certification of Excellence Program. They were part of a group of 20 teaching assistants who completed the year-long program in April 2012.



Jing is a proteomics, also known as protein structure, expert. She is interested in developing mass spectrometry-based methods to measure NX compound binding to collagen and other vascular components, and use quantitative vascular proteomics analysis to identify the up- and down-regulated matrix components and inflammatory mediators upon NX treatment.

Their approach to vascular therapy may transform the treatment of vascular injury in hemodialysis patients and patients suffering from weakened arterial walls, as well as pathology that requires vessel wall support or stent-like treatment.

This project builds on a growing relationship between the Department and the Avera Research Institute. The Department is the primary occupant of the Avera Health and Science Center on the SDSU campus.

The Avera Health System has been an important partner in establishing the department’s nationally accredited medical laboratory science program as a regional leader in preparing medical laboratory scientists to meet professional clinical workforce needs.

Ron Utecht Issued Two Patents

Dr. Ron Utecht, professor in the Department of Chemistry and Biochemistry, along with Kevin Vaska, Kaia Kloster, Millard Judy, and James Matthews, was awarded a patent for bonding tissues and cross-linking proteins with naphthalimide compounds. These compounds are capable of bonding various body tissues together as well as bonding pharmaceutical and other substances to body tissues. The patent was assigned to Alumend LLC of Sioux Falls.

The second patent, entitled “Biomaterials and a method for making and using same,” was awarded to Dr. Utecht along with Therese Downey, Kaia Kloster, Barbara Haberer, Patrick Youso, and James Chang. The group invented biomaterials for delivering drugs in the eye. This patent was assigned to Allergan, Inc., of Irvine, California.

Tille is 2012 Education and Research Grant Recipient



SDSU Department of Chemistry and Biochemistry Assistant Professor Patricia Tille was awarded a 2012 Education and Research Member grant award. Tille received a plaque and \$5,000 at the 80th Annual American Society for Clinical Laboratory Science meeting.

Tille applied for the grant and was awarded funding by the ASCLS Education and Research Fund, Inc. The award funding is intended to support research in clinical laboratory science.

Tille is working collaboratively with April Harkins of Marquette University in Milwaukee, Wis., on their project “The Effect of Cytokines on Polymicrobial Biofilm Growth and Laboratory Identification.”

Their research will examine the effects of biofilm on immune modulation with the primary organisms of the study being *Staphylococcus aureus* and *Candida albicans*.

For 10 years, methicillin-resistant *Staphylococcus aureus* or MRSA has made the Centers for Disease Control’s most wanted list.

CDC maintains active bacterial core surveillance of MRSA and ARTEMIS-DISK. surveillance system watches the anti-fungal resistance of *Candida* spp. globally.

A collaborative effort through the Department of Health and Human Services and the CDC have also developed a program to decrease the amount of hospital-acquired infections over a five-year period.

The program was developed due to the high amount of infections caused by *Staphylococcus* and *Candida* in central line associated blood stream infections.

Infections caused by biofilms made up of both *Candida* and *Staphylococcus* have increased in hospitalized patients by 20 percent.

Tille has been examining the effects of *Staphylococcus* biofilm for several years, and Harkin’s work has focused on biofilms in *Candida* spp.

Tille and Harkin optimize their expertise and resources by working together on the research project.

Their research involves undergraduate students from SDSU and Marquette University. At the end of the project, Tille and Harkin will have completed a publication and will present their research findings at the National ASCLS Meeting.

Biochem Student Summit League Male Cross Country Athlete of the Year



SDSU Biochemistry major Michael Krsnak was named the Summit League Cross Country Male Athlete of the Year. Earlier in the year Krsnak was named the Male Athlete of the Week twice along with being named the Male Athlete of the Month in October.

Krsnak consistently finished near the top during the year.

To start the season Krsnak won the NDSU Dual in 26:09.54 for 8k. At the lone home meet he placed second at the SDSU Classic with a time of 25:19.9. He finished fifth at the Griak Invite with a time of 24:47.8. At the Chile Pepper Invite, which was a 10k, he finished ninth with a time of 30:37.7. The peak of his season came at the 2012 Summit League Championships when he won the 8k race with a time of 25:06.4. In the season finale Krsnak finished 47th at the NCAA Midwest Regional with a time of 31:29.04 for 10k.

Krsnak is the first ever Male Athlete of the Year Award at SDSU.

Interested in keeping current on happenings in the Department?



Scan this code with a smart-phone QR code reader app to go directly to the latest departmental announcements or go to chembiochem.sdstate.edu.

Zhang receives Board of Regents Grant

Developing innovative electro-optic chromophores using synthetic organic chemistry methods will now be possible for Department of Chemistry and Biochemistry Assistant Professor Cheng Zhang.

Zhang was awarded funding for a FY '13 South Dakota Board of Regents Competitive Research Grant Program. He was awarded \$99,425 to initiate his organic electro-optic material research at SDSU.

South Dakota university faculty members in the first four years of their position with new or ongoing research were encouraged to apply.

Six South Dakota university professors received research grant awards, with the total support from the SDBOR approximately \$450,000.

The research grant program was designed to enhance the effort of researchers in universities around South Dakota in order to benefit the state's economic development.

Zhang's research project, "Design and Synthesis of Electro-Optic Chromophores for Spatial Light Modulation" is an important element of the investment that South Dakota has made to help increase research expectations and opportunities for system faculty.

A spatial light modulator is an object that imposes some form of spatially varying modulation on a beam of light. A simple example is an overhead projector transparency. In the 1980s, large SLMs were placed on overhead projectors to project computer monitor contents to the screen. Since then, more modern projectors have been developed where the SLM is built inside the projector. These are commonly used in meetings of all kinds for presentations.

Spatial light modulators have found wide applications such as optical signal processing, digital holography, holographic data storage, interferometry, wavefront correction, microscale medical devices fabrication and lithography patterning.

National Science Foundation has funded a number of SLM research initiatives on material development, novel applications, and instrumentation. Fabrication of SLMs using electro-optic chromophore-doped polymers was initiated at NSF Engineering Research Center for Integrated Access Networks at the University of Arizona, of which Zhang was a participant before moving to SDSU in fall 2011.



EO polymer SLMs can operate at much higher frequency than SLMs based on other materials or technologies such as liquid crystal, digital micromirror and quantum wells, and have potential applications in dynamic holography and high-speed optical switches for optical communications.

The objective of this SDBOR funded project is to develop novel chromophores that will help reduce the drive voltage significantly so that cheaper CMOS circuits can be used to drive SLM devices.

**Where are you?
What are you doing?
We'd really like to know!**

***We gladly publish updates on our
alums' careers and lives —
if we receive them.***

**If you would like to share something,
send us a note and we will include it
in the next issue. You can also fax
to us at (605) 688-6364, or e-mail us
at James.Rice@sdstate.edu.**



MLS Receives National Clinical Pathology Scholarship

“I always knew I wanted to do something that was in the medical field or at least in a science-related area,” said Jessie Paris, an SDSU senior from Sturgis.

Paris received a \$1,000 medical laboratory science scholarship from the American Society of Clinical Pathology, made up of more than 100,000 professionals, and Siemens Health-care Diagnostics, an international company of health care products and services.

The diversity and constant changes in the medical field drew her to it as a career path. “There is always something new to learn and problems to solve,” Paris said. “The challenges we face every day in the lab make for an exciting career.”

Currently Paris is taking part in a six-month clinical practice at the Avera McKennan Regional Laboratory in Sioux Falls. During the clinical practice, which is part of her degree program, she is responsible for performing tasks that include medical laboratory diagnostic tests on various types of body fluids and tissues to assist physicians in the diagnosis of diseases and conditions to ensure proper treatment for patients.

The work gives her a glimpse of different laboratory diagnostic tests that use such science as hematology, microbiology, chemistry, serology and phlebotomy, as well as offers her hands-on opportunity with state-of-the-art equipment to perform the tests.

“Jessie takes pride in her work and is very attentive to detail,” said Pat Tille, assistant professor and program director of medical laboratory science at State. “She works well independently and is always willing to assist her fellow students whether it is in the laboratory or within study groups.”

After completing her clinical experience at Avera in July, Paris will take a board exam to become a certified medical laboratory science professional.

To receive the scholarship, Paris submitted an application outlining her academic achievements and professional goals along with descriptions of her leadership and community activities. She also needed to be an ASCP student member, enrolled in an accredited laboratory science program and engaged in her final year of schooling.

“Jessie will undoubtedly make a very dedicated, outstanding and successful laboratory professional,” said Tille. Both Tille and Heather Hall, instructor of medical laboratory recommended Paris for the scholarship.



SDSU medical laboratory science student Jessie Paris, recipient of a national \$1,000 Siemens-ASCP scholarship, studies lab specimens at Avera McKennan Regional Laboratory in Sioux Falls.

Fall 2012 Dean's List

Chemistry

Jiwoo An
Sarah Johnson
Shandy Porter
Elizabeth Bosworth
Meredith Sauer
Lexi Temperley
Jason Schneider
Brandon Hubert
Kayla Erlandson
Dillon Hanrahan
Lindsey Haselhorst
Samantha Loutsch
Lisa Proulx

Biochemistry

Tanya Baldwin
Athukoralage
Gunawardana
Erica Manandhar
Gina Morseth
Scott Splett
Dakota Weathers
Rochelle Wynia
Stad Zeigler
Jeremiah Atkinson

Levi Hattervig
David Smith
Bryce Wilen
Allison McEldowney
Sydney Schmitz

Medical Laboratory Science

Lyndi Anderson
Lauren Chirnside
Christina Fanning
Erin Fernholz
Kayla Holscher
Megan Keifer
Mackenzie Pfeifle
Zakery Prpich
Stefan Stinnett
Adeline Wiertzema
Daniel Hagel
Lauren Ellingson
Peggy Jennings
Riki Peterson
Jennifer Goebel
Tara Meyers
Randy St. Pierre
Kristine Wheelhouse
Michelle Wilson

Alumni Updates

Noelle Umbach, Ph.D., a 1992 ACS Chemistry grad, has been appointed as a commissioner on the Forensic Science Education Programs Accreditation Commission of the American Academy of Forensic Sciences. She is currently a supervising criminalist within the DNA laboratory of the New York City Office of the Chief Medical Examiner.

Curtiss Kovach, Jr., who was awarded a Ph.D. in Summer 2012, is now a Post-Doctoral Research Associate in the Department of Coatings and Polymeric Materials at North Dakota State University in Fargo.

Faculty Updates

Doug Raynie served as guest editor of *Journal of Chromatography A*, Volume 1261, 2012, Special Issue on “High Speed and High Efficiency Separations.” In honor of Professor Milton Lee on the occasion of his 65th birthday.

Recent Publications

Doug Raynie

Journal Articles

T. A. Dioszegi and D. E. Raynie, “Kinetic performance comparison of a capillary monolithic and a fused-core column in micro-scale liquid chromatography,” *J. Chromatogr.*, 1261, 107-112, (2012). DOI: 10.1016/j.chroma.2012.08.030.

M. Zhang, F. L. P. Resende, A. Moutsoglou, and D. E. Raynie, “Pyrolysis of lignin extracted from prairie cordgrass, aspen, and Kraft lignin by Py-GC/MS and TGA/FTIR,” *J. Anal. Appl. Pyrol.*, 98, 65-71, (2012). DOI: 10.1016/j.jaap.2012.05.009.

Book Chapter

B. E. Richter and D. E. Raynie, “Accelerated Solvent Extraction and High-Temperature Water Extraction,” *Comprehensive Sampling and Sample Preparation*, H. Lord and J. Pawliszyn (editors), Elsevier, 105-115 (2012).

David Cartrette

Book Chapter

“Blending Organic and General Chemistry: A Unified and Holistic Curriculum Reform Effort.” David P. Cartrette and Matthew L. Miller. In *Advances in Teaching Organic Chemistry*, Duffy-Matzner, J., et al, Eds. ACS Symposium Series; American Chemical Society: Washington DC (2012).

Journal Article

“Purposeful Design of Formal Laboratory Instruction as a Springboard to Research Participation,” David P. Cartrette and Matthew L. Miller. Accepted for publication in *The Journal of Chemical Education*. Acceptance date: 3 November 2012.

Jim Rice

Journal Articles

Ding, G.; Rice, J. A., 2012, Black carbon evaluation in natural organic matter samples using recoupled long-range dipolar dephasing solid-state ¹³C NMR, *Geoderma*, 189-190: 381-387.

Stetson, S.J.; Osborne, S.L.; Schumacher, T.E.; Eynard, A.; Chilom, G.; Rice, J.; Nichols, K.A., Pikul, J.L. Jr., 2012, Impact of corn residue removal on soil carbon pools in a no-till corn soybean rotation, *Soil Science Society of American Journal*, 76: 1399-1406.

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