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Chemistry & Biochemistry Newsletter

Chemistry & Biochemistry

Fall 2011

Chemistry & Biochemistry Newsletter

Department of Chemistry & Biochemistry, South Dakota State University

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The Avera Health and Science 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 2011



Season's Greetings from the Department!

The fall semester just past is the first in a long time when we've had no construction, no accreditation visits or no major curriculum revisions to undertake or complete. We've actually had the chance to catch our collective breath and teach, think, discover and innovate. It feels great to be able to focus on the things that a university department and faculty should be focusing on!

We have survived last year's budget cuts with little long-term negative impact. It created an environment that allowed us to critically evaluate our chemistry and biochemistry undergraduate curricula, and I think they emerged stronger as a result. They now have fewer required courses but more elective course in the field, and they still meet national accreditation requirements. We've more deeply integrated research and the ability to "do" chemistry and biochemistry into them which is already benefitting our students.

The Department has continued to grow, and this newsletter introduces our new faculty (p.8) and graduate students (p.7). We now have 19 faculty members and 60 graduate students. We've got two faculty searches in progress, one for the MLS program and one for a biochemist. Graduate student admissions for Fall 2012 are in full swing, and we hope to have 65 graduate students when school gets underway in August.

This fall's newsletter continues to highlight the accomplishments of our faculty and students. They are a very talented group of scientists whose recognition reflect the commitment that the department has to graduate and undergraduate education. The state and SDSU is fortunate to have such a talented group of people serving them.

For those of you who haven't heard, we are in a decidedly unSouth Dakotan winter; yesterday—December 18, 2011—it was 49°F! It will be a brown Christmas, but after the last few winters we will take it. We wish you and your family the best in the New Year.

Stay in touch!

Jim Rice

PS: We really would like to hear from you in the new year. Let us know what you're doing now or your future plans, recent publications, or your memories of your time in the department. We'd like to know!

International Year of Chemistry Recognizes SDSU program

Two South Dakota State University chemists received one of 20 national grants awarded by the American Chemical Society's Division of Analytical Chemistry. The group supports outreach projects that demonstrate the significance of analytical chemistry during the International Year of Chemistry.

Analytical chemistry uses techniques to measure the chemical composition of substances. The applications range from measuring chemistry in food and health care products to monitoring substances in order to ensure environmental quality.

Brian Logue, assistant professor of chemistry at SDSU, and Raj Bhandari, a chemistry graduate student, embarked on a familiar South Dakota topic: water.

"The Water Analysis To Educate and outReach, or WATER, program is an education/outreach program that will allow South Dakota K-12 and undergraduate institutions to gain access to highly technical instrumentation available at the SDSU Core Campus Mass Spectrometry Facility (CCMSF)," said Logue.

The grant will be used for supplies to collect water samples, materials needed to analyze those samples and a student hired to create and maintain a Web site on collected data. In addition, the tests run will provide funding at \$2 to \$3 per sample.

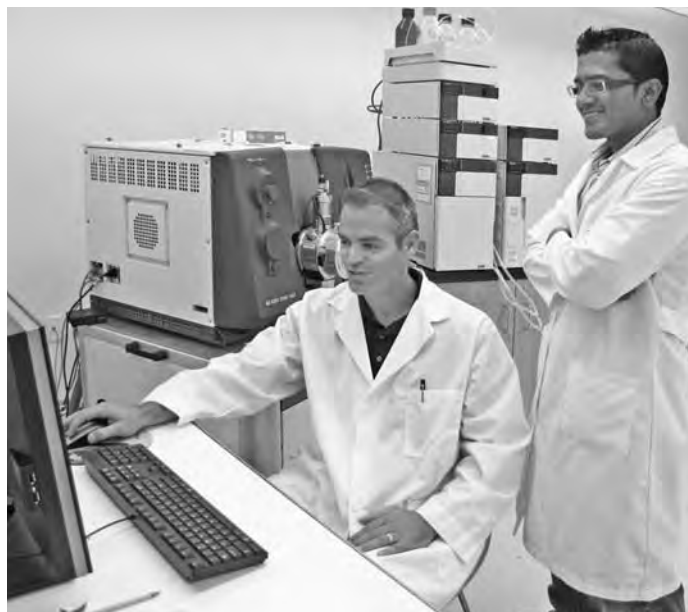
"The findings from WATER research will have larger impacts in the education of multiple levels of students and will provide a service to the broader community," said Logue.

Through WATER, CCMSF will obtain water samples collected by high school or undergraduate students from different institutions. SDSU chemistry students will then prepare the samples in the new mass spectrometry facility for analysis. Data achieved through tests are compiled in an Internet-based program. Both SDSU students and students from the participating institutions will have the opportunity to observe and study the samples to find chemicals of interest.

Logue said the program is very simple to use, and that those analyzing the material can take away "expert knowledge provided by SDSU undergraduate or graduate students."

An ultimate benefit of WATER is being able to map chemicals of interest, largely from pesticides, in South Dakota water sources.

Logue said that examining water samples for pesticides is a relatively simple process. Therefore, if finding contaminated water results, further testing could encourage "action to create a healthier water source."



Brian Logue, assistant professor of chemistry, and Raj Bhandari, a chemistry graduate student, use equipment in the SDSU Core Campus Mass Spectrometry Facility to analyze water samples with analytical chemistry to determine its makeup during the International Year of Chemistry.

A graduate student working under the direction of Dr. Logue, Bhandari was also interested in joining the study after reading about it in a Division of Analytical Chemistry publication.

"I was, and am always, interested to know what components are in the water samples around us," said Bhandari. "After talking to Dr. Logue, I found out that he was about to do this WATER project, and I thought, 'I should be involved.' This project enables users to get familiar with a powerful piece of instrumentation, the LC MS/MS."

"LC stands for liquid chromatography, which is a method of separation, and MS is mass spectrometry, which is the detector," said Bhandari. "This powerful tool separates compounds so they can be readily identified in MS, which gives us not only the mass of a molecule, but also characterizes breakdown products to identify compounds."

Logue and Bhandari are ACS members, and Logue is a member of the Division of Analytical Chemistry within the ACS. The Division of Analytical Chemistry is the world's largest organization of professionals in this field with more than 8,000 members.

Student Research Focuses on Soil Health

Measuring the “glue” that helps hold soil together can help solve a sticky research question for agriculture: How much crop residue can producers safely remove from their fields without hurting the health of their soils?

Undergraduate researcher Alex Bohlmann of South Dakota State University helped do the lab studies to begin answering that question as part of his recently completed bachelor’s degree in biochemistry.

Producers and people in agricultural processing want to know how much crop residue they can take off the land because engineers are rapidly refining the science techniques to make biomass materials such as cornstalks into biofuels. That means it could pay to harvest at least some of the plant residue as a bioenergy feedstock.

Bohlmann, a biochemistry major and student in SDSU’s Honors College from Brandon, S.D., studied soil proteins in the lab of research agronomist Shannon Osborne of the USDA’s Brookings-based North Central Agricultural Research Laboratory, or NCARL.

“What we found is that there is a correlation between the amount of residue that you remove and the amount of protein found in the soil,” Bohlmann said. “That’s what the research is about. We’re trying to figure out what is a healthy level to take off while maintaining soil quality.”

NCARL is a part of the USDA’s Agricultural Research Service. Working with Osborne and post-doctoral researcher Sarah Stetson, Bohlmann was especially interested in what happened under different crop management scenarios to a soil protein called glomalin. An Agricultural Research Service scientist first discovered glomalin in 1996, and it is now understood to play an important role in carbon storage and overall soil health.

“Glomalin is a protein found in soil. It’s produced by mycorrhizal fungi, one of the most common fungi found in soil in our area,” Bohlmann said. “Basically glomalin acts as a glue-like substance to hold the soil together to create micro-aggregates and macro-aggregates — small aggregate sizes and bigger aggregate sizes. That helps with keeping water and air moving through the soil and also with keeping carbon in the soil. In the big picture of things, more carbon stored in the soil means less carbon for carbon dioxide in the atmosphere. It also helps with the nutrient cycling of the soil.”

Using soil samples collected in 2008 from the Brookings location of a long-term national ARS project, Bohlmann used a technique called a Bradford assay to measure the concentration of protein, paying attention to the relations between different soil aggregate class sizes.



Alex Bohlman conducting a crop residue experiment at the North Central Agricultural Research Laboratory.

Though more research is ongoing, this work is a component of a larger national effort called the Renewable Energy Assessment Project, or REAP. Researchers are working towards developing recommendations and guidelines for sustainable biomass harvest while protecting the soil resource. The overall goal is to help producers know exactly how removing a known amount of cornstalks or other crop residue will affect levels of glomalin-related soil protein and ultimately, soil quality. That, in turn, will make it easier for producers in the United States and worldwide to keep their soils healthy while growing crops for both food and energy needs.

Bohlmann finds it satisfying that he worked on such an important issue as an undergraduate at SDSU.

“When I came to college I thought I’d do some important things, but I never thought I’d get involved in something that could potentially be really important to a huge part of society. We all need food to live. And energy,” he said. “It really puts things in perspective to say that I’ve done some research that can help large numbers of people and our government and maybe even the world to understand this.”

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.

Medical Laboratory Science Receives Accreditation

South Dakota State University's Medical Laboratory Science program received a five-year accreditation, the maximum allowed for an initial accrediting endorsement, from the National Accrediting Agency for Clinical Laboratory Science in Rosemont, Ill.

Because of growing demand for MLS majors and difficulty placing students in a hospital setting during their final year before graduation, SDSU determined it was necessary to seek its own accreditation to provide a full educational experience for its students.

As a result, SDSU is now able to place 24 students each year in clinical practice without depending on placement options in limited hospital-accredited programs where they need to compete with students from 18 other colleges and universities in the region. SDSU holds affiliation with the four major health networks including Avera Health, Regional Health, Sanford Health, and the Federal Veterans Hospital System in South Dakota and Minnesota, along with several independently owned facilities.

The longstanding major at SDSU has more than doubled in size during its first two years of a new modified curriculum that includes two years of pre-requisite classes followed by two years in a professional program. The program includes six months in clinical practice at an affiliated institution.

"Everyone was placed professionally from our first graduating class in 2010 and 100 percent of the graduates passed the national certification board exam from the American College of Clinical Pathology," said Pat Tille, assistant professor of chemistry and biochemistry and MLS program director. "In fact, their average score exceeded the national average of all other graduates combined from university-based programs around the U.S."

MLS majors are sought for research, laboratory diagnostics, throughout the healthcare industry and are often admitted to advanced degree programs including medical school, physical



SDSU senior Denisa Fejfar, Brookings, completes a parasitology concentration from a lab specimen in a microbiology lab.

therapy and graduate school. SDSU MLS graduates are trained in hematology, transfusion medicine, clinical chemistry, molecular diagnostics, immunology, microbiology and infectious disease testing and a number of highly complex techniques required in the diagnosis and treatment of disease.

As the state's only university accredited clinical lab program, SDSU graduates will be able to fill a severe national shortage over the next several years of laboratory science professionals.

Pat Tille is Honored by ASCLS and Alpha Mu Tau



Dr. Pat Tille, assistant professor of chemistry and biochemistry and MLS program director, received the Bio-Rad Professional Achievement Award in Genetic/Molecular Diagnostics at the July meeting of the American Society for Clinical Laboratory Science (ASCLS) in Atlanta. The award is presented to one individual for meritorious and professional achievement within the specific scientific assembly

as determined by peer nomination and review. This is the first

time that the award was presented in the area of genetic/ molecular diagnostics.

In addition, Dr. Tille was inducted in the National Laboratory Fraternity, Alpha Mu Tau, for her commitment to the laboratory profession and promotion of scholarship within the field. This is a peer nominated and selected honor. Pat is one of approximately 800 individuals nationwide selected for this honor and joins a select group of only four individuals in South Dakota recognized with this distinction.

Mass Spec Open House



Dr. Linhong Jing in the Core Campus Mass Spectrometry Facility.

The Core Campus Mass Spectrometry Facility at South Dakota State University celebrated its grand opening with an open house on August 31. The facility expanded recently as a part of construction and renovation of the operation to include more space and more state-of-the-art equipment. The mass spectrometry facility is now located in the new Avera Health and Science Center on campus. The expansion enabled the facility to acquire and commission two new mass spectrometers and open a proteomics sample preparation and analysis lab.

Visitors toured the facility to learn more about how its features can aid research students, professors and private businesses. Mass spectrometry is the science of measuring the mass-to-charge ratio in charged molecules. The field can also be used to discover a molecule's mass, elemental composition and chemical structures.

Findings through the use of mass spectrometry can aid an array of research projects. These include drug discovery and testing, molecular interaction, metabolism studies, oil composition analysis, organic molecule synthesis and further testing.

Proteomics studies the structure and functions of proteins. Proteins are vital to the existence of organisms, forming cells' main components and metabolic pathways.

The purpose of the CCMSF is to provide research services for a fee and research training in mass spectrometry. Cutting-edge technology enables staff and students to characterize small and large molecules, proteomics and metabolomics.

Dr. Linhong Jing, CCMSF director, is also available to help researchers incorporate mass spectrometry into projects, give advice on how the facility could be included in curriculums or assist in grant applications. Interested people can visit CCMSF's website (chembiochem.sdstate.edu/mass-spec) to learn about the facility's instruments and services. Dr. Jing can be contacted at by email or at (605)-688-5873.

Foundation Donors

Thank you on behalf of the department, it's faculty and students to the following donors!

American Chemical Society, Washington, D.C.
Keith and Glynn Bartels, Mitchell, S.D.
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SCSA Diagnostics, Inc., Volga, S.D.
Leo and Elaine Spinar, Brookings, S.D.
Youngjae You, Bray, Okla.

May 2010-June 2011

Grad Student chosen NSF Scholar

Angelica Reyes, graduate student in the SDSU Department of Chemistry and Biochemistry was selected as an National Science Foundation Scholar. This award helped her to attend the 15th Annual Green Chemistry & Green Engineering Conference/ 5th International Conference on Green & Sustainable Chemistry in Washington, D.C., in June. Her advisor is Dr. Matthew Miller.

Researcher Featured on SDSU's Web Site

Senior Research Associate Gabriela Chilom in the Department of Chemistry and Biochemistry was recently featured in an interview on the SDSU Web site. Chilom's area of research in physical environmental chemistry. The interview follows:

What motivates you about your chosen field?

The field of environmental chemistry is broad and poses many scientific challenges that are relevant to society. My particular interest is in soil organic matter—the most abundant form of organic matter on the earth's surface. Its large abundance makes it an important source of carbon and its persistence in the environment also makes it an important sink for carbon, having a great impact in modulating temperatures at the globe's surface. Understanding the structure of soil organic matter at the molecular level can bring valuable information that can be used to predict changes in the environment at a larger scale.

Why did you choose to conduct your research at SDSU?

This is a good place to do research. The Chemistry Department has a strong environmental chemistry program and it has faculty with expertise in my own field and related areas that are nationally and internationally renowned for their research.

What roles do your colleagues and student research assistants play in the work you do?

They are important to my research through their work and scientific discussions on their research topics. Some of my current research studies started as summer projects for undergraduate students. Technical and scientific discussions offer me the opportunity to learn from colleagues and students that have different expertise and ideas than mine.

What have been some of your greatest research accomplishments while at State?

I developed a procedure to fractionate the soil organic matter that allows the study of the effect of conformation on the environmental role of these components. This procedure led to the further development of a soil organic matter model, which opens the possibility to design practical strategies to control the behavior of organic matter in the environment. This research is currently funded by the U.S. Department of Agriculture and National Science Foundation.

What do you enjoy most about SDSU?

I enjoy watching the progress SDSU has made and the impact it has on the entire campus community: students, faculty, and staff. The development of new teaching and research facilities, as well as the efforts to increase the diversity on campus, will give students the opportunity to enjoy a wonderful college experience.

What piece of advice would you give new students?

I would advise them to try gaining as much experience as possible: Take challenging courses and work on various research



projects. I think is important that students give themselves time to explore different areas and techniques of chemistry because chemistry is so much broader than any of them are introduced to as undergraduate students. Later they can choose an area of specialization where they can apply their talents, passion, and enthusiasm so they can make a difference.

Recent Grants

Jihong Cole-Dai: Collaborative Research: Replicate Coring at WAIS Divide to Obtain Additional Samples at Events of High Scientific Interest (\$120,873, for 4 years).

David Cartrette and Matt Miller: NSF, "Fostering an Induction into Authentic Research in a Revised Freshman/Sophomore Sequence" (\$554,077, ends 7-21-2014)

Suvo Charkravarty: USDA ARS/SD AES, "Technology Platform for Epigenomics" (\$36,000, 7-1-2011 to 6-21-2012)

Linhong Jing: American Heart Association "Proteomics Biomarkers of Coronary Artery Disease" (\$61,750, ends on 6-30-2013)

Jim Rice: Rice-NSF-NOM Self Assembly (\$160,000 ends on 8-31-2013)

Ron Utecht: 2010 BCAAAP Center-FY12 Budget Increment (\$1,019,948)

New Graduate Students



Eric Boakye

My name is Eric Boakye and I come from Ghana in the western part of Africa where soccer is the game of the day. I had my BSc Biochemistry from Kwame Nkrumah University of Science and Technology in Ghana. I am currently a Ph.D. student in analytical chemistry. My field of interest

is the study and analysis of biomolecules. My favorite quote – “Blessed are the merciful for they shall obtain mercy.”



Shanmugapriya Dharmarajan

I came from India with lot of hopes and dreams. I have done my undergraduate and post graduate work in general chemistry in India. I worked at VWR International for three years as a chemical administrator in European Regulatory Affairs. I like reading, cooking and listening to music. Enthusiasm,

positive attitude and self-confidence are my strengths and my secret of success. I am interested in analytical chemistry and my research would be in that field under the guidance of Dr. Raynie. The research environment at South Dakota State University is really good and vibrational.



Jake Meier

I grew up in Merrimack, N.H., and am the oldest of three brothers. I like to snowboard, swim and play soccer and was on the swim team and the soccer team in high school. I went to Keene State College and graduated in 2011 with a BS in chemistry. I was actively involved in independent research while there.

I started to work for Dr. Kraly, trying to analyze pollutants in lichen. From this research I was able to attend several conferences including ACS and Pittcon. I received the MERCK award from the chemistry department, for excellence in the lab. I also ballroom dance and have been to several competitions.



Christopher Solis Ocampo

I consider myself a friendly guy, kind, and sometimes spontaneous. In my free time I enjoy going with my friends to see movies, reading books about castles and dragons, playing video games and cycling. I like new challenges and testing myself to the limit. That is why I chose to pursue a degree at SDSU. My research inter-

ests include heart failure and finding the causes by looking at cardiomyocytes. Prior to coming here, I was inspired in the use of liposomes, biomaterials and self-assembled macromolecules to apply to the treatment of diseases. I would like to apply any of these technologies in my future research at SDSU.



Kari Peterson

I grew up in Blooming Prairie, Minn., and graduated from high school in 2007, where I was a member of the cross country, basketball, and softball teams, as well as a member of the band. I attended Carthage College in Kenosha, Wisc., from which I received a degree in chemistry in the spring of 2011. At college

I was a member of the varsity softball team for four years, as well as a member of Theta Chi Delta. While at SDSU, I plan on working with Dr. Cole-Dai and doing ice core research.



Jianyuan Sun

My name is Jianyuan Sun. I am from China. I majored in applied physics and materials science in undergraduate and master. I have been learning polymer physics and chemistry during the research projects and am interested in the field of organic electronics. I work with Dr. Cheng Zhang in the organic chemistry lab

at SDSU and plan to learn the design, synthesis, and characterization of organic macro/small molecules for optoelectronic device applications. In leisure time, I like sports, music, plants and animals.

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

We gladly publish updates on our alum's 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.

New Faculty



Chang Zhang, assistant professor, chemistry, received a B.S. degree in chemistry from China's Wuhan University in 1987, and a Ph.D. in chemistry from the University of Southern California in 1999. He was material R&D director and chief chemist at Pacific Wave Ind. in El Segundo, Cal., from 2000-2004, research associate professor at Norfolk State University in Norfolk, Va., from 2004-2008, associate professor, Department of Chemistry, Norfolk State from January 2009 until joining SDSU in August 2011.



Suvo Chakraverty, assistant professor, chemistry/biochemistry, received a B.S. degree in ag sciences from India's Bidhan Chandra Krishi Vishwavidyalaya in 1995, an M.S. in biological sciences in 1998 and a Ph.D. in computational studies both from the Indian Institute of Science. He was a postdoctoral fellow at Mt. Sinai School of Medicine in New York City from 2002-2009. He joined SDSU in 2009 as a biochemistry teacher and bioinformatics researcher.



Stacie Lansik, instructor in Medical Lab Science, received a B.S. in medical technology in 1999 from the University of Nebraska Medical Center, Omaha. She is currently pursuing a master's degree in medical lab science at the University of North Dakota. She was a general lab scientist at Sioux Valley Hospital in Cherokee, Ia., from 1999-2001. Since 2001, she has been laboratory education coordinator for students at Avera McKennan Hospital in Sioux Falls as well as an instructor at SDSU.

Alumni Updates

Noelle Umback, Ph.D., Criminalist with the Office of Chief Medical Examiner, Department of Forensic Biology for New York City, has been selected to be a Commissioner on the Forensic Education Program Accreditation Commission of the American Academy of Forensic Sciences. FEPAC accredits programs that give degrees in forensic science. For the past four years she has served as a "practitioner" assessor for various undergrad and grad level programs teaching forensic science and that have applied for FEPAC accreditation.

Noelle, a 1992 ACS Chemistry grad, will serve an initial 3-year term, starting in February 2012, with the option of a second 3-year term. She has previously been involved in FEPAC as an on-site team member, visiting and evaluating programs seeking to become accredited.

Robert E. Wayryen: I graduated from South Dakota State in 1948 with a B.S. degree in Chemistry. I then got a Ph.D. degree and went to work in industry. We developed several successful new products in the field of medical x-ray imaging. For years, I gave lectures all over the United States and Europe on the x-ray imaging technology I knew so well. I retired in 1985 and then for about 10 years I taught medical x-ray imaging at the Medical Center. But then I had to quit teaching because the imaging technology I knew was being replaced with new digital technology. In the same way, the old Chemistry building I knew in 1948 was replaced by the new Avera Health and Science Center as the home of Chemistry and Biochemistry. Call it evolution or new developments in science, that is the way it should be. And, as Walter Cronkite used to say, "That's the way it is."

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