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Chemistry & Biochemistry Newsletter

Chemistry & Biochemistry

Spring 2007

Chemistry & Biochemistry Newsletter

Department of Chemistry & Biochemistry, South Dakota State University

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South Dakota State University

Chemistry & Biochemistry

Spring 2007

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- **2007 Chemistry and Biochemistry Graduates**

Message from the Department Head



The 2006/2007 academic year has flown by! We graduated outstanding classes of chemistry and CLS majors this May. We also graduated our first biochemistry major this fall only one year into the program! These students have accomplished much while they were with us, and they will accomplish much in the future. We wish them well as they continue to develop their careers. You can read more about these students on p. 8. It is also necessary to recognize Daphne Moutsoglou who was named a Goldwater Scholar for her senior year (2007/2008 academic year). This is an extremely prestigious award, and we offer her our congratulations (p. 4).

The facility plan for the new chemical sciences building to replace Old Shepard Hall has been completed. It still requires final approval by the Board of Regents, which should happen later this summer. When it does, I will share the plan with you in the form of a "special edition" newsletter later this winter. Our new president, David L. Chicoine, has received approval from the Regents to expand the project to include renovation of all of what is now "new Shepard," and planning for that project is also complete and awaiting final approval. The project is scheduled to start in February 2008 (weather permitting), which no longer seems very far away! With luck we should be moved into our new labs and offices by the end of 2009.

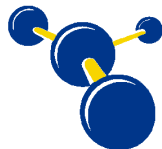
Raising the money to complete this project, both the new building and the renovation of new Shepard, is going to be a challenge. But it is a tremendous opportunity for you to get involved. And we are going to need your help! We continue to look for donations, but we are also in need of your time and contacts to help in the fund-raising process. If you are interested in helping us in any form, I would be delighted to visit with you about how you can contribute. Please don't hesitate to contact me.

We are also considering something new this summer — receptions for alumni at the national American Chemical Society meeting in Boston on August 19-23. I welcome any feedback on your interest in attending, either because you attend ACS meetings or because you happen to live in the area.

I hope you have a chance to enjoy the respite summer can provide. I will talk to you again this fall.

Stay in touch!

Jim Rice
james.rice@sdstate.edu



**chemistry
& biochemistry**

A Semester Break in Antarctica

What did you do over the end-of-year holiday break? Did you get a respite from the winter by going to some place warm in the south?

Graduate student Kevin Poenisch and Associate Professor of Chemistry Dr. Jihong Cole-Dai went south for the break. Way south.

They went to a place even colder than the winter of South Dakota.



Dr. Cole-Dai and Kevin Poenisch

Poenisch and Cole-Dai spent three and a half weeks in Antarctica, the frozen continent, from December 2006 to January 2007, on a research project funded by the National Science Foundation to study chemical composition of snow. This is a part of a major national research effort to recover a detailed history of the Earth's climate over the last 100,000 years from Antarctica ice cores. The national project is to obtain ice cores by drilling through the 3,500 meter thick ice sheet, at a location called the West Antarctica Ice Sheet Divide, or WAIS Divide (79.5°S, 112.0°W).

Poenisch and Cole-Dai began the Antarctica trip at Christchurch, New Zealand, the main jumping off place for U.S. scientists going to Antarctica.

At the “Clothing Distribution Center” in Christchurch, they received a set of extremely cold weather (ECW) clothing specifically for living and working in the Antarctic environment. The ECW gear included, among other things, ten pairs of gloves of different varieties and a pair of double-layered, white, rubber boots (called Bunny boots because anyone wearing them looks like a walking jackrabbit).

From Christchurch, the SDSU team of two traveled on a C-17 jet cargo plane to McMurdo Station, Antarctica. McMurdo is the main staging place for all activities and the hub of travel in Antarctica. It has a population of about 1,000 in the austral summer (November to February) which makes it the largest “city” on the continent. Because it was his first time in Antarctica, Poenisch was required to attend “snow school” (Snow Safety and Survival Training Course) to learn the basics of living and working in Antarctica before he was allowed to begin working. Cole-Dai decided that he needed to be refreshed and also attended the two-day “Happy Camper” course. Along with 11 other new arrivals, they camped in an open field just outside McMurdo for two days. With help from an instructor, they learned and practiced building and sleeping in snow



Kevin Poenisch at McMurdo airfield



Poenisch collecting samples in one of their three snow pits.

shelters, using communications equipment, emergency survival skills, and research-and-rescue.

On December 21, a ski-equipped C-130 propeller plane took the SDSU team to WAIS Divide, about 700 miles from McMurdo. The WAIS Divide camp, in the center of West Antarctica (the size of the United States east of the Mississippi), consists of about a dozen large, temporary, heated tentlike shelters and a couple of tall steel arches inside which the ice core drilling will take place over the next three years.

The work began right after their arrival. Over two weeks, they dug three three-meter snow pits to collect snow samples. Using clean saws and spatulas, they carved 24 snow blocks to fill eight large, insulated

boxes, which were shipped to the ice core and environmental chemistry freezer lab (Known as the ICEL lab!) on the second floor of Shepard Hall, to be analyzed for snow chemical composition. Besides taking snow block samples, they used small tools (fixed volume samplers and weighing balances) to measure snow density in the snow pits.

During the WAIS Divide stay, Poenisch and Cole-Dai slept in a large, heated sleep shelter called a “James-way.” The outside temperature was usually in the range of zero to +10 degrees Fahrenheit, but the wind-chill was always well below zero. A blizzard lasting more than 30 hours hit the camp on December 30 and created whiteout conditions with visibility down to about 20 feet. Fortunately, all shelter structures



Adelie penguins marching across the snow.

stayed up and everyone stayed safe and sound by remaining indoors during the blizzard.

On January 5, they flew, with their boxed snow samples, back to McMurdo. After arranging the safe transport of the sample boxes, they waited a few days for a flight to Christchurch. Surprisingly, some Adelie penguins suddenly appeared on the sea ice around McMurdo at this time.

Poenisch and Cole-Dai left McMurdo on January 8 and returned to the South Dakota winter around the middle of January when a cold spell began and lasted well into February. Somehow, the December and January weeks they spent in cold Antarctica sounded and felt much better than the cold January in South Dakota; maybe because that time is called summer in Antarctica.



Adelie penguins

Chemistry Major Receives Goldwater Scholarship

Chemistry major Daphne Moutsoglou was recently named a 2007 Goldwater scholar making her the third SDSU student over 10 years to receive a prestigious Barry Goldwater scholarship.

A junior microbiology and chemistry major from Brookings, she is one of 317 students from around the country awarded the scholarship which covers the cost of tuition, fees and books, as well as room and board for up to a maximum of \$7,500 per year.

“The Barry M. Goldwater scholarship program recognizes only top students planning professional careers in science, mathematics and engineering,” said Oren Quist, professor and head of SDSU’s Department of Physics and the Goldwater Scholarship Faculty Representative.

The 2007 Goldwater Scholars were selected on academic merit from a field of 1,110 students nominated by the faculties of universities nationwide.

“Receiving this scholarship is very exciting, because it indicates that my research experience is competitive at a national level,” said Moutsoglou. “It has inspired me to pursue research as a career.”

She began her research career the summer before her freshman year with Xiuqing Wang, associate professor of biology and microbiology. With Wang, she has been developing a stem cell line for porcine mesenchymal stem cells. Last summer she joined



Daphne Moutsoglou

Dr. Mary Mattapallil at the National Eye Institute with projects dealing with autoimmune diseases of the eye.

Recently, Moutsoglou has conducted research with Fathi Halaweish, associate professor of chemistry and biochemistry at SDSU.

“This research is exciting because it deals with cancer and chemotherapy and has a direct application to human diseases,” said Moutsoglou.

The Goldwater Scholarship will help Moutsoglou in a variety of ways.

“I plan on obtaining an M.D./Ph.D. degree so that I can conduct clinical research,” she said. “Receiving the Goldwater Scholarship will help me get accepted because this scholarship indicates that I am serious about conducting research.”

“Daphne should be very proud of her accomplishment, and we should be proud of her,” Quist added. “Her achievement is very significant.”

by SDSU University Relations

Recent Publications by the Department’s Faculty

Fathi Halaweish

Sandeep Jain, Amit Shirode, Shenouda Yacoub, Ashley Barbo, Paul W. Sylvester, Eric Huntimer, Fathi Halaweish, Khalid A. El Sayed, Biocatalysis of the Anticancer Siphonane Triterpenoids, *Planta Medica*, 73, 591-596, 2007

Zhang, D., and Halaweish, F.T. Isolation and Characterization of Ribosome-Inactivating Proteins from Cucurbitaceae, *Chemistry & Biodiversity*, 4, 431-442, 2007.

Singh, Y., Devkota, A.K., Sneed, C.D., Singh, K. and Halaweish, F.T., Hepatotoxicity potential of Saw Palmetto (*Serenoa repens*) in rats. *Phytomedicine*, 14, 204-208, 2007.

Continued on next page.

Hach Scientific Foundation Provides Two New Scholarships

Students with aspirations of becoming high school chemistry teachers could receive some extra help from South Dakota State University.

Beginning in the 2007-08 school year, the Department of Chemistry and Biochemistry will award two \$6,000 per year, renewable scholarships to students pursuing a chemistry or biochemistry major with the intent of teaching high school chemistry. They are funded through a donation made by the Hach Scientific Foundation, a nonprofit company dedicated to promoting chemistry education across the country.

“These are very substantial scholarships,” said Dr. Jim Rice, head of the department, emphasizing that receiving one of these scholarships could mean a total award of \$24,000 for an incoming freshman.

In order to be eligible for the scholarship, students must have a 3.0 GPA, be currently enrolled as an undergraduate chemistry major and be willing to sign a yearly agreement committing to become a chemistry teacher. Incoming freshman are eligible for the scholarship.

“The goal is to graduate highly qualified chemistry teachers to meet the requirements of federal programs aimed at improving secondary school chemistry education such as the No Child Left Behind Act,” Rice said. “Hach Scientific Foundation wants to support programs to improve chemistry teaching because its mission is to foster and support science and science

education and to show the interdependence between science education and the private sector.”

Hach Company founder, Dr. Clifford Hach, invented and re-engineered chemical analysis systems, particularly systems for testing water samples, which greatly simplified quantitative analysis. By reformulating coloring reagents and coupling them with precalibrated analytical protocols, simplified methods were developed that gained national acceptance and recognition. Many of these analytical procedures have found wide acceptance in the instructional science classroom.

For the Department of Chemistry and Biochemistry the scholarships bring recognition of a job well done.

“The scholarships recognize the quality education in chemistry and biochemistry provided by the department. That’s always nice because the faculty do an outstanding job and don’t always get recognized for the quality of the undergraduates that we graduate,” Rice said. “It’s confirmation of what we’ve known all along: We do an excellent job of preparing our undergraduates and the next generation of chemistry teachers.”

For information on the SDSU Hach Scientific Chemistry Teacher Scholarship, or an application, contact the Department of Chemistry and Biochemistry at (605) 688-5151. Applications can be downloaded at <http://66.231.15.132/ClassLibrary/Page/News/DataInstances/348/Files/293/HachApp.pdf>.

Recent Publications by the Department’s Faculty

Brian Logue

Baskin S.I., Petrikovics I., Platoff G.E., Rockwood G.A., and Logue B.A. (2006) Spectrophotometric Analysis of the Cyanide Metabolite 2-Amino-thiazoline-4-Carboxylic Acid (ATCA). *Toxicology Mechanisms and Methods*, 16(6), 339-345 (<http://dx.doi.org/10.1080/15376520600616933>).

Jim Rice

Berka, M.; Palau Pla, S.; Rice, J.A., 2006, Characterization of soil particle surfaces using adsorption excess isotherms, *Langmuir*, 22: 687-692.

Schindler, F.V.; Mercer, E.; Rice, J.A., 2007, Chemical Characteristics of Glomalin Extracted From Soil, *Soil Biol. Biochem.*, 39: 320-329.

Shang, C.; Rice, J. A., 2007, Investigation of humate-cetyltri-methylammon-ium complexes by small-angle x-ray scattering, *Journal of Colloid and Interface Science*, 305: 57-61.

Chemistry Alum Elected to National Academy of Sciences



Dr. Vern L. Schramm

Vern L. Schramm, Ph.D., professor and Ruth Merns Chair of Biochemistry at the Albert Einstein College of Medicine of Yeshiva University, has been elected to the National Academy of Sciences, the nation's most prestigious honorary society for scientists. His election was announced at the academy's annual meeting in Washington,

D.C. Schramm has been a member of the Einstein faculty since 1987.

Throughout his career, he has carried out groundbreaking research into the mechanisms involved in enzymatic reactions. This work has led to promising drugs now being tested in clinical trials for treating autoimmune diseases and several types of cancer.

Schramm studies the "transition-state structure" of enzyme-catalyzed reactions—the shapes that reacting molecules assume when enzymes catalyze chemical reactions. "Enzymes govern virtually all of the chemical transformations necessary for biological life but can also influence cells to become cancerous. By knowing the transition-state structure of enzyme-catalyzed reactions, we can design powerful inhibitors that can block those enzymes from acting and thereby treat or prevent cancer and other diseases."

One such inhibitor that Schramm has designed, known as Immucillin-H, is a promising anticancer

agent for treating T-cell malignancies. It is currently in a pivotal phase IIb clinical trial (specifically targeted to study efficacy).

Another transition-state inhibitor he developed is now being studied as a possible treatment for autoimmune diseases such as rheumatoid arthritis, multiple sclerosis, inflammatory bowel disorders and for preventing the rejection of transplanted organs.

The election to the academy is the latest among numerous honors recognizing Schramm's many contributions in more than 35 years as a biochemistry researcher and teacher, including the 2006 Repligen Award from the Biological Chemistry Division of the American Chemical Society, election as a Fellow of the American Association for the Advancement of Science, and the Harry Eagle Award for Outstanding Basic Science Teaching from the Einstein College of Medicine.

A native of South Dakota, he earned his bachelor's degree from South Dakota State College, a master's degree in nutrition from Harvard, and a Ph.D. in the mechanism of enzyme action from the Australian National University. He returned to the U.S. for post-doctoral training, serving as a research associate at the NASA Ames Research Center. He then joined Temple University School of Medicine where he was on the faculty for 16 years. He came to Einstein in 1987 as professor and chair of Einstein's biochemistry department. He was named Professor and Ruth Merns Chair of Biochemistry in 1995.

Recent Grant Funding by the Department's Faculty

Brian Logue

"Retrospective Analysis of Chemical Warfare Agent Metabolites in Hair," DoD Medical Chemical Program, PI, \$376,141 (2007-2010).

"Surface-enhanced Raman spectroscopy of cyanide and its metabolites for rapid diagnosis of cyanide exposure" modification to "Analysis of the cyanide metabolite 2-aminothiazoline-4-carboxylic acid (ATCA) in fish tissue and biological matrices," US Army Medical Research Institute of Chemical Defense, PI, \$169,791 (2005-2006).

2007 Lardy Lecture



Dr. Mark H. Thiemens

Dr. Mark H. Thiemens, dean of physical sciences and professor of chemistry at the University of California, San Diego, and a nationally recognized scientist conducting research on atmospheric chemistry and strategies to detect bioterrorist agents on aerosols, spoke as part of the two-day Henry A. Lardy Distinguished Lecture Series in Chemistry at SDSU February 8-9.

On February 8 he delivered a public lecture entitled "Climate Change, Mars, the Origin of the Solar System and Life," and on February 9 he spoke on "New Isotope Effects and Their Applications in Probing Nature on Earth and the Solar System; Past and Present."

Thiemens discovered a new variety of isotope effects in chemistry which overturned conventional theory regarding the formation and evolution of the solar system. His research used rocket-borne sampling to understand the chemistry of the Earth's upper atmosphere. Such sampling and work helps scientists understand and resolve issues in global climate warming.

He is currently working on a spacecraft that will fly and collect samples of the sun and Mars to help better understand the evolution of the solar system.

Thiemens was elected to the National Academy of Sciences in 2006.



Dr. Mark Thiemens directs preparation of a rocket to collect chemistry sampling to understand the Earth's upper atmosphere.

Scholarship and Awards

As of May 2007

Departmental Awards

CRC Press Chemistry Achievement Award: Stuart Anderson, Josh Kofford, Andrew Schieber and Joe Swanstrom

Phi Lambda Upsilon Award for Achievement in Organic Chemistry: Jordan Hout

Analytical Chemistry Award: Malissa Eng

Merck Index Award: Julie Garry, Sherif Halaweish and Daphne Moutsoglou

Hypercube Scholar: Jeff Fahey

American Chemical Society – Certified Graduates: Julie Garry, Sharon Klein and Joshua Kofford

Sioux Valley Outstanding Senior Award: Outstanding Chemistry Major—Jeff Fahey; Honorable Mention—Joshua Kofford, Julie Garry, and Sharon Klein

Departmental Scholarships

Eugene Burr and Ella Burr Schultz Scholarships: Kathryn Engle (returning student) and Nichole Taylor

Elmer and Roberta Johnson Leaders of Tomorrow: Alanna Grabouski (incoming major), Thomas Fischer (incoming major), Amy Rieck (returning students) and Sherif Halaweish (returning student)

Olive Burke Crary and Gerald D. Crary Jr. Scholarship: Malissa Eng

Hardin-Palmer Scholarship: Kalli Odegaard

Herbert H. Hodgeson Award: Nicholas Gau

Webster-Klug Award: Brian Eckrich

Arthur W. Dobberstein Achievement Award: Kristine Gums, Danielle High Bear and Lucas Zimney

Donald E. McRoberts Award: Shelby Bush

Hach Scientific Foundation Scholarship: Carrie Ostraat

Guss Memorial Award: Mitchell Dobberpuhl

Oscar and Elaine Olson Scholarship: Robert Cress

Lloyd Baillie Award: Amanda Heeren

E. R. Binnewies Memorial Award: Jordan Hout

Joseph and Coral Bonnemann Scholarships in Medical Technology: Julie Bender

Philip and Eleanore Haskett Award: Andrew Young (awarded in Fall 2006)

2007 Chemistry and Biochemistry Graduates

Doctor of Philosophy

Drew Budner

Development of a Continuous Analysis System for Ice Cores Using a Melter with Ion Chromatography and an Initial Study of an Electroanalytical Technique for Ice Cores
(Dr. Jihong Cole-Dai)

David Ferris

Dynamic Subcritical Water Extraction, GC-MS Analysis of Polycyclic Aromatic Hydrocarbons in Precipitation
(Dr. Jihong Cole-Dai)

Bachelor of Science – Chemistry

Jonathan Beattie (B.S. Chem, May '07), Major in Chemistry, Minor in Biology. (*Attend Pharmacy School*)

Allison Bormann (B.S. Chem, May '07), Major in Chemistry and Major in Biology with specialization in pre-professional. (*Attend Graduate School at SDSU*)

Jeff Fahey (B.S. Chem, May '07), Major in Chemistry. (*Attend Graduate School at SDSU*)

Sharon Klein (B.S. Chem, May '07), Major in Chemistry, ACS certified, Minor in Biology. (*Working in industry*)

Josh Kofford (B.S. Chem, May '07), Major in Chemistry, ACS certified. (*Attend Graduate School at SDSU for Ph.D. in Analytical Chemistry*)

Andrew Schieber (B.S. Chem, May '07), Major in Chemistry, Minor in Business. (*Attend Palmer College of Chiropractic in Davenport, Iowa*)

Joseph Swanstrom (B.S. Chem, May '07), Major in Chemistry, Minor in Physics. (*Working at Brown Research in Sioux Falls, doing analytical chemistry*)

Brianna Toppel (B.S. Chem, May '07), Major in Chemistry. (*Undecided*)

Bachelor of Science – Chemistry

Julie Garry (B.S. Chem, May '07), Major in Biochemistry, ACS certified, Minor in Biology. (*Attend USD Medical School*)

Bachelor of Science – CLS

Kimberly Bennett (B.S. CLS, May '07), Major in Clinical Laboratory Science, Minor in Chemistry and Biology. (*Work at Sanford Health USD Medical Center as a Medical Technologist, Sioux Falls*)

Heather Dammann (B.S. CLS, May '07), Major in Clinical Laboratory Science, Minor in Chemistry and Biology. (*Work at Avera McKennan Hospital, Sioux Falls*)

Joann Heien (B.S. CLS, May '07), Major in Clinical Laboratory Science, Minor in Chemistry and Biology. (*Work at Abbott Northwestern Hospital, Minneapolis, Minn.*)

CLS Internships in 2007/2008

Lori Bauer, Sanford Health USD Medical Center, Sioux Falls

Amanda Bredeesen, Mercy Medical Center, Sioux City, Iowa

Teresa Feldhacker, Mercy Medical Center, Sioux City, Iowa

Nick Gau, Sanford Health USD Medical Center, Sioux Falls

Kristie Gums, Mercy Medical Center, Des Moines, Iowa

Lin Hamburger, Rapid City Regional Hospital

Danielle High Bear, Sanford Health USD Med. Center, Sioux Falls

Melissa Johnson, Sanford Health USD Med. Center, Sioux Falls

Alycia Krcil, Sanford Health USD Medical Center, Sioux Falls

Aaron Lambert, University of Nebraska Medical Center

Lindsey Meier, Sanford Health USD Medical Center, Sioux Falls

Scott Ratermann, UND, Grand Forks, N.D.

Kacy Salter, UND, Grand Forks, N.D.

Carmita Sanders, Rapid City Regional Hospital

Jessica Solberg, St. Luke's, Sioux City, Iowa

Ann Thomas, Sanford Health USD Medical Center, Sioux Falls

