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Chemistry & Biochemistry Newsletter

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Fall 2009

# Chemistry & Biochemistry Newsletter

Department of Chemistry & Biochemistry, South Dakota State University

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*In 2010, the Avera Health and Science Center will be the new home of SDSU's Department of Chemistry and Biochemistry.*

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## South Dakota State University

# Chemistry & Biochemistry

Fall 2009



Greetings from the Department! The 2009/2010 academic year is flying by! It's hard to imagine that we are already starting the spring semester.

The construction of the Avera Health Sciences Complex and the renovation of new Shepard Hall have dominated the year so far. You can find some pictures of the progress on p. 7. For those of you that have lived through a renovation you have some sense of what we are going through. But just imagine going from four floors to about two, and still having to teach labs for ~2,000 undergrads each week and house a graduate program with ~60 graduate students this year! We occupied the third floor of the renovated Shepard Hall at the end of June, and will occupy the renovated second floor sometime in mid-February which helps to relieve the pressure on the research spaces. The biochemistry and organic faculty and their research groups, who recently organized as the Center for Biological Control and Analysis by Applied Photonics, are on the third floor. (See the story on BCAAP, p. 2.) The environmental/analytical research groups will be on the second floor. We are still scheduled to occupy the new building in June 2010

The newsletter again highlights some of the accomplishments of the Department's graduate and undergraduate students (p. 5). They are a talented group of young scientists whose recognitions reflect the commitment that the department's faculty have to graduate AND undergraduate education, and the commitment of the department's staff to supporting those endeavors. With 60 students, the graduate program is now at it's largest in the history of the department. Approximately 50 are in the Ph.D. program and over 30 percent on research assistantships (which is a very good percentage). The new graduates students joining the program this year are introduced on p. 6. The Department's research funding was also at its highest in history in fiscal 2009 and in fiscal year 2010 we have already matched that total with six months still to go. Again, a tribute to the efforts the faculty.

The CLS program has added three new faculty, and they are introduced on p. 4. Dr. John Robinson is a biochemist who will join the faculty in January 2010, and we'll introduce him in the next newsletter. We welcome them all to the department.

On behalf of the department, I wish you the best for a Happy and Prosperous New Year.

Stay in touch!

## Research Finds New Uses for Light or Applied Photonics

Chemists and biochemists in a new research center at South Dakota State University will use light to deliver and evaluate new medical treatments and to explore similar innovations.

The new center at SDSU is called the 2010 Center for Biological Control and Analysis by Applied Photonics. Photonics is a discipline that deals with generating, controlling, detecting and using visible light. Called BCAAP for short, the Center will lean heavily on the expertise of chemists. However, they will very likely work with colleagues in other disciplines at SDSU and elsewhere to carry out projects.

“The center brings together researchers, primarily in the areas of organic and biochemistry, to use light as one of the tools to either control biochemical processes, or to analyze biochemical processes,” said professor Ron Utecht who directs the new center.

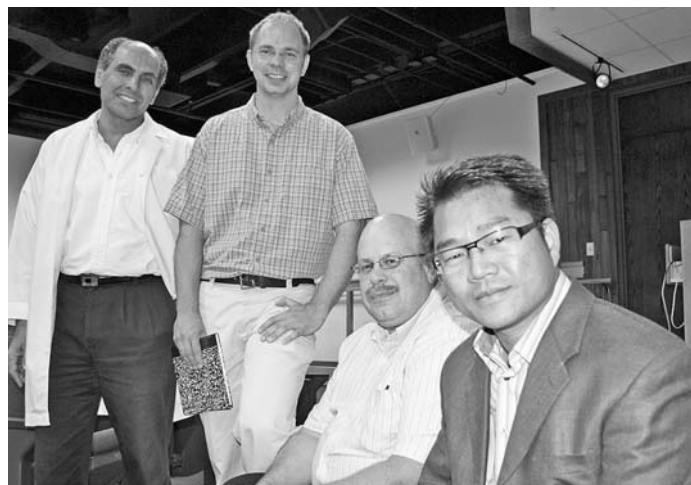
Jim Rice, Chemistry and Biochemistry department head, said they have been investing discretionary research spending over the past several years to put in place the people and physical infrastructure necessary for a successful center proposal.

“We have invested heavily in new faculty members such as Dr. Adam Hoppe by providing competitive research laboratory start-up packages and developing research instrumentation resources such as core mass spectrometry and nuclear magnetic resonance (NMR) facilities that are major chemical characterization tools and critical to the success of a group like this, and chemical research in general at SDSU. We will continue to make these investments with the Center’s new faculty hires. Many people don’t realize that academic research faculty are really entrepreneurs and these investments can be considered a form of ‘venture capital’ provided by the department to help them develop. The returns that we hope to receive on these investments are large research grants like the 2010 BCAAP Center.”

South Dakota will funnel \$4.3 million over the next five years to the center through its Research and Commercialization Council. SDSU also must make a major investment by providing a matching contribution of \$500,000 to the project. Its share will be used to hire and support two new chemistry faculty members whose areas of specialization will complement the expertise of the center’s other researchers.

Here’s what the researchers of the center already are doing:

Professor Ron Utecht’s research interests include working with a light-activated material that could replace surgical stents for treating peripheral arterial disease. The idea is to use the material to remodel the tissue in a patient’s arteries so that arteries remain open as the patient heals. Professor Fathi Halaweish, who works with drug discovery,



SDSU researchers Halaweish, Hoppe, Utecht, and You.

is evaluating a biologically active compound that can be administered through photoactive treatment. Light-activated techniques can make it a “smart” treatment that delivers the drug more accurately to where it is needed, Halaweish said.

Assistant professor Youngjae You’s research interests include working with photodynamic therapy, which uses visible light, a non-toxic chemical “sensitizer,” and oxygen to target and damage cancer cells while leaving healthy tissues unharmed. One focus of Dr. You’s work is finding new photosensitizers to improve the treatment.

Assistant professor Adam Hoppe uses light to study the biochemical mechanisms that control cell function, particularly within the cells of the immune system. Specifically, his lab develops new methods based on what is called Fluorescence Resonance Energy Transfer to monitor changes within cells. That can include exploring how cells respond to medical treatments, thus generating crucial knowledge to help scientists fine-tune new drugs or therapies.

The two new faculty members SDSU will recruit will likely include a biochemist specializing in cell function and enzyme structure; and a specialist in computational chemistry who can use computer modeling techniques for biomedical uses.

Utecht said just as with the state’s other 2010 research centers, the center is to become self-sufficient after five years. He said the intent is that the scientists, by increasing the professional stature of the BCAAP group, will draw in more research funding from government and maybe from industry.

If any of the center’s projects lead to commercial products, Utecht added, there is a strong possibility that any new manufacturing jobs that result—including high-tech, high-salary jobs—would be based in South Dakota.

## SDSU Grad Student Awarded EPA Sustainability Grant

Erin Mercer, a South Dakota State University chemistry and biochemistry Ph.D. student, received one of 43, \$10,000 grants awarded nationally under the EPA's People, Prosperity and the Planet (P3) program.

Mercer and her advisor, Professor Fathi Halaweish, are developing a catalyst to convert waste grease from local, fast food businesses into biodiesel.

"The current technology requires multiple steps to wash and separate the by-products," said Halaweish. "We've identified a catalyst to convert waste grease to biodiesel in an efficient, short time."

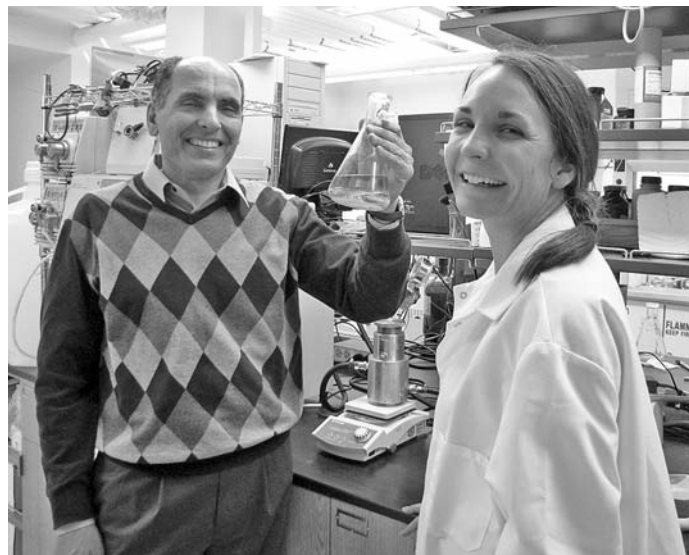
The Phase I EPA competition was open to college and university students to design creative technologies for sustainability challenges in the developing world. Student projects varied from a Clemson University project to design housing from retired shipping containers that could withstand hurricanes; to a Penn State project to fabricate a generator system that provides electricity to homes in Kenya from locally grown crops; to a UCLA project developing a portable, rapid detection method for pathogens in communities without a safe and clean water supply.

The proposal from SDSU suggests that its success would "enhance the economy of the community serviced by generating a market for local oil and waste grease resources, creating jobs in its business endeavors, feedstock sales, production process and resale while providing an ecologically benign end product."

Mercer, a graduate student from Lincoln, Neb., is in her third year working on the process.

"Our goal is to cut down on the process and make it more economically feasible for handling a broad range of waste," said Mercer. That broad range might come from local fast food businesses, recycled, local oil or potentially algae. "We've cut a multi-step process down to one step."

The P3 project teams have eight months to perfect their designs and take them to the 6th annual National Sustainable Design Expo in Washington D.C. where the projects will be judged by a panel of experts. A few projects will be selected for Phase II of the People, Prosperity and Planet program and receive grants up to \$75,000 to further their designs.



**SDSU Professor Fathi Halaweish and his graduate student Erin Mercer smile at the one-step results created by the catalyst they've discovered to make biodiesel from waste grease.**

## Alumni Update

### Michael P. Pietila

I graduated with degrees in Chemistry and Microbiology with a Biochemistry minor in 1995. John Grove was my advisor. I went on to the University of South Dakota for medical school and completed internship and residency in Internal Medicine and a fellowship in Pulmonary and Critical Care Medicine at the Mayo Clinic in Rochester, MN. While at Mayo I spent 12 months in a basic science lab researching various aspects of *Pneumocystis* organisms and *Mycobacterium Avium Intracellulare* organisms.

I am now a board certified physician practicing Pulmonary, Critical Care, Sleep and Internal Medicine at the Yankton Medical Clinic in Yankton, SD. I hold an appointment as an Assistant Academic Professor of Internal Medicine at the Sanford School of Medicine at USD. I was recently awarded with an appointment as a Fellow in the College of Chest Physicians (FCCP). I teach and mentor medical students on a daily basis.

I really enjoyed my time at SDSU and believe that the courses at SDSU had me well prepared for medical school and as I went on to training and now in my daily practice.

## New CLS Faculty



### Heather Hall

Heather Hall has joined the faculty as an instructor in the Clinical and Laboratory Sciences Program. Heather's undergraduate degree is in Clinical and Laboratory Sciences from SDSU. She also has a Master's in Business Administration with emphasis in HealthCare Management from the University of Phoenix. She holds

national certifications as a Medical Technologist and as a Clinical Laboratory Specialist in Cytogenetics.

Heather has worked in clinic, hospital, adult and pediatric settings. She also worked in the field of Cytogenetics for four and a half years. She is excited to be returning to South Dakota State and to be working in the Clinical and Laboratory Sciences program during its transition to a dynamic professional program.



### Mary Nagel

Originally from Linton, ND, Mary Nagel grew up on a family farm south of Bismarck with nine siblings; six brothers and two sisters. She graduated from Jamestown College with a Bachelor's degree in Biology and Chemistry minor and completed a Clinical Internship was in a hospital-based Medical Technology

program at St. Alexius Hospital in Bismarck, ND. Mary received a Master's in Education and Online certificate from Bemidji State University.

Mary is a member of American Society of Clinical Laboratory Scientist (ASCLS), joining as a student and having held several state and regional offices as well as attended many National, Regional and State meetings.

Mary worked in a rural hospital in Cavalier, ND, as a generalist in all areas and as the Lab Supervisor. She was hired by the Grand Forks Clinic where I was the Hematology Coordinator supervising technicians, technologists and phlebotomists.

She moved into teaching in 1999 and taught in an accredited Clinical Laboratory Technician program for nine years at Northland Community and Technical College (NCTC), East Grand Forks, MN.

Prior to accepting the CLS instructor position at SDSU, Mary was working in Mali, Africa, as a consultant hired by the National Institute of Health (NIH). My duties were to educate and train the laboratory staff, develop staff compe-

tency, move the laboratory towards accreditation and ensure accurate laboratory testing to support a clinical trial for a malaria vaccine.



### Dr. Patricia Tille

Pat Tille is a life-long resident of South Dakota. She completed her bachelor's degree in biology at the University of Sioux Falls in 1992 and completed her clinical training at Sanford USD Medical Center. Following her clinical training, she received her doctoral degree in microbiology from Sanford School of

Medicine in Vermillion, SD. Her doctoral thesis, "Replication and Maintenance of the Enterococcus faecalis plasmid pAD1," encompassed the genetic mechanisms for plasmid replication and stable inheritance.

Dr. Tille began teaching while completing her dissertation. She has taught primarily at private institutions in South Dakota, most recently her alma mater, the University of Sioux Falls. During her teaching career, she completed a two year post-doctoral appointment at the Sanford Health-Cardiovascular Research Institute examining the effects of thyroid hormone on cardiac hypertrophy. Her research and teaching efforts have been funded by the American Heart Association, the Waksman Foundation for Microbiology and the National Institute of Health INBRE program.

In addition to teaching and research, Dr. Tille is a highly recognized clinical laboratory scientist at the state, regional and National Level. She has held several positions at the state level, including two consecutive terms as ASCLS-SD president. She was awarded the ASCLS National Bio-Rad Professional Achievement Award in Microbiology in 2004 and South Dakota Member of the Year in 2005. She currently serves as the Treasurer for the South Dakota Academy of Science, Executive Board Councilor in Biology for the National Council on Undergraduate Research, the ASCLS National Scientific Assembly Chair in Molecular Diagnostics, Awards Chair for the Bio-Rad Professional Achievement Awards and Special Scientific Resource Editor for the ASCLS Professional Newsletter.

Dr. Tille and her husband David have been married for 30 years and have four children, Christina Tille-Wagner, Malissa, D.J. and Katie.

## Chemistry: It's Elemental

Iowa City was host of this year's American Chemical Society's Annual Regional Meeting, held October 21-24. The conference theme was, "Chemistry: It's Elemental" and researchers focused in areas of health, energy, and the environment were invited to share their work. Nineteen SDSU Chemistry and Biochemistry graduate and undergraduate students presented their research and participated in the meeting's events. Symposia topics included: Advances in Photopolymerization, Chemical Education Research and Practice, Atmospheric Chemistry and Climate, Supramolecular Chemistry, and Science and Nanotechnology: Environmental and Health Aspects. In addition to these areas presented, an exhibition integrating high school and undergraduate activities and an ACS career workshop was offered. The meeting was a great opportunity for conversation and collaboration among scientists having similar research interests and allowed student presenters insight into the interdependent relationship of society's progression by the contribution of science. All returned to their respected laboratories refocused on their research, having enjoyed the break from routine and reenergized by the dialogue shared.

SDSU faculty and students presenting research included: Bradley A. Anderson, *Greener Chelating Agents for Analytical Titrations*; Samuel G. Awuah, *Pyran BASED for Dye-Sensitized Solar CELLS*; Moses Bio, *Synthesis and Kinetic Studies of Singlet Oxygen-Mediated Cleavable Linkers as A Tool for Drug Delivery*; Dr. David Cartrette, *Qualitative to Quantitative—Rethinking the First Two Years of the Chemistry Curriculum*; Jennifer Chase, *The Role of Wnt-10b in Osteoblast Development*; Ganesh Degam, *Extraction of Fat in Peanut Butter*; Tunde Dioszegi, *Hydrolysis and Extraction of Fats in Dairy Products*; Brian Eckrich, *Pyrolysis Bio-Oil Fractionation and Characterization via Accelerated Solvent Extraction (ASE)*; Victor Essel, *Recovery and Characterization of Protein and Cellulose From Soybean Meal and White Flakes Dissolved in Ionic Liquids*; Jeff Fahey, *Food Preservative Activity of Phenolic Compounds in Orange Pee Extracts (Citrus sinensis L.)*; David Ficek, *Phenolic Compounds and Antioxidant Activity in South Dakota Spring Wheat*; Blanca Gilbes, *Development of Novel Cucurbitanes from Synthetic Transformations on (+)-Estrone*; Jessica Goerdts, *Investigating Knowledge Transfer between Chemistry Subdomains*; Remeredzayi Gudyanga, *Solid-State NMR Characterization of Geolipid Fractions Obtained by Size Exclusion Chromatography*; Alyson Lanciki, *The Climate Impact of the 1783 Eruption of the Laki Volcano*; James Lokken, *Interaction of Echinacea Purpurea with the Metabolism of Anti-Inflammatory and*

*Anti-Hypertensive Agents via Cytochrome P450 3A4*; Bethany M. Melore Lehrman, *Inquiry in the Chemistry Classroom: An Age Comparative Study of Higher Order Thinking Skills*; Erin Jo Mercer, *Biodiesel Synthesis via Recyclable Heterogeneous Catalyst: Titanium Niobate Nanosheet*; Gregory Nkepan, *Synthesis and Kinetic Studies of Singlet Oxygen-Mediated Cleavable Linkers as A Tool for Drug Delivery*; Kevin Poenisch, *Two-Dimensional Ion Chromatography with Preconcentration for Perchlorate Determination from a Greenland Ice Core*; Pallavi Rajaputra, *Delocalized Cations as Mitochondrial Targets in PDT and Their In Vitro Assessment*; Nichole Rice, *Synthesis of Prenylated Flavonoids as Anticancer Drugs*; Amy Lynn Rieck, *Synthesis of Prenylated Flavonoids as Anticancer Drugs*; Kan Shen, *The Use of Ionic Liquids in Bioprocessing*; Joelisa Tyler, *Simulated Docking of Lobeline Analogues On the Neuronal Nicotinic Receptor Alpha 4 Beta 2*.

## Alumni Update

### Dr. Gilberto Piedra M.

Right after my graduation from SDSU, I moved to North Dakota and worked there till February 1995. Then I returned to Costa Rica and started working for a couple of local industries; I joined Universidad Nacional (UNA) in 2000, as a part-time job, and have been teaching general, inorganic, and basic organic chemistry courses since then. I became a full-time, tenure track faculty member in 2005. I'm also managing a marine chemistry lab that conducts environmental studies associated with marine struans and related matrixes. I hold an assistant professor status due to my short teaching experience and that I haven't done much research so far. This will change in the next two years.

I'm still married to Elissa; I have two children: Ricardo is 18 and studies Music (saxophone) at UNA, he is a South Dakotan; Deborah (15) is in high school, she is North Dakotan. So far, we're all doing fine, no regrets or complaints.

## New Graduate Students



### **Naga Vinod Kumar Bathula**

I am from the village of Mogaltur in the southern part of India. I received my master's in organic chemistry in India. I have a passion for analytical chemistry and I am happy to be at SDSU working with Dr. Raynie. My favorite pastime is cricket.



### **George Gachumi**

I am from Kenya where I received a Bsc Hons., from the University of Nairobi in 2007 and a Ph.D., in chemistry from SDSU. Dr. Douglas Raynie is my advisor and I have been working on a project in Bioprocessing in Supercritical Fluids. My hobby is playing volleyball.



### **Raj Bhandari**

I am a native of Nepal and got my undergraduate degree from St. Cloud State University in 2008. After graduating I worked for a year as a research assistant at Harvard School of Public Health in Boston, Mass. I am now pursuing a doctorate degree in Analytical Chemistry

under my advisor Dr. Brian A. Logue. Besides chemistry my main interest is the Minnesota Vikings.



### **Randy Jackson**

I was born in Wichita Falls, Texas. I have a B.S. in Biology and a M.S. in Forensic Science. I came to SDSU to work with Dr. Logue and continue my master's research. My future goals are to work in clinical toxicology or forensic chemistry/toxicology.



### **Vidya Biradar**

I received a master's degree in chemistry in India. I joined SDSU to work towards a Ph.D. degree in organic chemistry.

I have always wanted to work on anti-cancer drugs and here at SDSU my research is focused on developing anti-cancer drugs through natural as well as synthetic methods. I like to play badminton and chess, watch movies, read books, go shopping and sleep a lot!



### **Hiranmayee Kandala**

I received a master's in microbiology in India and another master's from Western Kentucky University. My ambition is to be a doctor. I came SDSU to work towards a Ph.D. and in just four months SDSU has given me a new view of approaching research in a comprehensive way. Now I am an ex-officio member of IRC-SDSU and its fun to be an all-rounder.



### **Derek Brandis**

I was born in Spearfish, and was raised in Winner, SD, where I graduated high school in 2003. I graduated from SDSU this last spring with a B.S. in chemistry with a minor in math. I will be working with Dr. Adam Hoppe, and hope to pursue a project that ties math, physics,

chemistry, and biology together. I enjoy pro football (my team is the Jaguars), playing basketball, running, and hanging out with friends.



### **Jieqiong Lou**

I was born in Zhejiang, in the southeast of China. I went to Lanzhou University, in northwest China, where I got my Agricultural Bachelor degree on 2005. In 2007, I studied in the SDSU Plant Science Department for one and half years before transferring to the

Chemistry & Biochem Department in January 2009. Now I am doing research regarding signaling transduction in mammalian cells.



### **Sonia de la Torre-Melendez**

Hi! I'm from Puerto Rico where I used to go a lot to the beach and the movies with my friends. After my B.S. degree in Chemistry from the University of Puerto Rico, I decided to come to SDSU to pursue a Ph.D. in organic chemistry. I will be working with Dr. Halaweish.



### **Haribabu Maddineni**

I am from Hyderabad in the southern part of India. My hobbies is listening music and playing cricket. I am working for Dr. Brian Logue.



**Brendan Mitchell**

I hail from Somers, NY, which is just outside of New York City. I will be pursuing an advanced degree in analytical chemistry here at SDSU, while working with Dr. Brain Logue. I received my B.S. in chemistry from St. Lawrence University in Canton, NY. As an undergrad, I was a student-athlete and competed on the football team at St. Lawrence. I enjoy being outdoors and fishing. I am very excited to start my new career here at SDSU.

at Ahram Canadian University in Giza and did work at the master's level at school of pharmacy at Cairo University. My passion to come to the States to pursue a Ph.D., has lead the department of Chemistry and Biochemistry at SDSU where I joined Dr. Halaweish's group



**Vara Sakampally**

I was born in Warangal, India. I have a sweet family with one younger brother and sister. I received my early schooling at Baby Sainik School and later graduated in Pharmacy from Kakatiya University, India. I came to U.S. to improve my knowledge of chemistry and graduated from Western Kentucky University. To gain more in-depth knowledge I am pursuing a Ph.D. at South Dakota State University. I am a fun loving person and always search for happiness in the things I do. Badminton, football (soccer), and chess are my favorite games. Reading newspapers and journals are my hobbies.



**Mahmoud Salama**

I was born in Cairo, Egypt. I received a bachelor's degree from the School of Pharmacy at Helwan University in Egypt in 2000. I worked a year at a big pharmacy in Cairo and then became a research assistant at the National Organization of Drug Control and Research. Later I became a teaching assistant at School of Pharmacy

## Avera Health and Science Center Construction Update



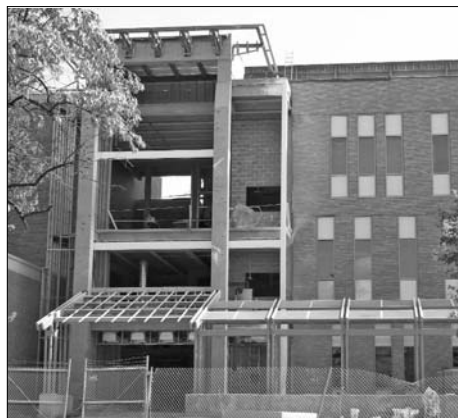
July 2009



September 2009



November 2009





## Rice Named to National Science Foundation Committee

James A. Rice, Chemistry and Biochemistry department head, has been named to his second advisory committee to the National Science Foundation.

Rice has been appointed to the Advisory Committee for Environmental Research and Education at NSF. He also serves on the foundation's Advisory Committee for Cyberinfrastructure.

The AC ERE is the most important means by which NSF receives external input on its environmental portfolio of funding activities and suggestions for environmental research and education initiatives. The initiatives figure prominently in NSF's 2006-2011 strategic plan.

"This is an interesting opportunity," said Rice. "It's a committee that provides important input to NSF, as its recently released report on critical transition points in complex environmental processes—like global climate change—has shown.

"It's also a chance to interact with the people who actually manage the environmental research and education programs at NSF," he added. "It also provides the opportunity to interact directly with the director and deputy director at NSF. "Being on the committee provides great insight into how NSF functions."

For Rice, whose research interests are in environmental chemistry and geochemistry, the appointment is not only

professionally rewarding, but also one that can benefit the Department of Chemistry and Biochemistry at SDSU.

"This is something I can contribute to from a technical point of view as an environmental geochemist," said Rice. "It will also benefit our department, especially our younger faculty, because one of our research focus areas is in environmental and sustainable chemistry.

"The interactions that take place through this committee provide insight into the directions NSF is going, so I can better guide faculty members as they develop and submit research grant proposals," he added.

Rice noted that serving on two NSF advisory committees also enhances his role as director of the South Dakota EPSCoR (Experimental Program to Stimulate Competitive Research) program which he has lead since 2002.

"The Advisory Committee for Cyberinfrastructure is important to what we try to accomplish in EPSCoR, because we are a large state with a small population, and in EPSCoR, we've learned that cyber-enabled communication and collaboration greatly enhances our ability to secure competitive research funding," he said.

"The two committees are complementary assignments in the sense that so much of environmental science involves the collection of data via cyber-enabled, research infrastructure," Rice added.

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