Fall 2010 http://www.k-state.edu/biochem

# Biochemistry News

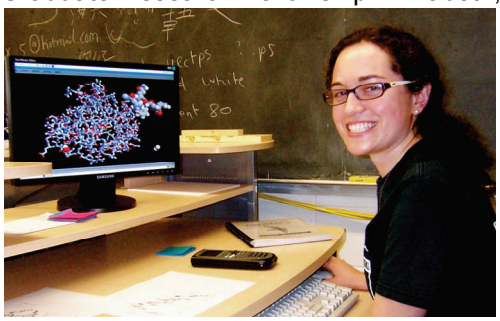
*Kansas State University - Alumni and Friends Newsletter*

## Newsletter Highlights



## Biochemistry Student Earns Graduate Research Fellowship from National Science Foundation

**Elizabeth Ploetz** from Kansas City, Kan., has received a National Science Foundation Graduate Research Fellowship. Elizabeth, a student in the concurrent B.S./M.S. program in Biochemistry, received both degrees in May 2010.



Elizabeth Ploetz

The fellowship provides a $30,000 stipend and $10,500 cost-of-education allowance annually for three years of education.

Elizabeth will attend K-State through the fellowship and will work for her Ph.D. with Paul Smith, professor of chemistry, studying mechanisms by which proteins are denatured and the process of protein aggregation. Elizabeth's focus has been improving the description of the interaction energy between particles in molecular dynamics simulations through the use of the Kirkwood-Buff theory.

During her undergraduate studies, Elizabeth received a Kansas State University Foundation Scholarship, a Wanda Bates Biochemistry Undergraduate Scholarship and an R. Kenneth Burkhard Women in Biochemistry Scholarship.

## National Science Foundation CAREER Award to K-State Biochemist Jianhan Chen

**K-State News Services**

An award from the National Science Foundation will boost a Kansas State University Biochemistry professor's contribution to the study of proteins while also helping college and high school science teachers learn more about computational and structural biology.

Jianhan Chen, an assistant professor of biochemistry, is receiving more than $670,000 as a CAREER Award from the National Science Foundation. CAREER is the foundation's most prestigious award for junior faculty to support early career development activities of teacher-scholars who most effectively integrate research and education within the context of the organization's mission. "The CAREER award is a great honor," Chen said. "I am really glad that I will be able to focus more on establishing a strong research program and providing useful educational and training opportunities to the campus and community."

Dr. Jianhan Chen

Chen will use the award to develop new methods for effective modeling of proteins and to study a novel class of functional proteins known as intrinsically disordered proteins. This type of protein plays fundamental roles in crucial areas, such as cellular signaling and regulation, and it is involved in neurodegenerative diseases and cancer.

**See CHEN page 5**

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# Biochemistry Student Selected as 2010 Undergraduate Student Fellow

The American Physiological Society selected **Jacob Hull**, junior in biochemistry from Garden City as a 2010 Undergraduate Student Fellow. He received a stipend to cover living expenses during the 10-week fellowship, which he served this summer in the laboratory of Bruce Schultz, professor of epithelial cell physiology in K-State's Department of Anatomy and Physiology and member of the Graduate Biochemistry Group.

Hull is one of 24 students worldwide to be named a Fellow. The fellowship program aims to encourage students about careers in biomedical research. Among the selection factors were academic merit and quality of research experience. Hull's research project was "Role of peroxisome proliferator-activated receptor gamma on epithelial growth, differentiation and activity" and is related to work done in Schultz's laboratory on the link between mutations in the cystic fibrosis protein known as CFTR and loss of the male reproductive duct that occurs in cystic fibrosis patients. As part of the fellowship, Hull also received additional funds for to present his research at the Experimental Biology 2011 meeting in Washington, D.C.

After earning his undergraduate degree from K-State, Hull plans to attend graduate school to get his doctorate in a biomedical field.

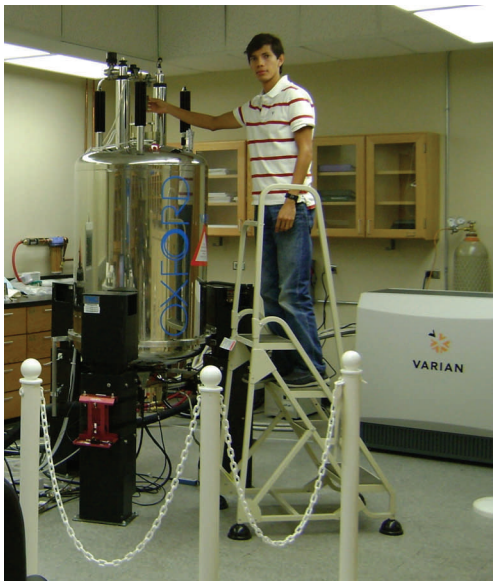
# Mary L. Vanier Biomolecular NMR Facility- Cryogenic NMR Probe

**by Dr. Om Prakash**

Nuclear Magnetic Resonance (NMR) spectroscopy is a key technique used to determine detailed molecular structures of biomolecules. NMR is particularly suited for obtaining detailed information on internal molecular motions and interactions, as well as conformation of proteins in their functional states. This information on proteins is extremely valuable, if we wish to understand at molecular level how any biological process in any living system works.

During the last decade, an important advance towards improving the sensitivity and resolution in NMR spectroscopy has been the development of cryogenic probes. An NMR probe is an important part of the instrument that holds the NMR sample in the magnet, excites the nuclear spins, and detects the NMR signal. It contains electronics which pulses the radio frequency field and necessary hardware to control the sample temperature.

In new cryogenic NMR probes, the radio frequency coils and preamplifier of the probe are cooled to cryogenic temperatures with liquid helium. These two components bring an improvement in sensitivity and also a massive reduction in noise, so enhancing overall signal-to-noise ratio, resulting in much better sensitivity of the instrument. Cryogenic NMR probes have become popular with researchers working in biomolecular NMR and those performing studies of low-molecular-weight compounds where sample quantities may be in the low-microgram range. The improved sensitivity is especially important to perform high-throughput NMR-based screening and to those studying proteins or metabolites.




**Facility Manager Alvaro Herrera testing the newly installed triple resonance cryogenic probe.**

The National Institute of Health and National Science Foundation awarded $675,000 to the Biomolecular NMR Facility in the K-State Biochemistry department to purchase a four channel 500 MHz Varian NMR console and a state-of-the-art triple resonance cryogenic probe with the capability to perform complete array of double and triple resonance heteronuclear NMR experiments using $^{13}C$, $^{15}N$ and/or $^{2}H$ labeled protein/or protein domain samples. In addition to federal support, the NMR facility has also received support from the Kansas Agricultural Experiment Station, Office of the Provost through the Targeted Excellence Program, KSU-Center of Biomedical Research Excellence (COBRE), Johnson Center for Cancer Research, and the Department of Biochemistry.

The acquisition of this cryogenic probe technology is critical to the cutting edge research of KSU scientists being performed at our Mary Vanier Biomolecular NMR center. The addition of this probe will provide enhanced capability for our most challenging NMR projects.

# RESEARCH TEAM INVESTIGATES MUTATED GENE'S ROLE IN BREAST CANCER

Dr. Anna Zolkiewska, associate professor of biochemistry, is leading a team investigating mutations within ADAM12, a gene of the "A Disintegrin and Metalloprotease" family, or ADAM family, and its role in breast cancer.

"We want to know whether ADAM12 plays a tumor-promoting or tumor-suppressing role in breast cancer," said Anna Zolkiewska. The answer to this question could ultimately lead to more effective cancer therapies and treatments. "Typically, normal human cells have very low expression levels of ADAM12, but its abundance is suddenly much higher in cancer tissue," Zolkiewska said. "When we look even closer, we find the highest level of ADAM12 expression in what we call cancer stem cells. Those cells are the most vicious as they drive the tumor growth and are responsible for cancer recurrence after therapy."

Although chemotherapy and radiotherapy kill tumors, they are ineffective on the cancer stem cells, Zolkiewska said. Without being effectively eliminated, the stem cells will grow another tumor over the course of a few years. This again raises the question as to the role of ADAM12.

"Is it helping that tumor re-grow or is it trying to prevent it?" Zolkiewska asks.

Perhaps the most perplexing question the team hopes to solve is why the ADAM12 gene mutates inside cancer tissue. There are only a handful of human genes that are often mutated in tumors. ADAM12 is one of those genes and the only one among the ADAM family. Prior research by the team indicates that mutations in the ADAM12 gene found in tumors cause misfolding of the ADAM12 protein and its mislocalization within a cell. While the wild-type ADAM12 protein is transported through the secretory pathway and is eventually present at the cell surface, ADAM12 mutants are retained in the endoplasmic reticulum and never arrive at their final destination. This discovery of mutations rendering ADAM12 inactive was a scientific first by the K-State team.

**Left to right: Sara Duhachek-Muggy, Dr. Anna Zolkiewska, and Dr. Hui Li.**

"When ADAM12 is present at the cell surface, it is an active protease that cleaves certain membrane receptors, sheds several growth factors, and regulates intracellular signaling pathways", Zolkiewska continues. "ADAM12 mutants are trapped in inactive forms inside the cell and thus they do not participate in cell signaling. The consequences for a cell in which ADAM12 mutants are expressed can be very significant."

Zolkiewska recently was awarded a three-year grant of $444,000 from the National Institutes of Health to further the research. The grant's title is "Structure-Function Analysis of Breast Cancer-Associated Mutations in ADAM12."

Assisting Zolkiewska in the research are Sara Duhachek Muggy, a graduate student in biochemistry, and Dr. Hui Li, who is conducting postdoctoral work. Zolkiewska credited a large portion of the team's findings to Emilia Solomon, Los Alamos, N.M., a December 2009 biochemistry doctoral graduate.

# Graduate Student and Postdoc Awards and Scholarships

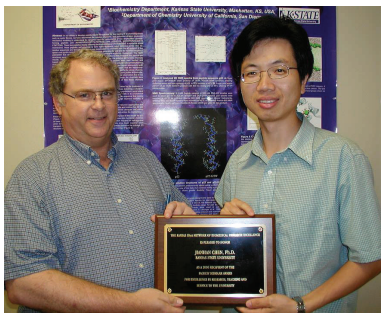
2010 Graduate Student Summer Stipends received from the Terry C. Johnson Center for Basic Cancer Research. **Sinu Jasrapuria** (Muthukrishnan), **Urska Bukovik** (Tomich), and **Sara Duhachek Muggy** (Zolkiewska).

American Society of Biochemistry and Molecular Biology travel award for **Minglin Lang** (Kanost) and **Emily Ragan** (Kanost) held in Anaheim, CA in April 2010.

Johnson Cancer Center Travel Awards were presented to several students. **Debjani Pal** (Wei) presented her poster at the 49th Annual Meeting of the American Society for Cell Biology in San Diego, CA in December 2009. **Debarshi Banjeree** (Takemoto) traveled to the American Society of Cell Biology Meeting in San Diego in December 2009 to present his poster. **Debabani Ganguly** (Chen) traveled to the 54th Biophysical Society Annual Meeting in February 2010 in San Francisco, CA to present her poster. **Sushanth Gudlur** (Tomich) visited San Francisco in February 2010 to give a platform talk on Peptide Vesicles at the Biophysical Society Meeting. He was also awarded a Hedgcoth Travel Award for this trip.

**Aashima Khosla** (Shrick) received a scholarship for international students from the Konza and Manhattan Rotary Clubs. Aashima is investigating the regulatory role of a putative lipid-binding domain termed START.

# Our Outstanding Faculty Awards:



**Making A Difference Award**

Qize Wei was awarded the 2010 "Making A Difference Award" from the Women in Engineering and Science program. He was nominated by Debjani Pal.

**Kansas IDeA Network of Biomedical Research Excellence Faculty Scholar Award**

Jianhan Chen has received a highly competitive award designed for outstanding junior faculty, the Kansas IDeA Network of Biomedical Research Excellence Faculty Scholar Award. This $10,000 award can be utilized for academic endeavors such as computers, travel to scientific meetings, and research assistant salaries.

# Innovative Research Awards

The Terry C. Johnson Center for Basic Cancer Research has awarded the innovative research award to: **Jianhan Chen** on a pilot project titled "Mechanism of coupled folding and binding of p27 to Cdk2/cyclin A", **Yasuaki Hiromasa** for his work on " Inhibition of pyruvate dehydrogenase kinase with a new class of inhibitor", and **Gerald Reeck** for his work on "Gossypol, Apogossypol, and Armet."

# Obituary - Wanda Bates

Wanda Izetta (Molsberry) Bates, age 95, of Manhattan, Kansas, died Tuesday, April 6, 2010, at the Good Shepherd Hospice House in Manhattan. She was born in Clarksville, Iowa, on January 11, 1914, the daughter of Malon Bion Molsberry and Rosetta (Davis) Molsberry. She attended Clarskville schools and graduated from Iowa State University in Ames in 1938 with a B.S. degree in Home Economics Education. Mrs. Bates taught Home Economics in Iowa schools for seven years at Superior Township Consolidated School at Superior and at Spirit Lake and Jefferson High Schools. In 1942, she married Dr. Herbert T. Bates, a Professor of Chemical Engineering. They lived in Cleveland, OH, and Lincoln, NE, before moving to Manhattan, KS, in 1958.

Mrs. Bates was a secretary and word processing typist in the Department of Biochemistry at Kansas State University for eighteen years. She was very helpful to faculty in preparing manuscripts and grant proposals, and she helped to pioneer the use of computers for word processing in the Biochemistry office. She was a published writer and a member of Kansas Authors Club, Manhattan Writers, Manhattan Literature Club, KSU Social Club and the First Methodist Church where she was a Sunday School teacher for a number of years and an active member of United Methodist Women.

She was preceeded in death by her parents, her husband, three brothers, and three sisters. Mrs. Bates is survived by a son Rodney Bates and his wife Candace Sherman, a daughter Wanda "Beth" (Bates) Lowe and husband Thomas Lowe, grandson David Bates and wife Amber, granddaughter Ellen (Lowe) McNellis and husband Michael McNellis, grandsons: Russell Lowe, Brian Lowe and wife October Strange and two great-grandchildren, Allison McNellis and Connor McNellis.

Links to some of Wanda's writing can be found at: http://skyways.lib.ks.us/orgs/kac/inmemoriam.html and http://ourecho.com/biography-123-Wanda-Molsberry-Bates.shtml#stories

# 2010 BS/BA Biochemistry Graduates

**Derek Low** (BS) **David Murphy** (BS) **Eizabeth Ploetz** (BS) **Jerald Sullivan** (BS)
**Jairo Correa** (BA) **Christopher Jones** (BS) **Melanie Katz** (BS)

# 2010 MS/PhD Biochemistry Graduates

**Debjani Pal** (M.S. with Wei) Coiled-Coil Domain-Containing protein 69 (CCDC60) Acts as a Scaffold and a Microtubule-Destabilizing Factor to Regulate Central Spindle Assembly.

**Vladimir Yevseyenkov** (Ph.D., with Takemoto) PKC Gamma Senses/Protects From Stress in Retina Through Regulation of Gap Junctions.

## Chen Continued from page 1

Chen said that this research can provide fundamental knowledge of the structure, interaction and control of intrinsically disordered proteins, and such knowledge will help to assess and manage related human diseases.

Chen's project also involves incorporating new biomolecular modeling tools in classes and training projects for college and high school students. Part of this will be accomplished through two-day summer workshops for college and high school teachers, particularly instructors from southern Kansas community colleges with many Hispanic students.

Chen's research focus at K-State is on computational biochemistry and biophysics. His lab uses computer modeling as a primary tool to understand how biomolecules perform their biological functions, via stable 3-D structures, or equally important, lack of stable structures.

Chen earned a master's degree and doctorate from the University of California at Irvine and a bachelor's degree from the University of Science and Technology of China. He was a postdoctoral researcher at the Scripps Research Institute in LaJolla, Calif., before joining the faculty at K-State in 2007.

## Tracking Alumni

Last time we checked, **Craig A. Behnke** (B.S.1995/M.S.1996, Reeck) was Director of Biochemistry at Sapphire Energy in San Diego. They are investigating making "crude oil" using algae. Also they have recently published a paper describing use of the alga Chlorella for production of human proteins in large amounts.

**Christina Chang** (Ph.D. 1988, Davis) in Taiwan, recently finished a 3 year term as director of the Institute of Molecular Medicine at the medical school of Cheng Kung University, and returned to her research. She has a grant for studies in cancer prevention, and another for functional genomics of cancer.

**Jwan Ibbini** (Ph.D. 2008, Davis) faculty member at Hashemite University in Jordan, had a baby boy Ali this past winter. Two of her sisters are now graduate students in Physics at KSU. Go K-State.

**Cameron (Fahrenholtz) Jeter** (BA 2003) received a Ph.D. in neuroscience from the University of Texas Graduate School of Biomedical Sciences at Houston in May 2010. She and her husband, David, continue to live in Houston as she completes a postdoc.

**Emily Ragan** (Ph.D. 2008, Kanost) is now an instructor at Dominican University of California in San Rafael, CA.

**Terry (Johnson) Shackleford** (B.S. 2001) completed her Ph.D. at the University of Texas Graduate School of Biomedical Sciences at Houston in 2008, and she now is a Grants Program Manager at the M.D. Anderson Cancer Center in Houston, TX.

**Lucinda Sullivan** (B.S. 2005, M.S. 2009, Kanost) recently moved from her position at the Mayo Clinic and is now a Forensic Scientist with the Ventura County California Police Department.

## Crystal Sapp Received Classified Employee of the Year Award

**K-State News Services**

More than 375 classified employees were recognized for their dedication to Kansas State University Wednesday, April 28, during the 33rd annual Classified Employee Recognition Ceremony. Biochemistry accountant Crystal Sapp was among those named for her dedication and hard work. Crystal has been the accountant for the department of Biochemistry since 1992. The ceremony was a chance for longtime employees and relatively recent newcomers to celebrate and be recognized for their dedication and hard work to the university.

"Classified employees touch every aspect of student life on campus and we are an integral part of K-State's friendly culture. We take a lot of pride in helping to make the K-State student experience one of a kind. "The annual recognition ceremony is a great opportunity to show classified employees how much they are appreciated for everything they do," said Jennyfer Owensby, president of K-State's Classified Senate.

## And the award goes to...

**Samuel Molina** (Takemoto) and **Huaien Dai** (Krishnamoorthi) received the 2010 Hedgcoth Biochemistry Graduate Teaching Awards.

**Sinu Jasrapuria** (Muthukrishnan) and **Debarshi Banerjee** (Takemoto) received the 2010 Hedgcoth Biochemistry Graduate Research Awards.

# PROFESSOR DISCOVERS LINK BETWEEN LOW OXYGEN LEVELS AND CANCER-AIDING PROTEIN **K-State Media Relations**

**Dr. Dolores Takemoto**

What began as research into how diabetics could possibly preserve their eyesight has led to findings that could prolong the vision of children afflicted with retinoblastoma. Dolores Takemoto, a Kansas State University professor of biochemistry who was researching protein kinase C gamma in the lens of the human eye, found her work taking a fascinating turn when she discovered a correlation between the protein Connexin46 and hypoxia -- a deficiency of oxygen which kills normal tissue cells. Connexin46, (Cx46), appears in the body during these levels of low oxygen. Besides the eye, which is one of the body's only naturally occurring hypoxic tissues, Cx46 also is present in cancer cells since the cells seal themselves off from the oxygen carried by the blood vessels, thus creating a hypoxic environment.

Takemoto believes the findings will lead to serious advancements in treating retinoblastoma, a cancer that forms in the tissue of the retina -- the light-sensitive layers of nerve tissue on the back of the eye. Retinoblastoma occurs in 300 U.S. children under the age of 5 each year, according to the National Cancer Institute.

Through her research, Takemoto believes that siRNA medication to suppress Cx46 expression can prevent tumor growth. In this case, the siRNA would suppress Cx46, which allows a tumor to exist in a hypoxic environment. In this manner, the tumor can be prevented from growing at the early hypoxic stage.
Using a mouse model for retinoblastoma, the Takemoto lab has found that use of siRNA to lower the levels of Cx46 can prevent tumor formation.

An international application has been filed with the Patent Cooperation Treaty regarding the findings.

During her trials with Cx46, Takemoto collaborated with Thu Annelise Nguyen, associate professor of toxicology at K-State. The two examined biopsies of MCF-7 breast cancer, where they also found Cx46 present. Takemoto said the same was true for samples of colon cancer. "Any time there's a drop in oxygen within the body, Cx46 appears," Takemoto said.

While Takemoto's research into Cx46 is focused on the eye, Nguyen is studying Cx46 in breast cancer. She is currently exploring drug discovery and drug testing related to breast cancer.

Besides treating tumors, Takemoto said she believes these findings could help with treatment in acute or chronic heart disease, heart attacks, retinal ischemia, ischemia of the brain, blood pressure problems and glaucoma, as well as for health applications in animals.

Findings have been published in an online edition of the International Journal of Cancer, "A novel role of gap junction connexin46 protein to protect breast tumors from hypoxia." Publication in a printed edition will follow.

The research is supported by a grant from the National Eye Institute.

# Undergraduate Scholars for 2010-2011 School Year

**R. Kenneth Burkhard Scholarship for Women in Biochemistry**
Chloe Callahan

**Wanda Bates Scholarship**
Kristen Waner
Kelsey Welliver

**W. Mack Barlow Scholarship**
Grace Petty

**Merrill (Fred/Virginia) Scholarship**
Karsten Evans

**University Foundation/ General Fund Scholarship**
Jarrod Bechard
Chloe Callahan
Jared Kevern
Clay Williams
Jared Wilmoth

**David/Tim Havely Memorial Scholarship**
Jithma Abeykoon
Jarrod Bechard
Katherine Gentry

**University Putnam/ Hughes (JS) Memorial Scholarship**
Ryan Zapotocny

Dear alumni and friends,

We hope you will keep in touch with us and your former classmates by contributing to our newsletter. Would you please take a minute to send us your news about you, your career, and your family?

The Department of Biochemistry would also like to thank you for your generous support. Your donations allow us to offer scholarships, improving our ability to recruit and retain outstanding and deserving students. General funds supplement the department's operating budget to enhance the quality of education and research experiences we can provide to our students and to attract and support new faculty.

If you wish to donate to any of the biochemistry Foundation Funds (see below) please send your contribution to the Department of Biochemistry and indicate which fund you wish to support. Please call us at (785)532-6121 or email biochem@ksu.edu if you have any questions.

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# Biochemistry Foundation Funds

**F17870** **Biochemistry General Fund Account**

**F66998** **Hageman (Richard/Elizabeth) Distinguished Lectureship**

**F68342** **Havley (David/Tim) Biochemistry Discretionary Account**

**Q53097** **Hedgcoth Biochemistry Graduate Scholarship Account**
Outstanding Graduate Teaching and Graduate Research Awards
Graduate Student Travel to Scientific Meetings

**Q17100** **Hughes (J.S.) Memorial Scholarship Account**
Undergraduate Scholarships

**F79431** **Merrill (Fred/Virginia) Biochemistry Discretionary Account**
Undergraduate Scholarships

**Q03227** **Wanda Bates Undergraduate Scholarship Account**
Undergraduate Scholarships for students with financial need

**N85330** **Willard & Ora M. Ruliffson Memorial Scholarship Account**
Scholarship for pre-dentistry or pre-veterinary students

**F81556** **Philip Nordin Memorial**
Awards for Graduate Student Research Travel

**F51745** **W. Mack Barlow Memorial Scholarship**

**Q55486** **R. Kenneth Burkhard Scholarship for Women in Biochemistry**
Scholarship for Outstanding Female Biochemistry Juniors and Seniors

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312

Our Biochemistry Department will celebrate it's **50th anniversary** in 2011! Send us your stories about your experience here. Email it to us at: **biochem@ksu.edu** Be sure to include your name, degree, year, position or title with your story. We can't wait to hear from you!

## KSU Biochemistry Web Page
## http://www.k-state.edu/biochem/

Our homepage contains information on the Department of Biochemistry, faculty, undergraduate and graduate programs, courses, seminar, and core facilities. Other K-State related pages that might be of interest:

## K-State Alumni Foundation http://www.k-state.com

## E-Collegian Newspaper http://www.spub.ksu.edu