

May 2010 to August 2010

To share the research and professional development activities of our faculty and students with the College, Utah State Administrators, and the Board of Trustees.

—The Dean’s Corner—

Good Day:

As I write this note I am looking at the first snow of the year that is down to about the 6,000 ft level. Though it is a dull, overcast day, this school year has been bright and happy. The overall enrollment at the University is up a bit: over 5% for the Logan campus. These numbers may not tell you how noticeable this increase is. Come to campus and walk from the Eccles Science Learning Center to the Ag building at 11:30 AM and you will have to wend your way through a throng of bustling students.

Not only are there more students, but they also seem anxious to learn. This portends a great future for our programs.

The faculty is hard at work attending to the details necessary to complete the transition of the College of Eastern Utah to be an integral part of USU. In addition to this, the faculty has increased the money they obtain from research grants by about 12% over last year. It is important to note that research grants also provide funds for students, graduate and undergraduate, who receive funds to conduct their own research or to aid the faculty with their research.

I have finished a year of being dean of the college. It has been a busy year with some problems. However, all in all, it has been a great year made possible by bright, engaged, and pleasant (sometimes funny) colleagues.



— College of Science Contract & Grant Activity —

\$ Amounts (# of proposals)	May 2010	June 2010	Cumulative Totals FY09-10	July 2010	August 2010	Cumulative Totals FY10-11
Proposals Submitted	\$4,947,252 (19)	\$2,048,500 (12)	\$93,852,858 (200)	\$17,173,927 (25)	\$3,533,551 (13)	\$20,707,478 (38)
Awards Received	\$868,695 (13)	\$672,419 (10)	\$9,968,484 (104)	\$5,134,889 (9)	\$1,110,059 (12)	\$6,244,948 (21)

— USU Student Researchers Aboard NASA's Vomit Comet —



Aboard NASA's microgravity aircraft, USU students Frank McCown, center, and Justin Koeln, right, float in zero gravity as they perform a nucleate boiling experiment. Photo courtesy of NASA

Gathered around a laptop in a sweltering hangar June 23 at Houston's Ellington Field, members of Utah State University's Get Away Special "GAS" student team watched a tiny platinum wire in a clear, water-filled container light up with bubbles that, sans gravity, dispersed not up but in random directions. The video footage had been captured minutes before during microgravity flight aboard a specially modified, NASA-contracted 727, one of the agency's infamous "Vomit Comets."

Still dizzy from a roller coaster ride of steep climbs and free falls from 32,000 feet, team member Frank McCown marveled at the results. "The flight was awesome, the experiment went well and I'm really excited that we got good, usable data," said the undergraduate computer science researcher. The students' celebration was the culmination of more than a year of steady toil, including late nights and weekends, leading up to a week and a half of intensive flight training at Johnson Space Center.

The team of nine – McCown and fellow flyers Andrew Fassmann, Justin Koeln, Travyn Mapes, and Troy Munro, along with ground crew members Phillip Anderson, Stephanie Peterson, Rob Barnett and Cameron Peterson – was among 14 university teams that ventured to Houston June 16-27 after being awarded a coveted spot with NASA's Reduced Gravity Student Flight Opportunities Program, also known as "Microgravity University."

NASA's microgravity aircraft, which the agency prefers to refer to as "Weightless Wonders" rather than their better known monikers, follows an elliptic flight path relative to the center of the Earth that literally propels the planes and their occupants into orbit. In a series of parabolas, pilots gun the engines into 45-degree climbs and, at the top of each arc, reduce thrust, point the nose down and fall. During each climb, passengers, instructed to lie on the floor of the plane or sit leaning against the cabin's walls, experience hypergravity more than twice their body weight. As the plane reaches the top of the arc, passengers begin to float in mid-air, which lasts about 25 seconds. With a shout of "Coming out – feet down!" from a NASA flight coordinator, passengers resume their hypergravity positions and await the next parabola. On separate two-hour flights over the Gulf of Mexico, two Aggie teams each experienced 30 zero-g parabolas, one lunar-g parabola, and one Mars-g parabola.

USU's experiment, called "Follow-up Nucleate Boiling On-flight Experiment" or FUNBOE, builds on a previous USU GAS experiment flown aboard Space Shuttle Endeavour in 2001. Developed by USU's then-GAS team and students from Utah's Box Elder High School, the original experiment explored the boiling dynamics of water in microgravity. "We analyzed data from the initial experiment and determined that more research is needed," said Koeln, 2010 USU Goldwater Scholar and FUNBOE leader. "Nucleate boiling would be ideal for thermal management systems but its dynamics in microgravity are not well understood. If we can prove that boiling water in space is practical and safe, we're on our way to developing more efficient energy systems for long-duration space travel."

From here, the USU students will further analyze the experiment's data, draft a report for NASA, and prepare varied research papers and posters from their experience. In addition, the team plans to submit a proposal for a revised experiment for next year's Microgravity University. The team will also continue its busy schedule of outreach presentations to K-12 students.

To learn more about the Aggies' adventure and view additional photos and video footage, visit the team's Facebook page, "USU Get Away Special Team," and the team website.

by Mary-Ann Muffoletto



USU GAS Team members hoist a "We puked for Science" sign as they celebrate a successful experiment aboard NASA's "Vomit Comet." Nine USU students participated in NASA Microgravity University June 16-27, 2010, at Houston's Johnson Space Center.

For the full story, visit <https://www.usu.edu/science/htm/houston-we-have-a-solution>

— USU Entomologist Says Ice Age Fostered New Species —

When discussing how one species evolved into two or more distinct species, scientists often surmise that the uplift of mountains, which split populations of plants and animals, was the major contributing factor. Not so fast, says Utah State University entomologist James Pitts.

“You might especially expect this of plants and animals in the desert, where the terrain is typically isolated by mountain ranges,” he says. “But for some organisms, species variation appears to have happened much more recently and the evidence points to glaciations that occurred during the Ice Age.”

An assistant professor in USU’s Department of Biology, Pitts studies velvet ants, members of the Mutillidae family. His research on velvet ant evolution during periods of glaciation appears in the report “Evolution of the nocturnal Nearctic Sphaerophthalminae velvet ants (Hymenoptera: Mutillidae) driven by Neogene orogeny and Pleistocene glaciations.” The paper was published in the July 2010 issue of *Molecular Phylogenetics and Evolution*.



USU entomologist James Pitts displays nocturnal velvet ants collected from Utah's Warner Valley.

Velvet ants are, in fact, not ants, but wasps, says Pitts, who joined USU’s faculty in 2005. He’s the only entomologist in North America conducting research on the creatures and publishing results in academic journals. Throughout the world, he’s one of five scientists who actively studies these solitary insects.

Pitts’s research for the paper focused on varied nocturnal velvet ant species, such as those found in Utah’s sand dune-studded Warner Valley. He collects specimens from the desert region that lies about 10 miles southeast of St. George. Using molecular data collected from current-day velvet ants and morphological data collected from fossils, Pitts and his students employed mathematical algorithms to assign probable dates of origin to each branch of the known Mutillidae family tree.

The findings support the idea that glacial action, some two million to as little as 10,000 years ago, separated groups of velvet ants and led to the formation of distinct species. This is considerably more recent than time periods when the Rocky Mountains and the Colorado Plateau arose.



Velvet ant specimens collected by Pitts reveal that some species have bright colors. The females (top) lack wings, while the males (bottom) lack stingers. Courtesy of James Pitts.

“We naively thought that once we determined the probable age of the species, we could easily match that information to known geological events,” Pitts says. “What we discovered is that the geological community is far from agreement on the time that specific geographical events occurred.” Even so, his research reveals that roughly one third of velvet ant species emerged during the Ice Age.

Pitts notes that velvet ants, which pack a ferocious sting and are known as “cow killers” in parts of the country, have no known predators. “Velvet ants are very abundant and are probably much more ecologically significant than we give them credit for,” he says.

by Mary-Ann Muffoletto

For the full story, visit <http://www.usu.edu/ust/index.cfm?article=47973>

— Research Week: March 28 - April 1, 2011 —

Monday	Tuesday	Wednesday	Thursday	Friday
Faculty Research Day	Undergraduate Research Day	Innovation and Scholarship Day	Graduate Student Research Day	Research Workshop Day

For more information on Research Week 2011 please visit: <http://researchweek.usu.edu>

— USU Physicist on National Geographic-funded Trek to Russia —

Utah State University graduate student Jeffrey Hazboun is just as comfortable recounting a day of executing “sweet boofs” and navigating “pushy rapids” as he is discussing the nuances of general relativity and quantum theory or the reproduction rates of desert tortoises and the life history of Gila monsters.

The seasoned wildlife biologist, who is pursuing a doctorate in theoretical physics, is among a team of intrepid kayakers exploring the rivers of Siberia’s Kamchatka Peninsula. Hazboun serves as science coordinator for The Kamchatka Project, a grassroots effort to explore critical salmon habitat in remote rivers of the peninsula, communicate information about the area to a broad audience and seek multi-partnered conservation solutions.

“Not only are we interested in finding new stretches of whitewater, we want to bring back a sense of this unique place and the troubles it’s facing,” Hazboun says. “Kamchatka is a pristine area with few roads and dams, but the salmon population faces growing pressures, specifically from poaching.”

Extending roughly north-south from Russia’s Far East, the 777-mile-long peninsula is bordered by the Pacific Ocean on the east and the Sea of Okhotsk on the west. Teeming with some of the world’s densest populations of salmon and brown bear, the peninsula is also home to more than 160 volcanoes, many of them active.

The group’s expedition, which began June 30 and continues through July 29, is funded by a number of sponsors, including the National Geographic Society. Last February the team received a grant from the society’s Expeditions Council and is filming the trip for an episode of the National Geographic Channel’s “Monster Fish” television program.

Along with kayaking never-run stretches of the region’s rivers, Hazboun is collecting various scientific measurements and recording observations. Among the team’s objectives, he says, is to collaborate with scientists and contribute to the body of ecological and hydrological knowledge of the peninsula.

The USU community is invited to follow the team’s adventure on Facebook (<http://www.facebook.com/#!/pages/The-Kamchatka-Project/40519800063>) and the project’s website (<http://www.kamchatkaproject.org/>).

by *Mary-Ann Muffoletto*

For the full story, visit <http://www.usu.edu/ust/index.cfm?article=47885>



USU physics student Jeffrey Hazboun, science coordinator for a National Geographic Society-funded expedition, collects water quality measurements. Photo courtesy of Reel Water Productions.

— Undergraduate Research Deadlines —

Undergraduate Research Event/Opportunity	When	Abstracts due
URCO Grants	October 15 and February 15	Noon deadline
Research on Capitol Hill—Tenth Anniversary Event	January 26, 2011	November 1, 2010
Utah Conference on Undergraduate Research (UCUR)	February 17-18, 2011	November 1, 2010
National Conference on Undergraduate Research, Ithaca	March 31- April 2, 2011	November 18, 2010
CUR Posters on the Hill, Washington, DC	April 2011	November 1, 2010
USU Student Showcase	March 30, 2011	March 1, 2011

For more information on the Undergraduate Research opportunities listed above, please visit:
<http://research.usu.edu/undergrad/htm/undergraduate-research-schedule-of-events>

— STUDENT ACTIVITIES —

Student Awards, Recognition & Grants

undergraduate* graduate**

Chemistry & Biochemistry

Megi Rexhepaj* received the American Heart Association Summer 2010 Fellowship. Faculty Mentor: **Sean Johnson**
1 June - 15 Aug 2010. The total award amount is \$4,000.

Alina Sergeeva** won the American Chemical Society Physical Chemistry Division Outstanding Student Poster Award for “Structure, Stability and Unique Chemical Bonding of Pure Boron Clusters: All-boron Hydrocarbon Analogs” at the 239th American Chemical Society National Meeting & Exposition, San Francisco, CA, 21-25 March 2010. Faculty mentor: **Alex Boldyrev**

Computer Science

Ali Cooley, **Amy Hansen**, and **Nare Hayrapetyan** received scholarships to attend and present their undergraduate research poster titled “An Empirical Study of Bugs in Undergraduate Programming Assignments” at the Grace Hopper Conference for Women in Computing in Atlanta, GA, 28 September - 2 October 2010. More about their work: <http://digital.cs.usu.edu/~bugs/>

Student Presentations

undergraduate* graduate**

Chemistry & Biochemistry

Alina Sergeeva** presented the poster “Deciphering Chemical Bonding: From Clusters to Solids” at the 239th National ACS Meeting & Exposition, Division of Inorganic Chemistry, San Francisco, CA, 21-25 March 2010. Faculty mentor: **Alex Boldyrev**

Katarzyna Grubel**, **Katarzyna Rudzka****, **Carlos Read***, **Amy L. Fuller****, and **Atta M. Arif** presented “Ligand and Metal Effects on the Formation of O₂-Reactive Divalent Metal Enolate Complexes: Evaluation of the Influence of Water” at the 240th American Chemical Society National Meeting & Exposition, Boston, MA, 22-26 Aug 2010. Faculty mentor: **Lisa M. Berreau**

The following posters were presented at the American Crystallographic Association Annual Meeting in Chicago, IL, 24-30 July 2010. Faculty mentor: **Sean Johnson**

Ryan Jackson**. “The Crystal Structure of the RNA Helicase Mtr4 Reveals a Unique and Novel Arch Domain That is Required for Nuclear 5.8 S rRNA Processing.”

Anna Lytle**. “1.75 Å Structure of a Fungal Type III Polyketide Synthase, a Potential Biosynthetic Tool for 'Unnatural' Natural Products.”

Computer Science

The following talks were presented during the proceedings of the AIAA Infotech 2010 Conference, Atlanta, GA, 21-23 April 2010:

Jacob Christensen**, **Bryan Hansen****, Craig Kief, Jesse Mee. “CubeFlow: Training for a New Space Community.”

Scott Cannon, **Jacob Christensen****, and **Bryan Hansen****. “Automatic Software Generation of ASIM Program Code from an xTEDS.”

The following talks were presented during the proceedings of the 24th AIAA Conference on Small Satellites, Logan, UT, 9-12 August 2010:

Scott Cannon, **Jacob Christensen****, **Bryan Hansen****, James Lyke, Jesse Mee, Fredrik Bruhn, Gael Chosson, Robert Lindegren, Henrik Lofgren, Jan Schulte, Robert Vick, Alonzo Vera, and Josette Calixte-Rosengren. “A Plug-and-Play Approach Based on the I2C Standard.”

Scott Cannon, **Jacob Christensen****, **Bryan Hansen****, and Jim Lyke. “Automatic Generation of SDM Application Source Code From xTEDS.”

The Center for Atmospheric & Space Sciences

A presentation created by **Lance Peterson**, **Mike Taylor**, Matt Bailey, **Jesse Hayes***, **Pierre-Dominique Pautet**, and Steve Cummer titled “Comparison of Sprite-Halo Characteristics Imaged Over the USA and South America” was presented by Lance Peterson at the joint meeting of the American Physical Society (APS) and the American Association of Physics Teachers (AAPT), Washington, DC, 13-16 February 2010.

The following posters were presented at the CEDAR Meeting held in Boulder, CO, 20-25 June 2010:

Thomas Martin*, **Jonathon R. Pugmire****, **Michael J. Taylor**, **Kim Nielsen**, **Pierre-Dominique Pautet**, and **Martin J. Jarvis**. “Investigating Short-Period Gravity Wave Characteristics Over Rothera, Antarctica (68° S).”

Michael E. Olson**, **Bela G. Fejer**, and Jorge Chau. “Equatorial Electric Fields During the 2002 Southern Hemisphere Sudden Stratospheric Warming Event.”

Jonathon R. Pugmire**, **Neal R. Criddle****, **Michael J. Taylor**, **Pierre-Dominique Pautet**, and **Yuchen Zhao**. “First 6 Month Investigation of Gravity Waves and Temperature Variability Over the Andes.”

Deepak B. Simkhada**, **Michael J. Taylor**, and **Steven J. Franke**. “Gravity Wave Propagation and Momentum Flux in the Mesopause Region.”

Zhonghua, Xu**, **Lie Zhu**, **Jan J. Sojka**, **Piotr Kokoszka**, and **Agnieszka Jach****. “Study of Geomagnetic Disturbances and Ring Current Variability During Storm and Quiet Times Using Wavelet Analysis and Ground-based Magnetic Data From Multiple Stations.”

— FACULTY ACTIVITIES —

Awards & Recognition

Biology

The research of **Dr. James Pitts** was the focus of an article in the Herald Journal: http://news.hjnews.com/news/article_c7774c2c-a5c6-11df-a031-001cc4c002e0.html. He has also recently been featured in the New York Times as well as on Utah Public Radio.

Chemistry & Biochemistry

The article titled “B₁₉: A Concentric Planar Doubly π – Aromatic Cluster” by Wei Huang, **Alina Sergeeva****, Hua-Jin Zhai, Boris Averkiev, Lai-Sheng Wang, and **Alexander I. Boldyrev**, published in *Nature Chemistry* **2010**, 2, 202-206, was highlighted in the News of the Week section of *Chemical & Engineering News* 12 July 2010.

Stephen Bialkowski has agreed to be a reviewer for the J. William Fulbright Scholar program. The Fulbright Program is the flagship international educational exchange program sponsored by the U.S. government and is designed to increase mutual understanding between the people of the United States and the people of other countries. This commitment is from 2010 through 2012.

Lisa M. Berreau served as an ad-hoc member for the NIH Macromolecular Structure and Function A (MSFA) Study Section, Chicago, IL, 10 June 2010.

Lisa M. Berreau and **Robert S. Brown** attended a workshop titled Process Oriented Guided Inquiry Learning in the Classroom and Laboratory (POGIL) at Westminster College, Salt Lake City, UT, 9 -11 July 2010.

Geology

Jim Evans was elected to be a Fellow of the Geological Science of America, formal announcement to take place at the national GSA meeting, October 2010.

Mathematics & Statistics

The Society for Mathematical Biology awarded the 2010 Lee Segel Prize for Best Paper to **Brynja R. Kohler**, **Rebecca J. Swank**, **James W. Haefner**, and **James A. Powell**, for “Leading Students to Investigate Diffusion as a Model of Brine Shrimp Movement” which appeared in *Bulletin of Mathematical Biology* 72(1): 230-257 (Jan 2010). This paper was selected from all the papers accepted to the *Bulletin of Mathematical Biology* in 2008 and 2009.

The Center for Atmospheric & Space Sciences

Michael Taylor was co-convener of two workshops “Mid-Latitude Stratosphere, Mesosphere and Lower Thermosphere (SMLT) Science Enabled by Lidar and Other Ground-Based Observations” and “Lightning Effects on the Upper Atmosphere” for the CEDAR Meeting held in Boulder, CO, 20-25 June 2010.

Faculty Grants

Biology

Daryll B. DeWald

NSF – Harvey Mudd

“RUI: Collaborative Research: SAC9, A Novel Plant-Specific Phosphoinositide Phosphatase Essential for Membrane/Cytoskeleton Dynamics in *Arabidopsis*”

1 September 2010 - 31 August 2011

\$181,924

Anhong Zhou and Daryll B. DeWald

US Army Medical Research

“Localization and Quantification of Single EGF Receptor on Single Breast Cancer Cell Surface”

1 September 2010 - 30 September 2011

\$104,100

James Pitts and David Tanner

United States Army Corps of Engineers

“Pollinator Survey of Lake Sakakawea”

January 2010 - December 2011

\$109,677

James Pitts

Western Region Cooperative Agricultural Pest Survey (CAPS)

“Area-wide Survey of Fire Ants”

January 2010 - December 2010

\$12,450

James Pitts and David Tanner

Colorado Natural Areas Program

“Impact of the Development on the Pollinators of *Physaria congesta* and *Physaria obcordata* (Brassicaceae) in the Piceance Basin, Colorado”

February 2010 - January 2012

\$56,344

Chemistry & Biochemistry

Stephen Bialkowski

Kestral Corporation

“Microwave-Infrared Differential Spectroscopy Technique”

1 March 2010 (open-ended)

\$6,000

Stephen Bialkowski

USU International Education Office

“Study Abroad Program in Environmental Science”

15 May 2010 - 15 June 2010

\$5000

Geology

James P. Evans

DOE

“Impact of Micro- to Meso-Scale Fractures on Sealing Behavior of Argillaceous Caprocks on Carbon-Sequestration”

June 2010 - June 2013

\$546,185

James P. Evans

DOE - National Energy Technology Lab with New Mexico Technology
"CO₂ at the Interface: Nature and Dynamics of the Reservoir/
Caprock Contact and Implications for Carbon Storage Performance"
October 2010 - September 2012
\$181,000

Mathematics & Statistics

Nathan Geer

NSF-DMS
"Low-Dimensional Topology from a 'Super' View Point"
15 May 2010 - 30 July 2010
\$2,800

Nathan Geer

NSF-DMS
"Vanishing Quantum Dimensions in Low-dimensional Topology"
September 2010 - August 2013
\$135,510

Faculty Presentations & Professional Activities

undergraduate* graduate**

Biology

Allen H. Hurlbert, **Katherine M. Thibault**, **Ethan P. White**, and **S. K. Morgan Ernest** presented a talk titled "Explaining Individual Body Size Distributions in Terrestrial Breeding Birds" at the 94th Annual Meeting of the Ecological Society of America, Pittsburgh, PA, 1-6 August 2010.

The following talks were presented at the Gordon Research Conference – Metabolic Basis of Ecology and Evolution, Biddeford, ME, 18-23 July 2010:

Xiao Xiao**, **Ethan P. White**, M. Hooten, and **Susan Durham**. "The Choice of Methods in the Analysis of Biological Power-laws."

Allen H. Hurlbert, **Katherine M. Thibault**, **Ethan P. White**, and **S. K. Morgan Ernest**. "Explaining Individual Body Size Distributions in Terrestrial Breeding Birds."

Joseph K.-K. Li presented as a poster titled "Selective viratherapeutic lysis of Human Cancer Cells with Oncolytic Bluetongue Virus" at the 1st World Congress of Virus and Infections, in Busan, South Korea, 31 July - 3 August 2010.

Chemistry & Biochemistry

Steven D. Aust, Scott Terry, Thomas O. Hebdon, and Broc Gunderson presented a talk titled "Determining the Local Origin of Hydroxyl Radical Generation During Phacoemulsification" at the 2010 American Society for Cataract and Refractive Surgery Annual Meeting, Boston, MA, 12 April 2010.

Katarzyna Grubel**, Atta M. Arif, and **Lisa M. Berreau** presented a poster titled "Photochemical CO-release Chemistry of Divalent Metal Flavonolate Complexes" at the Inorganic Chemistry Gordon Research Conference, Biddeford, ME, 20-25 June 2010.

Lisa M. Berreau presented an invited lecture titled "Ligand Effects on the Chemistry of O₂-reactive Divalent Metal Enolate and Eneiolate Complexes" in the Division of Inorganic Chemistry Ligand Design and Metal Behavior Symposium at the 240th American Chemical Society National Meeting & Exposition, Boston, MA, 22-26 August 2010.

Sean Johnson presented a poster titled "Structural Analysis of Mtr4" at the Post-transcriptional Control of Gene Expression: Mechanisms of mRNA Decay FASEB Summer Research Conference in Carefree, AZ, 11-16 July 2010.

Sean Johnson presented a talk titled "The 3.4 Å Structure of the 122 kDa Mtr4 Protein: Refinement and Revelation of a Novel Arch Domain" at the American Crystallographic Association Annual Meeting in Chicago, IL, 24-30 July 2010.

Mathematics & Statistics

Piotr Kokoszka presented a plenary talk titled "Two Sample Inference in Functional Linear Models" at the Annual Meeting of the Statistical Society of Canada, Quebec City, 24 May 2010. This paper won the 2009 Canadian Journal of Statistics best paper award.

Piotr Kokoszka presented a talk titled "Testing the Stability of Functional Data" at the Spring Resampling Conference, Texas A & M University, 25 March 2010.

Juergen Symanzik presented an invited talk titled "An Object-Oriented Approach in R for the Visualization of Functional Actigraphy Data" at the Interface 2010 Conference (41st Symposium on the Interface: Computing Science and Statistics), Seattle, WA, 18 June 2010.

Juergen Symanzik presented a contributed talk titled "Accuracy, Bias, and Notable Observations for Experimental Actigraphy Data" at the 2010 Joint Statistical Meetings (ASA), Vancouver, British Columbia, Canada, 5 August 2010.

Nathan Geer presented a talk titled "Quantum Geometry and Topology" at the CIRM in Luminy, France, 8 July 2010.

Nathan Geer presented a talk titled "Quantum Invariants of 3-manifolds" at the AMS Sectional Meeting Special Session in St. Paul, MN, 10 April 2010.

Nathan Geer presented a talk titled "Topology" at the MAA Sectional Meeting Research Session in Logan, UT, 27 March 2010.

Nathan Geer presented a talk titled "Volume Conjecture, Invariants and Geometry of Knots" at Waseda University, Tokyo, Japan, 14-16 January 2010.

Brynja Kohler gave an invited plenary address at the SMB Annual Meeting in Rio de Janeiro, Brazil on 26 July 2010.

Brynja Kohler gave an invited talk titled “A Collaborative, Project-Based Approach in Biomathematics at Utah State University” at Beyond Bio2010: Celebration and Opportunities at the National Academy of Sciences, Washington, DC, 21-22 May 2010.

Brynja Kohler led the Lesson Study Working Group as part of the IAS/Park City Mathematics Institute, Park City, UT, 27 June - 17 July 2010.

John R. Stevens presented a talk titled “Statistical Issues in the Normalization of Multi-Species Microarray Data” at the MAA Intermountain Section Meeting, Logan, UT, 26 March 2010.

Abdullah A. Masud** and **John R. Stevens** presented a poster titled “A Comparison of Weighted P-Value and Multi-Stage Analyses in Multiple Hypothesis Testing” at the Conference on Applied Statistics in Agriculture, Manhattan, KS, 26 April 2010.

John R. Stevens gave a talk titled “A Comparison of Probe-Level and Probeset Models for Small-Sample Gene Expression Data” at the annual meeting of the W1112 multistate project (Reproductive Performance in Domestic Ruminants), Davis, CA, 17 May 2010.

John R. Stevens and **Gabriel Nicholas**** presented an invited talk titled “Assessing and Accounting for Dependence in Gene Expression Summaries” at the International Chinese Statistical Association (ICSA) Applied Statistics Symposium, Indianapolis, IN, 23 June 2010.

John R. Stevens presented “Recent Statistical Tools for Next-Gen Sequencing Data” at the joint meeting of the multistate projects NCCC-170 (Research Advances in Agricultural Statistics) and USSSES (University Statisticians of Southern Experiment Stations), Ames, IA, 8 July 2010.

John R. Stevens, Jeremiah Rounds**, and David I. Schlipalius presented a talk titled “Penalized EM in Binomial Models with Missing Categorical Covariates” at the Joint Statistical Meetings, Vancouver BC, Canada, 5 August 2010.

Zhi-Qiang Wang presented a colloquium talk titled “Bifurcation Results for Nonlinear Schrodinger Systems” at Beijing Normal University, Beijing, China, 28 May 2010.

Zhi-Qiang Wang presented an invited talk titled “Bifurcation Results for Nonlinear Schrodinger Systems” at the International Conference on Variational and Topological Methods in Nonlinear Analysis, Beijing, China, 20-22 May 2010.

Zhi-Qiang Wang presented a colloquium talk titled “Bifurcation Results for Nonlinear Schrodinger Systems” at Capital Normal University, Beijing, China, 23 December 2009.

Zhi-Qiang Wang presented an invited talk titled “Bifurcation Results for Nonlinear Schrodinger Systems” at a special session on Nonlinear Elliptic PDEs, Joint meeting of American Mathematical Society and Korean Mathematical Society, Seoul, Korea, 20 December 2009.

Zhi-Qiang Wang presented a seminar talk titled “Bifurcation Results for Nonlinear Schrodinger Systems” at Peking University, Beijing, China, 10 December 2009.

Zhi-Qiang Wang presented a seminar talk titled “Periodic Solutions for Hamiltonian Systems” at The Chern Institute of Mathematics, Nankai University, Tianjin, China, 8 December 2009.

The Center for Atmospheric & Space Sciences

Michael J. Taylor presented a talk titled “Climatology of Ripple-Type Instability Imaged in the Mesopause Region over Maui, Hawaii” at the SCOSTEP (Scientific Committee on Solar-Terrestrial Physics) Meeting 2010, Berlin, Germany, 12-16 July 2010.

The following talks were presented at the 38th COSPAR Scientific Assembly 2010, Bremen, Germany, 18-25 July 2010:

S. Bailey, B. Thuraiajah, Kim Nielsen, J. Lumpe, C. Randall, **Michael J. Taylor**, and **Yuchen Zhao**. “Dynamics of the Mesopause Region as Revealed in Images of Polar Mesospheric Clouds.” (Invited talk)

Ludger Scherliess, Robert W. Schunk, Lie Zhu, and Vince Eccles. “A Physics-Based Data Assimilation Model for the High-Latitude Space Environment.”

Robert W. Schunk. “Weather Disturbances in the Ionosphere-Thermosphere System at Middle and Low Latitudes.”

A. Skjaeveland, J. Moen, **Herbert C. Carlson**. “Temperature Enhancements and Ion Upflows Around Cusp Poleward Moving Auroral Forms.”

Jan J. Sojka, Michael Nicolls, Anthony van Eyken, and Craig Heinselman. “Comprehensive Ionospheric Polar and Auroral Observations for Solar Minimum of Cycle 23/24.”

Jan J. Sojka, Robert W. Schunk, Michael Nicolls, Anthony van Eyken, and Craig Heinselman. “Coupling of the Auroral and Polar Ionosphere to the Solar Wind During the Extended Solar Minimum.”

Michael J. Taylor, Pierre-Dominique Pautet, William R. Pendleton Jr., R. Esplin, and D. McLain. “Development of an Advanced Mesospheric Temperature Mapper (AMTM) for High-Latitude Research.”

Michael J. Taylor, Pierre-Dominique Pautet, Yuchen Zhao, William R. Pendleton Jr., and **Jonathan Pugmire***. “New Measurements of Mesospheric Temperature and Gravity Waves over the Andes Mountains.”

W. Kent Tobiska. “The Solar and Geomagnetic Inputs into the JB2008 Thermospheric Density Model for use by CIRA08 and ISO 14222.”

W. Kent Tobiska, Robert W. Schunk, Jan J. Sojka, Herbert C. Carlson, Donald C. Thompson, Ludger Scherliess, Lie Zhu, and Larry Gardner.
“Commercializing Space Weather Using GAIM.”

Yuchen Zhao, Michael J. Taylor, F. J. Mulligan, and J. M. Russell III. “Investigating Variability in the Mesospheric OH Layer Peak Altitudes over Maui, Hawaii Using Coordinated Ground-based Imager and SABER/TIMED Satellite Measurements.”

Yuchen Zhao, Michael J. Taylor, Pierre-Dominique Pautet, C. E. Randall, S. M. Bailey, and J. M. Russell III.
“Two Dimensional Spectral Analyses of Wave Structures in Polar Mesospheric Clouds.”

Larry Gardner and Robert W. Schunk presented a poster titled “Generation of Traveling Atmospheric Disturbances During Pulsating Geomagnetic Storms” at the 38th COSPAR Scientific Assembly 2010, Bremen, Germany, 18-25 July 2010.

Robert W. Schunk, Ludger Scherliess, Jan J. Sojka, Donald C. Thompson, and Lie Zhu presented a talk titled “Ionosphere Data Assimilation Models for Physics and Applications” at the COSPAR Meeting of the Americas, Foz do Iguassu, Brazil, 8-13 August 2010.

The following talks were presented at the CEDAR Meeting, Boulder, CO, 20-25 June 2010:

Larry C. Gardner and Robert W. Schunk. “Large-Scale Gravity Wave Characteristics Simulated with a High-Resolution Global Thermosphere-Ionosphere Model.”

Pierre-Dominique Pautet, Narayan Chapagain,**
Michael J. Taylor, A. F. Medeiros, R. A. Buriti, J. J. Makela, H. Takahashi, and David C. Fritts. “Investigating the Ionospheric Bubble Structures Observed from Northeastern Brazil.”

Ludger Scherliess, Ja Soon Shim, and Robert W. Schunk.
“Challenges of Ionospheric Driver Estimation.”

Jonathan B. Snively. “Airglow Signatures of Gravity Waves Near the Onset of Dissipation, CEDAR Final Report.”

Michael J. Taylor. “A Tribute to Edmond Dewan.”

Michael J. Taylor. “Plans for Coordinated Optical Measurements at Bear Lake Observatory with the new USU Na Lidar.”

Michael J. Taylor, Pierre-Dominique Pautet, Jonathan Pugmire*, and Yuchen Zhao. “Initial USU Mesospheric Temperature Mapper Results, Cerro Pachon, Chile (30.25°S, 70.74°W).”

Titus Yuan. “Lidar Study of Impacts of 2009 Sudden Stratospheric Warming on Mid-Latitude Mesopause Region.”

The following posters were presented at the CEDAR Meeting, Boulder, CO, 20-25 June 2010:

Edgardo Pacheco, Bela Fejer, Jorge Chau, and Rod A. Heelis. “Equatorial Vertical Plasma Drifts During Solar Minimum.”

Johathan B. Snively and Michael J. Taylor. “Airglow Signatures of Stationary Gravity Waves.”

Faculty Publications

undergraduate* graduate**

Biology

Yangzhe Wu, Gerald D. McEwen, Sitaram Harihar, Sherry M. Baker*, Daryll B. DeWald, and Anhong Zhou.** 2010. BRMS1 Expression Alters the Ultrastructural, Biomechanical and Biochemical Properties of MDA-MD-435 Human Breast Carcinoma Cells: An AFM and Raman Microspectroscopy Study. *Cancer Letters* 293: 82-91.

Amanda V Bakian and Kimberly A. Sullivan.** 2010. The Effectiveness of Institutional Intervention on Minimizing Demographic Inertia and Improving the Representation of Women Faculty in Higher Education. *International Journal of Gender, Science and Technology* 2: 207-234.

James Pitts, Joe Wilson, and Carol von Dohlen.** 2010. Evolution of the Nocturnal Nearctic Sphaerophthalminae Velvet Ants (Hymenoptera: Mutillidae) Driven by Neogene Orogeny and Pleistocene Glaciation. *Molecular Phylogenetics and Evolution* 56: 134-145. UAES no. 8139.

Joe Wilson and James Pitts.** 2010. Illuminating the Lack of Consensus Among Descriptions of Earth History Data in the North American Deserts: A Resource for Biologists. *Progress in Physical Geography* 34: 419-441. UAES no. 8061.

Joe Wilson, Kevin Williams**, and James Pitts.** 2010. Preliminary Assessment of Velvet Ant (Hymenoptera: Mutillidae) Diversity in the Deserts of Southern California. *Western North American Naturalist* 70: 224-232. UAES no. 8094.

Joe Wilson and James Pitts.** Pleistocene Climatic Cycles Driving Diversification in the *Odontophotopsis unicornis* Species-group (Hymenoptera: Mutillidae). *Annals of the Entomological Society of America* 103: 555-565. UAES no. 8167.

Craig Brabant*, Kevin Williams, and James Pitts.** 2010. True Females of the *Photomorphus* Subgenus *Photomorphina* Schuster (Hymenoptera: Mutillidae). *Zootaxa* 2559: 58-68. UAES no. 8191.

James Pitts, Kevin Williams**, **Joe Wilson****, and **Nicole Boehme****. 2010. Nocturnal Velvet Ant Males (Hymenoptera: Mutillidae) of Deep Canyon, California Including Four New Species and a Fifth New Species from Owens Lake Valley, California. *Zootaxa* 2553: 1–34. UAES no. 8192.

Terry Griswold and Wensdae Miller. 2010. A revision of *Perdita* (*Xerophasma*) Timberlake (Hymenoptera: Andrenidae). *Zootaxa* 2517: 1-14.

Molly G. Rightmyer and **Terry Griswold**. 2010. Description of a New Species of *Osmia* (Hymenoptera: Megachilidae) from Southwestern North America, with a Redescription of the Enigmatic Species *Osmia foxi* Cameron. *Zootaxa* 2512: 26-46.

Joseph S. Wilson**, Lindsey E. Wilson, Larry D. Loftis, and **Terry Griswold**. 2010. The Montane Bee Fauna of North Central Washington, U.S.A., with Floral Associations. *Western North American Naturalist* 70: 198-207.

Chemistry & Biochemistry

Tiago A. S. Brandao, **Alvan C. Hengge**, and **Sean J. Johnson**. 2010. Insights into the Reaction of Protein-tyrosine Phosphatase 1B: Crystal Structures for Transition State Analogs of Both Catalytic Steps. *Journal of Biological Chemistry* 285: 15874-15883.

Natasa Mitic, Kieran S. Hadler, Lawrence R. Gahan, **Alvan C. Hengge**, and Gerhard Schenk. 2010. The Divalent Metal Ion in the Active Site of Uteroferrin Modulates Substrate Binding and Catalysis. *Journal of American Chemical Society* 132: 7049-7054.

Ryan N. Jackson**, A. Alejandra Klauer, Bradley J. Hintze, Howard Robinson, Ambro van Hoof, and **Sean J. Johnson**. 2010. The Crystal Structure of Mtr4 Reveals a Novel Arch Domain Required for rRNA Processing. *The EMBO Journal* 29: 2205-2216.

Jeffrey M. Boyd, Daniel D. Clark, **Melissa A. Kofoed****, and **Scott A. Ensign**. 2010. Mechanism of Inhibition of Aliphatic Epoxide Carboxylation by the Coenzyme M Analog 2-Bromoethanesulfonate. *Journal of Biological Chemistry* 285: 25232-25242.

Alina P. Sergeeva**, **Alexander I. Boldyrev**. 2010. The Chemical Bonding of Re_3Cl_9 and $\text{Re}_3\text{Cl}_9^{2-}$ Revealed by the Adaptive Natural Density Partitioning Analyses. *Inorganic Chemistry Communications* 31: 2-12.

Dariusz A. Sliwa**, Arathi M. Krishnakumar, John W. Peters, and **Scott A. Ensign**. 2010. Molecular Basis for Enantioselectivity in the (*R*)- and (*S*)-Hydroxypropylthioethanesulfonate Dehydrogenases, a Unique Pair of Stereoselective Short-Chain Dehydrogenases/Reductases Involved in Aliphatic Epoxide Carboxylation. *Biochemistry* 49: 3487-3498.

Prakash R. Joshi**, Oluwatosin O. Dada, and **Stephen E. Bialkowski**. 2010. Pulsed Laser Excited Photothermal Lens Spectrometry of Cadmium Sulfoselenide Doped Silica Glasses. *Journal of Physics: Conference Series* 214: 012117.

Luis C. Malacarne, Nelson G. C. Astrath, Paulo R. B. Pedreira, Renio S. Mendes, Mauro L. Baesso, **Prakash R. Joshi****, and **Stephen E. Bialkowski**. 2010. Analytical Solution for Mode-Mismatched Thermal Lens Spectroscopy with Sample-Fluid Heat Coupling. *Journal of Applied Physics* 107: 053104.

Nelson G. C. Astrath, Luis C. Malacarne, Paulo R. B. Pedreira, Marcos P. Belancon, Mauro L. Baesso, **Prakash R. Joshi****, and **Stephen E. Bialkowski**. 2010. Pulsed-Laser Excited Thermal Lens Spectroscopy With Sample-Fluid Heat Coupling. *Journal of Applied Physics* 107: 083512.

Lisa M. Berreau, **Katarzyna Rudzka****, **Katarzyna Grubel****, and Atta M. Arif. 2010. Hexanickel Enediolate Cluster Generated in an Acireductone Dioxygenase Model Reaction. *Inorganic Chemistry* 49: 7623-7625.

Computer Science

R. Bryce, S. Sampath, and A. Memon. 2010. Developing a Single Model and Test Prioritization Strategies for Event-Driven Software. *IEEE: Transactions on Software Engineering*. <http://www.computer.org/portal/web/csdl/doi/10.1109/TSE.2010.12>.

Mathematics and Statistics

B. P. Yurk and **J.A. Powell**. 2010. Modeling the Effects of Developmental Variation on Insect Phenology. *Bulletin of Mathematical Biology* 72: 1334-1360.

M. J. Garlick** and **J. A. Powell**. 2010. Mathematically Modelling Polymerase Chain Reaction: An Asymptotic Approximation with Potential for Optimization. *Mathematical Biosciences and Engineering* 7: 365-386.

B.R. Kohler, R. Swank, J.W. Haefner, and **J.A. Powell**. 2010. Leading Students to Investigate Diffusion as a Model of Brine Shrimp Movement. *Bulletin of Mathematical Biology* 72: 230-257.

Siegfried Hormann and **Piotr Kokoszka**. 2010. Weakly Dependent Functional Data. *The Annals of Statistics* 38: 1845-1184.

Inga Maslova, **Piotr Kokoszka**, **Jan Sojka**, and **Lie Zhu**. 2010. Estimation of Sq Variation by Means of Multiresolution and Principal Component Analyses. *Journal of Atmospheric and Solar-Terrestrial Physics* 72: 625-632.

Agnieszka Jach and **Piotr Kokoszka**. 2010. Empirical Wavelet Analysis of Tail and Memory Properties of LARCH and FIGARCH Processes. *Computational Statistics* 25: 163-182.

Inga Maslova, **Piotr Kokoszka**, **Jan Sojka**, and **Lie Zhu**. 2010. Statistical Significance Testing For the Association of Magnetometer Records at High, Mid and Low Latitudes During Substorm Days. *Planetary and Space Science* 58: 437-445.

Lajos Horvath, Marie Huskova, and **Piotr Kokoszka**. 2010. Testing the Stability of the Functional Autoregressive Process. *Journal of Multivariate Analysis* 101: 352-367.

Nathan Geer and **Bertrand Patureau-Mirand**. 2010. Multivariable Link Invariants Arising from Lie Superalgebras of Type I. *J. Knot Theory Ramifications* 19: 93-115.

Nathan Geer and Nicolai Reshetikhin. 2009. On Invariants of Graphs Related to Quantum $\mathfrak{sl}(2)$ at Roots of Unity. *Lett. Math. Phys.* 88: 321-331.

Nathan Geer and Benjamin Enriquez. 2009. Compatibility of Quantization Functors of Lie Bialgebras with Duality and Doubling Operations. *Selecta Math.* (N.S.) 15: 1-59.

Nathan Geer, **Bertrand Patureau-Mirand**, and Vladimir Turaev. 2009. Modified Quantum Dimensions and Re-Normalized Link Invariants. *Compos. Math.* 145: 196-212.

K.I. Aston, G.P. Li, B.A. Hicks, B.R. Sessions, A.P. Davis, L.F. Rickords, **J.R. Stevens**, and K.L. White. 2010. Abnormal Levels of Transcript Abundance of Developmentally Important Genes in Various Stages of Preimplantation Bovine Somatic Cell Nuclear Transfer Embryos. *Cellular Reprogramming* 12: 23-32.

L. Gilbert-Norton, R. Wilson, **J.R. Stevens**, and K.H. Beard. 2010. A Meta-Analytic Review of Corridor Effectiveness. *Conservation Biology* 24: 660-668.

J.R. Stevens, **J.L. Bell****, K.I. Aston, and K.L. White. 2010. A Comparison of Probe-Level and Probeset Models for Small-Sample Gene Expression Data. *BMC Bioinformatics* 11: 281.

T. Bartsch, N. Dancer, and **Z.-Q. Wang**. 2010. A Liouville Theorem, A-Priori Bounds, and Bifurcating Branches of Positive Solutions for a Nonlinear Schrödinger System. *Calculus of Variations and Partial Differential Equations* 37: 345-361.

K.C. Chang, T. Zhang and **Z.-Q. Wang**. 2010. On a New Index Theory and Non Semi-Trivial Solutions for Elliptic Systems. *Discrete and Continuous Dynamical Systems* 28: 809-826.

T. An and **Z.-Q. Wang**. 2010. Periodic Solutions of Hamiltonian Systems with Anisotropic Growth. *Communications in Pure and Applied Analysis* 9: 1069-1082.

Z. Liu and **Z.-Q. Wang**. 2010. Ground States and Bound States of a Nonlinear Schrödinger System. *Advanced Nonlinear Studies* 10: 175-193.

T. Bartsch, **Z.-Q. Wang** and Z. Zhang. 2009. On the Fučík Point Spectrum for Schrödinger Operators on \mathbb{R}^N . *Journal of Fixed Point Theory and Applications* 5: 305-317.

J. Byeon and **Z.-Q. Wang**. 2009. Standing Waves for Nonlinear Schrödinger Equations with Singular Potentials. *Annales de l'Institut Henri Poincaré - Analyse non linéaire* 26: 943-958.

The Center for Atmospheric & Space Sciences

Y. Rinne, J. Moen, **Herbert C. Carlson**, Marc R. Hairston. 2010. Stratification of East-West Plasma Flow Channels Observed in the Ionospheric Cusp in Response to IMF by Polarity Changes. *Geophysical Research Letters* doi: 10.1029/2010GL043307.

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