Undergraduate major
Jamie Thornton received an MSU Award for Excellence and Jill Roberts was awarded a Fulbright Fellowship in Germany

Graduate student Carl Olimb was selected as the Outstanding Graduate Teaching Assistant in the College of Letters and Science

Professor Isaac Klapper was chosen for the Center for Biofilm Engineering Outstanding Faculty Award

Professor Warren Esty received an MSU Award for Excellence

Professor Tomas Gedeon received the MSU Cox Faculty Award for Creative Scholarship and Teaching, and in a rare double, also received the CLS Award for Meritorious Research

TEACHING

In 2010 the Department of Mathematical Sciences had 123 undergraduate majors seeking a B.S. degree in one of four options (Applied Mathematics, Mathematics, Mathematics Teaching, Statistics). In addition we had 63 M.S. students and 33 Ph.D. candidates. In 2010, the Department awarded 23 Bachelor of Science degrees. Among these B.S. degrees were four who graduated with highest honors (cumulative Grade Point Average (GPA) greater than or equal to 3.70), six who graduated with honors (cumulative GPA of 3.25 through 3.69), and one who completed the University Honors Program. Also awarded in 2010 were 17 Master of Science degrees and one Doctor of Philosophy degree.

Our students received several awards this year. Casey Donoven and Hunter Lapp were MSU Presidential Scholars. Jamie Thornton received a Bozeman Area Chamber of Commerce and MSU Alumni Association Award for Excellence. Casey Donoven was funded by the National Science Foundation for an eight-week summer research project on carbon sequestration in Norway at the University of Bergen and the Norwegian University of Science and Technology in Trondheim. Jeremy Schwend was awarded a NASA Space Grant Scholarship. Spring semester 2010 Thomas Blake, Casey Donoven, Patricia Hurin, Micaela Newman, Stephanie Ouellette, Alyssa Peck, Ethan Perry, Jill Roberts, Jeremy Schwend, James

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<th>Books</th>
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<td>Technical Manuscripts</td>
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<td>Majors</td>
<td>219</td>
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<tr>
<td>Grant Expenditures</td>
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Shindoll, Lyne Tchapmi Petse, Jamie Thornton, Rachelle Wood, and Shuai Zhao made the President’s List with a perfect 4.00 GPA and 17 other majors made the Dean’s List with a GPA of 3.50 through 3.99. Fall semester 2010 the President’s List included Andrew Albers, Thomas Blake, Casey Donoven, Kevin Ferris, Elizabeth Geise, Danielle Hethcox, Tara Markuson, Lyndi Seidensticker, Katelyn Weber, Reed Witherspoon, and Shuai Zhao while the Dean’s List included an additional 21 majors.

Carl Olimb was honored as the Outstanding GTA in the College of Letters of Science. Corinne Casolara and John Long were departmental Outstanding GTAs. Shane Nowack was awarded a NASA Space Grant Fellowship. Professor Warren Esty received a Bozeman Area Chamber of Commerce and MSU Alumni Association Award for Excellence.

RESEARCH

Faculty research programs in the Department of Mathematical Sciences were outstanding. Our excellent faculty members continued working on numerous interdisciplinary research programs involving the American Heart Association, the Center for Adaptive Optics (CAO), the Center for Biofilm Engineering (CBE), the Center for Computational Biology (CCB), the Defense Advanced Research Projects Agency (DARPA), the Interagency Grizzly Bear Study Team, the Montana Office of Public Instruction, the Montana Water Center, the National Council of Teachers of Mathematics (NCTM), the National Institutes of Health (NIH), the National Park Service (NPS), the National Science Foundation (NSF), the Northern Yellowstone Carnivore Working Group, the Optical Sciences Company (tOSC), the State of Montana Fish, Wildlife, & Parks Department, the U.S. Department of Education, the U.S. Fish and Wildlife Service, the U.S. Geological Survey (USGS), Yellowstone National Park, and the Whitebark Pine Monitoring Working Group. Cooperative on-campus projects involved the departments of Agricultural Economics & Economics, Animal & Range Sciences, Cell Biology & Neuroscience, Chemical & Biological Engineering, Civil Engineering, Earth Sciences, Ecology, Education, Entomology, Land Resources & Environmental Sciences, and Psychology.

Several faculty were invited to give lectures abroad this year. Marcy Barge and Jarek Kwapisz both spoke at the Canadian Mathematics Society Winter Meeting in Vancouver, British Columbia, Canada while Dr. Barge also spoke at the conference Towards New Interactions between Mathematics and Computer Science in Marseille, France. John Borkowski, Mark Greenwood, and Megan Higgs all gave addresses at the Joint Statistical Meetings in Vancouver, British Columbia, Canada. John Borkowski also gave an address in Chiang Mai, Thailand. Lisa Davis was invited to speak at the conference, Emerging Topics in Dynamical Systems and Partial Differential Equations in Barcelona, Spain. Tomas Gedeon spoke at the Fourth International Conference on Recent Advances in Applied Dynamical Systems in Jinhua, China; gave two addresses at the Workshop on Applications of Computational Homology in Christchurch, New Zealand; spoke at the Conference on Multi-scale Stochastic Modeling of Cell Dynamics in Banff, Canada; and was invited to present at both the University of Auckland in Auckland, New Zealand; and McGill University in Montreal, Canada. Mark Greenwood gave papers at both the Conference of the Environmental Modeling and Software Society in Ottawa, Canada and at Infra Eco Network Europe International Conference on Ecology and Transportation in Velence, Hungary. Megan Higgs presented at the International Environmetrics Society
Conference in Isla Margarita, Venezuela. Al Parker spoke at the Workshop on Statistical Inference and Partial Differential Equations in Dunedin, New Zealand. Finally, Isaac Klapper organized an international conference hosted at MSU and funded by NSF, entitled “Fluid Dynamics: From Theory to Experiment.”

Beth Burroughs, Mark Greenwood, Jennie Luebeck, and David Yopp were funded by the National Science Foundation (NSF) to continue a five-year examination of mathematics coaching while Warren Esty serves on the Advisory Board for this project. Beth Burroughs and Jennie Luebeck were funded by the Department of Education for a Mathematics and Science Partnerships project to improve mathematics instruction in the public schools. Steve Cherry continued a research project with the U.S. Geological Survey concerning wildlife habitat in and around Yellowstone National Park. Thomas Gedeon continued work on two separate National Science Foundation grants. One involved the fluid-structure interactions in arthropods and one studied the dynamics of biochemical oscillators. He also had Defense Advanced Research Projects Agency (DARPA) funding to design physiologically complex networks. Mark Greenwood was funded by the USGS to investigate wetland hydrology and vegetation data and by the American Heart Association to study strategies to reduce cardio-vascular disease. Megan Higgs was funded by the NPS for a project predicting pregnancy status in bison in Grand Teton; by the National Oceanic and Atmospheric Administration (NOAA) to analyze dive-depth data for marine mammals; and by the U.S. Geological Survey to study methods for estimating grizzly bear abundance. Megan Higgs and Kathi Irvine were funded by the USGS to analyze impacts of blister rust and mountain pine beetle mortality on whitebark pine. Kathi Irvine was funded by the Inventory and Monitoring Program of five networks in the NPS and by the USGS to study wetland vegetation. Isaac Klapper was funded by NSF with an Interdisciplinary Grant in the Mathematical Sciences in order to complete work in the lab of Dave Ward in the Department of Land Resources and Environmental Science at MSU. Drs. Klapper and Tianyu Zhang were funded by the NSF in the Collaboration in Mathematical Sciences Program to study biofilms in porous media. Dr. Klapper also was funded by NSF to synthesize theory and practice in microbial community research. Curt Vogel was funded by NSF and the Optical Sciences Company to work on the Thirty Meter Telescope project.

This year one Ph.D. student graduated and many more were involved in exciting research ventures. Marcy Barge’s Ph.D. student, Carl Olimb, finished his degree which studied the branch locus for two-dimensional tiling spaces. Thomas Gedeon worked with a team of graduate students including Jesse Berwald, Jake Brown, and Ryan Waters on computational neuroscience and systems biology. Kathi Irvine worked with graduate student Kezia Manlove on water quality analysis for the Greater Yellowstone Network. Jarek Kwapisz worked with graduate students Andy Bouwman, David Buhannan, and Mark Mathison on problems in dynamical systems. Maurice Burke worked with graduate student Rejoice Mudzimiri on issues in mathematics education. Isaac Klapper’s Ph.D. student, Shane Nowack, continued working in a biosciences laboratory. Isaac Klapper and Tianyu Zhang jointly directed Ph.D. student Ben Jackson on biofilm modeling. Jim Robison-Cox’s Ph.D. student Ilai Keren worked on a project in land resources involving the preharvest application of herbicides on wheat crops.

SERVICE

The Department of Mathematical Sciences serves the
local and campus community, as well as the region, state and nation in a variety of ways. All of the faculty contributed to department and campus activities. As always, our faculty contributed to numerous efforts to improve our state. For the Montana Chapter of the American Statistical Association, Megan Higgs served as President, Kathi Irvine was the Vice-President, and John Borkowski was the Secretary/Treasurer. Jennie Luebeck served on the Montana Mathematics Standards Revision Team and was on both the Board of Directors of the Montana Council of Teachers of Mathematics and the Board of Directors of the Montana Learning Center for Mathematics and Science. Russ Walker was the MSU Unit Coordinator for the Montana University System (MUS) Transfer Initiative.

Beyond the borders of Montana, several faculty members contributed to their profession in a variety of ways. Robert Boik is an Editorial Board member for Psychological Methods. John Borkowski is an Associate Editor for The Journal of Probability and Statistical Science. He is also on the Editorial Review Board for The Journal of Quality Technology and The Thailand Statistician. Maurice Burke is the Editor of The Navigations Series produced by the National Council of Teachers of Mathematics. Beth Burroughs served on the Mathematical Association of America’s (MAA) Committee on the Mathematical Education of Teachers as well as on the Association of Mathematics Teacher Educators (AMTE) review task force on the NCTM. Tomas Gedeon is an Associate Editor for the Journal of the American Institute of Mathematical Sciences, the Rocky Mountain Journal of Mathematics and Discrete and Continuous Dynamical Systems B. Jennie Luebeck is co-editor of the 7th Monograph of the Association of Mathematics Teacher Educators.

**PUBLICATIONS**

**A. BOOKS / EDITED COLLECTIONS/ FULL-LENGTH WORKS**

ESTY, W.


**B. TECHNICAL MANUSCRIPTS**

BORKOWSKI, J.


HAMILTON, M.


PARKER, A.


**C. REFEREED JOURNAL ARTICLES**

BARGE, M.


BERWALD, J.

BOIK, R.


BORKOWSKI, J.


BURKE, M.


BURROUGHS, E.


CHERRY, S.


DOCKERY, J.


GEDEON, T.


GREENWOOD, M.


HAMILTON, M.


HAYES, C.


HIGGS, M.


KLAPPER, I.


KWAPISZ, J.


LUEBECK, J.

“Pre-Service Teachers in Mathematics Lesson Study,” E. Burroughs and J. Luebeck, *Montana Mathematics and Science*

PARKER, A.


ROBISON-COX, J.


VOGEL, C.


ZHANG, T.


BARGE, M.


BORKOWSKI, J.


BURKE, M.


BURROUGHS, E.


“Creating a Professional Learning Community through Coaching,” with K. Nelson, J. Luebeck and D. Yopp, National Council of Teachers of Mathematics (NCTM)
Davis, L.


Dockery, J.

“Quorum Sensing and Biofilm Modeling,” Biofilms in Infectious Disease: Biology to Mathematical Models and Back Again, Ohio State University, Columbus, Ohio, March, 2010.

Gedeon, T.


“Delays in Models of Gene Regulation,” Department of Physiology, McGill University, Montreal, Canada, November, 2010.

Geyer, L.


Greenwood, M.


HIGGS, M.

“Modeling Categorized and Aggregated Dive Depth Data from Marine Mammals,” with J. VerHoef, Joint Statistical Meetings, Vancouver, B.C., Canada, August, 2010.


IRVINE, K.


KLAPPER, I.


“Dormancy in Planktonic and Biofilm Cultures,” with B. Ayati, Biofilms in Infectious Disease: Biology to Mathematical Models and Back Again, Ohio State University, Columbus, Ohio, March, 2010.

“The Importance of Downward Mobility in the Biofilm Lifestyle,” Fluid Dynamics: From Theory to Experiment, Montana State University, Bozeman, Montana, June, 2010.


“Continuum Models of Biofilms,” Medical Device-Biological Interactions at the Material-Tissue Interface, Minneapolis, Minnesota, September, 2010.


KWAPISZ, J.


LAUGHBAUM, A.


LINDAMAN, B.


LUEBECK, J.


“Targeted Field Experiences in Lesson Study and Inquiry for Pre-Service Mathematics Teachers,” with E.


MANLOVE, K.


NOWACK, S.


PARKER, A.


“Drawing Samples from High Dimensional Gaussians using Polynomials,” American Statistical Association Montana Chapter Meeting, Montana State University, Bozeman, Montana, September 2010.


YOPP, D.


“Phase-Field Model of Biofilm,” 2010 Rocky Mountain Mathematical Association of America Meeting, Colorado State University, Fort Collins, Colorado, April, 2010.

ZHANG, T.


“Phase-Field Model of Biofilm-Flow Interaction,”
Minisymposium on Fluids with Dynamic Microstructure,
Society for Industrial and Applied Mathematics Annual

“Mathematical Model of Biofilm Induced Calcite
Precipitation,” Seventh International Conference on
Differential Equations and Dynamical Systems, Tampa,

“Mathematical Model of Biofilm Induced Calcite
Precipitation,” Mini Symposium of Bacterial Biofilms:
Models, Analysis and Simulation, Society for Industrial
and Applied Mathematics Conference on the Life
Sciences, Pittsburgh, Pennsylvania, July 2010.

“Physical-Chemical Based Modeling of Biofilm Induced
Mineralization,” with I. Klapper, Minisymposium on
Modeling of Complex Fluids: From Passive to Active
Systems, Society for Industrial and Applied Mathematics
Conference on Mathematical Aspects of Materials

“Mathematical Model of Biofilm Induced Calcite
Precipitation,” Illinois Institute of Technology, Chicago,

A. FUNDED EXTERNAL GRANTS

BURKE, M.
“Before It’s Too Late-VI,” Montana Office of the
Commissioner of Higher Education, Co-PIs: M. Burke
and D. Erickson, $30,000, (2010).

BURROUGHS, E.
“Examining Coaching in Elementary Mathematics
Classrooms,” National Science Foundation, PI: D.
Yopp, Co-PIs: E. Burroughs and J. Sutton, $3,500,000,

“Elementary and Secondary Education Act (ESEA),
Title II-B Mathematics & Science Partnerships:
Broadwater & Bozeman Project,” U.S. Department of
Education through the Montana Office of Public
Instruction, Co-PIs: E. Burroughs and J. Luebeck,

CHERRY, S.
“Modeling Habitat-Specific Probability of Occurrence
for Grizzly Bears (Ursus Arctos) in the Greater
Yellowstone Ecosystem,” U.S. Fish and Wildlife Service

GEDEON, T.
“Predictive Biology: Adaptability, Robustness,
Fundamental Laws Biology,” Defense Advanced
Research Projects Agency, PI: S. Levin and T. Gedeon,

“Dynamics and Synchronization of Biochemical
Oscillators,” National Science Foundation - Division of
Mathematical Sciences, PI: T. Gedeon, $156,770, (2008-
2012).

“Fluid-Structure Interaction in Arthropod
Mechanoreceptors,” National Science Foundation, PI: T.
Gedeon, Co-PIs: J. Miller and J. Heys, $399,943 (2008-
2011).

GREENWOOD, M.
“A Stress Reduction Strategy for Decreasing CVD Risk
by Reducing C-Reactive Protein,” American Heart
Association Pacific Mountain Affiliate, PI: M. Miles, Co

“Analysis of Multiple Time Scales in Wetland
Hydrology” U.S. Geological Survey, PI: M. Greenwood,

“Investigating Patterns in Wetland Hydrology and


**HIGGS, M.**


**IRVINE, K.**


**KLAPPER, I.**


“Microbial Communities: Theory and Practice,”
National Science Foundation, PI: I. Klapper, Co-PIs: D. Ward and R. Carlson, $250,000, (2010-2013),


**LUEBECK, J.**


“Elementary and Secondary Education Act (ESEA), Title II-B Mathematics & Science Partnerships: Broadwater & Bozeman Project,” U.S. Department of

**VOGEL, C.**


**YOPP, D.**


**ZHANG, T.**


**B. FUNDED INTERNAL GRANTS**

**DAVIS, L.**

“Using Sensitivity Analysis to Quantify Computational Uncertainty,” ADVANCE Leadership Award Grants for Women Faculty, $7,980, (2009-2010).

**GEDEON, T.**


**GREENWOOD, M.**


**LINDAMAN, B.**