Undergraduate majors Matthew Beamer, Eli Dean, and Bovard Tiberi received Awards for Excellence.

Graduate student Shane Nowack was selected as the Outstanding GTA in the College of Letters and Science.

Professor Jennie Luebeck received the Provost’s Award for Excellence in Outreach.

Professor Russ Walker received an Award for Excellence.

Professor Robert Boik was selected as a Fellow of the American Statistical Association.

Professors Beth Burroughs, Mark Greenwood, Jennie Luebeck, and David Yopp were awarded a 5-year, $3.5M NSF grant to examine mathematics coaching.

In 2009 the Department of Mathematical Sciences had 102 undergraduate majors seeking a B.S. in Mathematics degree. In addition we had 72 M.S. students and 29 Ph.D. candidates. In 2009, the Department awarded 23 Bachelor of Science degrees. Among these B.S. degrees were ten 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 four who completed the University Honors Program. Also awarded in 2009 were 22 Master of Science degrees and eight Doctor of Philosophy degrees.

Our students have received several awards this year. Matthew Beamer and Casey Donoven were Presidential Scholars. Matthew Beamer, Eli Dean, and Bovard Tiberi received Bozeman Area Chamber of Commerce and MSU Alumni Association Awards for Excellence. Spring semester 2009 Matthew Beamer, Melissa Bradley, Danielle Burrington, and Casey Donoven made the President’s List with a perfect 4.00 GPA and 16 other majors made the Dean’s List with a GPA of 3.50 through 3.99. Fall semester 2009 the President’s List included Andrew Albers, Thomas Blake, Melissa Bradley, Casey Donoven, Ashley Foster, Carrie Marshall, Jamie Thornton, Rachelle Wood, Micah Workman, and Shuai Zhao while the Dean’s List included an additional eight majors.

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<th>Books</th>
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<td>Technical Manuscripts</td>
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<tr>
<td>Majors</td>
<td>203</td>
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<tr>
<td>Grant Expenditures</td>
<td>$248,209</td>
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Shane Nowack was honored as the Outstanding Graduate Teaching Assistant (GTA) in the College of Letters and Science. Andrew Bouwman, Gaye Wolf, Rob Malo, and Kezia Manlove, were departmental Outstanding GTAs. Professor Russ Walker received a Bozeman Area Chamber of Commerce and MSU Alumni Association Award for Excellence. Professor Jennie Luebeck received the Provost’s Award for Excellence in Outreach for her years of working with in-service teachers statewide through curriculum revision, implementation of professional development academies, and online outreach programs for rural mathematics educators.

RESEARCH
Faculty in the Department of Mathematical Sciences have had a productive year in advancing their research programs. Our faculty are 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), Grand Teton National Park, the Interagency Grizzly Bear Study Team, the Montana Office of Public Instruction, the National Council of Teachers of Mathematics (NCTM), the National Institutes of Health (NIH), the National Oceanic and Atmospheric Administration (NOAA), the National Park Service, the National Science Foundation (NSF), the Northern Rocky Mountain Science Center (NRMSC), the Northern Yellowstone Carnivore Working Group, the Optical Sciences Company (tOSC), RMC Research Corporation, 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, Electrical and Computer Engineering, Entomology, History & Philosophy, Land Resources & Environmental Sciences, Physics, and Psychology.

Several faculty were invited to give lectures abroad this year. Marcy Barge gave a series of four lectures at the Workshop on Surface Dynamics in Madrid, Spain. John Borkowski gave addresses at Thammasat University and Silpakorn University, both in Bangkok, Thailand. Tomas Gedeon gave a talk at the Workshop on Mathematical Biology in Kyoto, Japan. Isaac Klapper spoke at Eurobiofilms 2009 in Rome, Italy. Jarek Kwapisz spoke at the Universitat de Chile in Santiago, Chile. Al Parker spoke at the 5th American Society for Microbiology Conference on Biofilms in Cancun, Mexico. Curt Vogel spoke at Adaptive Optics for Extremely Large Telescopes (AO4ELT) in Paris, France.

John Borkowski was funded by the National Park Service (NPS) for two studies, one on habitat and one on wildlife response to winter human use, both in Yellowstone. 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. Beth Burroughs, Mark Greenwood, Jennie Luebeck, and David Yopp were funded by the National Science Foundation (NSF) to commence a 5-year examination of mathematics coaching while Warren Esty serves on the Advisory Board for this project. Steve Cherry continued a research project with the U.S. Geological Survey (USGS) with the goal of modeling grizzly bear habitat use in and around Yellowstone National Park. Thomas
Gedeon continued work on three NSF grants involving optimal sensor receptor arrays, fluid-structure interactions in arthropod mechanoreceptors, and the synchronization 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 a stress reduction strategy for decreasing cardio-vascular disease. Megan Higgs was funded by the NPS for a project predicting pregnancy status in bison in Grand Teton National Park and by the USGS and Interagency Grizzly Bear Study Team for a project to distinguish unique female grizzly bears with cubs in Yellowstone. She also was funded by the National Oceanic and Atmospheric Administration (NOAA) to develop models for dive depth data acquired from marine mammals. Megan Higgs and Kathi Irvine were funded by the USGS to model the impacts of blister rust and mountain pine beetle on whitebark pine in the Greater Yellowstone Ecosystem. Kathi Irvine was funded by the Inventory and Monitoring Program of five networks in the NPS and also funded by the USGS to study the prediction of wetland vegetation. Isaac Klapper was funded by NSF through an Interdisciplinary Grant in the Mathematical Sciences in order to devote an entire year working in the lab of Dave Ward in the Department of Land Resources and Environmental Sciences at MSU. Isaac Klapper and Tianyu Zhang have an NSF grant in the Collaboration in Mathematical Geosciences (CMG) program to study the impact of mineral precipitating biofilms on porous media. Curt Vogel was funded by NSF on a project involving adaptive optics scanning laser ophthalmoscopy and by the Optical Sciences Company to work on the Thirty Meter Telescope project.

This year eight Ph.D. students graduated. Ken Bowers directed Nicomedes Alonso’s dissertation research on the Alternating Direction Sinc-Galerkin method for elliptic partial differential equations. Maurice Burke had two Ph.D. students finish. Taylor Jensen studied the relationship between students’ understanding of function and their understanding of limit. Sarah Segal’s work was a study of a master’s program for teachers. Thomas Gedeon had four Ph.D. students finish. Mark Campanelli developed multicellular mathematical models of somitogenesis. Bree Cummins developed low Reynolds’ number fluid-structure models to study the biomechanical response of a filiform hair array. Shaun Harker studied classical mechanics models with the inclusion of dissipative constraints. Kate Patterson looked at gene regulation in the LAC operon which is required in the transport and metabolism of lactose. David Yopp directed the work of Jerome Trouba who developed a teacher training workshop for GTAs.

Current graduate student research areas span the spectrum of the mathematical sciences. Marcy Barge worked with graduate students Carl Olimb and Adrian Soto on problems in topological dynamics. Maurice Burke worked with Rejoice Mudzimiri on issues in mathematics education. Tomas Gedeon directed a team of graduate students including Jesse Berwald, Jake Brown, and Ryan Waters, investigating computational neuroscience and systems biology. Lukas Geyer worked with Rob Malo and Joe Manlove on problems in complex dynamics. Kathi Irvine directed graduate student Will Barnett in a project involving Bayesian belief networks and Bayesian graphical models. Isaac Klapper’s student, Shane Nowack, spent the year working in a biosciences laboratory, supported by a NASA Space Grant Consortium Graduate Fellowship. Jarek Kwapisz directed graduate students Veronica Baker, Andy Bouwman, David Buhanan, and Mark Mathison looking at problems in dynamical systems. Jennie Luebeck worked with Roger Fischer, Heather
Mathison, and Gaye Wolf on topics in mathematics education. Jim Robison-Cox’s 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. This year was the second year of our new Colloquium Series, which was outstanding. The faculty panel that orchestrated this series was made up of Maurice Burke, Steve Cherry, Lisa Davis, and Russ Walker. In addition, our faculty contributed to numerous efforts to improve our state. Maurice Burke served on the State Mathematics and Science Teacher Initiative Committee. Beth Burroughs was on the Board of Directors of the Montana Council of Teachers of Mathematics. For the Montana Chapter of the American Statistical Association, Megan Higgs served as President, Kathi Irvine was the President-elect, John Borkowski was the Secretary/Treasurer and Mark Greenwood was the Chapter Representative. Jennie Luebeck served on the Montana Mathematics Standards Revision Team, was the Executive Secretary and Board Chair of the Montana Learning Center for Mathematics and Science, and was the mathematics representative on the Montana Office of Public Instruction Teacher Education Accreditation Committee. 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 and, through the Montana Office of Public Instruction, serves on the Common Core Standards Review Committee for the National Governors’ Association. Beth Burroughs served on the Mathematical Association of America’s (MAA) Committee on the Mathematical Education of Teachers. 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. Mark Greenwood was elected to a 3-year term as the Council of Sections Representative of the Section on Statistical Graphics in the American Statistical Association. Jennie Luebeck is co-editor of the Seventh Monograph of the Association of Mathematics Teacher Educators. Curt Vogel is an Associate Editor for the SIAM Journal on Numerical Analysis.

PUBLICATIONS

A. BOOKS / EDITED COLLECTIONS / FULL-LENGTH WORKS

CHERRY, S.

B. TECHNICAL MANUSCRIPTS

GREENWOOD, M.


VOGEL, C.


C. REFEREED JOURNAL ARTICLES

ALONSO III, N.


BARGE, M.


BOIK, R.


BORKOWSKI, J.


BOWERS, K.


BURKE, M.


BURROUGHS, E.


CHERRY, S.


DAVIS, L.


ESTY, W.


HAMILTON, M.


LINDAMAN, B.


LUEBECK, J.


PERNAROWSKI, M.


ROBISON-COX, J.


SWANSON, R.


VOGEL, C.


YOPP, D.


BARGE, M.


“Prime Ends and Surface Dynamics II,” Workshop on Surface Dynamics, Madrid, Spain, March, 2009.


“Prime Ends and Surface Dynamics IV,” Workshop on Surface Dynamics, Madrid, Spain, March, 2009.

BERWALD, J.


BORKOWSKI, J.

“Using a Genetic Algorithm (GA) to Generate Small Exact Response Surface Designs,” 2009 Faculty of Sciences Annual Conference, Thammasat University Bangkok, Thailand, June, 2009.


BURKE, M.


“Teaching Online Courses for High School Mathematics Teachers,” University of Montana Department of Mathematical Sciences Colloquium Series, University of Montana, Missoula, Montana, October, 2009.

BURROUGHS, E.

“Using Lesson Study to Enhance Content Knowledge and Use of Inquiry in Middle School Classrooms,” Joint Mathematics Meetings, Washington, DC, January, 2009.


“Including Pre-Service Teachers in Mathematics Lesson Study,” MAA Math Fest, Portland, Oregon, August, 2009.
“Insights From Pre-Service Mathematics Teachers,”
with J. Luebeck, Montana Education Association-
Montana Federation of Teachers Annual Meeting,
Billings, Montana, October, 2009.

“Broadwater and Bozeman: Lesson Study Comes to
Montana,” with J. Luebeck, Montana Office of Public
Instruction Mathematics Education Forum, Helena,
Montana, September, 2009.

DAVIS, L.

“Using Sensitivity Analysis to Predict Transition for a
Nonlinear Parabolic Partial Differential Equations,”
2009 SIAM Conference on Control and Its Applications,

GEDEON, T.

“Relaxation Oscillations and a Cell Cycle Oscillator,”
DIMACS Workshop on Control Theory and Dynamics
in Systems Biology, Rutgers University, New Jersey,

“Relaxation Oscillations and a Cell Cycle Oscillator,”
Workshop on Mathematical Biology, Kyoto, Japan,
February, 2009.

“Modeling Fluid-Structure Interactions in a Cricket
Cercus System,” Current Topic Workshop:
Computational Challenges in Integrative Biological
Modeling, Molecular Biosciences Institute, Ohio State
University, Columbus, Ohio, October, 2009.

“Fluid-Structure Interaction in Arthropod
Mechanoreceptors with Applications to Bio-Inspired
Microfluidic Sensors,” Research and Education in a Flat

GEYER, L.

“Iterated Monodromy Groups of Quadratic
Polynomials,” Iterated Monodromy Groups, University

GREENWOOD, M.

“Statistical Methods for Analysis of Cortico-Cortical
Beta-Frequency Connectivity Maps in a Macaque
Monkey Performing a Visual Working Memory Task,”
with O. Vsevolozhskaya, R. Salazar, and C. Gray,

“Functional Maps of Cortico-Cortical Beta-Frequency
Coherence in a Macaque Monkey Performing a Visual
Working Memory Task,” with O. Vsevolozhskaya, R.
Salazar, and C. Gray, Joint Statistical Meetings,

“A Quantitative Comparison of the Reliability of Animal
Detection Systems and Recommended Requirements for
System Reliability,” with M. Huijser, T. Holland, M.
Blank, P. McGowen, and S. Wang, International
Conference on Ecology and Transportation, Duluth,
Minneapolis, September, 2009.

“Three Q’s about Simpson’s Paradox: A Logic Based
Account,” with P. Bandyopadhyay, D. Nelson, G.
Britten, and J. Berwald, 37th Annual Meeting of the
Society for Exact Philosophy, Edmonton, Alberta, May,
2009.

HIGGS, M.

“Issues with Modeling Spatial Ordered Categorical
Data,” 2nd International Environmetrics Society (TIES)
North American Regional Meeting, Corvallis, Oregon,
June, 2009.

“Clipped Latent Variable Spatial Models for Ordered
Categorical Data,” 2009 Joint Statistical Meetings,

“What is the Likelihood You are a Bayesian at Heart, in
the Long Run?” Department of Ecology Seminar,
Montana State University, Bozeman, Montana,
November, 2009.
IRVINE, K.

KLAPPER, I.

KWAPISZ, J.
“Rigidity and Mapping Class Group for Abstract Tiling Spaces,” Universitat de Chile, Santiago, Chile, June, 2009.

LINDAMAN, B.

LUEBECK, J.


NOWACK, S.


PARKER, A.


“Ruggedness Assessment and Experimental Design in the Biofilm Laboratory,” 5th American Society for Microbiology Conference on Biofilms, Cancun, Mexico, November, 2009.

“Using Linear Solutions to Sample Large Gaussians,” University of Montana Department of Mathematical Sciences Colloquium Series, University of Montana, Missoula, Montana, October, 2009.

VSEVOLOZHKAYA, O.


VOGEL, C.


“Fast, Robust Parameter Estimation and Open-Loop Control of Point-Actuated, Continuous-Facesheet Deformable Mirrors,” with G. Tyler, R. Conan, and C. Blain, Optical Society of America (OSA) Frontiers in Optics 2009, San Jose, California, October, 2009.


YOPP, D.


“Examining Mathematics Coaching,” Montana Math and Science Teacher Initiative, Montana State University,


ZHANG, T.


Funded Grants

A. FUNDED EXTERNAL GRANTS

BORKOWSKI, J.


BURKE, M.


BURROUGHS, E.


CHERRY, S.


GEDEON, T.


GREENWOOD, M.


HIGGS, M.


KLAPPER, I.


LUEBECK, J.


“ESEA Title II-b Mathematics & Science Partnerships:

VOGEL, C.


YOPP, D.


ZHANG, T.


B. FUNDED INTERNAL GRANTS

BURROUGHS, E.

“Enhancing the Secondary Mathematics Education Program through Research,” ADVANCE Leadership Award Grants for Women Faculty, $8,000, (2008-2009).

DAVIS, L.

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

GREENWOOD, M.


LUEBECK, J.