Undergraduate major Elisabeth Brown received an Award for Excellence and Kelly Alsup and Bovard Tiberi spent the summer in Norway on an NSF funded research project.

Graduate student Jon Wixson was selected as the Outstanding Graduate Teaching Assistant in the College of Letters and Science.

Shae Thompson was selected as the College of Letters and Science Outstanding Adjunct.

Professor John Borkowski was awarded a Fulbright Fellowship.

Professors Tomas Gedeon and Mark Pernarowski were on sabbatical.

A Department Colloquium series was initiated.

## TEACHING

In 2008 the Department of Mathematical Sciences had 99 undergraduate majors seeking a B.S. degree in one of four options (Applied Mathematics, Mathematics, Mathematics Teaching, Statistics). In addition we have 71 M.S. students and 31 Ph.D. candidates. In 2008, the Department awarded 35 Bachelor of Science degrees. Among these B.S. degrees were six who graduated with highest honors (cumulative Grade Point Average (GPA) greater than or equal to 3.70), seven who graduated with honors (cumulative GPA of 3.25 through 3.69), and two who completed the University Honors Program. Also awarded in 2008 were 29 Master of Science degrees and two Doctor of Philosophy degrees.

Our students have received several awards this year. Matthew Beamer, Casey Donoven, and Kevin Rice were Presidential Scholars. Elisabeth Brown received a Bozeman Area Chamber of Commerce and MSU Alumni Association Award for Excellence. Kelly Alsup and Bovard Tiberi were funded by the National Science Foundation for eight-week summer research projects on carbon sequestration in Norway at the University of Bergen and the Norwegian University of Science and Technology in Trondheim. Spring semester 2008 John Kirtley made the President’s List with a perfect 4.00 GPA and 27 other majors made the Dean’s List with a GPA of 3.50 through 3.99. Fall semester 2008 the President’s List included Matthew Beamer, Danielle

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<th>Books</th>
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<tbody>
<tr>
<td>Technical Manuscripts</td>
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<td>Refereed Articles</td>
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<tr>
<td>Majors</td>
<td>201</td>
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<tr>
<td>Grant Expenditures</td>
<td>$132,218</td>
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</table>
Burrington, Jennifer Classen, Casey Donoven, Alexis Lund, and Tessa Mosdal while the Dean’s List included an additional 16 majors.

Jon Wixson was honored as the Outstanding GTA in the College of Letters of Science. Andrea Katz, Kim Nordby, and Carl Olimb were departmental Outstanding GTAs. Shae Thompson, who provides mathematics instruction through the TRiO Student Support Services program, was selected as the College of Letters and Science Outstanding Adjunct.

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 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, 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 US Department of Education, the US Fish and Wildlife Service, the US 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 Engineering, Civil Engineering, Earth Sciences, Ecology, Education, Entomology, Land Resources & Environmental Sciences, Physics, and Psychology.

Several faculty were invited to give lectures abroad this year. Marcy Barge spoke at the Workshop on Topology of Tilings in Banff, Canada. John Borkowski was a Fulbright Fellow in the Department of Mathematics and Statistics at Thammasat University in Bangkok, Thailand and gave addresses at Thammasat University; King Mongkut University of Technology North Bangkok; Kasetsart University; and the National Institute of Development Administration, all in Thailand. He also spoke at Academia Sinica; the National Cheng Chi University; and the National Tsing Hua University in Taiwan. Warren Esty was invited to address the Conference on Quantifying Monetary Supplies in Greco-Roman Times in Rome, Italy. Tomas Gedeon presented a poster at the Gordon Conference on Theoretical Biology in Il Ciocco, Lucca, Italy; and spoke at the Conference on Sensors in Biology and Engineering in Paola, Italy; and the Conference on Mathematical Biology in Luminy, Marseille, France. Jarek Kwapisz spoke at the Conference on Combinatorial and Computational Aspects of Tilings at the Imperial College in London, England. Al Parker spent the 2007-08 year at the University of Otago in Dunedin, New Zealand and gave two addresses there.

Steve Cherry continued a research project with the US Geological Survey concerning wildlife habitat in and around Yellowstone National Park. John Borkowski was funded by the National Park Service (NPS) for habitat studies in Yellowstone. Megan Higgs was funded by the NPS for a project predicting pregnancy status in bison in Grand Teton. 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. Thomas Gedeon continued work on a National Science
Foundation (NSF) grant on optimal sensor receptor arrays and completed an NSF/NIH grant to study NCR-circuit dynamics. He also had NSF funding for two separate projects. One involved the fluid-structure interactions in arthropods and one studied the dynamics of biochemical oscillators. Lastly he 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. Kathi Irvine was funded by the Inventory and Monitoring Program of five networks in the NPS. Isaac Klapper was funded by NSF with 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 Science at MSU. Jennie Luebeck continued work on the Department of Education funded Creating Opportunities in Mathematics for Exemplary Teaching (COMET) project, for which she served as the Principal Investigator. Al Parker concluded a Postdoctoral Fellowship in New Zealand funded jointly by the New Zealand Institute of Mathematics, the University of Auckland, and the University of Otago. Mark Pernarowski visited the University of British Columbia in Vancouver, Canada to collaborate with Michael Ward on electrode modelling. Jim Robison-Cox continued work on a whirling disease project funded by the US Fish & Wildlife Service. 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 two Ph.D. students graduated and many more were involved in exciting research ventures. Maurice Burke’s Ph.D. student, Raquel Vallines Mira, finished her degree which studied effective mathematics teaching strategies for Native American students. Diana Colt completed her Ph.D. under Jennie Luebeck studying online graduate mathematics courses. Thomas Gedeon worked with a team of graduate students including Jesse Berwald, Jake Brown, Mark Campanelli, Bree Cummings, Shaun Harker, and Kate Patterson 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 Veronica Baker, Andy Bouwman, David Buhannan, and Mark Mathison on problems in dynamical systems. John Borkowski directed Ph.D. student Wlpawan Laorun, at Thammasat University in Thailand working on number-theoretic methods in the generation of designed experiments. Maurice Burke worked with graduate students Taylor Jensen, Rejoice Mudzimiri, and Sara Segal on issues in mathematics education. Isaac Klapper’s Ph.D. student, Shane Nowack, spent the year working in a biosciences laboratory. 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. This year we instituted a new Colloquium Series, which was an outstanding success. 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. For the Montana Chapter of the American Statistical Association, Megan Higgs served as President, Kathi Irvine was the Vice-President, John Borkowski was the...
Secretary/Treasurer and Mark Greenwood was the Chapter Representative. 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. As part of the Mathematics and Science Partnerships, David Yopp served as Inter-rater Reliability Trainer for four different projects in Montana.

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 both The American Statistician and 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. David Yopp served as an external evaluator for the Idaho Mathematics and Science Partnerships program.

### PUBLICATIONS

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

**BORKOWSKI, J.**


“Diet and Nutrition of Central Yellowstone Elk During

BURKE, M.


CHERRY, S.


B. TECHNICAL MANUSCRIPTS

CHERRY, S.

C. REFEREED JOURNAL ARTICLES

BARGE, M.


BOIK, R.


BORKOWSKI, J.


BURKE, M.


BURROUGHS, E.


CHERRY, S.


DAVIS, L.


GEDEON, T.


GEYER, L.


HAMILTON, M.


IRVINE, K.

KLAPPER, I.


LUEBECK, J.


PARKER, A.


PATTERSON, K.


YOPP, D.


PRESENTATIONS

BARGE, M.


BORKOWSKI, J.

“Using a Genetic Algorithm (GA) to Generate Small Exact Response Surface Designs,” Academia Sinica, Taiwan, August, 2008.


“Variance Dispersion Graphs for Mixture Experiments,” King Mongkut University of Technology North (KMUTNB), Bangkok, Thailand, August, 2008.


“Using a Genetic Algorithm (GA) to Generate Small Exact Response Surface Designs,” National Cheng Chi University, Taiwan, August, 2008.

“Considerations for Publishing in International Journals,” King Mongkut University of Technology North Bangkok (KMUTNB), Bangkok, Thailand, August, 2008.


BURKE, M.


BURROUGHS, E.


CHERRY, S.


DOCKERY, J.

“Quorum Sensing and Biofilm Modeling,” Mathematical Tools for Multi-Scale Biological Processes, Montana State University, Bozeman, Montana, June, 2008.

“Senescence and Microbial Persistence,” Pattern Formation and Development in Colonial Organisms, Mathematical Biosciences Institute, Ohio State University, Columbus, Ohio, October, 2008.
ESTY, W.


GEDEON, T.

“Binding Cooperativity in Phage is Not Sufficient to Produce an Effective Switch,” Cell Biology and Neuroscience Department Seminar, Montana State University, Bozeman, Montana, August, 2008.

“Multi-Valued Characteristics and Morse Decompositions,” Mathematical Tools for Multi-Scale Biological Processes, Montana State University, Bozeman, Montana, June 2008.

“Binding Cooperativity in Phage is Not Sufficient to Produce an Effective Switch,” poster at Gordon Conference in Theoretical Biology, Il Ciocco, Lucca, Italy, June, 2008.


GEYER, L.


GREENWOOD, M.


“Spatial Analysis of Drumling Orientations,” Presenter: C. Gilstrep, Student Research Celebration, Montana State University, Bozeman, Montana, April, 2008.


HIGGS, M.


KLAPPER, I.

“Microbial Biofilms,” Biocomplexity Colloquium, Notre Dame University, Notre Dame, Indiana, April, 2008.


“Physical Influences on Biofilm Structure,” Pattern Formation and Development in Colonial Organisms,
Mathematical Biosciences Institute, Ohio State University, Columbus, Ohio, October, 2008.


KWAPISZ, J.


LUEBECK, J.


PARKER, A.

“Statistical Thinking in Antibiofilm Research,” Montana State University, Center for Biofilm Engineering, Bozeman, Montana, October, 2008.


PARKER, B.


SWANSON, R.

“What are Tiling Spaces?,” University of Maine, Orono, Maine, October, 2008.

“Tiling Spaces with Symmetry Groups,” University of Maine, Orono, Maine, October, 2008.

VOGEL, C.


WEEDING, J.


YOPP, D.


ZHANG, T.


A. FUNDED EXTERNAL GRANTS

BORKOWSKI, J


BURKE, M.


BURROUGHS, E.


CHERRY, S.


GEDEON, T.


GREENWOOD, M.


HIGGS, M.


IRVINE, K.

KLAPPER, I.


LUEBECK, J.


ROBISON-COX, J.


VOGEL, C.


B. FUNDED INTERNAL GRANTS

BURROUGHS, E.


DOCKERY, J.


LUEBECK, J.