Overdue Greetings

Greetings to alumni and friends of the Department of Physics and Astronomy of the University of Montana. It has been several years since our last newsletter (the last one was put out in 2004 when Prof. Jim Jacobs was chair). The intervening years have brought a number of changes to the department, both good and bad. Some things certainly have not changed. We continue to strive for an exceptional, undergraduate-only program with an emphasis on undergraduate involvement in research and the strengths of the department are the students, staff and faculty. To give us feedback and to learn more about the department, visit us online at: www.physics.umt.edu

David Friend, 1954 - 2008

The biggest change is that we lost our friend and colleague, Dave Friend. Dave died on May 22, 2008, following a bout with cancer. Dave contributed greatly to the department and he will be sorely missed.

Dave Friend was an excellent teacher. In his time at UM, Dave taught literally thousands of students and in 2005, he won the UM Distinguished Teaching Award.

A memorial fund has been established in David Friend’s honor at the UM Foundation. The proceeds of this fund will go towards establishing an award for excellence in teaching in the sciences. To contribute to the David Friend memorial fund, see the third page of this newsletter.

Welcome Nate McCrady

This fall we welcomed a new faculty member of the Department of Physics and Astronomy, Assistant Professor Nate McCrady. Nate received his PhD in astrophysics from the University of California at Berkeley. He also completed an NSF postdoctoral fellowship at UCLA before joining the UM faculty. Nate’s research involves star formation and the stellar populations of galaxies. He uses laser guide star adaptive optics technology with 10-meter class ground-based telescopes and the Hubble Space Telescope to obtain high spatial resolution imaging and spectroscopy of young, massive star clusters. Nate has made a quick start at UM. He is already mentoring a couple of physics with astronomy majors on their senior research projects and has successfully obtained a grant from Montana Space Grants.

Welcome Mike Schneider

Assistant Professor Mike Schneider joined the Department of Physics and Astronomy in the Autumn of 2007. Dr. Schneider received his PhD from the University of Wisconsin - Madison in 2003 and then worked for four years as a research associate at the National Institute of Standards and Technology before joining the UM faculty. His research involves the use of magneto-optical techniques to characterize thin films and nano-scale magnetic structures. The remodeling of Prof. Schneider’s laboratory facilities on campus was complete in January 2009 and Mike has made a fast start in setting up his lab. He currently has two undergraduate students working for him, taking measurements in the new laboratory. They are already getting useful data out of the lab and NIST is even sending samples to UM for high precision measurements.

Commencement Ceremony 2008

Back: Jaylene Naylor, Michele Kratz, Jim Jacobs, Andrew Ware, Mike Schneider, David Andrews, Dave Friend, Diane Friend, & Jen Fowler. Front: Laura Cote, Keith Ginoff, Alecia Jongeward, Pete Bolenbaugh, Gabe Carroll, Clark Kogan, Murphy Breyfogle, Erin Mondloch, Hilary Martens, Michael Johnson, Steve Schutten, & Kelly Stumpe.
Research Overview

The amount of research activity in our department has increased dramatically over the last five years. The scope of this work is quite broad with funding from a variety of sources. Much of this research is done with undergraduate research assistants.

Assistant Research Professor and Lecturer Diane Friend has been UM’s principal investigator on the Big Sky Science Partnership, a National Science Foundation-funded project aimed at strengthening elementary science education in Montana. Physics majors Miles Olsen and Arlo Johnson are working with Assistant Professor Mike Schneider on magneto-optical research which is funded by grants from the Research Corporation and the National Institute for Standards and Technology. Jennifer Fowler leads a team of UM physics majors on Borealis, a high-altitude ballooning project funded by the Montana Space Grants Consortium. Assistant Professor Nate McCrady has just received funding from the Montana Space Grants consortium. Physics majors Kathleen McGarvey and Miles Olsen, along with UM alum Tanner Marine (class of 2009) are working with Professor Andrew Ware on computational plasma physics projects funded by the Department of Energy and the NSF. Adjunct Assistant Professor John Williams has been working on the Cassini project. Physics majors Amber Jessop, Ron Powell and Tammy Abell are working with Associate Professor Dan Reisenfeld and Research Assistant Professor Paul Janzen on a number of NASA-funded projects. The rest of this page focuses on one of these projects.

IBEX
Exploring the Interstellar Boundary

Associate Professor Dan Reisenfeld and Assistant Research Professor Paul Janzen are part of a NASA team that has detected a vast ribbon of energized particles that surrounds most of the solar system. The discovery resulted from data obtained by NASA’s Interstellar Boundary Explorer spacecraft, or IBEX, which was launched in October 2008 to map the edge of the solar system. The results were published this November in Science, and the IBEX mission was featured on the cover of this prestigious journal.

The interstellar boundary is where solar wind particles from the sun, as well as the magnetic field they carry, encounter and interact with the atoms and magnetized plasma between the stars. In this interaction, some of the solar wind particles scatter back into the solar system where they can be detected by IBEX. The interstellar boundary represents the edge of the region of influence of our solar system, also known as the heliosphere.

As the sun orbits through the local interstellar medium at 60,000 mph, the interstellar boundary forms a giant teardrop-shaped bow shock around our solar system – sort of like a rock in a stream. Reisenfeld said models from before the launch of IBEX predicted energetic particles would be concentrated at the nose and/or tail of the interstellar boundary. However, when IBEX completed the first-ever, all-sky map of the boundary during a six-month period, something unforeseen was revealed. “There was a ribbon of denser ionized particles that surrounds our heliosphere,” Janzen said. “It forms an almost perfect circle around us.”

Where does the ribbon come from? “No one really knows, and this is one of the most exciting and fascinating aspects of the discovery—it was totally unpredicted,” Reisenfeld said. However, the scientists do have some ideas. “One thing we are pretty certain about is that the ribbon is caused by the interstellar magnetic field, which threads through our Milky Way Galaxy,” Reisenfeld explained. The sun produces a magnetic field that repels the galactic magnetic field at the interstellar boundary. Reisenfeld said one theory is based on the notion that the ribbon may be a band of greater plasma density due to magnetic pressure. He said the location of the ribbon has allowed them to determine the direction the interstellar magnetic field is coming from – at least locally – to a much higher precision than previously inferred.

Also working on the mission is physics major Tammy Abell. “Tammy has been working on a project to search for temporal variability in the skymaps. Basically, she is trying to answer the question of whether the signal from the interstellar boundary varies in time, and if so, what causes it,” says Reisenfeld.

For more information on IBEX, visit http://ibex.swri.com.
Teaching Overview
Excellence in teaching remains a primary focus of our department. We have more people teaching in our department than ever before. In addition to the people already mentioned in this newsletter, our department includes Professors Jim Jacobs and Eijiro Uchimoto, Adjunct Associate Professors David Andrews and Brad Halfpap, Adjunct Assistant Professors Jack Dostal and John Williams, Adjunct Instructor Julie Schneider, and Program Specialist Jaylene Naylor.

We have made a few changes in our curriculum to improve the education our students obtain as physics majors at UM. Our senior seminar course is now a requirement for all of our majors and requires them to make a presentation on research they have done, either on an REU or with a faculty mentor. “Optics” and “Classical Mechanics” are now one semester courses, but we have added a new course, “Waves and Oscillations” that precedes them in the curriculum. In the fall of 2010, we will introduce one new course and one revamped course. The new course is the “Freshman Physics Experience,” which is a seminar course that introduces freshmen to life as a physics major and to new topics in physics and astronomy research. The revamped course will be “Observational Astronomy” which has been expanded from 2 to 3 credits and will include more data analysis.

Professor Jacobs wins the DTA!
Professor Jim Jacobs won UM’s 2008-2009 Distinguished Teaching Award. A number of Jim’s former students wrote letters of support for his nomination and Jim did not even know he had been nominated for the award until he had won it! Jim is certainly very deserving of this award. His introductory physics class has been a great start to the physics careers of many of our majors. Jim’s humor was in fine form at the award ceremony. You can view his acceptance speech on YouTube (http://www.youtube.com/watch?v=PBve54_PW3k).

Department Initiatives
The department has targeted two initiatives for the next five years: (1) modernization of the lower-division physics and astronomy laboratories and (2) a new telescope and observatory. We will seek funding for these initiatives from a variety of sources.

State of the Art Physics Laboratories for Montana
Our upper-division teaching laboratory facilities are excellent, even if we do say so ourselves. Our lower-division laboratory facilities are in need of modernization and we have targeted this upgrade as one of our priorities for the next decade.

We believe that exposure to rigorous laboratory exercises at the college level is essential since students develop professional laboratory techniques based on their own college laboratory experiences. We plan to create technology integrated laboratory classrooms. To make this possible, the technology infrastructure will need to be put in place at UM. We will then be able to provide our students with engaging, hands-on, active learning experiences by integrating computer simulations with experiments that use laboratory apparatus.

Clarity of Vision: A new observatory in UM’s future?
One of Assistant Professor Nate McCrady’s first projects is leading a team to devise a plan for a new telescope and a new observatory for UM. We love Blue Mountain Observatory but use of BMO has always been limited due to lack of access in the winter, the sparsity of clear nights in the Missoula area, and the proximity of Missoula’s light pollution. A new observatory would enhance the education of our physics with astronomy majors.

Initial steps in this process have included a survey of potential new telescopes in the 1.0-m class, a study of potential funding sources for a new telescope and a site visit to Lubrecht Forest to visit potential homes for a new observatory that would improve access and viewing relative to what we have at BMO.

UM Excellence Fund: Department of Physics and Astronomy
Our department relies on gifts from our friends and alumni to enhance the quality of our program. If you would like to make a contribution, gifts to our department can be made through the UM Foundation. You can contribute online at: http://www.umt.edu/umf/

You can also send a check payable to the “UM Foundation” with a note in the memo to direct this to the “Department of Physics and Astronomy Gift Account” or the “David Friend Memorial Fund.” The address for the UM Foundation is: UM Foundation, P.O. Box 7159, Missoula, MT 59807-7159.
Commencement 2005 - 2009

Each year we continue to celebrate our graduates in our department ceremony. We would like to congratulate our alumni from the last five years. We wish them well in all of their future endeavors.

Class of 2005: Owen Applequist, Emily Chronister, Burke Fetscher, Stuart Graham, Daniel Guest, and James Willett in Physics; Adam Goldammer and Brian Hand in Physics with Astronomy.

Class of 2006: Jimmy Dilorenzo, Ari Margolin, and Tracy Melzer in Physics; Bonnie Gillian, Agatha Light, and David Podrasky in Physics with Astronomy; and Nova Daniels in Physics with Computational Physics.


Class of 2008: Pete Bolenbaugh, Gabe Carroll, Laura Cote, Clark Kogan, Hilary Martens, Erin Mondloch in Physics; Murphy Breyfogle, Stephen Schutten, and Kelli Stumpe in Physics with Astronomy; and Michael Johnson in Physics with Computational Physics.

Class of 2009: Seana Blohm, Aaron Christian, and Nate McLaughlin in Physics; Brian Fish, Alecia Jongeward, and Tanner Marine in Physics with Astronomy.

Alumni Updates

We are justifiably proud of our alumni and we’d like to highlight just a few noteworthy events in their lives. If you would like an item to be included in a future “Alumni Updates”, please send an email message to andrew.ware@umontana.edu.

Class of 1998: In 2006, Guy Pijuv received a PhD in forestry from University of Canterbury in New Zealand.

Class of 2000: In 2009, Ahmed Diallo began working as a research scientist at the Princeton Plasma Physics Laboratory.

Class of 2002: In 2008, Amanda Deisher received her PhD in physics from the University of California - Berkeley. Amanda is now a postdoctoral research associate for UCLA and is working at CERN.

Class of 2004: In October 2008, Anna (Haugsjaa) Hughes had a daughter, Saffron Oleanna Andromeda Hughes. Anna is currently working on her PhD at the University of Colorado at Boulder.

Class of 2006: In June of 2009, Agatha Light and David Podrasky were married in Arlee, MT. Professor Uchimoto was even seen to dance at the reception. David and Agatha are both graduate students at the University of Alaska - Fairbanks.

Class of 2008: In September 2009, Hilary Martens received an MS in space physics from University College London.