Mathematics Students Claim Five of Eight Noyce Scholarships

By Bonnie Spence

This year at the University of Montana, five of the eight new Noyce Scholarships were awarded to students studying secondary mathematics education. The Robert Noyce Teacher Scholarship Program is funded by the NSF and seeks to encourage talented science, technology, engineering, and mathematics majors to become K-12 mathematics and science teachers. The scholarship provides students with yearly support of $12,000 for their junior and senior years of study. Recipients of the Noyce Scholarship are recruited through a unique Learning Assistant Program that has been implemented at the University of Montana just this past year. The program encourages faculty to identify strong mathematics students who may have an interest in becoming teachers and gives them a chance to experience helping others learn mathematics. It should be noted that the students may not already be math or science education majors. The students are introduced to the profession of teaching through their role as a learning assistant in one of the recommending faculty member's courses or lab sections. Learning assistants are undergraduates and are not in charge of classroom instruction or any grading for the course. The learning assistant works closely with current students to help them succeed in the course. Having just recently taken the course themselves, learning assistants are able to connect with students and understand the difficulties encountered in learning the material. They can also share learning strategies that worked for them in the course. In addition to assisting in the classroom, learning assistants are supported through a seminar course coordinated by Dr. David Erickson. The seminar introduces students to educational strategies which will make them more effective learning assistants.

The math faculty is encouraged to seek out current students in their lower-division courses to serve as learning assistants in their classes the following semester. Early identification of students allows them to enter the education program and apply for a Noyce Scholarship prior to their junior year. An additional eight Noyce scholarships are scheduled to be awarded this year.

The Recipients in Mathematics

Mariah Smith

Tomi Ahearn

Peter Walde

Emily Wilson

Maddey Frey

Remembering Professor Myers

Dr. William (Bill) Myers, who was a professor in the Mathematical Sciences Dept. for some forty years, passed away Nov. 1, 2012 at the age of 87. A very nice obituary appeared in the Missoulian and a link to it can be found in the section on faculty on the department's website (umt.edu/math/People/Myers.html). His wife, Vera Myers, who also taught for us, has donated his books to the department and so there will be a William Myers collection available to future students.

Asking about, several stories emerged from people who knew Bill. Jim Hirstein tells of being struck by the collection of calendars that Bill had posted on his walls, from all different dates and months. The mathematical point was that for a monthly calendar to be useful, all it needs to do is start on the right day and have the proper number of days for the month. Ignoring February's peculiarities, there are not that many possibilites. Greg St. George was in Bill's analysis class, and remembers it as strong, clear and concise. Bill would fill the entire board with notes, and so polished were his lectures that stories circulated that he would sometimes just finish filling the board (for the third time) as the bell would ring ending class, at which point he would step from the room with a slight smile.

*The Department offers condolences to Vera and the rest of Bill's family.*

Math Professor Publishes New Text on Matroid Theory

By Mary Riegel

Matroids: A Geometric Introduction is the new textbook by Jennifer McNulty and Gary Gordon, published by Cambridge University Press. Matroid Theory is an active area of research in combinatorics which makes connections between Combinatorics, Graph Theory, Linear Algebra, and Finite Geometry.

This new text is meant as an introduction appropriate for both undergraduates and beginning graduate students. It is written in a fun and easy to read way which includes many examples, exercises, and interesting historical footnotes. According to one reviewer, "the production of this book makes it a joy to read and the great sense of humor of the authors keeps a smile on your face without detracting from the mathematics."

This geometric approach to matroid theory begins with an introduction to matroids before moving on to a wide variety of matroid related mathematics. As a first introduction to matroid theory, this is a good read that covers the material any newcomer needs to get started in this growing research area, including some open questions to whet your appetite.
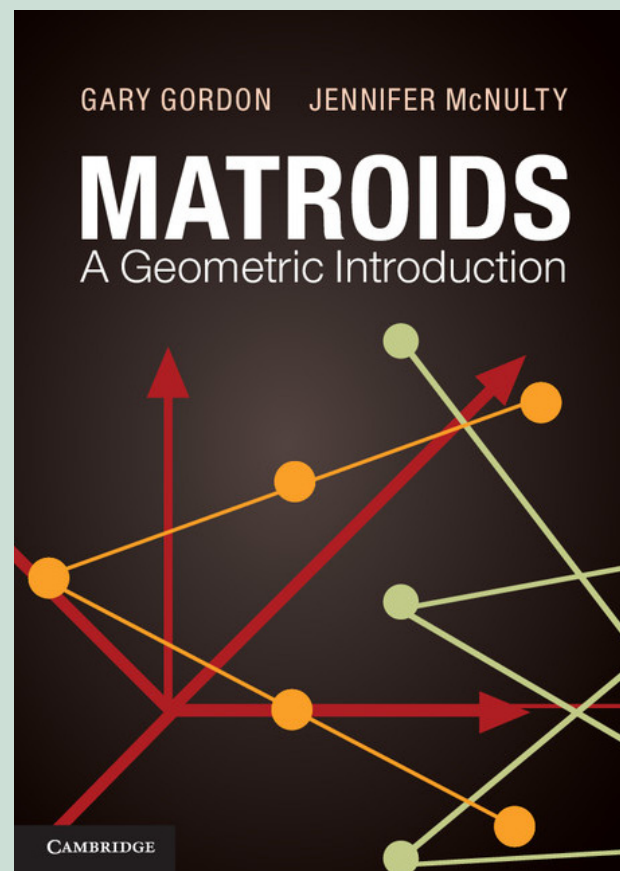
Notes From the Chair

By Leonid Kalachev

I would like to start this column by addressing our donors. During the past year our department received a large number of very generous gifts. I would like to thank everyone who donated funds! This money supports awards and fellowships for students, student travel, invitations for colloquium speakers and other department-related activities. The gifts that we receive are evidence of the strong support for the direction in which our department is moving, both in maintaining the quality of teaching, preparation of students for their future careers, and in the continued expansion of our emphasis on research. Starting in spring of 2013 the department will have an additional scholarship for students in math education. This new award will become possible due to a generous gift from Johnny and Carolyn Lott. The actual requirements for the award will be specified and announced shortly. I also would like to personally thank Duane Adams whose name was somehow missing from our Honor Roll of Donors (see spring 2012 Newsletter) due to a clerical error by The University of Montana Foundation staff.

Statistics and Applied Mathematics CORE (SAMC) launched in our department in March of 2012 and is now up and running. Three graduate students working on various projects with The University of Montana Rural Institute were supported during the summer through SAMC. Now we are working on some new grant proposals with The International Heart Institute and St. Patrick Hospital in Missoula and with other organizations. SAMC will enter these proposals as an integral part, contributing to the statistical design of experiments and to the data analysis. SAMC involvement can be critical for preparing a successful grant application, for increasing the likelihood of getting an award and eventually for writing the data analysis sections of the final reports on grant supported projects.

The teaching of dual-delivery format courses in our department has continued: STAT 216 was delivered in this mode to the students at Bitterroot College in Hamilton, and M 445 continued to be delivered this way to graduate students at University College Cork in Ireland. We also plan to start recording presentations of visitors giving talks at our colloquium with the intention of putting together a showcase of unique lectures on various mathematical topics that can be accessed by interested students, researchers and the public from outside of the UM campus.

This fall the department was working on a self-study for the Program Review, which happens every seven years. From the self-study material it was very interesting to see how the department has grown in terms of PhD production, research activity, and in the design and teaching of new courses. Just during the last academic year, among other activities and events, a new book entitled *Matroids: A Geometric Introduction* co-authored by Jenny McNulty was published, Mark Kayll has received the prestigious Allendoerfer Award from the Mathematical Association of America, and Jen Halfpap was awarded an NSF grant.

It is important to note that recently we were given permission to hire in the area of Combinatorics and Optimization (C&O). The new hire in this field will allow us to further strengthen the C&O group in our department.

Just as in the spring semester of 2012, I had to reduce some classes for the spring of 2013. The university has seen a drop in enrollment and more students are going to Missoula College. The meeting to discuss these and other related issues is now being scheduled by the Provost. We look forward to the opportunity to sit at the same table with representatives of Missoula College, the UM administration and professors from our department to discuss ways to eliminate duplication in course offerings, to reduce the cost to the Montana University System, and ultimately to better serve the students and the citizens of Montana. This will help us all to move towards achieving the UM Strategic Goals, such as Partnering for Student Success, creating Dynamic Learning Environment and others.

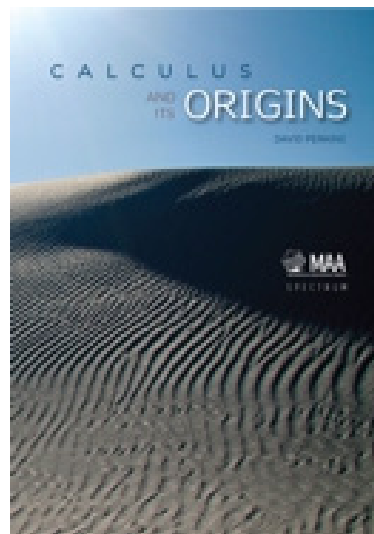As usual, I wish everyone all the best for the Holiday Season! Have a very Happy New Year!

Former Student Publishes MAA Book

By Mark Kayll
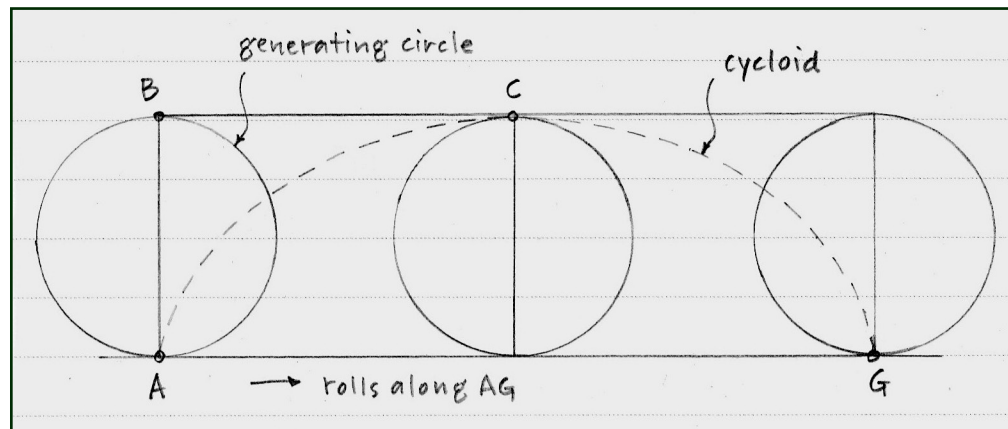
Reproduction of Figure 4.4 from *Calculus and Its Origins*.

Two newsletters ago, we reported on Seth Braver's eBook in the MAA's *Spectrum* series. Once again, we have the privilege of pointing readers to that series, this time for *Calculus and Its Origins*, by David Perkins. The new author completed his 2005 UM doctorate while holding a tenure-track position at his alma mater, Houghton College, in upstate New York. After ten years there, he moved to Luzerne County Community College, in rural Pennsylvania, to live and work with his wife, Michelle LaBarre (photo at right).

Calculus and Its Origins grew out of a disenchantment Dave began to feel after seven years of college math teaching. The preface describes how he "... had begun to feel like a painting teacher who taught color wheels but never let his students paint pictures..." It continues, "So I scrambled my calculus class to place the discovery of calculus at the end. I intended to teach calculus as the culmination of an intellectual pursuit that lasted two thousand years. I could not find a suitable textbook, so I taught for three years using my own notes and homework problems. Then, on sabbatical, I wrote this book."

Since Dave's sabbatical happened to coincide with this reporter's sabbatical, we took the opportunity to meet in Montreal during Spring 2009. His manuscript was well under way, and when he described its guiding theme—the introduction of calculus concepts through their early and sometimes ancient roots—my sabbatical host, Geňa Hahn, exclaimed, "That's a great idea!" Soon the MAA agreed, and thankfully, we have this gem of a book, which appeared earlier this year in both print and electronic versions. As of December, the MAA began marketing it as one of their bestsellers.

Aside from its novel pedagogical approach, another distinguishing feature of Dave's book manifests through its figures, all of which he carefully hand-drew. An example (from p. 48) is reproduced above, where we see a cycloid *ACG* tracking the movement of a point *A* on a circle as it rolls from *A* to *G*. The book's figure format lends a certain intimacy to the presentation which should be especially inviting to students. As we go to press, this claim is being put to the test right here at UM: Professor George McRae used Dr. Perkins' book to supplement his Autumn 2012 Honors Calculus course. Three or four years from now, perhaps we'll be seeing some new graduating math majors, who, thanks to our alum Dave Perkins, will have an enhanced appreciation of the historical foundations of that most beautiful of our subjects, The Calculus.

Solution to the Problem in the Bill Derrick Article

By Greg St. George

In the last newsletter, we posed the problem of proving Ptolomy's theorem using a scaling argument. Ptolomy's theorem says that for a quadrilateral inscribed in a circle, the product of the lengths of the diagonals equals the sum of the products of the lengths of the opposite sides (see figure). So the problem was to break the quadrilateral up into pieces, scale them, and put them back together into a figure which makes the conclusion of the theorem obvious. This solution, by Professors Bill Derrick and Jim Hirstein, was published in the November 2012 edition of *The College Mathematics Journal* (p. 386).
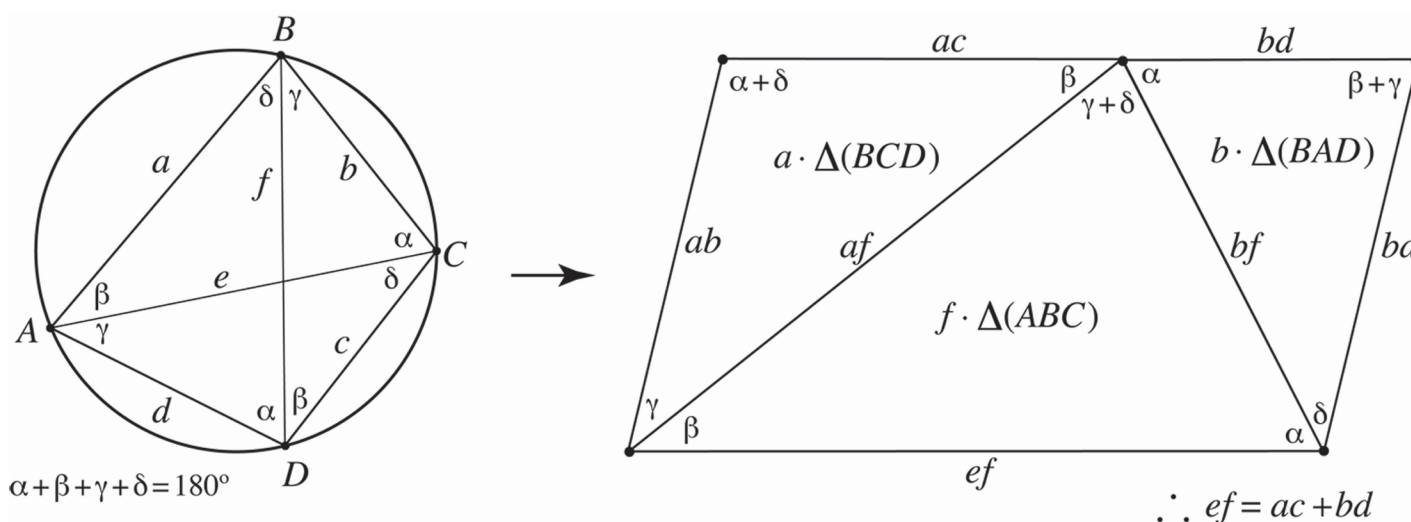
International Exchange in Ethiopia

By Solomon Harrar

As the old saying goes, better late than never. This article is a continuation of one that appeared in Fall 2011 outlining my year-long international exchange experience in the 2010-2011 academic year. It could not be published in the spring 2012 issue due to space limitations. This part focuses on my academic and scholarly experience in Ethiopia that took place in the second half of the year.

Ethiopia is located in the horn of Africa, a peninsula that stretches hundreds of miles into the Arabian Sea. There are over 80 languages (not counting dialects) spoken in this predominantly Orthodox-Christian land, which is one of the oldest nations in the world. The Ethiopian landscape is marked by northwestern and southeastern plateaus and rugged mountains (where the altitude ranges from 1500m to 4200m) divided by the north end of the African rift valley. Notwithstanding its tropical location, the country has a mostly temperate climate (temperature 40–80 ^{0}F) throughout the year largely influenced by elevation. Ethiopia is known in the western world mostly for its well-accomplished long-distance runners and for the famine that hit the country in the mid 80's. According to the CIA World Factbook (as quoted in Wikipedia) the country now owns one the fastest growing GDPs in the world.

Solomon Harrar by the first palace of King Minilik II on Entoto Mountain, the highest peak in Addis Ababa.

Ethiopia Continued

A home for 82 million people, Ethiopia has over 40 public universities and teacher training colleges. Addis Ababa University, founded in the mid fifties, is one of the oldest and most prominent higher learning institutions in Africa. With an enrollment of over 50K, the university has over 36 undergraduate and 220 graduate degree programs. As of recently, the university embarked on PhD training and it currently offers PhD degrees in 69 programs. The university is focused on working with several institutional partners overseas in an effort to realize its ambitious plan of producing 5000 PhDs by the year 2015. The University of Montana has been its partner since 2009 and its assistance in graduate course instruction has been substantial.


Above: A Graduate Seminar at the School of Public Health

During my stay in Addis Ababa University in spring 2011, I offered a graduate course in Time Series Analysis in the Department of Statistics of the College of Sciences and several graduate seminars to the School of Public Health. While the Department of Statistics is starting a PhD program, the School of Public Health has more than 30 students working towards the PhD. In my semester-long stay at the University, I also shared my experience in R programming and structural equation modeling with faculty members of the Psychology, Linguistics and Information Technology departments who at the same time were pursuing PhD degrees. Due to the variation in the backgrounds of the students, I offered the training in a hands-on workshop format. Participation in the workshop was limited to those who could bring their own laptop. My participation in the academics of the university also extended to serving on five Statistics MSc thesis committees. Despite the lack of a proper tenure

and incentive system and the shortage of resources, I was stunned by the level of dedication and enthusiasm expressed by the faculty and students of the university.

Alongside of my own research, I was able to spare some time to explore the Bhutajira Rural Health Project, a longitudinal demographic surveillance system with over 24 years of data, overseen by the School of Public Health. The project follows a dynamic cohort of a random sample of households from ten communities and tracks demographic changes in the households. Besides its usefulness in estimation of certain vital rates, the study also serves as a base (or frame) for other small-scale studies. One such study is the verbal autopsy study, which aims to predict causes of death in rural communities with no access to health care facilities based on data collected from family members of the deceased. Such studies have been effectively used in designing and implementing health care policies for rural communities in the country.

My wife and I also spent some time traveling to parts of the country we hadn't been to before. We had the luxury of traveling to Zege Island. This island is situated an hour boat ride from the coastline of the northwestern city of Bahir Dar. The calm yet comfortable boat ride cutting across the Tana lake, the main source of Nile River, afforded us the opportunity of watching exotic birds along our way to the island. Zege Island is home to two of the oldest monasteries in Ethiopia (Ura Kidane Mihret and Bete Mariam). Most fascinating for us were Ura Kidane Mihret's interior wall decorations, featuring bright paintings of scenes from the bible and lives of the saints. These paintings, dating back to the 16th century, were done using inks and brushes made in-house from vegetable sources on the remote island, and we found them profoundly and intensely inspirational.
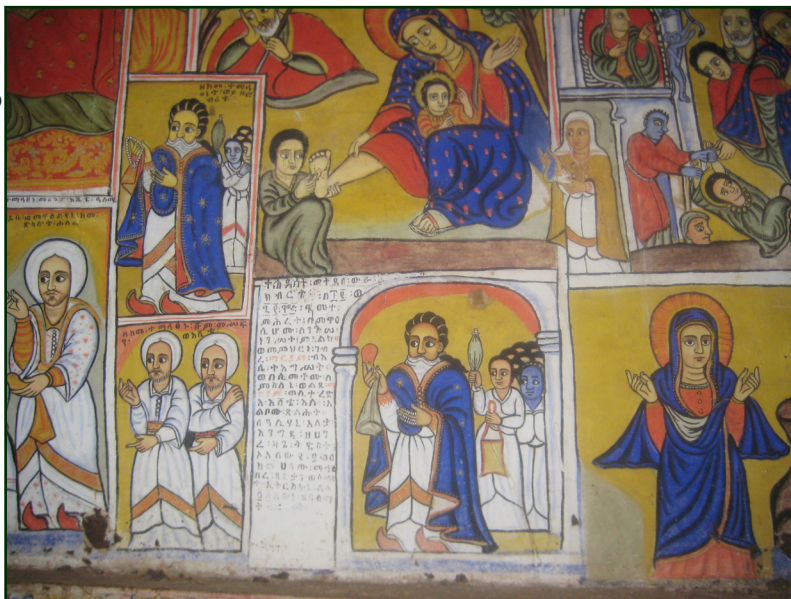
A wall painting in the Ura Kidane Mehret Monastry

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The Department of Mathematical Sciences increasingly relies on donations to support its activities. With tuition increases continuing to outpace inflation, scholarships are vitally important. Scholarship and other existing funds that help to meet some of the educational needs of the department and our students are:

Joseph Hashisaki Fund - an endowed scholarship for one or two upper-class math majors based on academic achievement

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Colloquium Fund - an endowment to provide funds to bring in visiting speakers.

Please consider a gift to one of these funds or to the Math Department's Excellence Fund to be used where the need is greatest.

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Mark Kayll Wins Allendoerfer Award

The Carl B. Allendoerfer award was established in 1976 to recognize exceptional expository articles published in *Mathematics Magazine*. Professor Mark Kayll was given the award for the article "Integrals Don't Have Anything to do with Discrete Math, Do They?'' (which appeared in the April 2011 issue) at MathFest 2012, in Madison, Wisconsin, last summer.

An article in the awards ceremony pamphlet says it very nicely, "The beauty of Kayll's article lies in its exposition of some not-so-well known integral formulas for the number of perfect matchings in a graph. Deftly alternating between discrete and continuous topics, the author expresses the number of perfect matchings in a complete bipartite graph in terms of the gamma function." It continues, "Kayll's well-written article provides us with engaging examples in which discrete and continuous mathematics come together. It reminds us that elements such as the gamma function are interesting in their own right, and it elegantly illustrates some of the ways in which continuous mathematics can be used to study discrete concepts."

Congratulations to Mark on this achievement!