

# Mathematical Sciences

UNIVERSITY OF MONTANA

Winter 2013



## The Department Welcomes a New Professor

By Mark Kayll



Cory Palmer

Last Spring semester, the department conducted a national search to fill a tenure-track position in Combinatorics and Optimization. The need for a new faculty member in this area had evolved over the last few years as long-time Professor Jenny McNulty became increasingly involved in university administration, namely as Associate Dean in the College of Arts and Sciences. As the search began, the Screening Committee was delighted to see a large applicant pool with extremely impressive scholarly credentials. And as the search concluded, the department as a whole was equally delighted when it managed to hire the committee's consensus number one candidate.

Cory hails from Montara, California, and he earned his bachelor's degree from UC Berkeley, one of the nation's premier mathematical research centers. (Look back at the

name of that hometown...all Cory had to do when moving to the Treasure State was to morph the 'r' into an 'n', one of the easiest tricks in children's penmanship.) While at Berkeley, he took part in the international Budapest Semesters in Mathematics, a junior-year-abroad program. Studying and living in Hungary inspired Cory to pursue his graduate studies there. A few years later, he was awarded master's and doctoral degrees from Central European University, which offers graduate math degrees jointly with the Institute of Mathematics of the Hungarian Academy of Sciences in Budapest (where Dr. Palmer was based). European university transcripts include professors' names along with courses taken. We mention this only because on Cory's transcript, one sees some of the heroes of twentieth-century combinatorics listed among his teachers.

While Berkeley and Budapest no doubt provided venerable starts, Cory's combinatorial lineage did not end there. He also spent a semester at the University of Memphis under the tutelage of Béla Bollobás, the doctoral advisor of Timothy Gowers. (In 1998, Gowers won the first Fields Medal ever awarded for research in combinatorics.) For the past two academic years, Dr. Palmer held a visiting position at the University of Illinois in Urbana-

Champaign, one of the USA's discrete math powerhouses.

Cory's research interests both complement and expand on the department's existing strengths. He's already published numerous articles: on graph colorings, tree packings, extremal hypergraphs, combinatorial games, combinatorial number theory, not to mention applications in neuroscience. He hit the ground running at UM, where he immediately began teaching graduate Combinatorics. His autumn lectures were so inspiring that two students from that class already call Dr. Palmer their research advisor.

We might describe our new colleague and his family as a 'cosmopolitan crew'. Cory used his ten years in Hungary not only to earn graduate degrees and conduct postdoctoral research, but also to become fluent in Hungarian (no small feat!). This reporter has already turned to Professor Palmer for help with a few of the many Hungarian names popping up in every graph theory course. Cory's wife, Zsuzsa, is Hungarian, as are their adorable, dual-citizen boys Marci (5) and Beni (3). Zsuzsa wasted no time before charging on to the Missoula hockey scene (though 'charging' can actually be a five-minute major penalty in that sport).

The department extends its warmest welcome to our newest Assistant Professor, Cory Palmer.

# Outstanding Students in Mathematics and Athletics

By Ke Wu



From left to right: Ashley Tombelaine and Maddey Frey

What is the probability of a smart female student choosing mathematics as her major? What is the likelihood of a full-time mathematics student maintaining outstanding academic performance while being successful in sports? In the fall of 2013, I was privileged to get to know two such students: Maddey Frey and Ashley Tombelaine.

Maddey grew up in Kalispell. She graduated from Glacier High School and was accepted by UM in Fall of 2010 with a Women's Soccer Athletic Scholarship. She chose mathematics as her major and will become a licensed mathematics teacher when she graduates.

Ashley Tombelaine grew up in Snohomish, Washington (a suburb of Seattle). She graduated from Snohomish High School and came to UM in Fall of 2009 with a Women's Soccer Athletic Scholarship and a Western Undergraduate Exchange Scholarship. She is a double major in mathematics and economics.

As you might imagine, Ashley and Maddey have very busy schedules between their soccer practices and games. For instance, in fall semester, they typically practice soccer from 3:30 – 7:00 p.m. on Tues., Wed., Thur. and Saturday, and they have games every Friday and Sunday. Almost every other week, the game involves travel: for away games the team typically leaves on Wed. or Thurs. and will not get back until Sunday. Basically, Mondays are the only days off from soccer. In spring semester, their practices involve a similar schedule.

Even with such intense practice and game schedules, Maddey and Ashley have been outstanding in their academic performance. Both have maintained grade point averages which will assure that they will graduate with High Honors in the spring. I have talked to several faculty members (e.g. Professors Jim Hirstein and Greg St.

George) who have had them in their classes. Both speak highly about Ashley and Maddey. When I asked Ashley and Maddey how they balance their study and sport activities, they told me the following have helped them: (1) Make use of a calendar: put homework deadlines and projects on the calendar. "I check on my calendar all the time and make sure to finish all the assignments before the deadline" says Ashley. (2) Communication with teachers in advance is very important. Making up exams or homework missed because of athletic schedules is a necessity. (3) They take some classes together and help each other out. (4) Teachers in the math department are very accommodating and supportive. Some faculty provide very good class notes so that they can catch up with the missing classes. "We also utilize the office hours of the faculty members very well. Teachers are willing to meet with me outside of their office hours. That's very helpful" mentioned Maddey. (5) Getting to know classmates to keep in touch. (6) If you are efficient with schoolwork, then you can have a little bit of time for social life.

Maddey and Ashley have both received multiple awards for their successes. A list of Maddey's awards includes: (1) Second Team All-Big Sky. This is an award based on playing and is voted on by all the coaches in the Big Sky Conference—an article on this award can be found at <http://www.gogriz.com/sports/w-soccer/spec-rel/110513aac.html>; (2) the Capital One Academic All-District 7 women's soccer team—an article on this award can be retrieved at <http://www.gogriz.com/sports/w-soccer/spec-rel/103113aaa.html>; (3) Three-time Academic All-Big Sky Conference student; (4) the NSF Noyce scholarship; and (5) The all Pacific Region 3<sup>rd</sup> Team for soccer. Not many students from Montana have been named to one of those teams.

The awards Ashley has received include: (1) Manis Award 2012-2014 (Math Department scholarship); (2) Shaun & Mary Ann Corette Scholarship 2012: A named scholarship given to student-athletes who excel in both academics and sport. A named scholarship means that the scholarship money goes to the athletic department to help fund the athletic scholarship that an awardee already receives; (3) UM Dean's List 2009-2013; (4) Academic All Big-Sky Conference Selection 2009-2011: An award given to top academic student-athletes in the conference that play in a specified number of games during the season; (5) Big Sky Conference All-Tournament Team Award 2011: An award given to the top players during the Big Sky Conference tournament. The BSC tournament is the playoff at the end of the season that determines the season champion. The champion then

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# Notes from the Chair

By Leonid Kalachev

Once again, I would like to start this column by expressing our sincere gratitude to our numerous donors! Our department continues to receive very generous gifts whose intention is to attract the best UM students to the mathematical sciences. They make possible many activities in areas such as student research, student education, career building through presentations at conferences, and many others. The gifts support our fellowships, summer research awards, and colloquium speakers. I wholeheartedly thank everyone who has donated funds! It is important to mention that an additional undergraduate fellowship will be established in our department at the beginning of 2014 due to the generous gift of our distinguished alumnus, Duane Adams!

Our new hire in the area of Combinatorics and Optimization, Cory Palmer, has arrived in Missoula with his family at the end of summer. On behalf of all our faculty members and staff, I want to say that we are very happy to have him as a colleague, and we wish him success in his professional life at UM!

Our department is actively involved in the Big Data Program development. For the university it is a strategic direction and the Department of Mathematical Sciences is playing a central role in this long term effort. One of our professors, Brian Steele is co-teaching the Big Data Streams course dealing with the programming issues related to near real time computations for streaming data (i.e., the data that is constantly produced and that must be analyzed almost immediately). Peter Golubtsov, visiting professor from Moscow State University (Russia) taught the unique course, Theoretical Basics of Big Data Analytics, during the fall semester. This is the only course currently being taught in the world that is completely devoted to this topic. This course is also going to be offered in the spring semester of 2014 — it is going to be delivered in dual format, both face-to-face and via internet, which will make it accessible for potential audiences outside of the State of Montana. The department has also received support from local businesses for Montana work force training / re-training in the general area of Big Data and Cyber Security. Alex

Philp, the president of the company GCS located in Missoula, provided money for undergraduate fellowships for students that are interested in the topic of Big Data and its numerous applications.

Statistics and Applied Mathematics CORE (SAMC) has been operating within our department since March of 2012 and is proving to be a valuable resource for UM research groups and various organizations that may need data analysis in their day-to-day operations and outside funding applications. A number of grants and projects involving SAMC were funded during the past six months. The Montana Legislative Audit Division expressed interest in collaborating with SAMC on the estimation of efficiencies of various state programs' performance. I want to emphasize once again that the SAMC activities are intended to be open and include everyone who may be interested. We invite all faculty members from our department as well as from other UM departments to participate, to use their skills and knowledge to help businesses in Missoula, the State of Montana and other states to solve problems involving statistics, modeling, optimization, etc. Some processes currently being encountered in business, medicine and government are so complex that without mathematical, analytical, and predictive tools they cannot be completely understood or optimized. As a result, without the involvement of mathematicians, many businesses will not be able to compete successfully and, eventually, will not be able to survive in the current economic environment.

The department recently went through a Program Review whose intent was to look closely at the current activities in the general area of graduate education and adjust, if needed, these activities according to emerging challenges, trends and societal needs. As chair, I feel that the review process was very good and useful for the department. The self-study document that was prepared for the review highlighted that there has been considerable growth in the number of things that we do as a department; it indicated the increase in the quality and quantity of research, teaching and service over the past seven years. The external



reviewer's report, while being slightly biased towards applied mathematics, led to an obvious energizing of the faculty members, making them revisit and assert the value of their activities and contributions in the areas of teaching and research. Various corrections and additions to the reviewer's report were included in the department's rebuttal prepared during the fall semester of 2013.

As expected, the budget situation at the university did not improve during the past semester. Another round of budget cuts is coming. In this new evolving environment that is accompanied by an alarming shortage of specialists in many STEM disciplines in the country, the cuts must not be distributed equally between the departments and schools. As a chair I can unequivocally state that our department is being run financially in the most efficient and economically viable manner. I think that the university must align the financial support of the educational activities of each department with the strategic vision, the economic needs and long term goals of society, the citizens of the State of Montana, and the technological and security challenges facing the US. I am sure that our department will play a decisive role in the strategic development and growth of the University of Montana in the future.

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

A handwritten signature in black ink, appearing to read 'Kalachev', with a long horizontal flourish extending to the right.

# Making the Transition

By Patrick Funk

There is a great deal of confusion regarding careers in mathematics among the uninitiated (a.k.a. undergraduates majoring in Mathematics). After deciding math was what I wanted to major in at the University of Montana, late in my sophomore year, I thought it would be a good idea to check if this strange field could actually get me a job. (Admittedly this was a complete afterthought.) Lo and behold, the business press seemed to say yes. What they did not clarify was how or where to go to get one of these ethereal “math jobs” that everyone was touting as the “it” career for the 21<sup>st</sup> century. So I began to do a bit of digging. What I found was both extremely helpful and utterly confounding. It seemed that mathematicians were hired everywhere. Maybe I was just naïve, but city planning, marketing, neuroscience and the military seemed like a long way away from the theorems of linear algebra. But I did have an answer to my question, and that was that you could get a job almost anywhere, in almost any sector. I had started with zero options and now had infinitely many, however, not ones with particularly insightful bounds.

With the search for a job not helping narrow my prospects, I decided to shift my focus a bit. By thinking about what I wanted to accomplish in the next few years outside of work, I was more successful in refining my options. Learning a new language and living abroad were both on the list. With no justification I was aware of, I’ve always had an affinity for Germany; so I thought why not combine these goals and look for applied math jobs there! Bombarding any and all contacts I had made in my previous undergraduate career with emails, I lucked out and found a few leads. After reading deeper into a few programs, companies, and institutes, I decided to apply to the DAAD (Deutsche Akademischer Austausch Dienst/ German Academic Foreign Exchange). This organization funds all types of foreign exchange to and from Germany, but specifically for my interests, they have a variety of programs and funding options for undergraduates, recent graduates, and graduate students to work or study in Germany for a variety of time periods ranging up to two years. I sent my application to a division of the DAAD that offers three to six month research positions with German companies and institute laboratories.

In the spring of my senior year, I was offered an internship with SMA Solar Technology in Germany. They are a worldwide company that produces solar power inverters, a necessary component to all photovoltaic (PV) energy production systems. While most of the interns and technical employees at SMA generally are electronic engineers, they hired me through the development

department to do “algorithm development”. With little idea of what that meant, I accepted the job to start two weeks after graduation in Kassel, Germany.

In general here in Germany, I work on smart grid technology. Specifically, I work with a team that uses machine learning to improve the coupled efficiency of home

appliances and users’ PV systems. This software finds the least expensive times to run home appliances given predictions of the appliances’ energy use and the PV system’s production. What some of you may be asking is, “where was that course at U of M? I don’t remember seeing any of that in the course catalog”, and you would be correct. The first few weeks were catching up on the algorithmic literature and the current progress of the development team. It was a complete crash course. However, with the theoretical and computational background I had coming from the University of Montana, I was as prepared as one could hope for moving from my earlier academic environment to an industrial setting. I split my time between reading theoretical computer science papers and testing code in Matlab. After narrowing down an algorithm to address the particular goals of the department, I began implementing it in C++, the language that would be used in the power inverter’s on-board computer. I am currently working on translating and testing the code in C++. While I had no previous experience in C++, which makes my work a daily challenge, I find myself comfortable in the vocabulary of computer languages, linear algebra, logic, and the methodical way of thinking required by mathematics.

I have extended my six-month contract for a year in total and greatly look forward to the second half of my stay in Germany. I am currently exploring graduate-school opportunities throughout Europe in math and its related fields. After a year of working in a math-related field I feel better prepared to search for some specific programs, but I will still use some “unconventional” indices to limit the search.



Patrick enjoying mulled wine (Gluhwein) at a Christmas market.

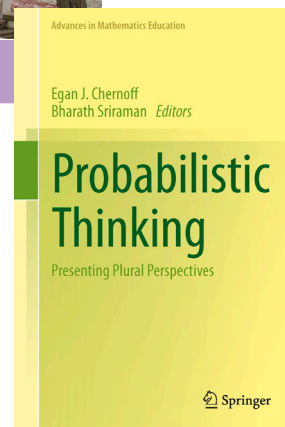
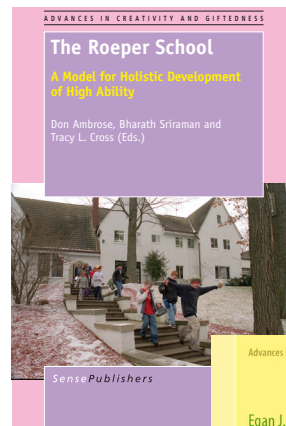
# Professor Sriraman Publishes Two New Books

By Greg St. George

Prof. Bharath Sriraman, who has long been one of the mathematics department's (and the University's) most productive professors, has outdone himself this year with the publication of two new books. The first of these books, *Probabilistic Thinking; Presenting Plural Perspectives*, co-edited by E.J. Chernoff, is published by Springer, in its *Advances In Mathematics Education* series. The book, which is the product of three and a half years work, "provides a necessary, current and extensive analysis of probabilistic thinking from a number of mathematicians, mathematics educators, and psychologists." It contains the work of 58 contributing authors, investigating probabilistic thinking across the globe.

The second book, *The Roeper School; A Model for Holistic Development of High Ability*, is a detailed study of The Roeper School in Michigan (co-edited by D. Ambrose and T. Cross) and is also the product of three years work. The school was started by Holocaust survivors and has mutated into something very unique. As the blurb asks "How can we design schools that energetically promote intellectual development while also attending to the social, emotional, and ethical growth of students?" The book is published by SensePublications in its *Advances in Creativity and Giftedness* series. More information on the Roeper schools is available at [www.roeper.org](http://www.roeper.org).

Congratulations to Professor Sriraman on this notable achievement.



# University of Montana Celebrates Math Day

By Kelly McKinnie

On September 27, 2013 the UM Mathematical Sciences department hosted yet another successful Math Day. In its fourth year, this event has really come into its own! Math Day was sponsored by the Dolciani education foundation through a grant from the MAA. It brings in between 150 and 200 high school students from around western Montana to the UM campus. This event is organized by Jenny McNulty, Ke Wu and myself, but is really starting to organize itself. This year students were treated to hands-on workshops by faculty members from the Math department and beyond:

- Eric Chesebro: Imagining in dimensions 2, 3, 4...
- Joel Egan: Using Applied Mathematics to Explore Bark Beetles, Wildfire, and the Forests of Montana
- James Hirstein: Semi-regular Things in Two or More Dimensions
- Mark Kayll: Forever Frets
- Kelly McKinnie: To infinity and beyond . . .
- Jenny McNulty: How to Guard an Art Gallery
- Cory Palmer: Drawing graphs without crossing lines
- Matt Roscoe: Quilt Symmetries
- Bonnie Spence: Got Art? Got Math? Come get both!
- Ke Wu: Figurate Numbers

We cannot express enough thanks for all of the hard work and dedication that these faculty members put into giving these talks.

In addition to these workshops, students were treated to a career panel featuring scientists from around campus, explaining how they use math in their research. We heard from Art Woods (Ecological and Evolutionary Physiology), Emily Stone (Applied Math) and Aaron Thomas (Chemistry). We could not make this day possible without these wonderful volunteers, so a big thank you to them! Last but not least, the 8-12<sup>th</sup> graders were treated to a subsidized lunch at the food zoo. Experiencing campus life is a highlight for many of them. We look forward to continuing this tradition in years to come!



# Outstanding Students

(continued from p. 2)

advances to the NCAA tournament (our team was the BSC Tournament Champion and advanced to the NCAA tournament in 2011); and (6) Big Sky Offensive Player of the Week September 2009.

Both Ashley and Maddey have only one semester left at UM. When I asked them what they plan to do in the future, Maddey's answer was "I am going to student teach at Hellgate Middle School in Spring 2014; after that it's kind of open right now, maybe travel a little bit. I would love to coach soccer". Ashley said: "I don't have a specific plan yet. (I) probably will move back to Seattle. I have graduate school in mind for sometime in the future, but I don't know in math or economics yet. Maybe I will find a job, work for a couple of years, and then figure it out. Working at a big company doing something analytical, using math, will be ideal. Having a degree in math is very helpful".

Maddey Frey and Ashley Tombelaine are smart, athletic, hardworking, and successful! They are great role models for female students who want to major in mathematics, and for athletes who are outstanding in both sports and academics. When I moved to the United States, I was shocked by how much sports outshone academics in importance in higher education. Ashley and Maddey are perfect examples of how it is possible to be on top in both worlds!

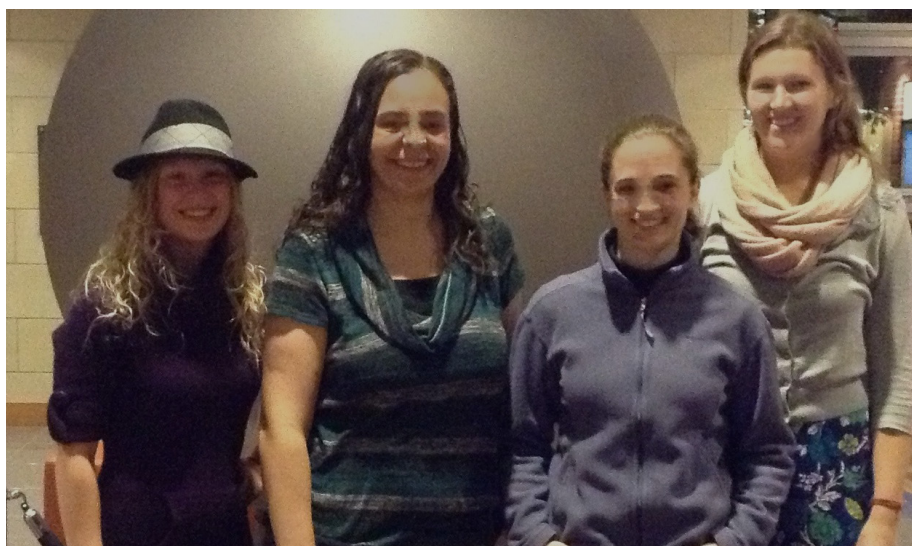


Maddey playing soccer.



Ashley playing soccer.

## Noyce Scholars 2013.....



Pictured from left to right (with the semester/year of anticipated graduation with a math major): Sara Killeen (Sp'15), Ariel Cornelius (F'13), Heather Powers (Sp'15), and Phoebe Webb (Sp'15).

In the Fall 2012 Newsletter, we talked about how Mathematics students had secured five of the eight Noyce Scholarships awarded that semester. This Fall 2013, mathematics students received four of the seven scholarships awarded. The Noyce Scholarships are intended to encourage talented students in STEM fields to consider teaching as a career. They are funded by NSF, and support the recipient with \$12000 for each of their Junior and Senior years. This year's recipients are Ariel Cornelius, Sara Killeen, Heather Powers and Phoebe Webb. Congratulations on this remarkable achievement!

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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:

**Anderson Fund** - an endowed scholarship for a student majoring in mathematics

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

**Mac Johnson Family Fund** - endowed scholarship for undergraduate students showing promise in mathematics

**Manis Memorial Fund** - an endowed scholarship for a student majoring in mathematics

**George and Dorothy Bryan Endowment** - an endowment in support of undergraduate and graduate students

**Lenes Fund** - an endowment to provide funds for the Lenes Exam Competition

**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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## University of Montana Hosts MAA Conference



The 2014 Annual Pacific Northwest Mathematical Association of America meeting will be held at the University of Montana in Missoula on June 26, 27, 28. The invited speakers include the current MAA president Bob Devaney of Boston University, Ravi Vakil of Stanford University and Skip Garibaldi of Emory University. The conference will include two evening lectures that are free and open to the public; please plan on attending! More information, including that of the public lectures, will be posted on our website <http://cas.umt.edu/math/pnwmaa/>. Planned and optional activities include an outdoor banquet, hiking and white water rafting. We will take advantage of the beautiful Missoula summer season! If you are interested in supporting a student to attend this conference, or would like more information on the conference, please contact Kelly McKinnie, [kelly.mckinnie@umontana.edu](mailto:kelly.mckinnie@umontana.edu).



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