

Mathematical Sciences

The University of Montana

Spring 2012



Teaching Rwanda's Children

By Sam Werme

Sam Werme was a student in Math Education in our department who graduated in Spring 2011.



I arrived in the beautiful country of Rwanda, Africa just two months ago with nothing but a vague idea of what to expect and a deeply rooted vision to follow my inner calling of using my education in Mathematics to empower and impact girls worldwide. This openness for opportunity and possibility has thus led me from Missoula, MT to the village of Gashora in the Bugesera District of Rwanda. After years of planning and anticipating this adventure, I finally find myself teaching math at The Gashora Girls Academy of Science and Technology (GGAST).

Since the 1994 genocide, Rwanda has made drastic strides towards rebuilding the country's culture to one of hope, forgiveness, and a potential that can be physically felt within this school that I am fortunate enough to call home.

GGAST was founded by two women in Seattle, Washington who had a profound vision of empowering girls in Rwanda with the education to become leaders who would undoubtedly impact the world for the better. As I am surrounded by these girls, my awareness of the immense potential within each of them is heightened with

each interaction and observation.

The school consists of S4, S5 and S6 grades which are approximately equivalent to grades 10, 11, and 12 in the U.S. Many of the girls have dreams of becoming doctors, lawyers, and teachers, and want nothing more than to positively impact and help the people of their beloved country. I am overwhelmed with a sense of confidence that these girls are capable of accomplishing and exceeding their goals, provided they have the necessary opportunities.

I am currently teaching mathematics to a group of S4 girls and am in awe of their brilliance. These girls have a powerfully quiet and humble confidence when it comes to mastering difficult and rigorous mathematical concepts. Although the opportunity for education is scarce compared to that of the U.S., the curriculum is far more advanced and this only illustrates further the significance of their success in the subject.

In addition to the academic potential of these girls, they exhibit an indescribable sense of gratitude, hope and light. Most have dreams of attending a university in the U.S. because of the opportunities that would follow. The first graduation will occur in November 2013, and I can promise these girls will make profound contributions to the world.

To learn more contact me at samwerme@gmail.com or visit <http://www.rwandagirlsinitiative.org> or <http://radiancoftheheart.blogspot.com>

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My Sabbatical in New Zealand

By John Bardsley



John on Routeburn Track in New Zealand.

Nearly from the moment that I returned to Missoula at the end of my Faculty Exchange to Helsinki, Finland in the summer of 2007, I was thinking about my sabbatical and where I would take it. I knew that I wanted to spend another year abroad, and New Zealand was my first choice, but it wasn't clear that I would be able to pull it off.

As is often the case in life, luck played a role in getting me there. My good friend Al Parker, who is a fellow Montana State University (MSU) Math PhD, and now a statistician at the Center for Biofilm Research at MSU, was a post-doc of Dr. Colin Fox, a Professor in the Physics Department at the University of Otago in Dunedin, New Zealand and an expert in my research area. In my sabbatical application, I proposed to spend the 2010–11 academic year doing research in Colin's group, and because of the connection through Al, the arrangements went smoothly.

In August of 2010, we made the trip to New Zealand with three bikes (in boxes) and five suitcases filled as much with outdoor equipment as with clothes. I had found an inexpensive place to live on Baldwin Street in Dunedin, which claims to be the 'Steepest Street in the World', and we settled in for a ten month stay.

What I hadn't expected was that pulling off our New Zealand experience would be significantly more difficult than was Finland. But in hindsight it's not surprising, since in Finland our housing was paid for by the University of Helsinki, I received full pay, and we didn't have a car.

In New Zealand, on the other hand, I received only 3/4 salary from UM, we paid for our own housing, bought a car, and traveled extensively, racking up 23,000 kilometers of driving in nine months. We also had a few additional, unexpected financial surprises that exacerbated the challenge.

Figuring out how to bridge the financial gap was one of the chief preoccupations (and stresses) of my sabbatical. We rented out our house in Missoula, I covered the lost quarter of my salary from my NSF grant, we took advantage of tax breaks associated with living abroad, and finally, we did what I'd hoped to avoid, refinance the house, which I've learned can be done from abroad.

Nonetheless, the experience was amazing and worth the stress and investment. First, Dunedin is a great city, reminiscent of Missoula, a university town of 120,000 people, but with a history and architecture more like Butte (my home town), once rich from the New Zealand Gold Rush. The weather in Dunedin leaves something to be desired, but the locals share a sentiment familiar to Montanans, "We like it this way because it keeps away the hordes." Indeed, outside and active on a rare blue-bird day, I would inevitably find myself thinking, "This must be the most beautiful place on earth." I'm convinced that if it had great weather too, Dunedin would be overrun with people.

Nonetheless, we didn't come to New Zealand to hang out in Dunedin the entire time. So we travelled throughout the country, going on several road trips, which mixed general car camping and sightseeing with hikes, backpacks, mountain bike rides and races, and, finally, surfing, for which Dunedin is well-known. Indeed, surfing became an obsession for my fourteen year old son and I, and in the end, we enjoyed over 90 outings.



John and Alex standing on Conical Hill in New Zealand.

Some of the highlights of our New Zealand travels include hiking the famous Milford Track, Routeburn Track, Abel-Tasman Track, and Tongariro Crossing, cycling the Central Otago Rail Trail, mountain biking in Queenstown and Naseby, rock climbing in Wanaka and at Castle Hill, Cave Stream, the Catlins, Central Otago, the West Coast, Golden Bay and Farewell Spit, Te Papa National Museum in Wellington, the Ron Mueck sculpture exhibit at the Christchurch Art Museum, Rotorua area natural hot springs, sunrises in Kaikoura, every moment on my bike exploring the stunning Dunedin countryside, often with my wife, and every moment on the wild and cold southern Pacific ocean sitting 'out the back' on my surfboard, taking in the view, my son nearby, at locales all around the South Island.

We ended our South Pacific travels with a ten day trip to Australia, where we had traded our Fairmont, Montana condominium for one in Sawtell, New South Wales. We brought the surfboards along and enjoyed our last surf sessions until who knows when in the warm Australian waters. None of us wanted to leave.

Cont. See "Sabbatical" pg 5

Notes from the Chair

By Leonid Kalachev

Traditionally, at the end of the academic year, I like to start this column with congratulations to our graduating students: four PhD students, two MA students, and eleven Math Majors. By the time this newsletter is published all of our graduating PhD students, John Hossler, Nick McClure, Jordan Purdy, and Mary Riegel should have defended their theses. As of now, John Hossler has accepted a position at Seattle Pacific University, Mary Riegel plans to take a one-year post-doc lecturer position in our department and Jordan Purdy has accepted a one-year Teaching Fellow position at Augustana College in Rock Island Illinois.

Our Math Ed. position search has been successfully completed. Matt Roscoe, a former graduate of our department, and currently a post doc at U. Wisconsin-Madison, has accepted a position of Assistant Professor. He will be joining us in July of this year. On behalf of all the faculty members and staff I would like to welcome Matt and express my strong conviction that he is the right person for the job.

Statistics and Applied Mathematics CORE (SAMC) has finally been approved; it is now up and running. The goal of the CORE is to increase the chance that grants submitted from UM are funded by helping to write the sections of the grant proposals related to data analysis, modeling, optimization and general mathematics, and by providing necessary expertise when the funding is received. Various departments on campus strongly supported the idea of starting SAMC and expressed interest in future collaboration. As of now two projects involving SAMC are underway, both with researchers from Montana Rural Institute.

The department's international

collaborations continue to expand. Next academic year in the fall we will have Professor Haario from Finland spending his sabbatical in our department. He will be collaborating with the applied mathematics group. In the spring semester we will have a visitor from Japan, Professor Miura, who will be working with Thomas Tonev.

Dual delivery courses (which are taught at the same time, both face-to-face and via the internet) offered during the fall semester of 2011 and the spring semester of 2012 as pilots proved to be very successful. I look forward to further expansion of this mode of course delivery. Ironically, our colleagues from University College Cork, Ireland, involved in teaching a dual delivery section of M445 Statistical, Dynamical and Computational Modeling in the fall of 2011, attracted my attention to a science fiction story "And Madly Teach" by Lloyd Biggle Jr. originally published in 1965 (before desktop computers!). In the futuristic world portrayed in this story, distance learning done the "wrong way" is depicted; this is somewhat reminiscent of the way the current web based instruction is understood by for-profit and some other educational institutions. After reading this story one becomes even more convinced that dual delivery courses, at least for mathematics, are distance learning done the "right way".

In the spring semester of 2012 I had to cancel one large section of M115 Probability and Linear Math due to low enrollment, while COT ran eight stand-alone sections of this course. I foresee that the problems associated with COT teaching courses with the same numbers as ours, and competing for the same students in Missoula, will escalate. These problems do not



only concern us, but also Computer Science and other departments, who already have had to cancel courses for the fall semester of 2012. I do feel that the easiest and most effective way to guarantee the uniformity of requirements and overall level of courses taught at UM and the COT is to have not only unified course numbering and common declared course goals, but also to align hiring policies (e.g., share the same adjunct pool and use grad students for teaching at COT), enforce the same syllabi for the same courses, and use course coordination under the umbrella of the UM Mathematical Sciences Department. The long-term interests of the students and the assurance of high quality education must be at the core of our activities. I hope we can all work together to solve these problems, since all of us are interested eventually in the success of The University of Montana of which COT is an important and integral part.

I would like to wholeheartedly thank our generous donors for their support of student awards, student and faculty travel, bringing in speakers for our seminars and colloquia, and for funding numerous other educational and research activities within our department! Thank you very much once again for your help and continuous involvement!

I wish everyone a great summer!
See you in the fall!

A handwritten signature in black ink, appearing to read 'Kalachev'.

Spring 2012 Scholarship and Award Winners

Joseph Hashisaki Memorial Scholarship

Lauren Morey

Anderson Mathematics Scholarship

Kegan McNeill Rabil

Mac Johnson Family Scholarships

Brittany Elliott
Nathan Sponberg
Peter Burns

Manis Memorial Scholarship

Ashley Tombelaine

Undergraduate Teaching Scholar

Patrick Funk

Undergraduate Tutorial Scholars

Peter Burns
Mikel Miller
Lauren Morey
Mariah Smith
Nathan Sponberg
Emily Wilson

N.J. Lennes Competition

1st place: Alec Patterson
2nd place: Peter Burns
3rd place: Kegan McNeill Rabil
3rd place: Mikel Miller
Honorable Mention: Patrick Funk and Pat Tresslar

Graduate Distinguished Teaching Awards

Adam Clinch
Kevin Renna

Graduate Student Summer Research Awards

Rachel Chaphalkar
Jeff Johnson
Michael Severino

John A. Peterson Awards for Mathematics Education

Brittany Elliott
Jessica Spencer

Mortar Board - Outstanding Seniors

Overall: Briana Peck
Statistics & Pure: Soya Bjorlie
C & O: Sean Burke
Math Education: Carlos Morales
Pi Mu Epsilon: Erika Blough

Honor Roll of Donors

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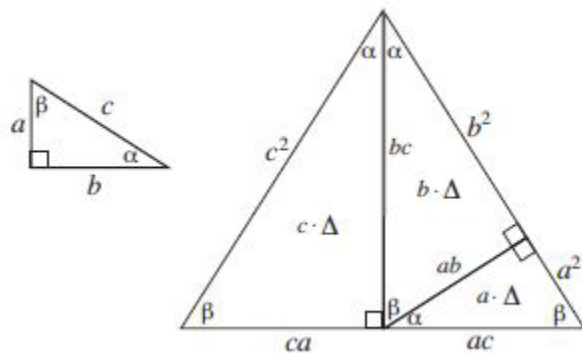
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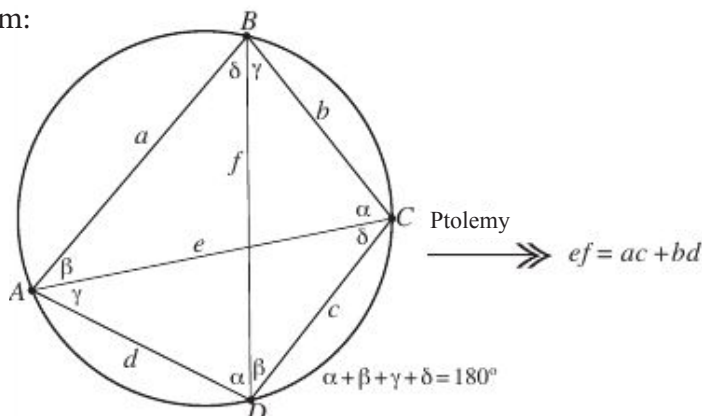
Proof By Similarity

By Greg St. George

In February, Emeritus Professor Bill Derrick gave a delightful colloquium talk to the department titled “New Proofs of Old Geometry Theorems.” The idea was to use scaling (similarity) to prove theorems in plane geometry. This was based on a proof of the Pythagorean Theorem by Frank Burk which appeared in *The College Mathematics Journal* in 1996. Bill, in joint work with Jim Hirstein, has used this technique to offer simple elegant proofs of many other theorems in elementary geometry. We demonstrate the idea: Taking the right triangle $\Delta(ABC)$, we scale it successively by its side lengths a , b and c . We then combine the scaled copies of the right triangle to produce a new triangle. Since the two base angles of this triangle are both equal to β , the triangle is isosceles, and the Pythagorean Theorem follows. A challenge to our readers: Use the same technique (scaling) to prove Ptolemy’s theorem. The solution will be in the next issue of the newsletter. In a sense, Euclidean geometry, which takes place in a surface of constant curvature of zero, lies between spherical geometry (with constant positive curvature) and hyperbolic geometry (with constant negative curvature), and is the only one of these geometries where similarity results exist. Proving theorems in plane geometry by similarity is thus fundamental, as well as producing beautifully simple, intuitive results.



Problem:



Sabbatical continued

In addition to an ambitious travel agenda, I came to Dunedin with work goals in mind, so that when we weren't gone, I hardly missed a day at the office. However, on most days, I'd cut out early for a bike ride or a trip to the beach for surfing.

In terms of work, it wasn't as full-on as Finland, but it was my sabbatical year, and I was in need of some rejuvenation. Nonetheless, the day-to-day consistency resulted in a productive year: I wrote several papers, an NSF proposal, and got some new collaborations going.

I was also fortunate to have my current PhD student Marylesa Howard visit. She and her husband Kaleb stayed for three months. It was great to have the company at the office, but also to share in their New Zealand experiences.

The year was a full one by any measure, and went by incredibly quickly. Still, in the end, after all of our visitors had come and gone, and our travels were over, we began to miss Montana, our family, and our friends, and I started looking forward to the myriad distractions of my UM job.

I write this essay from Helsinki (about one year prior

to this publication) in June 2011, where I am conducting research with collaborators that I met during my Finland exchange. To get here, I travelled from Dunedin via Missoula -- where I stopped for half a day and dropped a suitcase and my bike -- in one long brutal trip. The family remains in Dunedin and will leave in two weeks. It has been a difficult trip for me on many levels.

On the other hand, this is my first visit to Finland since I left in 2007, and I am happy to find that my connection to the place remains strong. The time that I spent here with the family has some sweet resonance, and the research work and collaborative relationships built then live on. Someday I hope to be able to say the same for Dunedin and New Zealand.

In my nine years as a UM faculty member, I've been fortunate to call some great towns home: Missoula, Helsinki, and Dunedin. These opportunities are thanks to UM, to the support of my colleagues in the Math Department who've "held down the fort" while I've been away, to my collaborators, and most of all, to the support of my family, especially my wife Jen.

Department News



Eva Peitz analyzes a math-magic trick.

On May 17th 2011 over 300 kindergarten through eighth grade students convened at the University of Montana to participate in Missoula County Public School's annual Gifted Ed Conference. After a general session on "How to Train Bees" by G. Wiz, students broke out into interest sessions. Students were able to select from an array of workshops to attend, including four sessions taught by members of the UM Math Department: Introduction to MATHCOUNTS by Jon Graham, Math and the Game of Set by Rachel Robertson, Uncovering the Secrets of Math Magic with Bonnie Spence, and How Logical is That? by Deb Johnson. Math continues to be one of the most requested categories from the students attending the conference. At the 2012 conference May 15th Jenny McNulty, Mark Kayll, Cindy Leary, Brian Steele, Nick Grener, and John Graham will present workshops on Encryption, Fret Patterns, Wildlife Populations, Exercise Statistics, Triangle and Square Games, and MATHCOUNTS, respectively. This is a great service to the community and the involvement of faculty and graduate students is greatly appreciated. To present at future conferences, contact Bonnie Spence at bonnie.spence@umontana.edu.

Alumni News

Abram McCormick moved to the Highlands of Scotland last May after graduating from the University of Montana. He is now a full-time mathematics teacher at Lossiemouth High School.

Aaron Luttmann, PhD Mathematics 2006, has just taken a job as a Senior Scientist at National Security Technologies LLC, which is a US Department of Energy Contractor located in Las Vegas. Aaron was formerly an assistant professor at Clarkson University in Potsdam, New York, where his first PhD student will graduate this spring. Aaron and his wife Susannah also just recently had their first child, a daughter named Anja.

Manis Memorial Award

You may have noticed, when looking at the awards given by the department this spring (p. 4), that there is a new \$1000 scholarship honoring Merle Manis, a much admired longtime Math Department Faculty member who passed away in 2008. This award was made possible this year by an individual donation, and although the donor hopes to be able to continue to fund the award, the ideal would be to have the scholarship funded by an endowment. We have received some funds toward such an endowment, and would encourage those who remember Merle to contribute if you are able. Thanks.

Degree Recipients 2011-2012

BA in Mathematical Sciences

Daniel Barthelmeh
Soya Bjorlie
Tomi Blakely
Erika Blough
Sean Burke

Tyler Cherry
Michael Decker
Brittany Elliott
Brendan Johnson
Lucas Jones

Carlos Morales
Briana Peck
Amy Roberts
Martin Schmidt
Micaela Smith

Jessica Spencer
Megan Wagner
Melissa Walker

MA in Mathematical Sciences

Michelle Beatty
Martha Ellis
Blake Miller

Mickey Smith
Elizabeth Stuker
Holly Wright

PhD in Mathematical Sciences

John Hossler
Advisor: Solomon Harrar

Nicholas McClure
Advisor: Leonid Kalachev

Jordan Purdy
Advisor: Jon Graham

Mary Riegel
Advisor: Jennifer McNulty

Inference for High-Dimensional Doubly Multivariate Data Under General Conditions

Mathematical Modeling and Disease Related Applications: A New Method of Estimating Bacterial Mutation Rates, Dynamics of Killer Yeast in a Chemostat, and Other Problems

A Theoretical Development and Simulation-Based Comparison of Four Parameter Estimation Methods for the Spatio-Temporal Autologistic Model with Emphasis on Maximum Generalized and Block Generalized Pseudolikelihood

Nontraditional Positional Games: New methods and boards for playing Tic-Tac-Toe

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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

Mac Johnson Family Fund - endowed scholarships for undergraduate students showing promise 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;

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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Math Day Madness

By Kelly McKinnie

Friday September 23rd, 2011, the UM Math Department hosted the second annual Math Day. Math Day is a one day enrichment program aimed at introducing Montana high school and middle school students to the wonders and possibilities of mathematics. It is funded by a Dolciani Mathematics Enrichment Grant from the Mathematical Association of America awarded to Professors Kelly McKinnie and Jenny McNulty. Over 200 students and teachers from Missoula, Frenchtown, the Bitterroot Valley and Polson attended Math Day 2011. Students participated in a variety of intellectually stimulating presentations. They attended workshops with titles like: Imagining in dimensions 2, 3, and 4!, Math and Music, Keeping Secrets with Cryptography, and Using Math To See What Can't Be Seen. A big thank you to all of the faculty and community and graduate student volunteers; this event would not be possible without their support. Thanks also to the Dolciani Education Foundation whose grant provided lunch for all participants.



Math Grad students lead the fun at Math Circle.

Following Math Day 2011, all students were invited to participate in an ongoing event called Math Circle: Mathematics Beyond the Classroom. This group of students met every other Thursday throughout the fall and spring semesters. In the fall the students explored Graph Theory and in the spring, students studied Number Theory. They were a fun, hardworking, dedicated group of students who ended the semesters with a great grasp of what higher level mathematics is really like.

More information about Math Day and Math Circle, including dates for 2012-2013, can be found on the webpage:

<http://www.math.umt.edu/mathcircle>.