



A Math Major Ventures into Biology

By **Stephanie Bell**

You can always tell when you like or dislike something. I knew I liked mathematics and I liked biology but I did *not* like not having a clue about what my future held. I wanted to somehow mix math and biology to do something that was worthwhile and fun. I debated majoring in math, majoring in biology or attempting to do both even though every attempt to schedule those together and still plan on graduating in 4 years proved impossible and only resulted in a migraine. Then I thought I should branch out and do engineering or computer science (yes... that's about as far as my branching would allow. I'm not gifted on the whole being "creative" type of subjects). Then I thought about every combination of those subjects and honestly was selfish and really wanted to do it all.

So after graduating high school in 2007, I came to my freshman orientation still without a clue of how I was going to be able to study everything I wanted, and I met Dave Patterson who was chair of the math department at the time. He asked me what I was going to study and I attempted to verbalize the debate that was still going on in my head and he solved my problem: MILES. MILES stands for Montana Integrative Learning Experience for Students and it's a program that seems like it was made specifically for me. Its goal is to mix math, biology and computer science and I fell in love.

In the spring of my freshman year, I emailed a few mentors currently in the MILES program and expressed interest in math, genetics, and programming. I got a prompt response with a referral to Dr. Frank Rosenzweig. Frank and I set up a meeting time and when I arrived (still not knowing what to expect) I met a

(Continued on page 7)



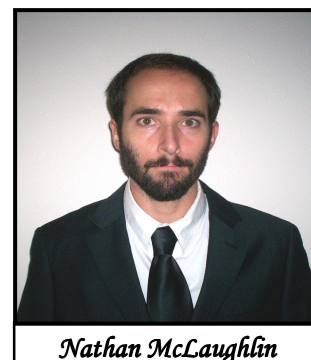
Student Wins Award for History Paper

By **Greg St. George**

I was fortunate to have several exceptional students in my History of Mathematics course in the Spring of 2009. Because this course fulfills the upper-division writing requirement, students have to write a long (>10 page) paper about some topic in mathematical history, broadly defined. There were at least two exceptional papers submitted. One of these, written by a physics-mathematics double major, **Nathan McLaughlin**, I forwarded (with Nathan's permission) for consideration to the 2009 Contest in the History of Mathematics sponsored by the Mathematical Association of America's Special Interest Group in the History of Mathematics (HOMSIGMAA). The paper was concerned with the interest of W. R. Hamilton (the famous Irish mathematician and physicist of the early nineteenth century) in the conical refraction of light in biaxial crystals (crystals with two axes of symmetry). Hamilton had predicted, and Humphrey Lloyd had experimentally verified this phenomenon in the early 1830's.

Later, in 1843, Hamilton discovered/invented the quaternions, which became his major scientific focus for the remainder of his life. Nineteen years later, Hamilton

(Continued on page 7)



Nathan McLaughlin

An Undergraduate Research Experience

By **Morgan Eichwald**



This past summer I participated in an NSF funded Undergraduate Research Experience (REU) at the University of Washington. This eight week program facilitated my engagement with other students from around the country in short term, paid research in applied mathematics. I was highly impressed by the content, quality of teaching, and caliber of the other students and professors at the program. The students at

this REU, under the direction of Professor James Morrow, have historically focused their research on inverse problems in network theory; however seepage into other areas of applied mathematics is also encouraged. Guest lectures were given throughout the program, and I expressed my interest at an early stage in working on two projects presented by professors of combinatorics, Sara

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And quite a bit more!

Notes from the Chair

This is my first Newsletter column in my new capacity as chair of the Department of Mathematical Sciences. The previous chair, Dave Patterson, and Associate Chairs Jim Hirstein and Nikolaus Vonessen, helped me have a smooth transition when I took over as chair in July of this year, and especially during the weeks just before and immediately after the fall semester classes started. In the coming months I will rely on all our faculty members' guidance and advice on how to make the department more vibrant (in teaching, research and service), more effective, and overall, a more enjoyable place to work.

I would like to welcome the new tenure-track hires in our department. Kelly McKinnie (Algebra) and Eric Chesebro (Topology) arrived in Missoula during the summer after finishing their post-docs at Rice University. We are very happy to have them as our colleagues.

This academic year is somewhat unusual compared to recent years, when a considerable number of our faculty were on leave, either participating in faculty exchanges, or on sabbatical, or taking leaves of absence. This year most of the permanent faculty members are staying on campus. Only Bharath Sriraman is on leave for the whole year, combining a sabbatical with a faculty exchange. Thomas Tonev is going to be on sabbatical in the spring semester of 2010. I should also mention that Libby Knott (Math Education) and Adam Nyman (Algebra) have resigned from our department after accepting positions at other universities.

I want to point out several challenges that we face as a department in the coming months and years. There is a trend at the university to move in the direction of offering more internet based and hybrid courses. Whether mathematics courses are suitable for such delivery mode, and if so, which of them can be successfully taught online, remains to be determined. Budget considerations will force us to only teach classes that meet strict minimal enrollment criteria (which were, in addition, recently increased for graduate courses). This means that each year we need to recruit enough incoming graduate students to help populate our graduate classes, and to strongly encourage current graduate students to take more classes, if we want to make sure that our graduate program runs without problems. The allocation of our travel funds is directly

related to our grant writing and subsequent funding activity. Unless the grant related money that the department receives increases within the next couple of years, we will have a significant reduction in the funds available for faculty travel.

We have very interesting and challenging times ahead of us. I look forward to working with the faculty and the students on resolving the issues and overcoming the difficulties that will arise.

Best wishes for the coming Holidays!



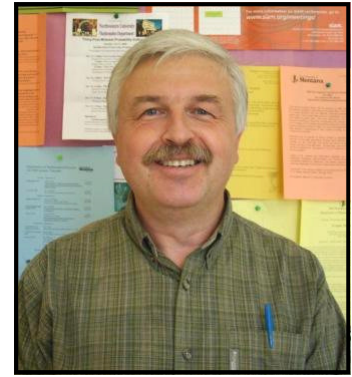
Summer Courses for Middle and High School Students

Math for Middle School Students

Instructor Bonnie Spence will offer two one-week courses; details will be announced in spring at <http://www.umt.edu/math/>.

Discrete Math for High School Students

June 13-25, 2010 (Instructor: Jenny McNulty) This course is offered through the UM Schwanke Institute for college credit. Room and board are available. For more information, see: http://www.dhc.umt.edu/schwanke_institute/



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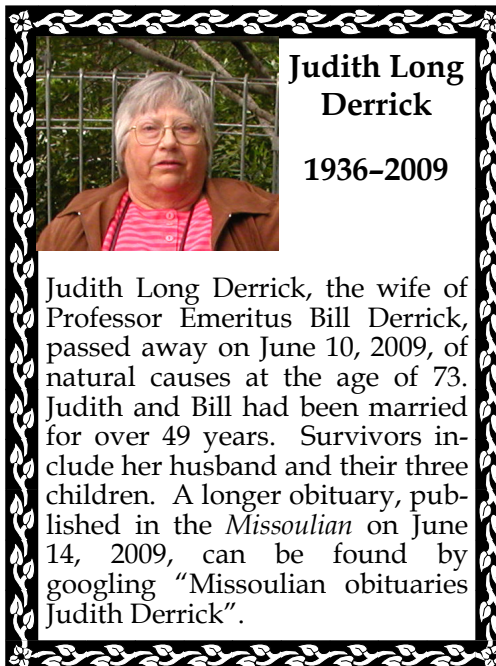
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Rick Billstein, Mathematics Education
Eric Chesebro, Topology
Lauren Fern, Lecturer
Jon Graham, Statistics
Jennifer Halfpap, Analysis
Solomon Harrar, Statistics
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Leonid Kalachev, Applied Mathematics
Mark Kayll, Combinatorics
Kelly McKinnie, Algebra
Jenny McNulty, Combinatorics
George McRae, Optimization
Ke Norman, Mathematics Education
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**Judith Long
Derrick**

1936-2009

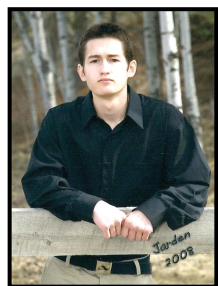
Judith Long Derrick, the wife of Professor Emeritus Bill Derrick, passed away on June 10, 2009, of natural causes at the age of 73. Judith and Bill had been married for over 49 years. Survivors include her husband and their three children. A longer obituary, published in the *Missoulian* on June 14, 2009, can be found by googling "Missoulian obituaries Judith Derrick".

In Memory: Jarden Carlat 1990-2009

By Jen Halfpap

I first met Jarden Carlat in the fall of 2006 when he enrolled in four of our 300- and 400- level math classes, including my advanced calculus course. As any math major knows, this is an incredibly heavy load for just one semester! Jarden not only made it through, but rose to the top of each of his classes. Even more amazing, at the time he was a 16-year-old high school student from Darby, Montana.

This was typical of Jarden. While in high school, he spent a summer as an intern at JPL/Caltech; he took eight of our pure and applied math courses, from abstract algebra to differential equations. He even took my (graduate) Fourier analysis course, along with several Ph.D. students in analysis. By the time he was 18 (and enrolled at UM as a full-time undergraduate) he had completed all the math requirements for a BA in mathematics



Within mathematics, Jarden enjoyed topology, combinatorics, and analysis. He also studied physics. According to John Espy (his friend and mentor), Jarden wanted to work through Einstein's original manuscript on relativity, and had recently ordered a copy of *The Mathematics of Minkowski's Space-Time with Commutative Hypercomplex*

Numbers. He was beginning to formulate ideas for a future doctoral dissertation. Jarden was also a huge fan of Iain Banks.

Jarden was much more than a really good math student. He understood mathematics in a way that eludes even many graduate students. He could write proofs that were not only correct, but simple and elegant. He saw the structure and the beauty of the subject, not just the definitions and results. Still, despite his tremendous gifts,

he was modest. He was quiet and did not share much about his personal life with us, but he was also sensitive and caring. Those of us who were fortunate enough to be his teachers had a great deal of affection for him, and will miss him.

How I Spent My Summer

By Nicolas Haverhals

Last spring semester, I was lucky enough to receive one of the Department's Graduate Summer Research Fellowships for the summer of 2009 (these are made possible by the Bryan family endowment; my sincere thanks goes out to them for their support). The award allowed me to take the summer off from teaching and concentrate on getting a start on writing my dissertation. The subject of my research is how students learn to complete mathematical proofs. My specific goal is to try to identify stages that students go through while learning to prove mathematical statements.

Although I had started my review of the literature during the Spring 2009 semester, there was (and still is) a lot more out there for me to read. I spent the first portion of this past summer expanding my reference list in order to get a better idea of the existing research on the subject. Then I started writing the first draft of the first three chapters of my dissertation. By the end of the summer, I'm glad to say, I was able to complete that first draft.

I feel very fortunate to have received the research award. I am sure that if I had not been able to concentrate exclusively on my research while it was in this early stage, the entire process would have been much more difficult and taken much longer. I am also convinced that it will lead to a better overall dissertation when it's all done.



Symposium for Northwest Women Researchers in Math and Science Education

By Ke Norman

When I came to UM a year ago as an assistant professor, I thought it would be wonderful to get to know other women researchers from the Northwest, who are also working in the fields of mathematics and science education. With support from the PACE external mentor program at UM, I was able to organize a two-day meeting last August to initiate a partnership and collaborative effort among women researchers in the fields of mathematics and science education from the Northwestern region of the United States. Participants included (in the following picture from left to right): Drs. Anne Adams (University of Idaho, Moscow); Min Li (University of Washington, Seattle); Elizabeth Burroughs (Montana State University, Bozeman); Libby Knott (Washington State University, Pullman (and formerly UM)); Jennifer Luebeck (Montana State University, Bozeman); Anne Kern (University of Idaho, Coeur d'Alene); Jerine Pegg (University of Alberta, CA); and Ke Norman (University of Montana, Missoula).

Each of the participants gave a presentation on her research project; these talks were open to UM faculty and graduate students. The papers presented at the symposium

will be published in a special issue of *The Montana Mathematics Enthusiast* in 2010.

During the symposium we had productive discussions about our current research projects and possible long term collaboration in research, and about the writing of grant proposals. The networking through this project was great. As all the participants came from the Northwest, we share some common challenges in education, e.g., large numbers of rural schools and long distance learning for teachers. I enjoyed getting to know other women faculty in my field, both professionally, and at a more personal level. Finally, I would like to thank UM's Project PACE for supporting this meeting.



By David Patterson

Quick! The number 236! ends in how many zeros when expressed as an integer? What is the probability that a two-digit number selected at random has a tens digit less than its units digit? What is the remainder when 5^{137} is divided by 8?

Those are some of the questions you might be asked if you were a middle schooler participating in the Countdown Round of a MATHCOUNTS competition. MATHCOUNTS is a national math enrichment and competition program for middle schoolers. It was started in the 1980's by the National Society of Professional Engineers and the National Council of Teachers of Mathematics and has grown greatly with the help of a variety of national and local sponsors. Each fall, the national organization provides a large set of training material and practice problems to schools that sign up. Starting in February, local (Chapter) competitions are held, with the top teams and individuals progressing to state competitions in March. The top four individuals in the state competition plus the coach of the winning team get an all-expense paid trip to the national competition in May (in 2009, it was at Disney World).

MATHCOUNTS questions cover a wide variety of topics: number theory, probability, geometry, algebra, sequences and series, logic, and unconventional problems requiring good problem solving skills (but no calculus). The competition is divided into four parts: the Sprint Round consisting of 30 problems to be done in 40 minutes without a calculator, the Target Round consisting of 4 pairs of problems with 6 minutes for each pair with calculators, the Team Round where 4 team members work jointly on 10 problems in 20 minutes, and, finally, the Countdown Round for the top competitors. All questions are free response. The Countdown Round is the most exciting for spectators as two contestants at a time square off against each other. A problem is projected on a screen and read aloud. The first contestant to buzz in with the correct answer gets a point. There's a 45-second time limit on each question so it requires quick work to beat both your opponent and the clock.

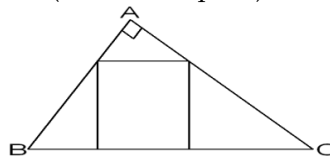
What does a middle school math program have to do with the Department of Mathematical Sciences? A few years ago, Professor Jon Graham and I got involved in MATHCOUNTS through our children and their schools. We quickly realized two things: that MATHCOUNTS is a great program with a lot of interesting mathematics, and that many area schools didn't have MATHCOUNTS programs or had loosely organized programs that didn't provide much preparation for their students. It's hard for schools to find a teacher or parents with the time, skills, and support to run a good MATHCOUNTS program. So we decided to do some outreach. We recruited fellow instructors Regina Souza, also a parent of middle schoolers, and Bonnie Spence, a former middle school math teacher and MATHCOUNTS coach, to help. For the past three years, we have offered two Saturday morning workshops each January where students and their coaches can come to work on problems. We usually choose a specific topic or two, do a short presentation, and then have them work in groups on related problems we've selected from past competitions. The last part of the morning, we do a group countdown round, which is usually the favorite part for the kids. We attract anywhere from 10 to 20 kids and coaches from about 10 different schools, small and large, in the area.

We've also developed and collected a variety of resource materials, including copies of most chapter, state, and national tests from the past 10 years, which we offer to any interested parents or teachers. Finally, we convinced the local MATHCOUNTS organizers (the local society of professional engineers) to move the Missoula Chapter competition from a motel conference room to the University Center Ballroom with financial support from the UM Vice-President for Student Affairs. A benefit of being on campus is that we've been able to recruit volunteers from the Math Club to serve as scorers and judges for the competition and expose our prospective teachers to this excellent program.

Check out <http://www.mathcounts.org> if you're interested in getting involved in this program. MATHCOUNTS depends on community volunteers to help coach and to run the local competitions. I can also send you my resource materials. It is great fun and I guarantee that you will learn some new mathematics and new problem solving skills. If you are already involved in MATHCOUNTS as a teacher or volunteer, I'd enjoy hearing about your experiences. By the way, MATHCOUNTS is not just about the competition. It's a great program even for kids who choose not to compete. In fact, MATHCOUNTS offers a free school club program for schools that aren't interested in competing, at least initially.

Here are a few of the more challenging problems from past competitions to whet your appetite. These are designed to be done without calculus or an excessive amount of work. Answers are on page 5.

1. If $x + 1/x = 4$, then what is the value of $x^3 + 1/x^3$? (2003 State Sprint)
2. A collection S of integers is defined by the following three rules: (I) 2 is in S ; (II) for every x in S , $3x$ and $x + 7$ are also in S ; (III) no integers except those defined by rules (I) and (II) are in S . What is the smallest integer greater than 2004 which is NOT in S ? (2004 National Target)
3. A gecko is in a room that is 12 feet long, 10 feet wide, and 8 feet tall. The gecko is currently on a side wall (10' by 8'), one foot from the ceiling and one foot from the back wall (12' by 8'). The gecko spots a fly on the opposite side wall, one foot from the floor and one foot from the front wall. What is the length of the shortest path the gecko can take to reach the fly assuming that it does not jump and can only walk across the ceiling and the walls? Express your answer in simplest radical form. (2005 National Sprint)
4. Right triangle ABC has one leg of length 6 cm, one leg of length 8 cm and a right angle at A. A square has one side on the hypotenuse of triangle ABC and a vertex on each of the two legs of triangle ABC. What is the length of one side of the square? Express your answer as a common fraction. (2007 State Sprint)



Alumni News

We recently heard from **Andrew Bissell** (B.A. Economics 2005, B.A. Mathematics 2006). For the first two years after graduation, Andrew worked as a management consultant for Galt & Company. During this time, he spent a few months in London and over a year in South Africa as part of his work for a mining industry client. Currently he is working as a trader for Hun Derivatives Strategies. He has worked on algorithmic oil trading in oil markets in Chicago, and is now trading options on the Japanese Nikkei 225 and Korean Kospi 200 indices from San Francisco. This sounds very interesting - thanks for keeping in touch!

Scott Gragg (B.A. 1995) was featured in the Fall 2009 issue of the *Montanan*, UM's alumni magazine, in the cover article "The Guys of Griz Nation: An inside look at the trek from UM to the NFL". After playing for eleven seasons in the NFL, he is now a mathematics teacher and head football coach at his former high school in Silverton, Oregon. You can read the interesting article at <http://www.umt.edu/montanan/f09/contents.asp>.

Laura Williams (B.A., 2009) was caught on camera by the *Missoulian* last spring flashing the victory sign while walking in full regalia in the graduation procession. The very nice photo, which also shows **Christina Anderson** (B.A. 2009), was used as the cover for the August 2009 edition of "Bear Necessities", the *Missoulian's* annual guide for newcomers to UM and Missoula.

Please send in your news; we're always glad to hear from you, and your classmates and professors would love to read about you in this column. Upon request, we are happy to include a phone number or email address, to make it easier for former class mates to get back in touch with you.

N.V.

Department News

Congratulations are due to Associate Professor **John Bardsley** who earned tenure effective this academic year! In July, John organized a two-part mini-symposium at the annual meeting of the Society for Industrial and Applied Mathematics, at which both he and his Ph.D. student **John Goldes** gave a talk. And, certainly unusual for a mathematician, John Bardsley recently published two poems. You can read them in the Spring 2009 issue of *The Montana Professor* at <http://mtprof.msun.edu/Spr2009/>.

Congratulations are also due to **Bharath Sriraman** for promotion to full professor! In May, he co-organized *The Third International Symposium on Mathematics and its Connections to the Arts and Sciences*, which took place in Moncton, New Brunswick, Canada. He was also honored with an impressive two-page faculty profile in UM's 2008 *President's Report*, see <http://www.umt.edu/urelations/Report/2008/BharathSriraman.html>.

N.V.

Answers to MATHCOUNTS Problems from page 4

Countdown Round: 57, 2/5, 5

- | | |
|-----------------------|--------------|
| 1. 52 | 2. 2009 |
| 3. $2\sqrt{113}$ feet | 4. 120/37 cm |

If you have questions email:
david.patterson@umontana.edu

Math-Ed Summer Courses

The Department of Mathematical Sciences plans to offer three courses for secondary and middle school mathematics teachers during the summer of 2009.

June 14 - July 16, 2010 (on-line course)

M 526 *Discrete Mathematics for Teachers*

Dr. Jenny McNulty (mcnulty@mso.umt.edu, 406-243-2473).

There has been an abundance of material written about discrete mathematics for use in middle and secondary schools. This course will be structured around various models chosen from these sources. We will examine the materials, study the theory behind them, and investigate related applications.

June 14 - 18, 2010 (on campus)

plus one on-line day (July 9)

M 520 *Algebra for Teachers*

Dr. Jim Hirstein (hirsteinj@mso.umt.edu, 406-243-2661)

This course will explore the content of algebra from multiple perspectives (number structures, their properties, graphing), its place in the 5-12 curriculum, and techniques for teaching algebra: exploration, conjecture, justification, and the use of technology.

June 21 - July 2, 2010 (on campus)

M 504 Integrated Math and Science - Functions in Context

Drs. Brad Halfpap, Jen Halfpap and Ke Norman (ke.norman@mso.umt.edu, 406-243-4818).

This is a graduate course primarily for in-service K-8 teachers. In it, we explore the mathematical concept of function in physical contexts. Students collect data from a variety of scientific contexts in which one variable has a functional dependence on another. We explore multiple representations for functions, cover the most common classes of functions, and discuss what the form of the function says about the underlying physical phenomenon. We then design standards-based grade-appropriate lessons concerning these concepts.

For further details, check out the website <http://www.umt.edu/math/> and look under **Summer Programs for Teachers**. You can register for these courses starting January 25 at <http://www.umt.edu/xls/summer/>.



Online Giving

With tuition increases continuing to far outpace inflation, scholarships are vitally important for our students. If you wish to make an online donation to the Department of Mathematical Sciences and its various programs, please visit <http://www.umt.edu/math/giving>. When you fill out the electronic giving form, please pay special attention to how you designate your gift, thus ensuring that your gift really reaches the math department and its students. For donations by mail, please use the enclosed Alumni Reply form.

New Tenure-track Faculty: Eric Chesebro & Kelly McKinnie

Last year, the department was able to hire two very talented young mathematicians, Eric Chesebro and Kelly McKinnie. At the time, both held prestigious G. C. Evans Instructorships at Rice University, and opted to stay there an additional year before joining us this fall. Before their individual introductions, we might as well let the cat out of the bag and reveal that Eric and Kelly are married. Eric is introduced by **Mark Kayll** and Kelly by **Nikolaus Vonesen**.

Kelly McKinnie graduated *summa cum laude* with a BS in mathematics from the University of Missouri (Columbia, 1999). She earned her PhD in non-commutative algebra from the University of Texas (Austin, 2006) under the supervision of the well-known algebraist David Saltman. Based on her thesis, she won a National Science Foundation (NSF) Postdoctoral Research Fellowship. Being awarded one of these three-year fellowships is a rare and great honor.



Dr. McKinnie spent the first year of her NSF postdoc at Emory University (Atlanta), and the next two at Rice University (Houston), where she also held the G. C. Evans Instructorship mentioned above. She has already co-organized two mathematical conferences. The first was a special session on division algebras at the annual meeting of the American Mathematical Society in San Antonio, Texas (January 2006). The second was the 8th Brauer Group Meeting in Pingree Park, Colorado, in the summer of 2008.

Recently, Professor McKinnie received an NSF grant for over \$100,000 to fund her research over the next three years. In addition, she was selected as a national Project NEXt fellow for 2009-2010.

Since arriving at UM, Kelly has given several stimulating lectures on quadratic forms in our weekly algebra seminar. And her graduate course on Groebner bases is a big hit with the students.

I guess it is obvious that we are all very impressed with Kelly and are excited that she could join us.

When's the last time UM hired a topologist? Wasn't that another era? Not quite so... it was spring 2008. **Eric Chesebro**, a low-dimensional topologist hailing from Corvallis, joined UM's ranks as an Assistant Professor last year. As noted above, he delayed his arrival in Missoula by one year so that he could complete his G. C. Evans Instructorship at Rice.



Was that Corvallis, Montana? Yes, you read that right! Eric grew up and attended school (K-12) "down the Bitterroot," as Montanans say; his parents still live in the family home. He's delighted to be back in the area, and UM's lucky to have him - it's a genuine win-win.

Dr. Chesebro earned his Bachelor's degree in mathematics at Colorado College (Colorado Springs, 1993) and his PhD in geometric topology at University of Texas (Austin, 2006). Between these milestones, he worked variously as a ski coach, a sculptor, and a printmaker. One of his sculpting highlights was a series of *random chairs*, crafted in oak and individually determined by a set of randomly chosen values for selected dimension parameters.

Since he's been back in Montana, Professor Chesebro has wasted no time in rekindling and cultivating his outdoor passions: rock climbing, skiing, and the latest, hockey. (Rumor has it that Eric is no stranger to the penalty box, but we hear that enthusiasm plays as much a role as any nefarious activity.)

Another source of Dr. Chesebro's delight in returning to his home state is the daily opportunity to teach Montana children. Eric's 'pay-it-forward' attitude makes him a perfect fit for the UM Math Department.

While we're on the topic of Montana children, we can't pass up mentioning that Eric is soon to become a father to one of them. He and Kelly are expecting a baby in December! A most hearty welcome and congratulations!



Graduate Student Profile – Matt Roscoe

By Jim Hirstein

Matt Roscoe grew up in Billings and graduated from Billings Central High School. He went to Notre Dame on an engineering scholarship, where he received a degree in engineering in 1993.

Matt decided that one way to see the world up close was to teach, so he signed on to join a group of other students in Santiago, Chile. He taught there at two high schools for two years, teaching mostly English to native Chilean students. Through these experiences, he learned that he really liked teaching.

When he returned to Montana, he went to work for the family steel company, drawing the assignment to come to Missoula. Matt wanted to be able to teach in Montana, and due to his engineering background, he was closer to a mathematics credential than anything else. So he enrolled at UM in the graduate program through the School of Education. He had taken quite a bit of applied mathematics for his engineering degree, but here he needed the courses for teacher certification - abstract mathematics, geometry, al-



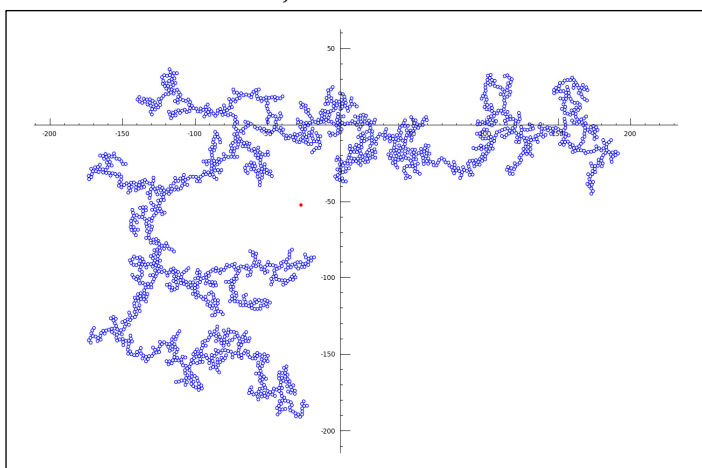
gebra, technology, history of mathematics - so many of us met Matt in these courses. He was an excellent student and he worked as a tutor in the Math Learning Center. His leadership and skills working with students were obvious to all of us who worked with him. Then one semester, when a TA did not show up, we hired Matt to teach a section of our precalculus course. While completing his M.E.D. and teaching for us, Matt developed many hands-on experiences for precalculus students. After he graduated, he taught mathematics at Clinton Middle School, filling in for a teacher on leave, where he continued to work on student exploration activities. He moved into Missoula the next year where he taught at Hellgate and Sentinel High Schools. When our position for Director of Developmental Mathematics opened, Matt applied and was selected for that job. Matt served as an innovative manager of the developmental courses and the tutoring center. He also built up his resume as a teacher of precalculus and mathematics for elementary teachers, and he took

(Continued on page 7)

(Continued from page 1 (“An Undergraduate Research Experience”)
 Billey and Matthew McCauley.

My research with professor Billey focused on branched polymers, which are studied in molecular chemistry, statistical physics, random graphs, and geometry. Our results and conjectures were based off of the data we collected by implementing Richard Kenyon and Peter Winkler’s algorithm to grow branched polymers uniformly in the plane. Kenyon and Winkler’s paper, “Branched Polymers” was recently published in the August/September 2009 issue of the *American Mathematical Monthly*. Here is an example of a polymer that we generated using this algorithm:

My work with Professor McCauley involved the study of cyclically fully commutative (CFC) elements of Coxeter groups. Through our research we were able to characterize and enumerate the CFC elements. A paper describing this research (co-authored with other colleagues of Professor McCauley’s) was recently submitted to a refereed journal.



The REU at the University of Washington was an ideal way for me to get a taste of mathematical research, something that I had never previously experienced. While research is a major component of graduate school, undergraduate math majors must be very proactive if they want to see mathematics to any extent outside of their courses. I would recommend an REU to any undergraduate in mathematics who is possibly interested in an advanced degree or a career in research.

Morgan Eichwald will graduate in December with high honors. During her time at UM, she was supported by a Presidential Leadership Scholarship through the Davidson Honors College. Morgan is also a professional dancer; last year she trained with the San Francisco Conservatory of Dance, and is now, in addition to finishing up her math course work, a company member of Labayen Dance/SF.



(Continued from page 6 (“Graduate Student Profile”)
 courses and eventually taught statistics for us.

Two years ago, Matt decided he would enter our doctoral program in mathematics education. He made it past his preliminary exams and presented his proposal last spring. He has begun work on a project examining the attitudes of prospective elementary teachers toward geometry,

(Continued from page 1 “Student Wins Award”)

wrote a paper in which he used his quaternions to give a new description of the wave surface in these crystals. This was the topic of Nathan’s paper, which was the winner of this national contest. As of this writing (October 25, 2009) the paper is posted at the HOMSIGMAA website (<http://homsigmaa.org>). The contest was open to students from across the nation, so Nathan’s success represents a considerable achievement.

Nathan is originally from Hamilton, MT, and relates an interesting road to his present position. Not liking the idea of taking loans to go to school, he worked first as a beekeeper, and then after culinary training in Vancouver, in a restaurant until he had the necessary tuition money. He then came to the University as a physics major, but added a mathematics major after finding his math courses to be enjoyable and useful. Nathan has since gone on to graduate work in Applied Physics at the University of Oregon, and now says that his description of the physics of the refraction in the paper was a bit naive. Since he is studying optics for his masters, this may be, but I must confess that even the easy version was beyond me. For myself, I am grateful to have been able to teach such a student, and wish him success and enjoyment in his further studies.

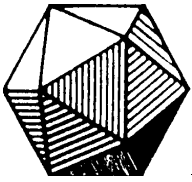
(Continued from page 1 “A Math Major Ventures”)

math PhD student, Nick McClure, who was also invited to this meeting. Nick worked in Frank’s lab and was doing *genetic* research on Yeast and about to start doing *mathematical modeling* of the bacteria *Pseudomonas aeruginosa*. This couldn’t have been a more perfect coincidence.

I applied to the MILES program and was awarded a summer internship. After working in the Rosenzweig lab that summer, I continued through the fall and again the following summer. I am so glad that I got to experience a way to mix all of my academic passions. There are very few courses that I could have taken that would have been able to even remotely give me the knowledge my MILES internship gave me. In that year, Nick and Frank (and the rest of the Rosenzweig lab, especially Jenya Kroll!) taught me so much about microbial genetics, lab technique, experimental design, experiment frustration (if you’ve done any work in a microbiology lab then I’m sure you know what I’m talking about!), MATLAB programming, maximum likelihood, statistics, scientific writing, basic dynamical modeling, and so much more. A major thing I learned was that biology research is not what I would like to do for the rest of my life, but that’s okay because I’m really glad I got help finding a way to mix the subjects I enjoy studying. I had a great overall experience in the MILES program and next I would like to try to leave out the bulk of the biology and try some math research (okay, some programming is welcome to join!).

Math major Stephanie Bell is currently the president of our Math Club. Last spring, she was awarded a Mac Johnson Family Scholarship and a full-year Undergraduate Tutorial

under the direction of Bharath Sriraman. He hopes to finish in the next couple of years, and he would like to find a mathematics education teaching position in the Northwest if he can. In his spare time Matt enjoys self-provisioning: hunting, fishing and gardening. He also plays folk music and is an avid bicyclist.



Math Club Corner

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

By **Nikolaus Vonessen**

The highlights of the fall semester were two presentations by alumni. On October 6, **Susan (Bickell) Cole** (BA 1965, with honors) gave the presentation "What do you do with a BA in math?" Well, for some of us the answer is (or was) obvious: teaching in high school, or going on to earn a graduate degree. For Susan, the answer was "an interesting zig-zag course through several different fields"; you can read a bit about it in the Alumni News column of the previous newsletter. The students loved her presentation, and stayed long after to talk with her. According to Susan, "Having a BA in math prepares you for many things. You just need to find where your path takes you."

A few weeks later, **Ted Fitzpatrick** (BA 1994) gave us a talk with the title "What keeps actuaries up at night: an introduction to the actuarial profession". Ted worked for many years as an actuary, and really gave us an idea of what an actuary does. As a pure mathematician, I appreciated Ted's avoiding statistical technicalities. Instead, he made us think about the problems an actuary encounters. Among many other interesting things, I learned that the actuaries an insurance company employs are heavily involved in determining the company's earnings, since the actuaries determine the amount of the reserves which need to be kept. And this can result in quite

a bit of pressure from management to come up with favorable numbers. Thanks a lot, Susan and Ted, for your wonderful talks!

On the lighter side, the Tuesday before Thanksgiving we watched a very funny DVD, *The United States of Math Presidential Debate*. In it, math professors Colin Adams and Thomas Garrity square off on "who should be the next president of the United States of Mathematics? Should it be the figure-eight knot, representing fresh new mathematics and the changes we believe in, or should it be the Euclidean algorithm, representing the needed stability that comes from the traditional roots of mathematics?" If you cannot find it at a library, you can purchase this DVD at <http://www.maa.org/>.

The Math Club is always looking for outside speakers, especially alums, to talk about their professional lives, and how they use mathematics or statistics in their careers. Please let me know if you can help out! (406-243-6222, nikolaus.vonessen@umontana.edu)



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