The University of Montana
Department of Mathematical Sciences

Alumni Interview: John McGowan, M.A. 2002

By Jenny McNulty

John, Thanks for agreeing to be interviewed. Can you tell the readers where you are right now?

Hi Jenny, I am in Taiwan, teaching at the Taipei American School.

How did you end up teaching in Taiwan?

It has always been a dream of ours to be able to teach and live abroad. We were working in Hawaii and a few of our colleagues just came from Asia and continued to tell us how wonderful it was to teach here, which gave us the extra push. We had an amazing opportunity to come to Taipei and jumped at the chance.

By we, you mean you and your wife Deanna. Tell us how you met her?

We actually met in math class. The way I like to tell the story is that I was explaining a solution to a problem that involved modular arithmetic with a lot of passion. She saw the excitement in my eyes and it sparked her interest, so I say we fell in love over modular arithmetic. Because of this, I always tell my students "you should study and work hard so you can impress the ladies with all of your brilliant math knowledge". She likes to say "you better pay attention

A Job, Learning Experience and Summer Camp All In One

By Hannah Stanton

When I started college I had no idea what field I wanted to study. About midway through my sophomore year it dawned on me that math could be the path to take. So, I decided to give it a try. I got my major form signed and there I was, a full-blown math major.

Mid-way through my junior year I heard from a friend about STEM REUs, summer research programs put on by different universities and funded by the National Science Foundation in science, technology, engineering and mathematics. I found some intriguing programs and got my applications in. A few weeks later I heard back from Hope College in Holland, MI.

One of their research groups was going to be looking at a problem in the field of Complex Analysis and they had chosen me as a research group member. So June 2nd I flew out to Michigan to spend the next six

A Former Ph.D. Student Describes his Research in Statistics (and Marketing)

By John Chandler-Pepelnjak
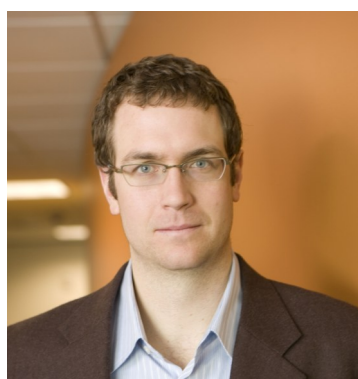
In the spring of 2010, I received my Ph.D. from the University of Montana. My degree and my research are inextricably linked to the somewhat tortuous path I took. My undergraduate degree was in mathematics from Middlebury College. In 1997, I moved to Seattle to begin a Ph.D. program in mathematics at the University of Washington (former Montana professors Adam Nyman and Jed Mihalisin were a few years and several leagues ahead of me at

Notes from the Chair

I would like to start this column with congratulations to two of our faculty members: Solomon Harrar has been awarded tenure, and Jen Halfpap was promoted to the rank of Associate Professor. On behalf of everyone in our department I would like to wish them continued success in future teaching, research and service activities that benefit the students, our department, and the university.

The new orientation procedures for incoming students, including an obligatory web based math placement exam, led to some unexpected challenges for our department at the beginning of the fall semester: seven new sections of lower division math courses were introduced at (almost) the last moment, and the instructors for these sections had to be found at very short notice. We were lucky that two qualified adjuncts were available to be hired to teach these new sections in addition to those adjunct instructors already serving our department.

The uncertainty about class offerings for the coming semesters remains a problem. I hope that the addition of a new lecturer position to our base budget will provide some extra degree of predictability compared to the situation where money for hiring adjuncts comes from faculty vacancy savings (i.e., from positions in the College of Arts and Sciences that remain unfilled for a number of years after faculty members retire or go on leave). The Department of Mathematical Sciences teaches a large number of general education courses, and one of my goals as a Chair is to make sure that eventually a special pool of money intended for general education is established at UM.

Rick Billstein is going to retire at the end of this academic year after 45(!) years of service at UM. He will continue to be active in grant writing, and will keep a 1/3 time position with the department for the next academic year. I would like to thank Rick for his hard work and the positive impact that he made on our department and the university.

Serving on departmental and university committees is an integral part of faculty members' responsibilities. Without faculty dedicating some time to such activities, the life of the department and the university as we know it would not be possible. The students must be excited about mathematics not only through taking classes, but also through their participation in math contests, undergraduate seminars and research, student conferences, etc. All these activities have devoted faculty members behind the scenes working on their preparation, making sure that the students have the best possible university experience at UM. I want to express my strongest belief that the faculty participation in service will become even more pronounced in the coming years, which, in turn, will be very good for the students and rewarding for the faculty members.

Best wishes for the Holiday Season! Have a very Happy New Year!
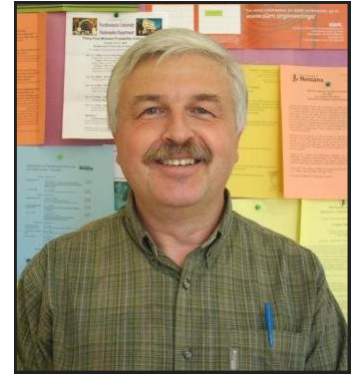
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A memorable May afternoon for three: **Jade Roskam**, who earned two UM Bachelor's degrees with High Honors (mathematics education and psychology), poses after graduation with her proud grandfather, sporting legend **Gordie Howe**, also known as "Mr. Hockey", and a star-struck Canuck, Professor **Mark Kayll**.

A New Graduate Mathematics Program is in the Works:
The Master of Arts in Teaching Middle School Mathematics

We are hoping to soon offer a new graduate degree program aimed specifically at middle school mathematics teachers. The program is currently under review by UM's Faculty Senate and Administration, and will, if all goes as planned, be submitted next February to the Board of Regents for final approval.

The new master's program is aimed at teachers who are certified to teach middle school mathematics with a K-8 teaching endorsement. It was suggested by a statewide task force formed to improve the teaching of mathematics and science in Montana. Middle school teachers of mathematics often have a K-8 teaching endorsement that requires only two courses of mathematical content and one course in the pedagogy of teaching mathematics. According to some estimates, approximately half of the middle school mathematics teachers in Montana do not have an adequate depth of preparation in mathematics to meet current standards of federal legislation. The new program, unique to Montana, was designed to address these concerns.

It gives middle school mathematics teachers the opportunity to acquire a graduate degree that significantly expands their mathematical and pedagogical knowledge, to a level that meets current recommendations by national authorities. Students in the program will learn mathematics content and pedagogy to provide them with skills and expertise to teach middle school students appropriate mathematics. The program is available mostly online, but with the requirement to spend three weeks on campus during each of two summers. It can be completed during two summers and the academic year in between. Typically, students will take 10 credits each over the first summer, the subsequent academic year, and the second summer.

Assuming the new program is approved, the three graduate mathematics education courses offered next summer (see below) will count towards it. If you are interested in further developments, updates will be posted at http://www.umt.edu/math/ (click on "Summer Programs for Teachers").

Summer 2011 Graduate Courses in Mathematics Education at UM

June 13 – July 29 (on-line course)
C&I 542 *Supervision and Teaching of Mathematics*
Dr. David Erickson, Department of Curriculum and Instruction (david.erickson@mso.umt.edu, 406-243-5318) Curriculum trends, instructional materials, research and supervisory techniques relevant to a modern school mathematics program. The focus is on effective implementation of teaching/learning strategies to supervise, assess, and facilitate mathematics instruction. Students will use appropriate technology, search the Internet, use hands-on–minds-on learning strategies, evaluate student materials, and develop a philosophy for approaching mathematics learning and teaching for enhancing mathematical power of all students.

Drs. Jim Hirstein, David Erickson and Ke Norman

June 13 – 17 (on campus),
plus one on-line day (July 15)
M 530 *Geometries for Teachers*
Dr. Jim Hirstein (hirsteinj@mso.umt.edu, 406-243-2661) This course investigates different approaches to geometry for the secondary schools. Beginning with topics in synthetic geometry, we will also consider solutions using analytic geometry, vectors, and the properties of geometric transformations. Approaches and solutions to geometry problems will also be illustrated using interactive computer software.
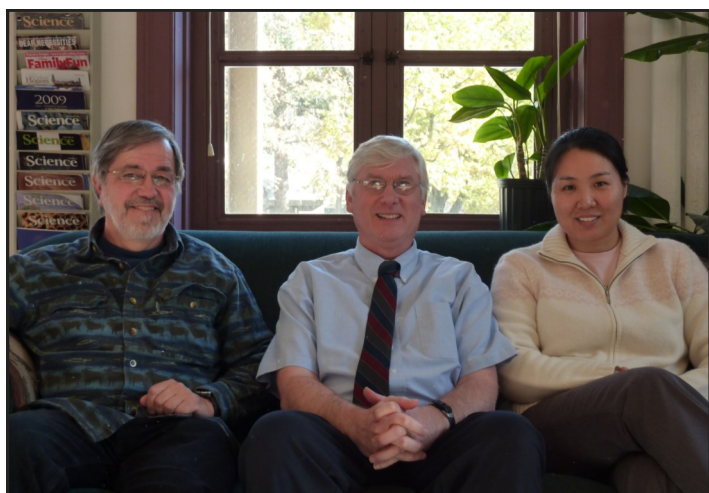
June 27 – July 1 (on campus),
plus one on-line day (July 22)
M 540 *Probability and Statistics for Teachers*
Dr. Ke Norman (ke.norman@mso.umt.edu, 406-243-4818)
This course presents a survey of modern topics in probability and statistics as they relate to content introduced in middle-school and high-school mathematics curricula. The course will use technology to enhance the teaching and learning of probability and statistics. There is an emphasis on applications of statistics in real-world situations.

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 at http://www.umt.edu/xls/summer/ starting January 24 , 2011.

in math class, because you never know what you might find".

What is the most surprising thing about teaching in Taiwan?

I think the most surprising thing about teaching in Taiwan is how much the students and their families value math. At parent teacher conferences, I will see almost all of the parents come (even the students who have A+). When the students put so much time and effort into their math class, the amount of material we are able to cover is surprising. The work ethic is amazing.

Additionally, it is surprisingly easy to get around without being able to speak Chinese. I have been trying to pick up the language, but everyone is so eager to speak English that you almost never have to use Chinese.

What advice do you have for others who are interested in an experience such as yours?

Just go for it! It takes a leap to move abroad, but it is an amazing experience. I would say that you definitely need to use one of the agencies Search Associates or Carney Sandoe. Schools like to see IB experience and/or experience teaching at other private schools. International schools are like a school system in themselves. Initial contracts are usually for 2 years and it is very common for teachers to move on after that and you will then have contacts all over the world. It is a culture that encourages travel, adventure, and great friendships. The pay is great and you can take advantage of living out of the US. Most schools will also give you housing or a housing allowance, and you most likely won't have to pay federal taxes on your income.

Let's back up a bit, tell us about your experience as a graduate student at UM.

I had an amazing experience at UM, some of my fondest memories are from the interaction I was able to have with other grad students and faculty members in the seminar classes. I also really enjoyed how everyone was eager to share the latest topics they were working on and give advice on how to solve a problem if you were stuck. Although, I must admit my favorite times at UM were on the soccer field playing with the Irrationals. It was great to play with a great core group season after season and having the opportunity to really get to know Jenny and Jon Graham.

What did you do after completing your Master's degree?

After completing my Master's degree, I went to Colorado University in Denver to begin a PhD program in Discrete Math. After a snowboarding accident, I had to take a semester off for rehab. I had to teach during my semester off because my health insurance was through the university. I was resisting the temptation to become a teacher because I come from a family of teachers, but during that semester I realized that I loved teaching! I switched programs to become a certified high school

teacher and met my wife on the first day of class. After teaching in Colorado for a year, we set off to Hawaii to teach and began our journey teaching math around the world.

What advice do you have for math students today?

The advice I am always trying to relay to my students is two-fold. It is never about the grades, but about the understanding of the material. Additionally, I try to inject a passion into their math learning. Finding out about the origins of a topic and the humanity involved in the discovery can really make a topic interesting. If you get a chance, take a Math History class!

As a high school teacher, my students generally think that Calculus is the highest level of math; I try to show them other areas that are equally as challenging but not usually taught in the high school curriculum, like Discrete Math. Exposing yourself to some other areas of mathematics can be a great way to get a full understanding of the possibilities out there, it took me a long time and many different math classes to find my love for Discrete Math and Graph Theory!

Thank you, John, for taking the time to be interviewed and for sharing your experiences with us. I hope your mathematical journey continues to be rewarding and exciting!

weeks of my life doing math research for 7 hours a day, 5 days a week as my summer job.

It was one of the best experiences of my life. There were students there from all over the country: California, Georgia, North Carolina, Pennsylvania, and Montana, just to name a few.

Everyone was motivated and interested in the math, and fun and outgoing outside of work. We were only a few miles from Lake Michigan; a group of us spent every Saturday of the summer at the beach. Also, my research group came up with some results on a nearly 75-year-old problem introduced by George Pólya.

Before I went to Michigan, I had not really thought about what I would do after I got my undergraduate degree in math. After my REU experience, I know that graduate school is the next step. While the research process was hard and frustrating at some points, it was enjoyable. The sense of accomplishment after coming up with a proof of a new result with your group is incomparable to anything.

To anyone thinking of going to graduate school in mathematics, I would definitely recommend trying to be part of such a program. It gives a helpful view of what graduate school will hold. You learn so much and meet amazing people; it is an unforgettable and priceless experience.

Senior Hannah Stanton is currently working with Professor Jenny McNulty on a research project in Matroid Theory. She will present a poster on her results at the annual math meetings in New Orleans in January 2011.

Department News

Doctoral student **Tien Chih** (M.A. 2009) won an outstanding presentation award at UM's annual Graduate Student and Faculty Research Conference on April 24. In his talk "Constructing Designs Using Near-Rings", he explained to an interdisciplinary audience the concept of a design (such as in the design of an experiment in science) and the relatively recent use of the algebraic structure of near-rings to construct such designs.

Assistant Professor **Jen Halfpap** was promoted to the rank of Associate Professor, and Associate Professor **Solomon Harrar** (currently on a faculty exchange visiting East China Normal University in Shanghai) earned tenure. Congratulations!

Congratulations are also due to Professor **Jenny McNulty**, who was appointed Associate Dean of UM's College of Arts and Sciences. The primary duties of her new half-time position include promoting research and scholarship in the College of Arts and Sciences as well as managing space issues. She also represents the College on various committees and functions, and assists the Dean as needs arise. This sounds like a lot of work!

Funded by a Dolciani Mathematics Enrichment Grant from the Mathematical Association of America, Assistant Professor **Kelly McKinnie** and Professor **Jenny McNulty** are organizing several activities for talented high school students in Western Montana. Math Day on October 2 was a success: it attracted students from as far away as Great Falls and Polson. The ongoing Missoula Math Circle is a biweekly program aimed at acquainting students with exciting mathematics. In addition, Jenny taught this past summer a two-week Discrete Mathematics course as part of the Schwanke Honors Institute for High School Students, a program of UM's Davidson Honors College.

Undergraduate students **Jordan Rooklyn**, **Sharee Russell** and **Hannah Stanton** recently won MIRA research awards worth $1,500 each through UM's MILES program. Their research in matroid theory is supervised by Professor **Jenny McNulty**.

Professor **Bharath Sriraman** is the main editor of "The First Sourcebook on Nordic Research in Mathematics Education"; the recent publication of this 750-page tome completes a three-year project. He was also, jointly with a faculty member of the University of Tromsø in Norway (one of UM's partner universities), the co-recipient of a competitive three-year Norwegian Research Council Grant. The grant funds the investigation of structures and patterns in Sami ornaments as a basis for secondary school mathematics.

Last May, the traditional **faculty-student baseball game** was replaced by a game of **kickball**. Although this boosted the number of players on the faculty team, the students still won in a landslide! Before the retirement of Professor (and former baseball pro) **Rudy Gideon**, the annual baseball game had been regularly won by the faculty for decades. *N.V.*

Alumni News

Samantha Allen (B.A. 2001, M.A. 2006) wrote from Los Angeles to tell that their "second child, a son, was born on Thanksgiving. George Allen Wright arrived 11/26/09 and loves math already!" Congratulations!

We heard from **David Goldsmith** (M.A. 1998), who was recently hired as an information technology specialist in the Environmental Assessment Program of the Washington State Department of Ecology. He is writing MATLAB and Python software to analyze data for the Marine Waters Data Management System Project. This sounds very interesting! David also created some amazing artwork using fractals. You can check it out (and maybe buy some postcards for the holidays) at his site http://www.mathartifact.com.

Todd Oberg (Ph.D. 2000), an associate professor at Illinois College in Jacksonville, Illinois, was this year's recipient of Illinois College's highest honor, the Harry Joy Dunbaugh Award, which recognizes outstanding classroom teaching. It is worth mentioning that the winner of this award is chosen by a committee of students in the junior and senior classes. Todd is also chair of the Department of Mathematics, chair of the Illinois College Teacher Preparation Program, a member of the board of directors of the Illinois Mathematics Teacher Education group, and chair of the Teacher Education Committee of the Illinois Section of the Mathematical Association of America. Congratulations! We are impressed!

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.*

N.J. Lennes Book Collection

The Department is putting together a collection of books by N.J. Lennes, former department chair (1913-1944). Professor Lennes was a prolific writer, a prominent figure on campus and the original owner of the President's house. The list of books collected so far can be viewed at http://www.math.umt.edu/lennes-collection. Several of Lennes' books are available electronically; these are posted on this site as well.

If you are interested in donating to the collection, please contact the math department at (406) 243-5311 or mcnulty@mso.umt.edu. We are in particular need of Lennes' high school workbooks. We plan to have the collection in place by Summer 2011; please stop by to see it!

UW). After three months I realized I was not cut from the right cloth to finish a Ph.D. in pure mathematics and in a mere 27 additional months I finished up an MS in applied mathematics with a focus on optimization. As I graduated I started work in the analytics group of a Seattle internet start-up. That was 1999 and at that point I had zero experience in advertising or in statistics.

Essentially, I still have that same job today. After years of doing internet searching for concepts like "t-test" and "regression" when I was caught in meetings that discussed the terms, I decided that taking some statistics classes would help me feel like less of a fraud. I started with Math 341 (Probability and Statistics) and then took Mathematical Statistics with David Patterson. At that point I was hooked and my idea of doing some coursework without pushing for a degree was over. I completed my coursework and then, after drifting through a couple of topics, one of my advisors, Brian Steele, suggested that I do research related to my work since I had access to such a wealth of data.

Throughout my coursework, I worked full-time from home for my company in Seattle, aQuantive, and in 2007 we were acquired by Microsoft. I work on research surrounding a straightforward question, "How do people respond to advertising online?" This question is answered by using anonymous tracking of ads that are shown on the internet, measuring the response to those ads in terms of things like clicks and interactions, and then seeing how people who have seen those ads behave in the future with regard to an advertiser's website. Users who see ads and then purchase from a website are called "converters" and all online advertisers seek to increase converters in the most efficient way possible. As is typical in so many industries today, our data are both enormous (several terabytes of data a day are collected) and sparse (for many people we have only a handful of measurements). My dissertation research, titled "Modeling Conversions in Online Advertising", sought to apply the tools of statistical learning to this data. As such, my research sits at the intersection of statistics, computer science, and marketing.

I tackled two primary questions in my research. The first question was "How can we cluster converters to better understand their behavior?" I performed a cluster analysis on approximately 3,000 converters for a major advertiser. Perhaps the most challenging aspect of cluster analysis is determining the number of clusters in the data. I modified an existing statistic, the GAP statistic, to work with mixed-variable data sets and developed a version of the algorithm that was efficient enough to work with large data sets. The results were useful, splitting the converters into several different purchase "paths", broadly grouped in three categories: converters arriving via a search engine, those seeing only display advertising, and those receiving advertising from both marketing channels. These groups showed markedly different results on the second question of my research.

Having grouped converts, I next tried to understand the drivers of purchasing via a proportional-hazard model (PHM). PHMs are common in survival analysis—the extension to marketing is seamless if, rather than modeling covariates that affect death, we instead analyze how marketing affects purchasing. This work required a major statistical computing effort to calculate purchase probability estimates on data sets that included tens of thousands of people and millions of records. Here is one interesting result from the work:
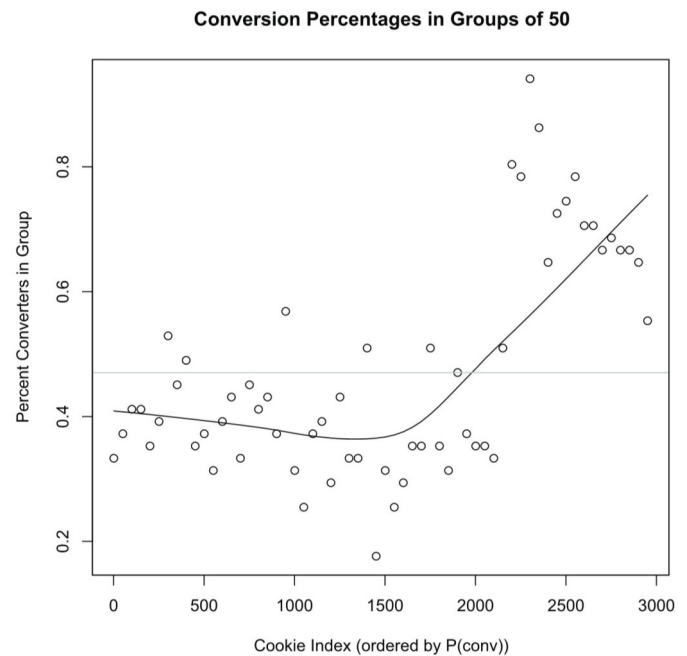
This figure shows predicted purchase probability and the actual conversion probabilities for groups of 50 people. Each dot represents a group of 50. The horizontal axis is ordered by predicted conversion probability with those people with the lowest predicted probability on the left-hand side of the figure. The actual fraction of people purchasing is given on the vertical axis. The model does a reasonably good job predicting purchases for the one third of cookies with the highest purchase rates. The remaining cookies appear largely undifferentiated, and refining this lack-of-fit is a current area of research. The model and techniques developed in this work have now been used to help over a dozen large advertisers to plan and evaluate their online advertising campaigns.

Dr. John Chandler-Pepelnjak is a Director in Microsoft Advertising. He finished his dissertation "Modeling Conversions in Online Advertising" under the supervision of Professors David Patterson and Brian Steele in May 2010.

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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;

Lennes Fund - an endowment to provide funds for the Lennes 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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Smiling in Seattle

Six of our graduate students attended the annual meeting of the Pacific Northwest Section of the Mathematical Association of America last April in Seattle. From left to right: Mary Riegel, Joe Oldenburg, Michael Severino, Liam Rafferty, Holly Wright and Rachel Robertson.

Several of them gave talks: Liam Rafferty spoke on "Probabilistic nonconstructive existence proofs", an introduction to the area of his doctoral research which is supervised by Professor Mark Kayll. Mary Riegel gave a presentation on "Distinguishing and fixing numbers of matroids", part of her Ph.D. research under the guidance of Professor Jenny McNulty. And Michael Severino's talk was "Combinatorial approaches to sonority analysis", on master's level research done with Associate Professor Greg St. George.

Also two of our faculty members were involved: Assistant Professor Kelly McKinnie gave a lecture on "Finite dimensional division algebras over fields", while Professor Jenny McNulty arranged the extensive program for the Project NExT fellows (in which Kelly and Assistant Professor Eric Chesebro participated).