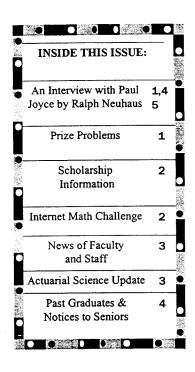# Mathematics News - Spring 2000
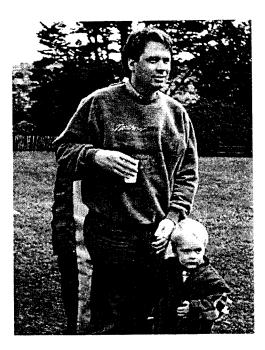
An Interview with Paul Joyce

When did you first become interested in mathematics?
While taking a Geometry class during my sophomore year in high school.

Once in college is this what made you decide to major in math? Yes. They tried to get me to become an engineer but I had really no interest in becoming an engineer. I was really into rigor at that time. Rigorous mathematical arguments were the only way to go.

Were either of your parents mathematical? Math saved my father's life. He was the son of a poor Irish immigrant who had no money and no chance of going to college. After he was drafted and after boot camp he took an exam. He did really well on the mathematics part. As a result, he got to go to the University of Oregon instead of fight the Japanese and the Nazis. He was able to save the world from the Axis powers from his desk at the University of Oregon.

(Paul Joyce with son Andrew)

Prize Problems

Solve one of the problems below and you win a book! You can choose a book about mathematics, the history of mathematics, a collection of famous theorems, a collection of problems, special topics, and so forth. The problems are harder than what you have seen before, but the solutions are interesting. **Rules for participating: 1.** You must be an undergraduate, an alumnus, or an alumna. **2.** You must solve one of the problems. **3.** One prize per person. *Prizes will be awarded while supplies last. Show or send your written solution to Ralph Neuhaus.*

1. a.) What are the last two digits of 7^{9999}?
   b.) What are the last three digits of 7^{9999}?

2. Let A be any subset of $N = \{1, 2, 3, ..., n\}$. Arrange the elements of A in decreasing order of magnitude. Form the sum S by alternately adding and subtracting successive members in this arrangement. For example for $n = 15$, the subset $A = \{12, 10, 8, 4, 3\}$ yields the sum $S = 12 - 10 + 8 - 4 + 3 = 9$ Find the sum of all such alternating sums that are generated by the set N.

3. Let $\{a_n\}$ be the infinite sequence given by $a_1 = \sqrt{1}, a_2 = \sqrt{1 + \sqrt{1}}, a_3 = \sqrt{1 + \sqrt{1 + \sqrt{1}}}...,$
   $a_n = \sqrt{1 + \sqrt{1 + \sqrt{1} + ... + \sqrt{1}}}$ with n 1's. Show that a_n converges and determine its limit L.

4. Show that the sum of two consecutive odd primes is the product of at least three (possibly repeated) prime factors.

5. Let f denote the function which gives $cos\ 17\ x$ in terms of $cos\ x$, that is $cos\ 17\ x = f\ (cos\ x)$. Show that it is the same function f which gives $sin\ 17\ x$ in terms of $sin\ x$, that is $sin\ 17\ x = f\ (sin\ x)$.

SCHOLARSHIP INFORMATION

Several scholarships are available to mathematics majors, all are based on merit. The Taylor, Botsford, Wang and Hower scholarships are awarded to mathematics majors entering their junior or senior year. Total awards for these scholarships are $500, $1500, or $2500. The Mathematics Department Scholarship has no class restrictions. If you are a mathematics major, you will automatically be considered for a scholarship. If you are not now a mathematics major, you can still be considered. Merely fill out an application form obtained from the secretary and indicate that you will become a mathematics major or will add mathematics as a second major. The selection is made by the faculty of the department in March.

J. Lawrence Botsford Scholarship

This scholarship was established by the family of J. Lawrence Botsford who was a member of the department from 1949 until his retirement in 1970. He also served as head of the department from 1950 to 1954. This scholarship is based on merit and is awarded to mathematics majors entering their junior or senior year.

Ryan S. Adams is this year's recipient.

Linn Hower Honor Scholarship

This Scholarship was established in 1991 by Mildred and Loyal L. Hower, parents of Linn Hower, who graduated from the University of Idaho in 1979 with a B.S. In Mathematics. This scholarship is awarded to junior and senior applied mathematics majors, preferably from rural Idaho, with a high potential for success in a mathematics or scientific field.

Jaimos F. Skriletz is this year's recipient.

Mathematics Department Scholarship

This scholarship is supported by annual contributions of friends of the department and is awarded primarily to freshman and sophomore mathematics majors.

Elizabeth Alford, Travis J. Bemrose, Jayne E. Bird, Sarah N. McIntosh are this year's recipients.

Ya Yen Wang Memorial Scholarship

A long-time member of the Mathematics faculty, Ya Yen Wang died in January of 1995. Acting on her wishes, her family established the Ya Yen Wang Memorial Scholarship. This scholarship is intended for a junior or senior in Mathematics, preferably to be awarded to a woman.

Brandy S. Wiegers is this year's recipient.

Eugene and Osa Taylor Mathematics Scholarship

This scholarship was established in 1979 by the family and friends of the first head of the department, Eugene Taylor and his wife Osa. He directed the department from the time he came to the department in 1920 until he retired in 1950. In 1981, his family donated many of his personal mathematics books to the University of Idaho library. This scholarship is based on merit and is awarded to mathematics majors entering their junior or senior year. The recipients of the Taylor Scholarship this year were:

Ryan S. Adams, Craig J. Beisel, Daniel K. Burton, Kathryn Christensen, Momoyo A. Dahle, Richard Giampietri, Melissa J. Hodge, Matthew J. Mackay, Brian M. Orr, Zachary M. Saul, Jaimos F. Skriletz, Alecia D. Sparrell, and Roy W. Tromble

PARENTS AND TEACHERS – CHALLENGE YOUR KIDS!!!!

The Department continues to run a contest for pre-college students via the Internet Math Challenge. The contest, found at :

http:/www.uidaho.edu/~imc

features a weekly math puzzle. Each week a specially designed prize T-shirt is awarded to one of the students submitting a correct solution. Students who answer at least 5 weekly puzzles correctly become eligible for the grand prize drawing in May, when we will award a personal computer donated by Micron Technology.

This contest has generated a lot of interest, with hundreds of entries coming from schools around the region, as well as from students as far away as Massachusetts, Georgia, and Alaska. (Even some very talented elementary students have been participating!)

Check out the homepage for the contest – you'll find past puzzles (and solutions), a list of past winners, links to other math education resources, and of course, this week's puzzle!

NEWS OF THE FACULTY AND STAFF

MARY VOXMAN and MARK NIELSEN attended the Western Meeting of the National Council of Teacher of Mathematics in Boise October 7th and 8th. Mary gave a talk on Advantages and Disadvantages of the Graphing Calculators in Calculus Courses. Mark gave a talk on the Internet Math Challenge.

MARK NIELSEN attended the Big Sky Discrete Mathematics Conference in Missoula Montana in September.

PAUL JOYCE attended a Linkage Disequilibruim Mapping Meeting in November at the University of Washington in Seattle.

STEVE KRONE gave Colloquium talks at Rice University in September. In January he will give a presentation at an AMS short course on Environmental Mathematics in Washington, D.C. At the end of January he will attend a workshop on Complex Interacting Particle Systems in Mathematics, Biology and Physics at Castle Ringberg in Germany. The workshop is sponsored by the Max Planck Institute.

RALPH NEUHAUS is attending the American Mathematical Society's National meeting in Washington, D.C., in January.

MARY VOXMAN, CYNTHIA PEIZ, JIM CALVERT and BILL VOXMAN traveled to Virginia Tech University in Blacksburg, Virginia, to investigate their method of computer assisted teaching for beginning mathematics courses.

ACTUARIAL SCIENCE UPDATE

YEAR 2000 CHANGES

You may be aware that to be an actuary, you need to pass a series of exams. The beginning exams cover certain mathematical nd statistical subjects. This year the Society of Actuaries and the Casualty Actuarial Society has changed the format and content of the exams. There are fewer exams, but each covers more material. Many of the exam questions will involve applications of mathematics and statistics to actuarial problems. Students who have passed exams prior to the year 2000 will be given credit in the new system. At the UI, the requirements for the major, Applied Mathematics: Actuarial Science Option, have been changed to reflect the new exams. The new requirements will appear in the 2000 UI General Catalog. They can also be found by visiting the Mathematics Department homepage: **www.uidaho.edu/LS/Math/**

Current students will be able to graduate under the existing requirement or the new curriculum requirements. Ralph Neuhaus can tell you more about the new exam format.

SPRING EXAM DATES

The exam for Course 1 will be given: **Wednesday, May 24, 2000.**

The exam for Course 2 will be given: **Thursday, May 25, 2000.** Both exams can be taken at UI. The deadlines for applications to reach the Society of Actuaries for the May exams is: **April 1, 2000.** Application forms can be obtained from Ralph Neuhaus, Room 302, Brink Hall.

Review for Exam 1 can be arranged by contacting Ralph Neuhaus.

FREE FOR THE ASKING
(BUT YOU MUST ASK)
(See Ralph Neuhaus in 302 Brink Hall.)

The magazine CONTINGENCIES, a publication of the American Academy of Actuaries has interesting articles about things that affect the insurance industry. One recent article forecast the future of Social Security, another compared safety devices for sky divers with airbags in automobiles.

The ASSOCIATESHIP and FELLOWSHIP CATALOG of the Society of Actuaries contains all the rules and requirements necessary to become an Associate of the Society.

NEW ADDITION TO THE MSAC!!!!!!

SCOTT BUXTON is our new customer service rep. in the MSAC this fall! He graduated from Auburn University in Alabama with a degree in Economics and holds a Masters in Special Education. He has traveled extensively and loves to snow ski.
Stop by and say hello!!

PAST GRADUATES

ROBIN CRUZ is an Assistant Professor of Mathematics at Albertson College of Idaho. She earned her B.S. and M.S. in Mathematics from UI in 1979 and 1981 and her Ph.D. from the University of Oregon.

BRAD DIRKS has become an Associate of the Society of Actuaries. He is an Associate Actuary with Regence Blue Shield in Lewiston Idaho. He received his B.S. in Mathematics from UI in 1992.

DIANA (CORDWELL) JOHNS has opened an office to practice internal medicine in Idaho Falls. She graduated from UI in 1977 with a B.S. in Mathematics and received her M.D. degree from the University of Nevada, Reno, in 1994.

DORIAN OWEN won the Silver Pin for Service Award from the Intermountain Affiliate of College and University Residence Halls at their regional conference held in Albuquerque, New Mexico, in November. She graduated in May with a B.S. in Mathematics and is currently seeking a degree in economics from UI.

KIMBERLY VINCENT received her Ph.D. in Education from UI in December. She received her M.S. in Mathematics from UI in 1989.

NOTICES TO SENIORS

MAY GRADUATION

A reception will be held for mathematics graduates and their guests following the Letters and Science commencement ceremony on Saturday, May 13, 2000. Last year, parents and guests of graduates enjoyed visiting with the faculty and other graduates. During this semester we will request the addresses of your guests so that we may send them an invitation. We hope that all graduates and their guests will come to the reception.

EMPLOYMENT

One of the bulletin boards outside the department office (300 Brink Hall) is devoted to job opportunities. Career Services' monthly list of campus interviews will be posted there along with other job information the department receives. You can sign up at Career Services to schedule interviews with companies interested in mathematics majors. Your instructors can write letters of recommendation for the Career Services files, and they can also write letters of recommendation to specific employers.

GRADUATE SCHOOLS

Another bulletin board outside the department office is devoted to graduate school posters. Your advisor also has more information which can help you. Your instructors can write letters of recommendation for you which can be sent to each university to which you apply. Several copies of a pamphlet listing assistantships and fellowships in mathematics, statistics, and computer science in the U.S. are available. See Ralph Neuhaus in Brink 302 for a copy.

What did he study in Oregon? Radar research. They were just developing radar at that time. He took lots of mathematics and physics courses so he basically had a math degree when he finished. He hadn't intended on going to college in math if he was able to go but then the GI Bill paid his whole way through college all the way through law school.

So where did you go to college?
I went to Montana Tech. at the University of Montana then on to Montana State.

How did you become a graduate student at Montana State? I was in my third year and Dr. Swartz who used to play bridge with my dad came up to me and he said how about going to graduate school next year at Montana State? I told him "well I'm only a junior it's just my third year." He said "oh really! I thought you were about ready to graduate!" He looked up my transcript and he came

back later and said "well if you go to summer school this summer you'll have enough credits to graduate". I didn't realize that, so I said OK fine. I took all my humanities courses that summer and went to graduate school in my fourth year of college. Being a TA was a very frightening experience. I was just a little kid. I even had kids from my high school that were in my class. It was so weird but I survived that.

Why did you decide to go to the University of Utah to get your Ph. D.?
Well, amazingly there were two professors at Montana State who had both gotten their Ph.D.' s at the University of Utah and they were pushing the University of Utah. Dick Gillette was my undergraduate advisor. He always encouraged me to take more as well as harder courses. Do we have advisors like that at UI?

How did you ever get interested in probability?
My advisor was Simon Tavaré. I took his class and switched to probability that first day of class and never looked back. It was the best move I ever made. He was the best advisor any student could ever have.

You talked about your research in probability. It's connected to genetics.

Yes. I didn't take biology in college because I only liked science that was related to math. Simon got me interested in population genetics. When you talk to these geneticists, you just can't believe how fast the subject moves along. One of the things that is interesting is that biology used to be a data poor area. It was hard to get a lot of good data in biology. Now with the human genome project they have more data than they know what to do with. One of the most exciting things is to use DNA data to draw inferences about relationships between species and within species. It's called phylogenetic analysis. The idea is that if you see differences in the DNA code those differences are explained by mutations that occurred in the past evolution of the species. They are explained by mutations that occurred sometime in the history of the organism and that were passed on. Those mutations can give you some information about how to connect the species up into a tree. Originally they used methods like parsimony. This picks the tree with the fewest number of changes. The parsimony algorithms are still used today. The problem was that you cannot be certain that the tree that you pick is the correct tree. So it's more reasonable to consider a number of plausible explanations of the evolution. In doing that, weighting those according to their plausibility and that leads to probability models. Probability models are the natural way to define evolutionary processes because evolution is fundamentally a stochastic process. Statistical methods didn't really catch on until the early 1990's so Simon was ahead of the game in that regard.

What teacher has particularly motivated you to study math?

My favorite teacher was professor Nigindra Panday who taught me the theory of calculus. He had a great system. I loved his exams. Students used to complain about him because he was hard. It just amazed me that you could get away with that because I went to Catholic school and the teacher reigned supreme and they could abuse you any way they wanted to and you couldn't complain. So in college this idea of students complaining about the teacher I just couldn't believe that such a thing existed especially this nice man who was patient and helped students. He was just the best person. The only thing that he did wrong was that he set pretty high standards and gave students C's when they deserved them. That was the only thing that he did that you could complain about. His teaching was excellent and his manner with students was excellent too. His exams were quite difficult. He broke them down into three parts. You had to get 100% on part I to get a C because that was the minimum amount of material that he thought necessary to get through the class. Then he had part II and if you got one problem in part II you'd get a B and if you got one problem in the hardest part, part III, you would get an A. That's how he ran his exams. Nobody ever got higher than 70% on his exams overall because you just couldn't get through the whole thing. I thought it was a good system but I've never implemented it myself.

Have other professors impressed you?

I loved Art Western in Physics. He was a great professor because he could jump on top of the desk in one leap and he used to run around the room with his shoes off with his accelerometer. He had a lot of energy. He was really a good physics teacher. Physics was hard for me. I liked to take physics classes but I knew I just didn't have as much talent or I wasn't as good in physics as in math and I could tell. So a good teacher was really helpful in physics. In math I could usually make up for a bad teacher at least as an undergraduate. When you get to graduate school then of course you realize that you aren't nearly as good as you thought you were.
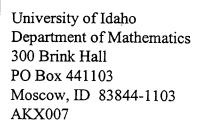
You also liked Simon Tavaré

Simon Tavaré was my advisor and he was a great teacher. I took this martingale class and I've even used things from that class in my research. Even just a few weeks ago I was going back over those notes to come up with an argument for a paper that Steve Krone, Tom Kurz and I are working on. Simon was the greatest.

What made you decide to come to the University of Idaho?

A big reason for coming to the University of Idaho was my lovely wife who was in a panic that her husband was not going to get a job. When I first started applying for jobs she was pregnant and then when I was interviewing, we had a small baby to take care of. She was worried that I wasn't going to get a job at all so she was very helpful in getting my applications together. I sent out all kinds of applications in November to a lot of big name schools and didn't hear anything for a long time. We were in a panic so we sent out a new wave. We thought well, we'd go with some more regional schools. Montana State was one. The University of Idaho and Idaho State we sent applications to those. Montana State was looking more for a statistician so they didn't interview me and Idaho State sent a letter out telling me that I had made the pool of candidates that they wanted to consider but they wanted to make sure that I was really interested in the job. The job will pay $30,000 or less?? You'll be required to teach at least three courses each semester. If this does not seem to be something of interest to you, please let us know and we won't bother you anymore. So I sent back that I was not interested. What I really liked about the University of Idaho was that at the time it was the Department of Mathematics and Statistics. It was the only mathematics and statistics department that I applied to. Most of the places that I applied to were statistics departments with a probability component to them. Nothing happened for a long time. Then I got a call from Terry Speed at Berkeley. He said that he would like to offer me the Nehman Visiting Assistant Professorship and would I like to come to Berkeley for two years. My advisor said I had to go to Berkeley and that was the end of that. Jana and I were both saying oh no we have moved three times since we've been married. We are sick of packing up and moving and packing up and moving again. We are not doing another post-doc. We didn't tell Simon that for quite a while. Then I got an interview at Columbia University. At UI I really liked the chair Clancy Potratz and we got along well. We just clicked right away and he was probably the major influence in why I chose UI. He told me at the end of the interview that we'll probably be offering you the job this afternoon and that just amazed me. I thought oh no what am I going to do. So I called Columbia and asked where they were with the process and they said they hadn't decided yet. So I held off Idaho for a little bit and Columbia came back and said they offered the job to someone else so then it was between Idaho and Berkeley and we went with Idaho. Then Columbia came back and offered me the job after I had already accepted at Idaho because the guy turned them down. But we had decided on Idaho.

How do you spend your free time?

I get lots of instruction from my wife and so I do basically what I'm told. And there's my son. So my free time is spent with my family. I also give interviews for the Math News.

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Spring '00

CHECK OUT OUR WEB SITE:

www.uidaho.edu/LS/Math/

You'll find:

* information on the undergraduate program.
* information on the graduate program.
* information on teaching assistantships.
* time schedule of classes.
* a two year schedule of courses beyond Calculus.
* course handouts.
* information on the people.
* information on the MSAC.