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Interviews

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Last Spring, after classes, I sat down with a few of our students and one of our professors to talk with them about their special projects and plans. I would love to introduce you in this way to everyone in the department. There are so many interesting and involved people here. But since that is impractical, I hope that you will nevertheless enjoy hearing from some of the people who are making things happen. Let me know if you would like to read more interviews orzechg@post.queensu.ca.

Now a summer has passed since I interviewed Erica, Susan and David and some things you will read about in the interviews have evolved. Erica's meeting was a wonderfully successful 3-day event. One hundred and fifty of Canada's best and most enthusiastic undergraduates were in attendance. The energy was tremendous and the organization superb. Susan has moved to Syracuse for the coming academic year. David's radio telescope is currently off-campus where it is being treated with a special protective coating. It is currently scheduled to swing into place on top of Jeffery Hall in September or October.

An Interview with Erica Blom

Erica Blom is a fourth year student in mathematics. She was a summer research student in the department and led the organization of a national mathematics conference for undergraduate students.

GO: I recall that when I first met you, you were doing a program that involved political studies as well as mathematics. Will your final degree involve both subjects?

EB: Actually, I will be receiving two degrees. I am finishing up a BA Minor in Political Studies right now and then I will get a BSCH with a Major in Mathematics next year. I had been planning to complete a BAH Medial in Mathematics and Political Studies this year, but changed my mind last Fall.

GO: What made you change your mind?

EB: I like the challenge of mathematics. I felt that I had gotten about as much as I could out of political studies. I want to see what I can do with mathematics.

GO: What have been the highlights of your experience at Queen's?

EB: I've really enjoyed the environment in the Department of Mathematics and Statistics. The atmosphere in this department was one of the things that persuaded me to change my program.

GO: What is special about the atmosphere?

EB: The professors are very friendly. They take an interest in the students and really want to know who you are. It's quite a contrast with the Political Studies Department which has a huge program with large class sizes in every year. Classes in mathematics are small which lets you get to know people and to get involved.

GO: What are your plans for the future?

EB: I'm not really sure. This Fall I will be taking complex analysis and a computing science course that I need for the major concentration. I may also take a few other mathematics courses. After that I will have completed all the degree requirements and I plan to spend some time travelling and thinking about what to do next.

GO: What sort of non-academic interests do you have?

EB: I've always liked languages and I play the piano. Reading is something I love to do. I also enjoy individual sports like biking and swimming.

GO: I hear that you are working as a summer research student right now and I remember that you did the same last summer? Tell me what that is like.

EB: Summer research projects give students a taste of "real" research, allowing them to explore things that interest them while working pseudo-independently on a project. Last summer Robert MacDonald and I worked on a project about random matrices, supervised by Professors Mingo and Speicher. We wrote up some of our findings at the end of the summer and gave a small talk in the department. I also gave a short talk on free probability theory at CUMC (the Canadian Undergraduate Mathematics Conference) in Halifax. It was something Robert and I learned about while doing the project. It was my first experience giving a talk to my peers.

GO: What are you working on this summer?

EB: Tim Kusalek and I are working with Greg Smith right now. The project is about the ideal of quasi-symmetric polynomials. Not very much is known about them and for now we are exploring, trying to find out whatever we can about this class of polynomials. Later in the summer, Professor Geramita will be here and we will be working with him too.

GO: This sounds like a great complement to the rest of your academic work.

EB: Yes. I've learned a lot of math this way. I also appreciate the opportunity to collaborate with professors in a completely different setting than the professor-student relationship of the school year.

GO: You mentioned the Canadian Undergraduate Mathematics Conference. A while ago, I saw that you had received a grant from the Dean to support holding the conference at Queen's this summer. What can you tell me about that?

EB: Well, this will be the twelfth conference. It's a meeting organized by undergraduate students and it is hosted at a different university each year. Last year it was at Dalhousie in Halifax. A group of students from Queen's went there and we won with our bid to have the conference at Queen's in 2005.

GO: What was your role?

EB: I thought it would be great to have the meeting here and asked the other Queen's students if they would be willing to help. They all loved the idea and that is how we came to make the bid.

GO: What has to be done to organize a meeting like this?

EB: As hosts, we have to take care of everything to do with this year's conference. That includes establishing the website, taking care of all the advertising like making up posters and sending them out, inviting keynote speakers, room bookings, and fund raising.

GO: That's a lot of work. I hope you have plenty of help with all this.

EB: In terms of the organizing committee, I'm only overseeing it. A great many people are involved in organizing the CUMC: Alex Duncan, from U of T (summer 2004 research assistant), set up the website, while Steve Rayan designed the posters and will also be designing the T-shirts, bags, and many of the other conference materials, as well as helping with website maintenance. Nithum Thain was responsible for finding and liaising with keynote speakers, Jérôme Grand'Maison and Emilie Dufresne did translation for me, and Anne Burns has been wonderful about arranging room bookings for us. The CMS Student committee, Susan Cooper, and Peter Taylor have also been wonderfully supportive.

GO: I know that you made a very successful application to the Dean's Conference Support Competition. Have you found other sources of funding?

EB: We have received a lot of help. The Canadian Mathematical Society was behind CUMC from its historical beginning. Our own funding started with $1000 from the CMS Student Committee. In addition to the Dean's grant there has been a lot of help from Queen's. We have funding from the Department of Mathematics and Statistics, the Office of the Principal, the Alma Mater Society, and the Arts and Science Undergraduate Society. Many Canadian organizations also support CUMC. We have grants from AARMS, CAIMS, CRM, MITACS, PIMS,* the Fields Institute, and McGraw-Hill.

GO: What can you tell me about the program?

EB: Most of the program is devoted to talks by students for students. This is probably the most important aspect of the meeting. Getting to know mathematics students from across Canada in a setting that is both relaxed and professional is a great experience.

GO: You mentioned that there will also be some keynote speakers.

EB: Yes, we have a great lineup of keynote speakers: Ram Murty, Richard Hoshino, Peter Taylor, and François Bergeron. Mike Roth and Greg Smith are going to do a session which will feature the zone toys they showed us at the Math Club this year.

GO: How many people are likely to attend?

EB: We don't know for sure; registrations are coming in now. However, there were 70 people at CUMC last year and we hope to have at least that many.

GO: How long will CUMC last?

EB: It begins on the evening of July13 and winds up on July 17.

GO: I know it is going to be a great event. You have all the ingredients. I wish you all the best with CUMC, with your summer research, and with life after graduation.

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* AARMS = Atlantic Association for Research in the Mathematical Sciences, CAIMS = Canadian Applied and Industrial Mathematics Society, CRM = Centre de Recherche Mathématique, MITACS = Mathematics of Information Technology and Complex Systems, PIMS = Pacific Institute for the Mathematical Sciences

An Interview with Susan Cooper

Susan Cooper finished her Ph.D. this summer and has taken up a postdoctoral fellowship at Syracuse University this fall. She is an award-winning teacher and has worked on the department's TA development program.

GO: So...when did you come to Queen's?

SC: I started in January 1999 as an MSc student.

GO: Was it a big change from your undergraduate experience?

SC: It was a huge change. I think graduate school anywhere would have been a big change. I went from taking regular elementary courses to sitting in a seminar where there were a ton of unanswered questions. It was a bit overwhelming in the beginning, but very exciting. I got to see that there are different ways of looking at things. At Regina, linear algebra was the preferred environment. At Queen's, the department is much larger and I encountered a much more varied menu of mathematical approaches.

It was my first time away from home, too.

GO: So you were actually experiencing two big changes. That's quite an adjustment.

How did you choose Queen's?

SC: Well, first I sent my transcript to a variety of places, asking whether anyone was interested in supervising me. At the University of Regina, there were a number of people who knew I was interested in algebra and who encouraged me to come to Queen's. In particular, Steve Kirkland had done a post-doc here and was able to tell me about the department and to suggest people I might like to work with. So, before I came, I had corresponded with my future supervisor. I would say that my main motivation was to work with the commutative algebra group at Queen's.

GO: Who is your thesis adviser? What is the topic of your thesis?

SC: Actually, I have two advisers; they are Tony Geramita and Leslie Roberts. I'm working on commutative algebra with a little bit of algebraic geometry. I study things called Hilbert functions and look at subsets of complete intersections.

GO: When do you expect to defend your thesis?

SC: If all goes well, I'll defend it in August. It's been a long road and I'm very excited about that.

GO: While working on your thesis you spent a term in Italy while Tony Geramita was there. Did you get an idea of what graduate student life is like in Genoa? ... or did you feel more like "just a visitor"?

SC: Well, I interacted more with faculty members than with graduate students in my area. That said, being in a different country with a different culture affected my graduate student life. I ended up with a certain focus that I didn't have before. In many ways, I think I grew up there. It changed the way I accepted different people and different ways of doing things. It changed me as a person and therefore as a student. Something I learned in Italy was how to take a break. Most people I knew took Saturdays and Sundays off. In fact, you couldn't even get into the university because you needed a key and there weren't enough keys to go around. If I was going to work on the weekend I had to do it outdoors in a nice park. That part was new to me and I learned the importance of taking a break.

Just before I went to Italy I had finished my first teaching assignment and had passed my comprehensive exam. So, I was very accustomed to working round the clock all week long. I was surprised by the more relaxed pace of things in Italy. I saw that people could stop and smell the flowers and still be just as productive. It's something I miss, but I have tried to bring it back with me, to share.

Everyone was so accommodating. The University of Genoa is just amazing. They made me feel so welcome.

GO: There have been some changes in the accommodations for students while you've been studying here. So, you have gotten to see the "before" and the process of change, if not the "after". What have you observed?

SC: One really positive change has been the opening of the Student Study Centre. It's a place where undergraduate students can come to either work quietly at a table or with other students or with a tutor. There are tutors in the room at nearly all times of day from 9:00 to 5:00. I send my own students there all the time and I have sometimes held my office hours there.

I've noticed that the students who go to the Study Centre get wonderful help. Some of them prefer it to office hours. For one thing, it works well with whatever schedule they have.

Another thing about the Study Centre is that students work together there. I see it bringing about a change in atmosphere among students. I'm really looking forward to seeing the centre grow. The programs that run there are very promising.

GO: Oh, I only knew about the presence of tutors at the Study Centre. What kind of programs do you mean?

SC: Well, someone was talking about running some sessions on precalculus mathematics at the beginning of the academic year for students who need a brush-up.

GO: I guess something like that would run on an "as needed" basis.

SC: Yes, and these sessions would also provide opportunities for TA development. Some students need and want some experience with running a tutorial or a review session whereas their TA assignments may just involve marking.

But the most important thing about the Centre, for me, is the way it is bringing about a more inclusive atmosphere. This past term I was teaching linear algebra to Applied Science students and calculus to Arts and Science students. I was pleased and a bit surprised to see the two groups of students working together at the Centre when they came for my office hours. The engineering students, who are taking their own calculus course, began to help my MATH 121 students. I found that very interesting, because traditionally, those two groups of students have tended to cultivate unhelpful myths about one another.

GO: Ever since I was Chair of Undergraduate Studies I have known that you were an outstanding teacher. This year you have received special kudos from your students–a Golden Apple and an Applied Science First Year Teaching and Learning Award (which is given to the instructor who the students recognise as having contributed the most to creating a good teaching and learning environment). Did you yourself feel there was something special about this year?

SC: In some ways that is a really hard question for me to answer. Each group of students I teach brings something different to the relationship and as I get more experience as a teacher, I bring something different too.

I was fortunate this year in teaching APSC 174 for the third time. This meant I was confident in the course material and I had very clearly in mind the story I wanted to tell. The students this year were more active in extracurricular activities than my students in previous years. That means they were more interested in nominating someone for an award. At other times, you might have a wonderful class that goes very well, but no student who thinks of organising a nomination.

I have to say, though, that this year I had much more fun with my class than ever before. I laughed a lot more in class and I think they laughed a lot too. This broke down some of the tension that comes from students struggling with linear algebra. It's a hard course for them...very abstract. I had more confidence...more experience...and that allowed me to be more comfortable with the class. I even told them when I was having a grumpy day. They seemed to respect that.

It's hard to know why things work with a particular class. Last term I had fun all the time and the students were ready to join me. In order to teach change of basis, we took a little trip to Italy where we needed a dictionary. Some students in the class knew Italian and challenged me as I tried to make this analogy work. In the past, when I tried something like this, I found the students less willing to play. This year the game brought some comic relief to the lesson.

GO: In addition to the effort you put into your own teaching, you have been active in helping others develop themselves as teachers. What do you think are the important features of a good program for developing university level teachers?

SC: I think that one of the most important things is to have experienced teachers care to help younger teachers develop. I had wonderful mentors: yourself, Morris Orzech, Leo Jonker. These were people I could speak to comfortably and who cared how I was progressing. Also, for a good program you need participants who want to develop themselves as teachers. If they are not interested, it's kind of a lost cause. Part of what makes a wonderful teacher is someone who wants to improve every time, even after twenty-five years.

It's important to have a program run by people who care because it shows new graduate students that the department believes teaching is an important job. Queen's is also wonderful because in addition to the things done in the department, the university has the Instructional Development Centre (IDC) where I took a course. That was an interesting experience for me because it involved more than just mathematics. Some of the ideas we tried were things I could not imagine adapting to a mathematics classroom. On the other hand they dealt with the issue of teaching large classes. That matched my experience exactly. The resource material I found at the IDC made a big difference for me. I think we should think about having material in the department too.

One important thing is to develop a comfortable atmosphere that allows people to explore and to develop a philosophy. One of the things I learned at the IDC was to keep a diary. In fact, someone sat down with me and discussed how to create a teaching dossier. It's also great to have people who will challenge your ideas.

I was so glad I had worked on the teaching dossier when it came time to apply for jobs. I found that I have developed a teaching philosophy and I know that it is something that is not going to remain static. I expect that it will evolve over time.

GO: You yourself have helped formulate our departmental teaching development days. What sorts of things have you done?

SC: My favourite thing is case studies. I love going through them. The first time I did a case study workshop, the students broke up into small groups so that people would not be left out of the discussion. For each group, someone would read out a situation and say "What should we do?"

The second time I was coorganizing with Chris Leith. We really wanted experienced TA's to come to the training day. We wanted them to talk to the new TA's because they can and should be an important resource. However, it's hard to convince experienced TA's to spend their time at a development day for TA's. So, we approached this by asking the experienced people to act out case studies.

This was incredibly successful in my opinion. For one thing, people were willing to do it. We got together to work on a few prepackaged case studies that I brought along. Those were very quickly put in the garbage, so to speak. The experienced TA's wanted to act out their own personal experiences. That was great. We could tell the incoming TA's that "this actually happened" and the experienced TA's found acting skills they didn't know existed. They were amazing and it was a fun way to get everyone together and to open up a discussion. I also noticed that the year we did this there was a nice community feeling among the graduate students.

That was my fondest memory of TA development days. I've also run sessions on marking, following Leo Jonker's past sessions. That's a very practical thing to do. And I've arranged for guest speakers. Katherine Lagrandeur, who was a TA from the French Department, worked for the IDC and developed a program for TA's training TA's. She was amazing.

GO: As a graduate student here at Queen's you have distinguished yourself by covering the full range of academic activity. We've talked about research and teaching, but you have also done a number of things in the area of collegial service. For example, you served on the student committee of the Canadian Mathematical Society. I wonder if you would tell about the role you played there and what you learned from that experience?

SC: I was on the Canadian Math Society Student Committee, referred to as "Stewed C", right from the beginning. It was something that grew from the Canadian Undergraduate Mathematics Conference (CUMC) which had been funded by the CMS from its inception. I was asked to sit on the committee when it was formed. For the first two years I was just a rather passive member. At the end of that time I felt I hadn't done anything significant, so I told the CMS I wanted to step down. Later that day I became the co-Chair of the committee for the next two years. This made me really, really nervous because I felt that I didn't understand how the committee worked. However, it turned out to be a great two years for me. I did learn what I needed to know and saw some interesting projects develop. We oversaw the CUMC each year, we worked on getting funding for students to attend regional conferences, we made a poster to advertise the committee, and we ran social events at each of the CMS meetings. Writing an operations manual was my own personal project. I hope it will spare future incoming chairs some of the panicky moments I experienced.

Also, as chair of the committee I got to go to the Board of Directors meetings of the CMS. That made me aware of some interesting dynamics and I learned things about how the CMS works that I don't think I would have been aware of otherwise.

And one other thing that came out of my being on "Stewed C" is that I got to help organise the first ever Connecting Women in Math Across Canada Conference. Since I was the only woman on the student committee, the Women in Math Committee decided I would act as liaison between the two committees. That was a lot of fun. The first conference was very successful and the second one will take place later this month in Banff.

GO: Will you be going to that?

SC: No. I was invited but I can't spare the time right now because I am finishing my thesis. I'm sorry to miss it. I enjoyed being on a panel about how to survive graduate school and it was great to connect with that group of people. There are some very strong young women in mathematics in Canada and I think they are going to do great things.

I kind of miss being on the student committee. It used to be that I would come to my office and there would be a million emails about the newsletter we put out every a year. I really liked having the connection. One great thing about the committee is that it involves both undergraduate and graduate students. It helped me learn to work with people. Of course there were some rocky times, but I learned how to deal with that.

GO: I also know that you've done some administrative work in the department. That must have been quite an addition to your workload. But the department really benefits from student input. What things have you done and what have you learned from that experience?

SC: I was the graduate student representative on the Headship Search Committee last year. I found that eye-opening and I think it gave me some insightful perspectives on my job interviews. I picked up on things that might have gone over my head. Something

I realised after sitting on that committee is that people making decisions are often constrained in ways that might not be immediately apparent.

GO: I seem to recall your doing other things involving graduate student activities.

SC: Well, I ran the graduate student seminar for awhile. I learned to convince people to give talks! It is not easy for graduate students. But the seminar has really grown.

GO: It's really a great initiative.

SC: I wasn't the one who started it. It had stopped for a little while and I thought it was time to start it up again. It was pretty difficult to get it going, but now it is huge. We laugh about people not wanting to give talks, but somehow someone volunteers every week. Usually the talks are very good, and afterwards there is a social. We also have guest speakers. The seminar contributes to a community feeling that seemed to be getting lost during the time when it wasn't running.

GO: You've really done a lot of work with the mathematical community.

SC: And it's been a good lesson for me. I've learned not to be so tense and to relax when things don't seem to be going exactly the way I think they should. I've learned to be more appreciative of the constraints on other people. It just wasn't something I used to think about. You know the saying about having to walk a mile in someone else's shoes.

GO: You've also done the kind of work that people sometimes call "outreach". That means working in the wider community, outside the university.

SC: Oh yes. I helped Leo Jonker do some Math Days for elementary school students.

GO: And I remember you volunteering to be a judge for the provincial Science Fair when it was held in Kingston.

SC: I really liked that. I was amazed at the things young children know these days, and at the things they thought of doing with their knowledge.

GO: It's always great to see students move on, but we also miss them. Anyone reading this interview will understand the contribution you have made to the life of the department. But, soon you will be done with your thesis, so the natural question is "What is next for you?"

SC: For next year I've accepted a one-year post-doc at Syracuse University. The September after that, I will be moving on to a tenure track position at California State Polytechnic University (Cal Poly) in San Luis Obispo. They have been very encouraging about taking the year to do a post-doc before starting to teach there. Something I'm looking forward to at Cal Poly is the value placed on TA development. It is similar to what I have known at Queen's. They have something very like the IDC. Also, there is someone on the faculty who will be a good research colleague for me.

GO: So, I'm glad to hear that we are not losing you as soon as I had feared.

SC: That's right. I'll be able to come to Convocation and most likely I'll come to the Route 81 Commutative Algebra Conference.

GO: And I hope to see you at the MAA Seaway Section meetings since Syracuse and Queen's are both in the section. Thank you very much, Susan, for doing this interview. I know that everyone in the department joins me in wishing you all the best. We're going to miss you.

An Interview with David J. Thomson

David Thomson graduated from Acadia University in 1965, and from there went to work for Bell Labs in Murray Hill, New Jersey. While working for Bell Labs, he earned a Masters and Ph.D. at Brooklyn Poly and then went on to have a distinguished career in the Communications Analysis Research Department. In January 2002, David came to the Queen's Math and Stats Department where he holds a Tier 1 Canada Research Chair. One of his projects at Queen's is the establishment of a solar radio telescope laboratory housed in and on Jeffery Hall.

GO: You worked at Bell Labs for many years. Taking up a Canada Research Chair brings with it a lot of expectations for the department's development in applied mathematics. What sort of adjustments have you had to make in moving to a university setting in Canada?

DJT: At the Labs, when things were working well, hiring new staff was quite a stream-lined affair. If we heard that MIT was turning out the best student in twenty years in our area, we could make an offer to that person very quickly. We didn't have to advertise the position and typically, the technical staff in our department did most of the interviewing during a two-day visit. Even if there was a hiring freeze, the director would find a position for the best MIT student in twenty years. At a Canadian university we are required to advertise and then there are many layers of committees and hierarchical structure to negotiate before an offer can be made. Sometimes the candidate has gone elsewhere by the time we are ready with an offer.

In retrospect, I find it pretty amazing that I received the Canadian Research Chair offer in time for me to be able to say yes.

GO: How does the addition of teaching and supervising students affect your life?

DJT: Well, there were always students and postdocs at the Labs.

GO: Were they mostly graduate students?

DJT: Yes, but there were also undergraduate summer research students.

GO: How did that fit in with Bell's agenda? Was it viewed as a public service?

DJT: Actually, the summer research program was started as part of the settlement of an affirmative action suit. It was targeted for women and minorities. There were some really good students. For example, Cynthia Quo ended up as a co-author (with me and a postdoc) of a *Nature* paper on global warming. That work grew from her summer project.

GO: How did that happen?

DJT: As you know, I study time series. Well, temperature data is a function of time. A time series is just a sequence of numbers. What distinguishes one time series from another is what is being measured and the time scale. There are minor differences beside that, but at a basic level, they are all the same. There are, of course, issues about the number of samples you have, how much noise there is, and how complicated the data is.

When Cynthia was at Bell, a summer project was supposed to be a) something straightforward enough for an undergraduate to do in a summer, b) something not involving classified data, and c) not something that the company was counting on. Cynthia was given the task of converting some programs from FORTAN to S. The first thing she did was to ask me for data. She wanted to begin by running the programs to see what they produced. That way she would be able to check her conversions when they were done.

As it happened, I was in the process of reviewing a paper on global warming and I was a bit sceptical of the results in that paper. So, I gave the temperature data to Cynthia. She played with it as she worked on the conversion. Then she told me she had found some CO_2 data and wondered if she could work with that since everyone said it was related to global warming. I said "fine with me" and that's how the *Nature* paper came about.

GO: I have read that one outcome of your work at Bell is undeniable proof that the earth is heating up. Was that work in the *Nature* paper?

DJT: Actually, the *Nature* paper was just the beginning of my work. I went much further than that. The problem with global temperature data is that once you get into it, you find it's not so easy to get out. About a year after the *Nature* paper, Christiansen and Lassen published their paper in *Science* which used the period of the sunspot cycle as a proxy for solar irradiance. When my department head asked if I believed it, I took that as a great opportunity to go and play with the data. There was no point in repeating what Christiansen and Lassen had done. I could see that it was more or less correct.

I had my hands on a lot of things I could work with. For example, I had a program I'd used on cell phones. Instead of modulating simulated cell phone data, I modulated temperature data. Instead of microseconds, I was working with years.

I decided to use the central England series because it was the longest one I had. It gave monthly data starting in 1667. I found things that just didn't make sense. I had to make various corrections including some for England's change from the Julian to the Gregorian calendar in 1750.

At a certain point I decided to check the value of the phase slope. It turned out to be 52 arc seconds per year. Well, I knew that number from my work in paleoclimatology. It's the precession constant. I asked myself...why is that showing up in the temperature data?

When I thought about England I realized that the ocean and atmosphere move heat up from the tropics in the winter and export heat from England in the summer. So, when you calculate the average global temperature it doesn't really matter which way the North Pole leans over to the sun. Eventually I saw how we could filter out the annual cycle correctly, with a real filter, not just subtracting an average. When I did this, the nineteenth century became a nice simple signal, with about the same variance as you see for everything else. We checked a few hundred more stations because the phase depends on many things...geographic location, the direction of heat flows, etc. Everything held together in a kind of coherent pattern and that work ended up in *Science*.

GO: Getting back to the difference between being at Bell Labs and being in a university department; what differences do you find in your interactions with students here and there?

DJT: For one thing, there are a lot more students here. I have my own graduate students and I've been teaching a time series course. Now I'm trying to get a lot of this stuff into a book form.

GO: What is the topic of the book?

DJT: Oh, spectral estimation and data analysis. There are a lot of books on time series, but if I'm going to choose one for a course, I have to use bits from about ten of them.

But you have to be careful writing a book. I remember a friend of mine at the Labs getting his copy back from the editors with the suggestion that he try writing for normal mortals.

I'm glad to be teaching from my material for a year or two before the book is out.

GO: Do you think you are getting a sense of what's needed for "normal mortals"?

DJT: Yes. The class lets me know when I'm not making myself clear. I hope people will actually be able to read this book. But you never know.

GO: Well, it's good to write a book like this when you see a need.

DJT: The thing that always impressed me when I was at Bell Labs was that when I went to work with somebody, they would have a Ph.D. in engineering or physics or something and they'd been working at the Labs for ten years. They had had a graduate course on stochastic processes and maybe one in statistics and yet, watching them deal with a time series was sort of like watching a puppy chasing a car. They wouldn't know what to do with it once they caught it. They knew they could make a computer spectrum but had no idea about how to get the units right; how to get the frequencies right. They'd end up getting a power spectrum that was negative. Of course, they knew it wasn't the right answer.

GO: So, you are hoping your students will not have this problem after they take your course?

DJT Yes. I want them to be able to make practical use of what they learn. When I was teaching at Princeton I gave my students an assignment. I told them to go to an engineering and science library, pull two or three of the major journals, and find out how many months you have to go back before you find somebody using a periodogram. It turned out to be an average of three to six months. And these were top of the line journals like *Annals of Statistics* and *Biometrica.*

Lord Raleigh, working in the 1890s, knew that periodograms just don't work. Of course, he isn't really fair competition. Fermi once commented that most great scientists have one idea in their entire lives, except for Lord Raleigh, and he had two. (But there's a corollary to that. When someone writes hundreds of papers and a number of books, you find 0.01 ideas per paper.)

GO: One of the new things you have brought to Jeffery Hall is impressively large equipment.

DJT: It's not really that big.

GO: But your dish is large for a Math Department. I've never seen anything like it in Jeffery Hall before. What sort of data collection is the lab designed to do?

DJT: At Bell Labs I spent a lot of time looking at communication systems. After they are designed according to the theory and tested in the lab, they are put out in the field and you find that they don't do anything like what you expected of them. So, we looked at satellite failures and ocean cables and things like that.

One thing I looked at was dropped calls in cell phone systems. When I was working on cell phones back in the 1970s, one of the design goals was that the dropped call rate (for all causes) should be less than half a percent. As anyone who has used a cell phone in the last couple of years knows, it is way more than that by a factor of 10 or so.

So, of course, Lucent's customers were complaining that they were not getting the performance they had hoped for and the managers of the customer systems were unhappy. It seemed important for me to look at the reasons for dropped calls.

We know that a lot of problems are not equipment related. People drive out of the coverage area or they take their cell phones to a private room in the basement with the door closed. But you don't expect to have a big difference from such causes between summer and winter. After all, these things are described by a Poisson distributed random variable. You don't even expect large changes from day to day. But that's not what was happening. You'd have half a percent one day and 4% the next. And then there was a large difference between summer and winter! Something was up.

We discovered that a lot of it was solar. But that's a mystery because the sun doesn't radiate much radio energy. Every six months or so at solar maximum you expect to get a solar flare that's big enough to cause problems, but this was going on at solar minimum, more or less continuously.

We built a solar radio telescope at Murray Hill to try to find out more about this...but a bolt of lightning put it out of commission. When I came here I started to build a similar one, getting rid of some of the problems I knew about and hoping not to introduce too many new ones in the process. The dish you saw in the lobby has now moved to the lab where we are working on all the hardware needed to operate it.

GO: Oh, so it's now moved from the third floor to the second floor of Jeffery Hall. I thought it would be moving upward.

DJT: Its final destination is up on the roof of Jeffery Hall sometime later this summer. We're going to put it on top of the little air intake doghouse up there that's higher than anything else.

GO: Will getting it up there be a special project?

DJT: We'll need to get an industrial size crane to do it.

GO: So the laboratory is not collecting data at this time.

DJT No; we're building hardware and testing it... that type of thing.

GO: Are other departments at Queen's involved in the laboratory?

DJT: Not particularly. We use the stock room at the Physics Department and the Mechanical Engineering Department's shops to build the mounts and other pieces and we've borrowed some equipment from Electrical Engineering. We talk to the people in Physics who do radio astronomy and we talk to people in other parts of the world who do this kind of work. Once you pick up the phone, a couple of digits more or less doesn't matter.

GO: So, who is actually working in the lab right now?

DJT The main ones right now are Ben Gardiner and Lindsay Smith. Ian Moore has done some work on it; and there's Patrick van Kooten. Rob MacArthur is doing a lot of mechanical work.

GO: I know that Ben and Patrick are Mathematics graduate students and Lindsay is a Maths and Engineering undergrad. Who are Ian and Rob?

DJT: Ian is a Maths Engineering graduate student with a BSCH in Computing and Rob is a Mechanical Engineering student who just graduated.

GO What sort of publication output will you have from the lab?

DJT: I hope to get several papers and theses. There have already been some fourth year projects. One of them looked at reasons for changing the design by analysing some of the Air Force's data. The U.S. Air Force has an array of solar radio telescopes that's two generations old and which they have updated somewhat. They are spaced out so that the sun is under continuous observation. There's one in Massachusetts and others in Hawaii, Italy, and Australia.

GO: So, is your radio telescope part of a network?

DJT: We will certainly coordinate data with the others. There's another one in Owens Valley, California.

GO: Has moving to a university setting expanded your complement of research colleagues or changed the kind of research you do?

DJT: Well, I've got one Ph.D. student from the School of Business. We're working on economic time series...but then I was working with an economist from NYU before I left Bell. I've done a couple of collaborations in the medical school here and I have projects developing with the Geomagnetic Lab in Ottawa and the Radio Observatory in British Columbia. But I had met both those people before.

GO: I can see that your work has always had a very wide scope.

DJT: Yes, while I was at the Labs I had a contact at Columbia and I worked on MRI data. I guess my research life is pretty much the same as it was, which means very varied. I remember a colleague at the Labs saying we needed a "Just say no" sign over our phones. But, I still don't have that sign. People send me data and I like to have a look at it.

GO: You have so many projects encompassing so many fields. Is there an over-arching theme in your research? Going back to the story about Fermi's view of scientists, do you have one big idea?

DJT: I work on a lot of different things from seismology to space physics and clinical data. But I always have in mind that there should be a method (or group of methods) for analysing time series which consistently produces the right answer, if you accept that there is a right answer. Or, if the method doesn't give the right answer, it should give you a warning that you don't have enough data or something. You see an awful lot of methods that only work for a particular data set or for data in a particular field. From my point of view, if it only works in a very specific context, I am suspicious that maybe it doesn't even work there.

I want methods that work regardless of the context. For example, I just had an email asking about the frequency of influenza in Ontario. Of course, the questions that are asked vary, but the mathematics stays pretty much the same whether the data is seismological or medical or anything else.

So, my goal is to unify and to make the analysis of time series into a science. I remember my coauthor, Doug Martin, saying that time series was the absolutely worst statistics topic that he could think of to teach. You go through the whole theory and then, if you are being honest, you have to tell the students that none of this works. Heuristically, you do this and this and this. Well, I think we have progressed a little beyond that.

GO: So when did he say that to you?

DJT: That would have been in the late 1970s.

GO: So you are talking about the progress you've made in the last twenty-five years or so.

DJT: Yes, the multitaper method I've invented seems to explain where a lot of those heuristic methods come from and why they actually work. It gives a theory as to why you should taper the data.

In practice, you have just a finite amount of data and you'd like to know what its Fourier transform looks like. But the real Fourier transform you are interested in, the spectrum, depends on the whole data sequence... which you don't have. So, you have a finite sample from a potentially infinite sequence and you want to know what the power spectrum of the whole sequence looks like–or a reasonable approximation anyway.

If you just take the data from here to there and take its Fourier transform, what you get is terrible because you get the convolution of the whole series with $\sin x/x^2$. That's why people had begun, on a heuristic basis, to use a data taper that smoothes out the ends so you don't get so much effect from the discontinuities. People would say there are so many of these tapers in the different literature. I had a boss who asked, "Which one is right?" The answer I have found is that using only one is the wrong answer. You look at the convolution and you call it an integral equation instead of a convolution and then you try to solve that. The heuristic tapers people knew about show up in the course of using Fourier methods to do this.

GO: But I have the impression that most statistics students do not learn about Fourier methods.

DJT: In statistics if you run into a Fourier transform, you call it a characteristic function. It's a tool you use to manipulate probability densities. Whereas if you are brought up in engineering or physics, you will have learned about Fourier transforms but not so much statistics.

But Fourier transforms underlie an enormous amount of what we do and understand. We see this table as flat because the eye uses a Fourier transform to take out all the noise from the size of the molecules.

Of course, the mathematician's definition of the Fourier transform is a complete fairy-tale. It applies to functions that physically don't exist. You get into dichotomies that mean there are some basic things we don't understand. Hamming, who was at the Labs and invented the first error-correcting code, among other things, said that if the design of an airplane depends in any way on the difference between Riemann and Lebesgue integration, he wasn't going to fly on it ... and I tend to agree with him. For all the functions you actually encounter in data analysis, the question of whether they are in L^1, L^2, or L^∞, is almost a distraction. You just don't get real discontinuous functions or infinite bandwidths. Infinite frequency simply can't exist due to Planck's Law.

GO: I can see that your work is a lot of fun.

DJT: Yes, if you look at the binders in my office you can get an idea of the variety of data sets I play with. *(There are a lot of binders in David's office.)*

GO: Thank you very much for taking the time to do this interview. I know you are very busy.

Grace—a line drawing from Joan

Joan Geramita

And so the Head asks me for a "simple line drawing" to capture – nothing more than a glimpse surely – of my colleague (*emerita*) and friend (*semper*) Grace Orzech. Well, it will have to be reading. Grace has done many things in, outside of, and for, the Department, the University, the Mathematical profession. She is very smart, very persuasive, very effective. I think it is because she reads so many damned books. She has read hard research mathematics while pondering research questions, boring mathematics texts hunting for inspiration for interesting yet do-able questions to put on a first year calculus exam, and arcane (and not so arcane) articles on math education. This is not so surprising since reading is one of the things that a professor does. However, I do not know of any other mathematician at Queen's (though the current Head when he morphs into a poet may have received a similar request) who has been asked to sit as the 'outside' examiner on a committee examining a thesis from the English Department on Eudora Welty.

In the 36 years that I have known Grace, she has always been reading something interesting. Her reading is made more interesting (to me) because Grace selects a theme (or has a theme thrust upon her) to guide her reading. Categories that I recall are: things to do with the Pacific Ocean, travelogues, voting methods, early American politicians, tiling, biographies of mathematicians, math anxiety, and books having to do with jungles. Having established the category, she reads (maybe three, maybe thirteen) books which are connected to the topic. Not all the books are of the same genre. A book on the geology of the Pacific might be in the same read as *Kon Tiki* and *Shogun.* A series of articles about various methods of voting (one individual one vote is not the only way) might share time with a novel in which this sort of issue is raised (*On the Beach* comes to my mind but, of course, Grace would probably have a better example).

Some of these books are dauntingly difficult – at least from my point of view. But I don't have to read them because Grace gives 'reviews' or 'book reports.' As the weeks unfold, I hear about the books and their contents. As well, I hear about the quality of the writing and whether I might enjoy reading them. Sometimes, I have already read the book (ever so rarely, I may have actually recommended the book) and then we will have a wonderful discussion and I will leave feeling very well read indeed. I suspect that it is a feeling her students knew well.

Joan Geramita
August 2005

The Math Club

Mike Roth

The Math Club meets once a week in Winter term, on Thursday evenings for an hour. It is intended for anyone interested in mathematics, whether they are a math major or not. We try to pick topics that can be understood without too much background. An ideal topic is one which starts with something apparently simple, and by exploring its twists and turns, leads to something unexpectedly deeper, perhaps even to an open research question.

The goal is to show mathematics the way that mathematicians see it: a living subject full of deep and intertwining ideas, growing organically out of our desire to understand, and our perceptions of, the fundamental concepts of space and number.

The club has been, I think, a success. What makes it work is, first of all, the students. They come, often after seven hours of classes (and before dinner) to hear about mathematics simply because it's something that they care about deeply.

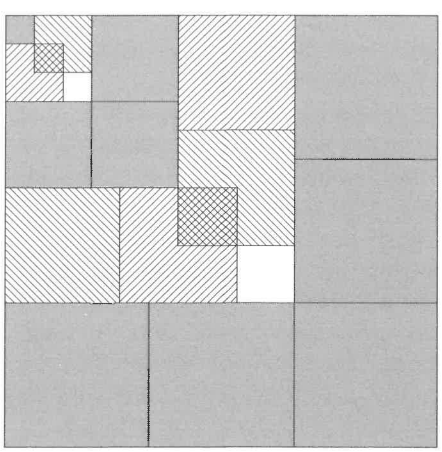
The second important factor is the generosity and willingness of the members of the department to talk in the math club. The club is jointly organized by Ivan Dimitrov and myself, and we do give a few of the talks, but the bulk of it is done by our colleagues in the department who volunteer to do the difficult job of picking a suitable topic and figuring out how to develop it, seemingly naturally and from scratch, in the space of an hour.

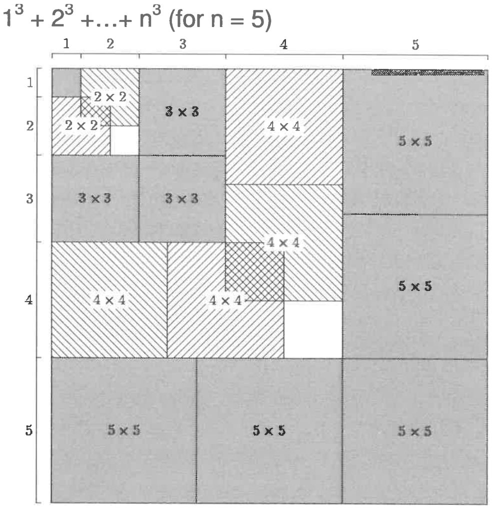
The titles and speakers of this year's talks were:

- Sums of powers and powers of sums (Mike Roth)
- Computing elliptic integrals the 18th century way (Mike Roth)
- To infinity and beyond (Ivan Dimitrov)
- Algebraic proofs in combinatorics (Sebi Cioaba)
- Colours and Patterns: The elegant World of Ramsey Theory (Navin Kashyap)
- Russell's paradox and the consistency of mathematics (Ole Nielsen)
- The Poincaré conjecture (Leo Butler)
- Crystallographic Groups (Mike Roth)
- The number 142857 (Mike Roth)
- Polynomial equations and convex polytopes (Greg Smith)
- 2D Topological quantum field theories (Chris Brav)

Below is a picture from the talk on sums of powers.

Picture proof of identity $(1 + 2 + \ldots + n)^2 = 1^3 + 2^3 + \ldots + n^3$ (for n = 5)





$$\text{Area} = (1 + 2 + 3 + 4 + 5)^2 = 1 \cdot 1^2 + 2 \cdot 2^2 + 3 \cdot 3^3 + 4 \cdot 4^2 + 5 \cdot 5^2$$
$$= 1^3 + 2^3 + 3^3 + 4^3 + 5^3$$

Significant Events in the Department of Mathematics and Statistics

Peter Taylor, Head

The section "Significant Events" in our strategic plan is updated yearly – in it we record the important events in the Department. This past academic year was distinguished by an unusually large number of teaching awards that went to the Department.

Comings and Goings.

A new appointment in Applied Mathematics is **Abdol-Reza Mansouri** a control theorist who will be a much valued addition to our Engineering Mathematics Program. Abdol Reza did his PhD at Harvard and came to us as a Post-Doctoral Fellow at MIT. He comes with his wife Ilvana Grebovic, a student of economics, and his 10-month old daughter Leyla.

A new appointment in Statistics is **David Steinsaltz** a demographer from Berkeley. When he visited us last fall he talked about the analysis of the data behind the various models for the evolution of senescence (why do we lose our powers as we get older?—we are still not sure what the "right" answer is). David is a scholar of wide interests, having a Ph.D. from Harvard in pure mathematics, and publications and works of art in literature, philosophy, poetry, politics, and musical theatre.

David's partner **Julia Brettschneider** is a biostatistician specializing in the analysis of gene and protein microarray data, and she will spend half her time with us, the other half with the Department of Community Health and Epidemiology in the Cancer Research Center. This appointment provides the first formal link with the Faculty of Health Sciences, a connection we hope to extend over the next few years.

Ram Murty was appointed **Fellow of the Fields Institute** at the Fields Annual General Meeting, June 2004. This was to honour Ram for his leadership in the Canadian mathematics community, and for his continued support for Fields. Ram has also been cross appointed to the Department of Philosophy. That's neat and is a new form of outreach for us. We have always regarded Ram as our resident philosopher, but now it's official! The letter of appointment anticipates Ram's continued contributions to Indian Philosophy but we're thinking we might just get a 4th year course in logic and paradox out of the deal.

Troy Day was granted tenure this year. Troy is a theoretical biologist who in fact was one of our star PhD students in the mid-90's, winning one of (only two) NSERC doctoral prizes for the best thesis in all areas of science and math in 1998. One of Troy's current interests is to apply the tools of evolutionary ecology to gain a better understanding of host-pathogen systems, for example, the spread and control of infectious diseases. A hot topic to be sure, and indeed Troy is one the participant in the MITACS project that was set up in the wake of the SARS epidemic. Troy is about to leave for a well-earned sabbatical year in Australia and Edinburgh.

Mike Roth had his appointment renewed this year. Mike was one of our star undergraduate students in the late 80s. Mike works in Algebraic Geometry and his referees described his work as if they were talking about a great pianist. Mike, together with **Ivan Dimitrov** has been coaching our Putnam team in the Fall and they have now parlayed this into a successful undergraduate winter seminar series.

After an extended (!) tour of duty in this portfolio, **Jamie Mingo** will step down as Associate Head and return to normal (?) academic life. He had planned to do this a year ago but the disadvantage of having long arms is that they can be twisted several times. The past few years have been very busy for Jamie, particularly as Chair of the Appointments Committee and I am hugely grateful that he agreed to stay an extra year.

At the same time, **Roland Speicher** will retire as Graduate Chair. This has also been a demanding portfolio as the competition for top graduate students (not to mention the money to fund them) is intense, and I am grateful to him for navigating all the obstacles and keeping a lively and energetic program going. Random matrices beware – Roland and Jamie are on the loose.

Leslie Roberts will take on the formidable duties of Associate Head and **Andrew Lewis** will take on the ever increasing challenge of Graduate Chair. I once thought Leslie might have a quiet year ahead of him (as this one has been so busy) but (happily!) we will be looking to fill two faculty positions next year. Andrew's challenges will come from the rumoured increased pressure (and hopefully increased resources) to expand our graduate program.

We are fortunate that **Morris Orzech** is staying on as Undergraduate Chair and **Fady Alajaji** is continuing as Chair for Engineering Mathematics. These are both huge jobs. The administrative aspects of Morris's position seem to get more complicated each year and the timelines get less generous. Is that because computers are increasingly running the show? And Fady is knee deep right now in our CEAB (Engineering Accreditation) report. This is a thick document full of data and projections and I am grateful to Andrew Lewis for helping him with this.

A retirement dinner for **Eddy Campbell** was held last June at the University Club and there were the expected ribald speeches and genuine accolades. On that occasion a photo was taken of our six previous Heads and this is what we chose for the cover of this issue. Eddy is an amazing guy with an incredible capacity to get things done. He has now taken up his position as VP Academic at Memorial University. He is also **President of the Canadian Mathematical Society** for a two-year term. In addition, he won the first **T. Geoffery Flynn Award**, presented annually to a member of the Queen's community who has made a significant contribution to linking Queen's University advancement activities with research and teaching excellence at Queen's. I once asked Eddy what it was all about and he replied, without hesitation: "make a difference."

Agnes Herzberg has retired though she continues to keep one of the most active schedules in the Department. Last Fall the Department organized a **Statistics Day** in her honour. Professors Steven Lagakos from Harvard, David Andrews from Toronto, and David Cox from Oxford were the principal speakers. Many recognized her contributions not only to Queen's but also to the world at large in her diligent organization of conferences on science and public policy at the Herstemonceux Castle.

Shawn Kraut is alas leaving us to take up a position in Lincoln Labs, a research facility associated with MIT. Shawn was a key player in our signal processing group and over the past couple of year played a leading role in the organization and rationalization of our Departmental computer resources. We will certainly miss him.

Bob Erdahl retired July 2004 after completing a 3-year term as Head. A send-off was held at the Art Centre last December and you can imagine the thrust of the parody: his "bulldog" manner, his insistence on not letting go, his relentless drive. In fact this has paid great dividends over the past couple of years and as a Department we have come to have a great reputation for the quality of the files we put forward into any competition for awards or resources. Bob has in fact retired in name only; he has continued to play a significant role in the strategic growth of the department, particularly in fund-raising and in the search for Canada Research Chairs.

David Pollack retired this year after 37 years as Assistant and then Associate Professor. He studied Lie Algebras and published a number of papers. His outstanding characteristic was perhaps his easy individuality; he did not "play the game," when it was simply for the game's sake, and he rejected our growing tendency to organize everything into boxes to make procedures and analysis more convenient. He was a dedicated and admired teacher and sought to organize the courses he taught so that the big mathematical picture was presented, for example, he believed that a course in linear algebra should work in an essential way with geometry and analysis. I admired and valued his wry observations on what we humans are and ought to be.

Grace Orzech retired this year (July 2005). Grace joined the Faculty as a Teaching Fellow in 1968 and retired as an Associate professor. Since 1991 she has been our Chair of Undergraduate Studies and if she had not been good enough to provide us with a husband (Morris!) I'm not sure how we would have managed to teach anyone how to do her job.

M.T. Wasan, emeritus professor of Statistics, died this year. He had been a member of the Queen's community since 1959, starting as Assistant Professor, Full Professor in '68, and retired as Emeritus in '94. He came to Queen's from a consulting position at Dupont but proved himself already an accomplished teacher by winning the best teacher of the year award from his premed students in '59. His research interests were varied, and centred around stochastic processes and Brownian motion. He published 47 papers and 3 books and visited and talked at many universities around the world. He was the gentlest soul in the Department and much loved and respected for that.

Teaching distinctions.

Mike Roth has been named one of two winners of the 2004-05 **Frank Knox Teaching Award**. This is the Alma Mater Society award and is entirely run and judged by the students, and thus winning it is a real vote of confidence from our students. This is not however a popularity contest and it is interesting to note the general selection criteria:

- How well does the instructor motivate or charge their students with enthusiasm for learning?
- Has real learning taken place under the instructor, and the instructor is not simply a popular person who is enjoyed by the students?
- Does the instructor use novel or innovative instructional methods in attempting to convey the material to their class?
- Is the instructor available outside of the classroom for interaction with students?
- How has the instructor demonstrated a true commitment to the education of Queen's students over and above the norm?

In the 17 year history of this award (34 winners), the Department has won it three times, the others being **Jim Whitley** in 90/91 and **Ole Nielsen** in 01/02.

In June 2004 it was announced that **Leo Jonker** was one of this year winners of a **3M Teaching Fellowship**. The 3M is the most prestigious national teaching award; only six Queen's faculty have been named 3M Fellows, and three belong to this department: Peter Taylor in 1995, Morris Orzech in 2001, and now Leo Jonker.

And then in April 2005 Leo was appointed as the first **Queen's University Chair in Teaching and Learning**. This Chair is a new initiative at Queen's and was created as a teaching parallel to the Queen's Research Chair program. The terms of reference of this Chair are to "recognize teachers who have a record as excellent teachers and as scholars of teaching and learning, who have demonstrated educational leadership in Queen's and elsewhere, and who have a program of activities that would allow them to make their expertise widely available to the university community." Leo will hold the Chair for 3 years and will receive an annual research award of $20,000.

Possibly Leo's most significant innovation is his establishment of Math 010 a course for prospective elementary school teachers complete with a practicum! In her letter of support for Leo's appointment, Christiane Rousseau, a past CMS Chair, refers to this course:

The work of Leo Jonker with elementary school students and teachers is exceptional in the Canadian mathematical community. Before working with teachers Leo Jonker started working with the kids themselves already 20 years ago. Over the years he has built up a series of tasks which have now appeared in two volumes. These books aimed at grade 7 and 8 students are intended to open the students' eyes to the beauty and power of mathematical ideas. More recently Leo Jonker moved to the establishment of a new course Concepts in elementary math for teachers. The audience of the course rapidly increased to 50 students, much more than expected. At the same time the reputation of Leo Jonker in the elementary schools allowed to find positions for all these students. The former students of the course all say that the course has transformed their vision of mathematics. "He essentially changed us from a bunch of non-math minded students who lacked confidence in our abilities to teach it effectively, to a group of people who were excited and eager to go into our schools every week and teach math to our students" said Ryanne Flattery, one of his enthusiastic students.

At the fall 2004 Convocation **Morris Orzech** received the **Chancellor A. Charles Baillie Teaching Award**. Established in October 2003, this award recognizes a faculty member whose teaching at the undergraduate or graduate level has had an outstanding influence on the quality of student learning. This Award stands alongside the Alumni Teachings Award as one of the two highest teaching awards given by Queen's.

Morris has been an important contributor to developmental and scholarly works in general undergraduate education, and mathematics education. His contributions have led to improved learning, including curriculum development, educational leadership, and innovative classroom teaching and supervision of teaching assistants.

Peter Taylor was one of six 2004 winners of the prestigious **OCUFA Teaching Awards** of the Ontario Confederation of University Faculty Associations.

Susan Cooper. Each term (twice a year) the Applied Science Faculty gives the **First Year Teaching and Learning Award** to the instructor who, in the opinion of the students, has contributed the most to creating a good teaching and learning environment. Susan was the winner of this award this past winter (2005). The award also comes with a one-year membership in the American Society of Engineering Education. Susan also won a coveted **Golden Apple** this year, awarded by the Engineering Society. During her years as a Ph.D. student with us, Susan has been one of our top instructors and has played a major role in organizing and "teaching" in our TA training sessions. She is off to Syracuse this fall; she will certainly be missed.

Outstanding Thesis Award.

Firouz Behnamfar a PhD student last year of **Fady Alajaji** and **Tamas Linder**, and currently one of our post-doctoral fellows, holding a prestigious NSERC Post-Doctoral Fellowship has been awarded the "Outstanding Thesis of Division III." This recognition will appear in the 2005 Convocation program. Firouz was actually a PhD student in the Electrical Engineering Department but already in the selection of his supervisors he was wise enough to realize that mathematics is where the action is.

Undergraduate Awards.

The Prince of Wales Prizes

Established by the Prince of Wales in the 1860s, these are the most prestigious awards for Arts and Science undergraduates. Each year at spring convocation four prizes are awarded for academic excellence – the Science Prize and Runner-Up, and the Humanities Prize and Runner-Up.

Spring 2004 Convocation

Yoonjung Huh: the Science Prize.

Spring 2005 Convocation

Jerome Grand'Maison: (Hons. Math): the Science Prize;
Jonathan Beauchamp: (Hons. Math): the Science Runner-up Prize;
Jennifer Goodman: (Math Econ) the Humanities Runner-Up Prize.

That's three out of four for Math! In fact since 1991, Math and Stats have failed to win at least one of the four prizes only once (in 2000). We've won two of the four three times, but this is the first time we hit 75%.

Departmental Medals

Spring 2004 Convocation

Yoonjung Huh: Medal in Mathematics and Statistics;
Ryan Mahaffey: Medal in Mathematics and Engineering

Spring 2005 Convocation

Jennifer Goodman: Medal in Mathematics and Economics;
Jerome Grand'Maison: Medal in Mathematics & Statistics;
Jamie McIntyre: Medal in Mathematics and Engineering.

Fundraising.

Active fund-raising continues for the **Coleman Fellows Program**. In the long run, this program will make this large number of postdocs possible. More specifically, of the roughly $36K annual salary for a postdoc, a third comes from teaching and another third from research funds of the supervisor, leaving $12K to be covered in some other way. At the moment most of this has to come from the Dean, perhaps even by foregoing a position for a year or two, but our long-term plan is that the Coleman Fellows endowment will provide that extra third, at least for 8 post-docs at a time. So far we are halfway towards that goal.

Changes in Jeffery Hall.

First, Room 202 has become the **Undergraduate Study Centre** and is staffed most of the day by grad students or senior undergrads. The idea is that first- or second-year students can come at any time and get help with their courses, or simply sit and work together around a table. It was a great success and will be continued and expanded. Secondly, the old math library has become the **Research Centre** and starting this Fall will house our PhD students—a much brighter airier space than the first floor offices they have been used to. We also plan to relocate the Fifth Floor Lounge to that space. That should facilitate grad student/faculty interaction.

Conferences.

The Department hosted two major conferences this year. In April, **Grace Orzech** organized the Seaway Section of the MAA and in July, **Erica Blom** was the local organizer for the annual meeting of CUMC, the Canadian Undergraduate Mathematics Conference. This latter was a marvellous occasion: a gathering of 150 of the best and most vital undergraduate math students in Canada for three full days of talks and fellowship. Erica assembled a formidable team of workers and it made me proud to see how wonderfully our undergraduates can "respond to the occasion."

Celebrating Bob Erdahl

at the December 3rd 2004 Math and Stats Christmas Party

Tribute from Eddy Campbell

I loved working with Bob. His dedication to the department knew no bounds, and he was fiercely determined to do whatever it took to get the latest job done. I learned so much just by watching him in operation. And Bob in operation was never less than in full flight. We had a great time, he was a delight to work with, always in good humour.

One of my favourite anecdotes about Bob is told by Bob. He tells of gathering a large number of our graduate students at his house for dinner, lighting a fire in the backyard, which alas led to a lot of smoke, and quickly resulted in a visit from the Fire Department. This story is usually told around a smoky fire in Bob's backyard with Bob's guests anxiously looking around, listening for the sirens, with Bob chortling away, quaffing his wine, serene and happy.

Bob comes by his nickname, Bulldog Bob, honestly. In my experience, first as Head to his Graduate Coordinator, and then as Associate Dean to his Head, once he glommed onto to your rear end, he never, ever let go until you had yielded or thrown him out. He was forever building platforms, sometimes constructed of pure rhetoric and about as stable as you would expect, sometimes rock solid and achievable, dreaming dreams, writing documents, scheming, rewriting documents, plotting, re-rewriting documents, talking, schmoozing, re-re-rewriting documents, pounding the table, re-re-re-rewriting documents. Did I mention that he used to spend a lot of time writing documents? The phrase 95 percent of the time spent on the last 5 percent of the work was invented for this aspect of Bob's personality, and, yes, I don't think the word obsessive is too strong. But these documents were models of their kind, they were persuasive and effective, and the Departments cause was always advanced. Even in those cases where a particular battle was lost, the effect of this kind of energy, persistence and determination lingered on and had a positive impact on the next battle. It was simply amazing to watch, and quite a lot of fun as well.

Bulldog Bob—words from Leo Jonker

Leo presented Bob Erdahl with the coveted "Bulldog Award" of the Canadian Institute for Imaginative Leadership, presented annually to a person deemed to have shown exceptional qualities of dogged leadership at a Canadian Institution.

Leo read the following citation: *I think it is fair to say that over the years I have been at Queen's there has not been a Department Head who has given as unselfishly and generously of his time for the well-being of the Department. Whether it was the nomination of students and colleagues for prizes and awards, the capturing of a grant opportunity or a new Canada Research Chair, or the landing of a promising alumni donation, Bob was on target, the meat of the matter between his teeth, refusing to let go. [Have you ever tried to get him out of your office?]*

Leo ended with a quote from an admiring colleague. *A couple of years ago I had a serious job-related problem that needed the attention of the Head. I wrote Bob about it, and followed that letter with two others. I even asked Marge what had happened to my letters. She reassured me that they were safely buried under other papers on Bob's desk. I commend Bob for his wisdom, for eventually the problem went away.*

Solutions to "More 'heads and tails' problems"

(from Fall 2004 issue)

Peter Taylor

Problem 1. Player A has 11 coins, while player B has 10 coins. Both players throw all of their coins simultaneously and observe the number that come up heads. Assuming all the coins are unbiased, what is the probability that A obtains more heads than B?

Let A have 10 green coins and 1 red. Let A have a green heads and B have b heads. Let

p = Prob($a>b$) = Prob($b>a$) (symmetry)

q = Prob($a=b$).

Then $2p + q = 1$.

Now A will have more heads total than B if $a>b$ and if $a=b$ and he has a red head. The probability of this is

$p + q/2 = ½$

using the above equation.

Problem 2. Amar and Belinda play the following game. A fair coin is flipped repeatedly and Amar wins if the sequence Heads-Tails occurs before the sequence Heads-Heads; otherwise Belinda wins. For example, Amar wins on the toss sequence T, T, H, T and B wins on the toss sequence T, T, H, H.

(a) (easy) Show that Amar and B both win with probability 1/2 .

As soon as the first head appears, the game will be over on the next roll and they will each win with probability 1/2.

(b) Now consider a simple variation on this game. Instead of betting on the outcome of a single coin, imagine what would happen if A and B each had a coin and flipped it until the desired sequence was obtained, HT for A and HH for B. The game is now played as follows. The winner is the one who gets the right sequence in the least number of flips. [If there's a tie you play again.]

At first glance it seems like the second game might also result in each player having a probability of winning of 1/2. However this is not true—this version favours A.

I don't think it's so easy to calculate the winning probabilities, but it's certainly possible. A simpler but closely related question is to calculate the average number of flips it takes either player to obtain their desired pair. On average, how long does it take for A to get HT and for B to get HH? That's your problem.

The two cases are similar. I'll calculate the time to get HH. We first introduce a couple of conditional probabilities. Let x_H be the total number of flips required on average to get HH given that the first flip is H, and let x_T be the total number of flips required on average to get HH given that the first flip is T. We calculate these recursively.

First get an expression for x_H. Suppose the first flip is H. Then with probability 0.5 the next flip is H and we've got it in 2 flips, or with probability 0.5 the next flip is T and in that case it's just as if the first flip was a T except we've already used a flip to get there. Thus the total left on average is $x_T + 1$. This gives us:

$$x_{H}. = 0.5(2) + 0.5(x_T+1).$$

Suppose the first flip is T. Then with probability 0.5 the next flip is H and in that case it's just as if the first flip was an H except we've already used a flip to get there. Thus the total left on average is $x_H + 1$. Otherwise, with probability 0.5, the next flip is T and in that case it's just as if the first flip was a T except we've already used a flip to get there. Thus the total left on average is $x_T + 1$. This gives us:

$$x_{T}. = 0.5(x_H+1) + 0.5(x_T+1).$$

These two equations solve to give $x_H = 5$, $x_T = 7$. Now the first flip is H or T each with probability1/2, so the average number of flips required to get HH is the average of these which is (5+7)/2 = 6.

A similar argument shows that the average number of flips required to get HT is 4.

Problem 3. You start flipping a fair coin, and can at any time stop and claim a prize in cents equal to the fraction of flips that has come up heads. So, if you stop playing after 5 flips with 4 heads, you win 80 cents. Find an optimal strategy.

Note: Solutions to both the first problems were obtained from Dave Mason and Mac Smith. Both proposed the same answer to #3. Here are Dave's comments:

The optimal strategy is simply stated: *any time you get up a single head then quit*, otherwise continue to play. Expectation provides the rationale. At any point in time if you are up some number of heads (over the number of tails) then your expectation is to always be up that number, but since this number is being amortized over more and more throws your expected payout is decreasing downwards towards 50 cents if you continue. So don't throw any more. Similarly, if you find yourself down some number of heads then this deficit is expected to be maintained, but is being amortized over more tosses and is rising towards 50 cents. So keep throwing.

This is a reasonable argument though it is not rigorous. In fact it's possible to show that you *can* do better than this but the question of exactly how well you can do seems very difficult. One of our undergraduates, Eric Hart, has done some investigations and here is his report.

A popular strategy for Problem 3 is to play until one more head has been tossed than tails, and then to stop. In other words, the player should wait until the amount of money being won is greater then 50 cents, then take what he/she has.

The first question is: what is your expected payoff using this strategy? An elegant argument using the famous *Catalan numbers* shows that the average amount won is exactly $\pi/4$ which is around 78.5 cents. That might seem high but isn't when considering that if your first flip is a head you get paid a full dollar, and that should occur around half the time.

But, armed with a computer that "flips coins" for you at a high rate, it's not hard to convince yourself that there are better strategies. For example, how about "stop when the expected payout is greater than 51c"? In "short games", or in this case games with less than 100 total flips, simulations show that this strategy does no better, but in longer games (1000 flips) it seems to give a higher payoff.

The question then becomes what if you wait for 52c? Or 53c? How far can you go before the strategy becomes worse than the original wait for 50c? In the computer simulation, the strategy was consistently better in waiting for more in all trials of up to 63c, at which point the average payout drops below that of the 50c strategy. The next question to ask would be which of those is the best strategy, and the answer appears to be, as might be expected, almost in the middle at 57c.

As interesting as this is, it is not a solution to the problem for two reasons. First of all it is not a mathematical solution, it is only a numerical solution based on a computer simulation, so it doesn't account for any errors possible, problems with the computer's random number generator, or the fact that the results given by the computer (in this simulation at least) only allow for games of 1000 flips in length before ending the game anyway, for example. Second of all, it is not a solution to the problem because it doesn't answer the question of the best strategy. The "waiting for a payout of at least 57c" strategy may be better than waiting for any other payout, and may be better than waiting for a certain number of more heads than tails, but it doesn't address all ways to word and therefore structure a solution. It is quite possible there is a solution of another sort entirely that is better than this one, but has not yet been considered.

Finally, Ernest Enns at University of Calgary proposes the following nice problem:

Suppose n players each have some number k coins. Every player has the same chance of winning on each round of play. The winner of a round, gets one coin from all the other players, hence increasing his/her assets by n–1. The game is over when one of the players is broke, namely has no more coins. Find the expected length of the game? This is easy for n=2 and n=3, but I have not been able to do it for n=4 or higher.

New Problem

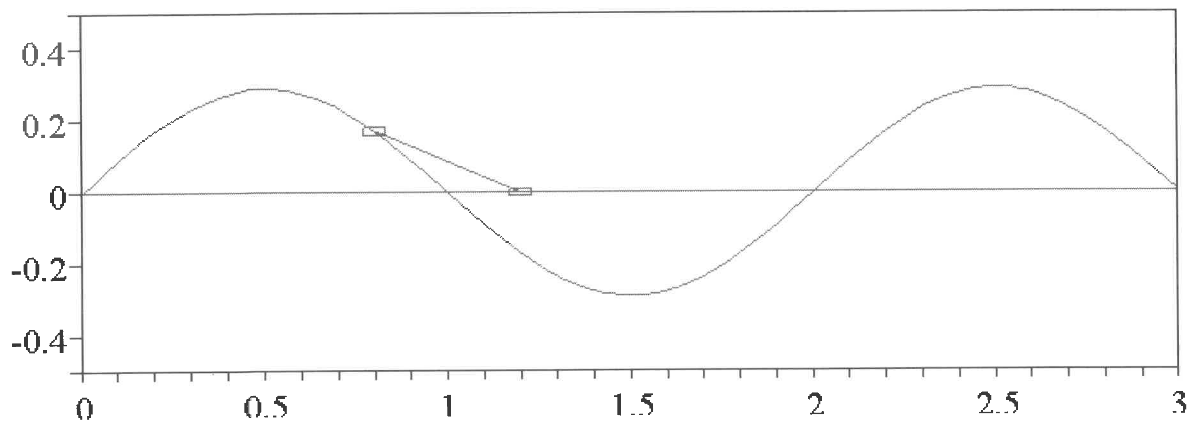
Peter Taylor

What happens when we shorten the tow rope?

Competitive waterskiers follow a slalom course with the boat traveling at constant speed up the centre line. I was talking to one such skier recently (a math education Prof in fact) and asked her at what point she had the fastest speed. She said she figured it was just about where she crossed the path of the boat. Then she thought about it a bit and said that maybe it was just past that point. I then asked her whether the length of the tow rope had any effect on that. The point is that in a competition, after each "run" those who miss any of the markers are eliminated, and the tow rope is shortened for the next run. This continues until a winner is declared. It's much the same as raising the height of the bar after each round in the high jump. Well, she wasn't sure about that but suggested that maybe with a shorter rope the max speed point might be farther from the centre line. Show that this is the case.

If you want a particular function to work with, take a sin curve with the boat traveling up the x-axis. It's clear enough that with an infinitely long tow rope the point of max speed is exactly when the x-axis is crossed. What happens as the rope is shortened?

The diagram below uses a sin curve and is drawn "to scale" in the sense that the relative dimensions are correct for a tournament course. The tow-rope length shown is the starting length. Subsequent reductions in length are in the order of 10%. The speed of the boat is such that it would travel the horizontal distance shown in the graph in 8 seconds.



Send your solutions, or new problem suggestions, to:

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