Mathematics Newsletter

Message from the Head, Mike Bennett

Department Head and budding number theorist

Dear Friends, Colleagues, and Alumni of UBC Mathematics:

Another exciting year has passed here at the UBC Department of Mathematics, with the coming years promising more of the same. The significant growth in the number of international students at the university (an increase at the admissions level exceeding ten percent in the past year alone) brings with it opportunities and serious challenges, both for our faculty and our students. Our department is, in my opinion, well positioned to meet these challenges. We now comprise more than 200 faculty, postdoctoral fellows and graduate students, housed in five separate buildings, ranging from the sleek new EOSB (host to the Pacific Institute for the Mathematical Sciences) to our more, shall we say, homely "West-side heritage homes", the Mathematics Building and Annex. In the coming year, we anticipate teaching roughly 18,000 students in over 200 sections, including more than 30 graduate courses. Directing our teaching mission is our new Undergraduate Chair, Mark MacLean. Starting in the new year, we will also have a new Graduate Chair in Dan Coombs. I would like to take this opportunity to express my gratitude to Rajiv Gupta and Greg Martin who served the department with great distinction in these roles for many years (nine in Rajiv's case!).

The coming years will also see remarkable transformations in how Mathematics instruction is carried out. While it is difficult to predict the effects of online instruction and other new technologies, it is virtually certain that they will be significant. The department is currently engaged at all levels in these initiatives, through our funded "flexible learning" proposal and our continuing development of online resources, including textbooks, for our undergraduate courses.

In many ways, this has been our most successful year ever in terms of both research and teaching. An unprecedented three of our faculty have been invited to speak at the International Congress of Mathematicians in Seoul, Korea in 2014. The summer saw a diverse number of conferences honouring some of our more celebrated senior faculty, both in Canada and internationally. The department further enjoyed a 100% success rate in this year's competition for NSERC Discovery grants. On the teaching front, this year we had recipients of Killam teaching prizes, both in the Faculty and Graduate student categories. Remarkably, Dragos Ghioca, this year's faculty honouree, is the 10th faculty member in the department to win this award in the past decade (far exceeding any other department at the university). For more notable achievements and highlights of the preceding year, please visit our awards page.

The Department continues to benefit from continuing interactions with mathematics institutes: BIRS, IAM, MITACS and PIMS. These institutes provide many opportunities for attracting the finest visitors, students and postdocs, as well as exciting workshops, to UBC.

It is with sadness that I note that some of our longest serving and most celebrated colleagues will be retiring in the coming year. Offsetting this, our department is younger, more dynamic and more productive than ever. For proof of this, one had only to witness the striking number of tots and tykes in attendance at the departmental dinner!

In any case, wherever you find yourselves, please keep in touch with us, via email, by checking out our webpage *http://math.ubc.ca*, or, if you're in town, by dropping by to catch a seminar or colloquium, or to attend an alumni event. We'd love to hear what you're up to. ■

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Editors: Brian Marcus, Lior Silberman

New Faculty

Sabin Cautis did his undergraduate work at Waterloo, where he achieved three top-ten Putnam placements. He then did his PhD work at Harvard, studying algebraic geometry under Joe Harris but quickly branching out into representation theory and knot theory as well. Sabin uses algebro-geometric and representation theoretic constructions to categorify representations and knot and link invariants. He has held postdoctoral fellowships at MSRI, Rice, and Columbia and was a faculty member at USC before joining the faculty at UBC. He is currently an Alfred P. Sloan Foundation Research Fellow. ∎

Originally from France, **Rachel Ollivier** received her PhD from the Université Paris 7 in 2005 under the supervision of Marie-France Vignéras. She subsequently held a postdoctoral position at the ENS in Paris and faculty appointments at Université de Versailles Saint-Quentin en Yvelines and Columbia University, before moving to UBC as an Assistant Professor in 2013. Ollivier's research is in representation theory related to algebraic number theory. ∎

Costanza Piccolo received her PhD in Fluid Dynamics from Politecnico diTorino in 2000. She has been a Science Teaching and Learning Fellow with the UBC Science Teaching Initiative, directing the Mathematics Department component since 2010, and now joins the department as an Instructor. A highly successful teacher, she has also had oversight of projects involving many of our undergraduate courses and has developed a significant understanding of student learning, engagement, and attitudes as they study mathematics. ∎

Juncheng Wei received his PhD from University of Minnesota in 1994 and has worked at Chinese University of Hong Kong since then. His last position in Hong Kong was Wei Lun Professor of Mathematics. In 2013, he joined UBC as Professor of Mathematics and Canada Research Chair. An invited speaker of the 2014 International Congress of Mathematicians, Wei has co-authored more than 300 papers on research fields covering nonlinear partial differential equations, applied analysis, mathematical biology and material sciences. Wei's family just moved to Vancouver this past summer and their two children, aged 13 and 8, are looking forward to learning how to sail and ski. ∎

IAM Report

Mathematics is increasingly important in the understanding and development of our high tech world: Modern industrial processes involve the flow of fluids with complex, carefully designed properties; handling and processing the large amounts of data from geophysical exploration, high frequency financial trading and modern communication networks is done using new algorithms designed for emerging computer architectures; The design of new drugs is assisted by computational simulations of molecular interactions. A summary (with some technical details) of some trends in the applications of mathematics can be found online in the document, "Mathematics in Industry," (*http://www.siam.org/reports/mii/2012/report.pdf*), prepared by the US-based Society of Industrial and Applied Mathematics, a counterpart to the Canadian Applied and Industrial Mathematics Society.

IAM Students

Our department has several strong research groups in Applied Mathematics including Mathematical Biology, Scientific Computing, Complex Fluids (with an experimental laboratory) and Applied Analysis. Some of our faculty from traditionally pure areas are also engaged in application research. In addition, the Institute of Applied Mathematics (IAM) at UBC fosters interdisciplinary activity with a theoretical component. The IAM has faculty members from Mathematics and also from Science, Engineering, Business, Arts, and Land and Food Systems departments. The list of IAM members and their research interests shows by itself the importance of mathematics to many application areas.

I'd like to thank my predecessor Neil Balmforth for his work over the last five years. He has kept a high level of scientific activity, including a fantastic level of graduate student involvement in the IAM.

The IAM is a home for graduate students who study Mathematics with a focus on an application, or who pursue projects that have a significant mathematical component. Interdisciplinary work is promoted through a colloquium series, several seminar series, and an annual retreat. For more information about the IAM and its activities, please check out the web site or contact me. ∎

www.iam.ubc.ca / director@iam.ubc.ca

Brian Wetton

Interview with Alumnus Andrew J. Weaver

Andrew Weaver is the first Green party MLA in British Columbia. His constituency is Oak Bay-Gordon Head in Victoria. He is also a leading climatologist from the University of Victoria, B.C. He served for many years as a member of the IPCC, the Intergovernmental Panel for Climate Change (The IPCC is a United Nations based committee, involving over 2000 scientists and dedicated to synthesizing climate research into comprehensive reports. The IPCC was the 2007 recipient of the Nobel Peace Prize along with Al Gore).

He received a PhD in Applied Mathematics from UBC in 1987.

Professor Weaver was interviewed by UBC Undergraduate Deshin Finlay, combined honours in mathematics and physics.

Andrew Weaver will give an IAM Public Distinguished Alumni Lecture on Monday, November 18 at 3pm in LSK 460, entitled "Pipelines, Politics and Climate Science." See: *http://www.iam.ubc.ca/pipelines-politics-and-climate-science*

Deshin: So, why don't we start by you telling me a little about how you originally got interested in ocean and climate modelling.

Andrew Weaver: I was born in Victoria. I went to high school in Oak Bay. I always enjoyed math. I liked science. So, I went into math and physics at university, without any idea where I was going to head up at that point. So, then you graduate from university and go into this position of 'now what?'

I guess I should do grad school. So, I went to Cambridge to do Applied Math. I was playing rugby all the way through and I had a bit of a nasty injury there.

I came back to have an operation here and while I was here I transferred to UBC, but I got a Masters in Advanced Studies in Mathematics (from Cambridge).

I started my PhD with Lawrence Mysak who at the time was in the mathematics department. His area of application was maths applied to oceans and he was making a transition into climate. Ever since I was a kid, I've always enjoyed hanging out with people who are not other scientists; so I liked to do science that I perceive to be relevant to societal interests. And, fluid mechanics applied to oceans and atmosphere really resonated because it's mathematics and physics applied to relevant problems. So I worked with Lawrence and Brian Seymour in maths was on my committee and became my maths advisor when Lawrence transferred over to McGill.

So, I ended up doing a very, very applied maths thesis on air-sea interaction. I thought, well this was fun, but I always wanted to work in Australia. So, to me getting a post-doc in Australia was far more important than the actual area I got the post-doc in. But it was a perfect match. Jason Middleton worked in mathematics in Australia doing ocean-atmosphere applications, which was brilliant.

I then took a post-doc at the University of Washington in Seattle to work at the Joint Institute of Atmosphere and Ocean, with Ed Sarachik. He was instrumental. I sat down with Ed and was showing him the things that I was working on. He said "Andrew, Andrew, Andrew. You need to work on important problems. Take a look at these papers. This is important." Basically, I tried to reproduce a guy's results as a first step and I couldn't do it. But in trying to reproduce these results, I saw all sorts of other stuff and that took off into the ocean's role in climate.

Deshin: So, to double back a bit, back to UBC again, were there any experiences or events that really stood out for you in a non-scholastic sense?

Andrew Weaver: Yes. The last game of rugby I ever played was at UBC. I was scheduled to play in the afternoon and I showed up early because I heard that they were short some players, in an earlier game, and I decided to step in. One thing led to another and I broke my ankle. It was a very nasty break: ambulance and all that stuff and that was the last game of rugby I ever played. So that's number one.

Number two is: one of the things the math department did was give me my first opportunity to teach a course. I taught MATH 100 (first year calculus). I loved it. I loved the teaching. I was a very nervous speaker. I could not stand in front of a crowd and talk. This was a September of some year, probably 1986, and there were these young faces in the audience looking at me petrified, because it was their first class, 8:30 on a Monday morning. And I looked out at them and I said 'This is the very first class at a university you have ever taken. And I bet that you're really nervous.'Nervous laughter.' But you have no idea. This is the very first class I have ever taught and I am petrified.' So, it broke the ice right away. It was really good that UBC did that. It was fantastic training. And I think, actually, the students got good education, because we gave it our all when we were teaching these classes.

Deshin: Throughout your education, were there any math related courses that really stood out as having made an impact?

Andrew Weaver: Chuck Murley taught topology at the University of Victoria at the fourth year level and he was just so in love with mathematics and the beauty of topology and I thought it was just so esoteric. I was more interested in applied maths, but he was able to show, with his enthusiasm, how you could love something that is rather abstract. He was a teacher.

He was not a strong researcher but I thought he was very effective. I mean, you can imagine, as a young mathematician, when you have some guy with this beard and he's rather esoteric, just bounding enthusiasm about algebraic topology.

When I went to Cambridge, I had a course in perturbation methods, learning asymptotic techniques. I really enjoyed that because you could see how you could solve mathematical problems using estimate approaches. I thought that was fascinating.

At UBC, I took an Applied Maths course on perturbation methods, but also it was on solutions to PDEs by a visiting professor from Germany (Hubert Weinitshke). He was so hard and he gave us so much work. It was excruciating, but it was fascinating. I got 100%; the first time I got 100% in a grad level course. I probably put more hours in that course than I did in every other course I took at UBC combined over my PhD.

Deshin: Moving a ways forward, what was the experience like of working in such a huge team as the IPCC (Intergovernmental Panel on Climate Change)?

Andrew Weaver: That's a really good question. OK. I've been probably more times than any other Canadian involved in this. The first assessment was '95 but it started in '92, so I was 5 years out of my PhD at that time. So I was awestruck. So in some sense, when you're a young Turk coming into this, you're blown away by the papers that you read -- guys who you're worshipping in terms of your field. They're there on the committee with you. I was just humbled, you know, to watch in awe, starstruck, to watch the discussions and the debates.

But this was in the '90s. We're just finishing the last one and now we're in 2013. So, now, you know, I'm one of the old guys. I know the process inside and out. But you see the young starstruck guys. You see how they interact and you see different types. Climate science, by its very definition is very collaborative. It's collaborative because there is a diversity of disciplines involved, from applied maths, physics, chem. The difficulty is that, as a mathematician, when you are trained, you really do stuff by yourself. You sit there and you solve problems, and some collaborative papers because you sit over a coffee and you talk about solving problems. With this, though, we're writing chapters together and we have to come to consensus. It's a learning experience. I've been fortunate in that I've grown as the IPCC has grown. I don't know what it would be like for some young person coming in now with the size and magnitude of it now.

Deshin: In the media, you have come under several attacks from various people and I'm wondering how that affected you and how you've dealt with that.

Andrew Weaver: If we were meeting at UVic, I'd show you my wall of hate. My wall of hate is a board I have where I post all the diatribes. Oh, I can show you some here . . (he reads out several messages, only one of which is included here):

> *'The University of Victoria should be ashamed to employ such a giddy huckster. He's a flatulent demagogue whose hysterical fear mongering shouldn't be featured, but investigated. After all, he receives grants to do his research.'*

So very quickly you learn that you need a thick skin in this business. So, the transition from a climate scientist to a politician is relatively simple. The thing about the science is that within the community, it's not controversial. The controversy is that the solutions require public policy decisions and those public policy decisions are controversial because they imply various things.

Deshin: How did you get involved with the activism, media and press side of the issue?

Andrew Weaver: I have always believed that as somebody who is funded by the taxpayer, you have a duty and a responsibility to communicate your science to those people who fund it. So, what I've been doing, ever since I was a new faculty member, is when a media person phoned up, and it used to be a lot on El Niño, for example, and they asked a question, I responded. I wouldn't be rushing around with a scientific paper saying 'Will someone cover this story, please?' In fact, there are many examples where I've asked the university not to put out releases on work that I've done because I felt it was best if the media comes to you, and the journals put out releases anyway. You know, when you look like you're drawing attention to your own science, you gotta question it. It's a cold fusion kind of thing. So, I just did it by responding to calls. It was not something I did intentionally. The media would phone up because there's a big storm somewhere. Who's the guy in B.C? Well, it's Weaver. If you do it a couple of times and you're quotable, then you get it more often. Next thing you know, it's happening all the time.

There are those scientists who do not want to discuss their research because they feel that they don't need to talk to media about it. I think that's wrong. This is one of the reasons why I've been particularly aggrieved to see the federal initiatives to undermine access to federal scientists by the media, because ultimately, federal scientists are doing science for the public good and the public needs to know what they're doing. They're public servants. They're not ministerial slaves.

Deshin: And when did you decide that you wanted to go from research with talking to community to actual politics?

Andrew Weaver: I have been asked over the years by many parties to consider running both provincially and federally. I have always said no. I have always believed that it's easy to criticize and to hurl abuse. It's easy to pontificate from the outside. But if you really want to facilitate change, you have to get involved yourself. So, I had worked very carefully with governments at all levels for decades advising policy based on science. In 2009 I was quoted as saying:

> *'Scientists have done their job. Now it's time for politicians to do theirs.'* Which is true. The science of climate change is well known.

The follow up to that quote with Rob Stewart (former UBC Professor of Oceanography) is that here we are in 2013. Politicians are not doing their job. So what do I do?

Well, I can sit on the outside and continue to give lectures on this and advise on that and be ignored, or I can get engaged in the system and ensure that the issues that concern me and my constituents are raised at the political level and try to make a difference that way. So, I'm basically practising what I preach.
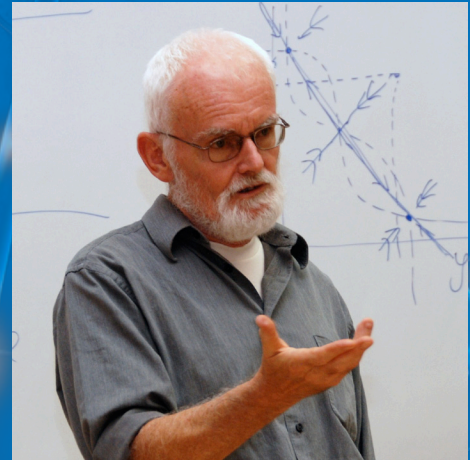
PIMS Hugh Morris Lecture Series

Philip Holmes (Princeton University)

Can We Choose Optimally? The Neural Dynamics of Decisions

November 1, 2013, 3:00 pm
University of British Columbia
Earth Sciences Building room 2012
Reception at PIMS, 2:30 pm

Abstract: Each day we make many choices, often under time pressure and with poor information. How do we do this? The basic electro-chemistry of individual neurons and synapses in our brains is fairly well understood. The key problem is one of scale: how do almost a trillion neurons and many more synapses interact to sift noisy evidence and weigh it against prior knowledge? I will describe how mathematical models, coupled with human and animal experiments, illuminate the neural mechanisms responsible for some simple decisions and actions.

Bio: Philip Holmes is the Eugene Higgins Professor of Mechanical & Aerospace Engineering at Princeton University. He is a member of the American Academy of Arts and Sciences and a Fellow of the American Physical Society, the Society for Industrial and Applied Mathematics and of the American Mathematical Society. His research is in nonlinear dynamics and differential equations, developing qualitative and analytical methods for studying mathematical models of solid, fluid, and biological systems.
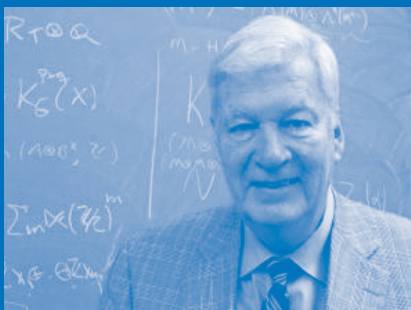
About this series: This Series has been generously endowed by Dr. Hugh Morris (1932-2012), former Chair of the PIMS Board of Directors, and long-time friend of the mathematical sciences. Dr. Morris had more than 40 years of experience in the mineral industry, including a term as Chairman and Chief Executive Officer of Imperial Metals, and was a fellow of the Royal Society of Canada. Dr. Morris was a member of NSERC's Council and Chairman of the Board of Directors of the Lithoprobe Project.

I've always said the single most important thing a person can do is to actually get elected and to vote, because in order to facilitate change, you need to have those willing to make the hard decisions that need to be made to facilitate such change. If you don't like it, get out and run yourself. And, well, I actually did that.

Deshin: You just mentioned that you were asked several times, both federally and provincially. What made you decide provincial over federal?

Andrew Weaver: Simple answer. I have a family. I have two children. I kind of like my family and I didn't want to spend half my time in Ottawa. But also, why I would be willing to do it provincially is that British Columbia used to be a leader in climate policy and I was involved in the climate action team through advising the Gordon Campbell government on this. That leadership is lost. And I feel his legacy is also being lost on that file. I think it's important to bring it back.

Deshin: What do you think the ideal relationship between scientists and government is?

Andrew Weaver: First of all, I think we need way more scientists in government. How many lawyers are out there? In law, the winner is the person with the best argument.

In science, the winner is the person with the best data or the most compelling explanation of the existing observations of a phenomenon.

In mathematics, the winner is the person who can prove the thing first. These are very different. It's not about arguing. It's about evidence based decision making. When I say science, I'm including maths obviously. We see a problem and we find a solution. That's what we do. It's the essence of Applied Math. You're trying to find solutions to problems. And what I think we should be doing more of in politics is trying to find solutions to problems. Right?

But what we're doing is we're finding ways of staying in politics. I hope that my running in B.C. will maybe inspire a couple of other people to run. I don't care what party. We got Moira Stilwell, a radiologist in Vancouver in the Liberal party - she's really good.

In terms of science, it can never proscribe policy, but science can inform policy. So, for the scientists, our job, I think, is when we see policy that is claiming to be based on science, we have a job to ensure that that science is correct. Scientists can say 'What you're saying is not true', but we can never say that 'This is the policy solution'. Science can inform policy. So for a scientist, the ideal world is to hold policy makers accountable by the evidence that they are using to justify decisions not to use the evidence we have to tell them the decision. Policy makers have to account for many other constituent groups of which scientists are one. At the same time, when these other people say 'science says', well that's when we have a duty and responsibility to say 'No, it doesn't' or 'Yes, it does'

Deshin: Who would you say, both in science and in politics, were your inspirations as you were moving into these fields?

Andrew Weaver: What inspires me are people. My English teacher in Grade 12. His name was Norman Welch. I'd been getting C+s in English all through. This guy saw behind my messy handwriting (all mathematicians have messy handwriting) and my poor spelling (most mathematicians have poor spelling). So, he looked beyond that to the substance. And he encouraged me in a way that inspired me. So, that's the first thing.

Then, Lawrence Mysak, my math supervisor at UBC. He was just always joyful about science. The joy of science and importance of positive reinforcement in publishing.

Jason Middleton was the guy in Australia, in the school of Maths that I went to visit as a post-doc. He inspired me through the importance of balance and showing how it's important to make a creative, vibrant and positive working environment for your students and post-docs.

There's Ed Sarachik in Seattle, who taught me the importance of guiding post-docs early on into addressing important unresolved scientific questions: the questions that matter.

In terms of politics, well, it's very clear. Elizabeth May who shows how one hardworking person, unhindered by the party whip system, willing to listen, can actually make a difference. Elizabeth May is that inspiration.

Deshin: For potential up-and-comers in science, activism or politics, what advice would you give to the next generation?

Andrew Weaver: You've got to be an expert in something early on in your career. So, if you're going into climate science, become an expert first in biology, chemistry, physics, maths or some sub-field. This is for undergrad. Also, you know, at the end of the day, you've always got to go to sleep at night. So, always do stuff that keeps your conscience clear. It's when you do something - speaking out on an issue because you know it's the right thing to do.

I believe in truth and the communication of truth. So, it means sticking to my morals. You get lots of temptations by people who would like you to have your morals be pulled aside for a few minutes, but stick to your gears. The secret to success is to surround yourself with people who are way smarter than you, way more talented than you and remove barriers to allow them to flourish. Because, when they flourish, you flourish. That, I think, is also true of supervisors of grad students.

Your job as a supervisor is to protect the grad student from all the bs (and there is a lot of bs) in universities, to allow them to flourish because if they flourish, your legacy as a scientist is not judged by what you do, but by what the students that you graduated do when they start publishing.
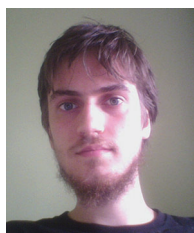
Deshin: Is there anything else that you want to add to the interview?

Andrew Weaver: No. I thoroughly enjoyed my days at UBC. I am a proud alumnus of the maths department at UBC. I just wish I hadn't played that extra game that one day at UBC, because I might still be playing rugby now. ∎

Deshin Finlay

Report from the Undergraduate Chair

On June 30, 2013, my colleague Rajiv Gupta stepped down as Undergraduate Chair in Mathematics after nine years of outstanding service. The Mathematics Department and the students we teach have benefited greatly from his strong stewardship of our vast, diverse undergraduate program. Rajiv has done an amazing job and we all thank him for his outstanding service. I have big shoes to fill and I am grateful for Rajiv's willingness to mentor me through the complexities of my transition into the Undergraduate Chair role.

Our undergraduate program is vast and undergoes continual evaluation and revision. Here are a few basic facts about it:

- For the 2013 academic year, our total enrolment will be over 17,000. For a sense of the growth rate, the total enrolment in 2001-02 was around 13,500. International student enrolment continues to be the fastest growing segment of our student body, with an increase of 23% over 2012.

- Mathematics is one of nine departments in the Faculty of Science, but does 20% of its teaching.

- Our students come from all Faculties with undergraduate entry programs. About 70% of our students are in Science (36%) or Applied Science (34%), with the remaining students coming from the Sauder School of Business, Arts, Land and Food Systems, Forestry, and Kinesiology.

- Students with majors or other specializations in Mathematics come to us from Science, Arts, and Applied Science.

- About 45% of our teaching is done through first-year calculus courses. About 25% of our teaching occurs in more advanced third and fourth year courses aimed at Math Major and Honours students.

We have the challenge of constantly providing quality teaching in both first and second year courses for a wide audience of students on a large scale, and in advanced courses for some of UBC's very best undergraduates.

For a fuller appreciation of the scope of our teaching, please visit our undergraduate website: *http://www.math.ubc.ca/Ugrad/index.shtml*.

Our Math-CWSEI Collaboration

The Mathematics Department has been involved actively in the Carl Wieman Science Education Initiative (CWSEI), a Faculty of Science based program aimed at improving undergraduate science education at UBC, since 2008. Since 2010, this work has been generously supported by a $2 million donation from Dr. David Cheriton to the Mathematics and Computer Science branches of the CWSEI program. Dr. Cheriton, a UBC alumnus, is currently a professor at Stanford University and mentored Google's founders.

Recent projects have ranged from assessing basic mathematical proof skills to incorporating new MATLAB programming activities in a variety of applied courses. The Math-CWSEI team of Science Teaching & Learning Fellows (STLFs) in 2012

was Warren Code, Joseph Lo, Sandi Merchant, and Costanza Piccolo (who acted as the Director of the Math-CWSEI).

These four STLFs have been working together and with faculty on various projects, collecting data on student learning and implementing changes in the courses as needed. After three years of fruitful collaboration, it was time for some of the members of the Math-CWSEI team to move on to different positions. In January 2013, Warren Code joined Skylight, another Faculty of Science based program aimed at improving science education at UBC. More recently, we were pleased to have Costanza Piccolo join the Math Department as Instructor in July. These changes created the opportunity to hire Wes Maciejewski, who will be joining Joseph and Sandi and their STLF team in early September. Wes has been a postdoctoral fellow in our department since 2012 working on mathematical biology problems, but he has also maintained an active interest in teaching and mathematics education throughout his academic career. The Math-CWSEI team is looking forward to working with him: Welcome to the team, Wes!

This past year the Math-CWSEI program concentrated most of its efforts on the development and implementation of online homework in first- and second-year courses. Over the last decade, various schools across the country have experimented with online homework in mathematics courses. Different internet-based systems, featuring either open source or proprietary software designed specifically for handling math problems, are now available, and a number of research studies have been conducted in university courses to investigate their effectiveness. The results of these studies seem to indicate that test performance of students completing homework online in a math course is at least as good as, if not better, than that of students who hand in traditional "paper and pencil" homework. There is also evidence that students complete more homework and spend more time working on it when the submission occurs online rather than in the traditional written format.

In our large, multi-section courses online homework has provided an effective alternative to the more resource-intensive written homework format. In order to ease the transition from traditional to online homework, the Math-CWSEI has supported faculty in the development and implementation of online assignments in over 80% of the first-year courses, and in all of the large second-year calculus and linear algebra courses, for a total of more than 10 courses with a total enrolment of over 9000 students. Specifically, the STLFs have worked with faculty to create, revise, and administer weekly online assignments on WeBWorK, an open source internet-based homework system designed specifically for Mathematics and supported by the Mathematical Association of America. They also designed and administered surveys to monitor students' perceptions about and interaction with the system.

Based on end-of-term surveys, we know that student attitudes towards WeBWorK have been for the most part positive, with a large majority of first-year students using WeBWorK in their math courses feeling that WeBWorK questions were

good practice for solving problems on tests and thought the immediate feedback provided by the system helped them learn the course material.

Overall, the experience with online homework was positive for both faculty and students, and we plan to extend its use to more courses this year. In doing so, we would like to thank the Centre for Teaching, Learning and Technology at UBC for hosting and maintaining WeBWorK and providing prompt technical support.

Our Programs

The Mathematics Department offers Majors and Honours degrees to students, and about 70% of our degree students are in Science and 30% are in Arts. In addition, we have about 20 Applied Science students pursuing a "Minor in Honours Mathematics." About 100 students graduate each year with a degree in Mathematics.

Our programs are diverse and students are able to choose from Combined Honours (e.g. some common ones are Physics/Math, Computer Science/Math, and the relatively new Economics/Math), Double Majors, Combined Major in Science, and a Co-op option. Graduates from our programs attend top graduate schools and enter a range of public and private sector jobs. Students interested in a teaching career can take the Dual Degree Program in Mathematics and Education, which was created in 2008, and allows prospective teachers to complete a Mathematics degree and a degree in Education simultaneously. We also actively participate in two special programs for first-year students: Science One and the Coordinated Science Program. We also are in the process of designing courses for the new UBC Vantage College.

Our Excellent Students

Our students are some of the most talented at UBC:

- 13 times in the past 21 years, including each of the last three years, the Governor General's Silver Medal for the top graduating student in Science has gone to one of our students!

- In the past decade, 6% of BSc students specialized in Mathematics but 60% of the top graduating BSc students were from one of our programs.

- In the past three years, the UBC Putnam team has ranked in the top 10 in North America. The annual Putnam Mathematics Competition is the preeminent undergraduate mathematics contest in North America.

Our students consistently do well in comparison with students across Canada and the United States: in the past decade, in each year the UBC team has placed in the top 20 in the Putnam exam, involving around 400 universities and colleges. Participants attend weekly training sessions led by Greg Martin, with the number of UBC contest participants doubling in the past decade. We had 23 students write the contest in 2012.

A number of scholarships and prizes are awarded to Mathematics students each year.

Karlming Chen receiving his prizes

At the May 2013 graduation, Ruiyuan (Ronnie) Chen received the Governor General's Silver Medal for being the top graduate in the Faculty of Science, and also the Dr. R. D. James Medal for being the top graduate in Honours Mathematics. Ronnie was also our top member of the Putnam team this year.

Students who have won awards in the past year are listed alphabetically below.

- Entrance Scholarship in Mathematics: **Maxwell Allman**

- Reginald Palliser-Wilson Scholarship: **Shamil Asgarli**

- John Collison Memorial Scholarship in Mathematics: **Daniel Baker**

- Reginald Palliser-Wilson Scholarship, G. C. Webber Memorial Prize: **Karlming Chen**

- Reginald Palliser-Wilson Scholarship , Dr. R. D. James Medal in Mathematics: **Ruiyan Chen**

- Reginald Palliser-Wilson Scholarship: **John Enns**

- Reginald Palliser-Wilson Scholarship: **Ron Estrin**

- John Collison Memorial Scholarship in Mathematics: **Eric Hyunh**

- Ralph D James Prize: **De Wen Li**

- W. H. MacInnes Scholarship in Physics and Mathematics: **Paul Liu**

- Lawrence Roberts Putnam Prize: **Eric Naslund**

Our undergraduate students as a whole also have a strong involvement in the local mathematical community:

- Our Math Club sells final exam packages with detailed solutions of old exams to support undergraduates in lower-level courses.

- Our energetic math undergraduates voluntarily lead the Metro Vancouver Olympiad Circle, bringing about 40 talented students from Metro Vancouver for weekly faculty presentations and to work on challenging Math problems.

- Undergraduate tutors provide after school workshops in various BC elementary and secondary schools, and some are especially involved with Aboriginal students.

Our undergraduates also get together at the Undergraduate Mathematics Colloquium under the guidance of Fok-Shuen Leung.

Our Instructors and Staff

Teaching around 17 000 undergraduate students a year requires the hard work not only of the 90 or so instructors who teach around 200 undergraduate course sections, but also of our efficient staff. MATH courses are taught by our faculty, postdoctoral fellows (PDFs), visitors, and graduate students (the last under the supervision of an experienced faculty member). This teaching experience for graduate students and PDFs is a critical part of their professional development, and we provide a range of training activities for them.

Governor General's Silver Medalists (from Math) in Science, 2000–2013

Year	Name	Program
2013	Ruiyuan Chen	Combined Honours Computer Science and Mathematics
2012	Connor Meehan	Combined Honours Physics and Mathematics
2011	Dennis Huang	Combined Honours Physics and Mathematics
2007	Tyler Dodds	Combined Honours Physics and Mathematics
2006	Dustin Tseng	Combined Honours Computer Science and Mathematics
2004	Max Metlitski	Combined Honours Physics and Mathematics
2003	Pascal Tomecek	Combined Honours Mathematics and Statistics
2002	Zheng Zhang	Combined Honours Computer Science and Mathematics
2001	Joseph Wong	Combined Honours Computer Science and Mathematics
2000	Scott MacLachlan	Combined Honours Computer Science and Mathematics
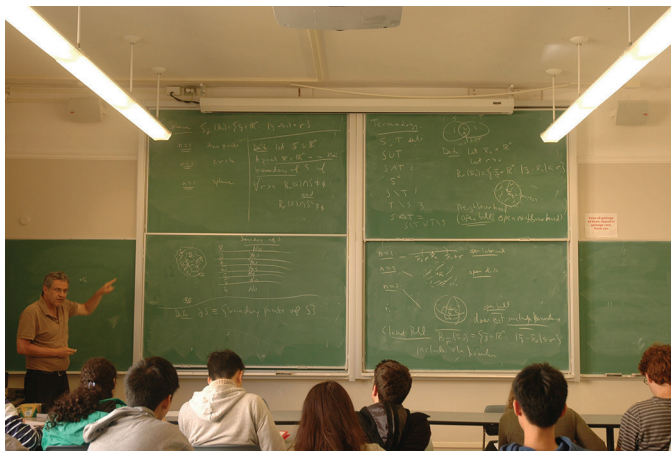
Math 226 Class

My colleagues are great teachers: ten Mathematics Department faculty members have received the UBC Killam Teaching prize over the past decade, including most recently Dragos Ghioca in 2013, Fok-Shuen Leung in 2012, and Malabika Pramanik in 2011. As well, one of our graduate students, Carmen Bruni, won the Killam graduate student teaching prize in 2013, which recognizes outstanding contributions to teaching. The Mathematics Department also annually awards teaching prizes to outstanding postdoctoral fellows and graduate students.

Managing the needs, queries, and paperwork from many hundreds of students and our instructors is no small matter. Our front office manager and course registration and scheduling expert, Margaret Ness, and our undergraduate secretary, Verni Brown, are invaluable, effective, and ever-patient in their support of students and instructors. As the new Undergraduate Chair, I am grateful to be supported by such caring, experienced people. ~ Mark MacLean ■

Mark MacLean

Performance of UBC Team & Students in Putnam Competition

Year	Team Rank	Students in Top 200 and Rank
2012	8*	Ruiyuan Chen (43), Karlming Chen (63), Eric Naslund (137)
2011	9*	Ruiyuan Chen (43), Karlming Chen (109)
2010	6	Mohammad Bavarian (45), Yuqi Zhu (126)
2009	11	Cedric Lin (49), Karlming Chen (147), Joel Fox (197)
2008	19	Cedric Lin (13), Farzin Barekat (46), Stanley Xiao (115)
2007	15	Cedric Lin (45), Joel Fox (205)
2006	11	Cedric Lin (17.5)
2005	13	Nima Kamoosi (57), Dustin Tseng (90)
2004	13	Daniel Brox (42), Dustin Tseng (53), Balin Fleming (142)
2003	10	Daniel Brox (29), Eva Koo (106), Dustin Tseng (118)
2002	14	Daniel Brox (48), Wayne Grey (104), Miranda Holmes (210)
2001	15	Miranda Holmes (130), Max Metlitski (130), Daniel Brox (144)
2000	15	Wayne Grey (140), Jesse Goodman (156)

* First in Canada

Mathematics Awards for Undergraduates

Daniel Buchanan Scholarship in Mathematics: As a memorial to Daniel Buchanan, Dean of the Faculty of Arts and Science (1928-1948), and Head of the Department of Mathematics (1920-1948), and in recognition of his teaching and research in Mathematics, Alumni and friends (through the UBC Alumni Fund), together with members of the Department of Mathematics, have endowed a scholarship of $750. It is offered to the student who gains the highest standing in the third year of an Honours Course in Mathematics and proceeds to the final year in that course.

John Collison Memorial Scholarship in Mathematics: Scholarships totalling $5,000 have been endowed in memory of John Collison by the Madison Group. The awards are offered to students who are either in the Honours Mathematics Option in any engineering discipline or in the combined Honours Program in Mathematics and Physics. Preference is given to students who participate in UBC varsity sports and/or have a serious interest in aeronautics. Eligible candidates must have completed Mathematics 301 (Applied Analysis) or equivalent. The awards are made on the recommendation of the Department of Mathematics.

Entrance Scholarship in Mathematics (NEW): Through the generosity of a UBC Mathematics alumnus, scholarships totalling $15,000 are offered to students with exceptional ability and interest in Mathematics who are entering UBC Vancouver directly from high school. The awards are made on the recommendation of the Department of Mathematics.

Dr. R. D. James Medal in Mathematics: A medal plus a cash prize of $150 recognizes the meritorious service and distinguished achievements of Dr. R. D. James as Head of the Department of Mathematics from 1948 to 1973. It is awarded to the student in the graduating class whose record and promise in Mathematics are considered by the Department of Mathematics to be the most outstanding.

Ralph D. James Prize: A prize of $315 has been endowed by friends and colleagues in memory of Professor R. D. James, Head of the Mathematics Department from 1948 to 1973. The award is made on the recommendation of the Head of the Department of Mathematics to the student with the highest mark in Mathematics 121.

W. H. MacInnes Scholarship in Physics and Mathematics: A scholarship of $1,500, the gift of Mr. W. H. MacInnes of Vancouver, is offered to the student obtaining highest standing in the second year and proceeding to the combined honours course in Physics and Mathematics.

James A. Moore Memorial Scholarship (NEW): A $15,000 Scholarship is offered by The James A. and Donna-Mae Moore Foundation to a Canadian student entering third year pursuing a Combined Honours Degree in Mathematics and either Physics, Chemistry or Biology. Mr. Moore was an alumnus of UBC, Double Honours Baccalaureate Degree in Mathematics and Chemistry 1932, Master of Arts, 1939. An enthusiastic teacher and pioneer of the B.C. Community College System, he dedicated his career to helping students realize their academic potential. The award may be renewed for an additional year or until the first undergraduate degree is obtained, whichever is the shorter period. The award may then also be renewed for an additional year if the recipient enrols in the Faculty of Education to specialize in Mathematics and Science education after receiving a Combined Honours Degree from the Faculty of Science. The recipient cannot receive the James A. Moore Memorial Scholarship and the James A. Moore Major Entrance Scholarship concurrently. The award will be made on the recommendation of the Faculty of Science.

Reginald Palliser-Wilson Scholarship: Scholarships totalling $3,400 have been endowed through a bequest by Joy Gertrude Palmer Helders for students majoring or honouring in Mathematics. The awards are made on the recommendation of the Department of Mathematics.

Ron Riddell and Roy Douglas Memorial Scholarship in Mathematics: Two scholarships of $250 each have been endowed by friends, family and the Math Club in memory of Ron Riddell and Roy Douglas. One award of $250 is offered to an honours student entering fourth year. The other award of $250 is offered to a majors student entering fourth year. The awards are made on the recommendation of the Department of Mathematics.

Lawrence Roberts Putnam Prize: In memory of Dr. Lawrence Roberts, Associate Professor in the Department of Mathematics. A $250 prize is awarded to any student who places in the top 200 on the Putnam contest for the first time.

Lawrence Roberts Mathematics Entrance Scholarship: A $1,500 scholarship has been endowed through a bequest by Frances Roberts in honour of her son Lawrence Roberts. The award is offered to a student entering the Mathematics program from a B.C. secondary school outside the Lower Mainland or Greater Victoria. The award is made on the recommendation of the Department of Mathematics in consultation with the Major Entrance Scholarship Committee and is non-renewable.

Lorraine Schwartz Prize in Statistics and Probability: In memory of Dr. Lorraine Schwartz, Assistant Professor in the Department of Mathematics. 1960-65, a $300 prize has been endowed by her friends and colleagues. It is awarded for distinction in the fields of statistics and probability to an undergraduate or graduate on the recommendation of the Departments of Mathematics and Statistics.

G. C. Webber Memorial Prize: A $650 prize has been endowed as a memorial to G. C. Webber, through a generous donation from his wife, Mrs. Eva Webber. The award is made on the recommendation of the Department, to an outstanding student in Honours Mathematics.

USRA

The USRA program is an initiative of the Government of Canada to support research activities for undergraduates: top students are selected to work (for pay) with faculty on a wide variety of research projects. Typically one student and one faculty are paired up for a summer. "Research" here is the same research discussed elsewhere in this newsletter. Sometimes the summer's work results in scientific publications; even without publications, this work is enormously valuable for students contemplating graduate school.

In addition to the research experience I have the pleasure of organizing a seminar where each week two students give 30 minute presentations of Mathematics of their choosing,

Richard Antsee

typically of their research. It's a fun venue for the students to sharpen their expository skills and also learn to ask questions in seminars. It also helps the students to know one another and creates a useful network for their undergrad studies. Topics are extremely varied! We typically socialize after the seminar, and sports are sometimes organized by the students.

One highlight was the Black Mountain hike (if weather permits). This year we went July 25 in blissful Vancouver summer weather and enjoyed the view from Eagle Bluff and a swim in Cabin Lake (which was surprisingly warm). ∎

NSERC USRA student hike (2013)

Department Dinner (2013)

Summer 2012 USRA Recipients

Student Name	Year/Program	Supervisor	Research Project
Asgarli, Shamil	2nd / BSc	Angel/Silberman	Random Quadrangulations
Baker, Daniel	3rd / BSc	Homsy	Curvature Induced Forces and Torques on Spheroidal Particles on Fluid Interfaces
Burke, Nigel	3rd / BSc (Victoria)	Marcus/Rechnitzer	Entropy of Multidimensional Shifts and Stochastic Processes
Chen, Edwin	3rd / BASc	Angel/Silberman	Eigenvalues and Eigenfunctions on Random Graphs
Chen, Karlming	3rd / BSc	Magyar/Pramanik	Problems in Density Ramsey Theory
Chen, Ronnie	3rd / BSc	Magyar/Pramanik	Problems in Density Ramsey Theory
Enns, John	3rd / BSc	Marcus/Rechnitzer	Entropy in Symbolic Dynamics
Estrin, Ron	2nd / BSc	Antsee	Forbidden Submatrices
Kaplan, Maia	2nd / BSc	Leung	Mathematical Modules in Science One
Kim, Junghoo	3rd / BSc	Leung	Mathematical Modules in Science One
Moon, Ju Young	2nd / BSc	Keshet	Computer Simulation of Motors and Microtubules in a Cell
Woodbury, Tyler	4th / BSc	Peirce	Numerically Solving the Semi-Infinite Hydraulic Fracture Problem

Summer 2013 USRA Recipients

Student Name	Year/Program	Supervisor	Research Project
Asgarli, Shamil	3rd / BSc	Gordon/Ramdorai	Resolution of Singularities and Toric Varieties
Byrne, Catherine	4th / Arts&Sci	Hauert/ Maciejewski	Evolutionary Symmetries in Populations Undergoing Moran Processes
Dong, Xiao Han (Steven)	3rd / BASc	Frigaard	Flow of Non-Newtonian Fluids
Fadai, Nabil	4th / BSc	Ward	The Influence of Delay on Gene Expression Models and Their Associated Nonlocal Eigenvalue Problems
Finlay, Deshin	3rd / BSc	Barlow/Perkins	A Numerical Study of Critical Probabilities in 2 and 3 Dimensional Long Range Percolation and 1 Dimensional Contact Process
Gosselin, Alexander	3rd / BASc	Frigaard	Oilfield Applications of Non-Newtonian Flows
Harrington, Peter	3rd / BSc	Hauert/ Maciejewski	The Effects of Spatial Dimensions in 2x2 Games
Liu, Jiashuo (Josh)	3rd / Arts	Silberman	Primality Testing and Factorization in Algebraic Number Fields
Lou, Wei Yuan (William)	4th / BASc	Feng	Modelling Dorsal Closure Process of the Fruit Fly via Chemical Kinetics and Coupled ODEs
Naylor, Geoffrey	4th / BSc	Rolfsen	The Orderability of Knot Groups
Smith, Christopher	3rd / BA	Adem	Free Finite Group Actions on Riemann Surfaces
Tom, Foster	1st / BSc	Antsee	Forbidden Submatrices and Configurations

Summer 2013 - Other Summer Research Students

Student Name	Year/Program	Supervisor	Research Project
Ghorbani, Behrooz	3rd / BA	Yilmaz	Compressed Sensing with Highly Coherent Matrices with Applications in Finance
Rastogi, Ananya	3rd / BSc	Coombs	Modelling Mating Behaviour of Flour Beetles
Towfighi, Sohrab	3rd / BASc	Feng	Simulations of Bubble-Wall Collision and Rebound
Valdivia, Sebastian	3rd / BSc	Leung	Online Educational Resources for Incoming First-Year Calculus Students

Graduate Student Report

Young researchers from all over the world continue to seek out the graduate program in the mathematics department at UBC. In the Fall of 2012, twenty new graduate students joined the department: twelve in the M.Sc. programme and eight in the Ph.D. programme. Four more students moved from the M.Sc. programme to the Ph.D. In the Fall of 2013 we are welcoming 23 new students split between the two programmes. Again four other students are transitioning from the M.Sc. to the Ph.D. programme. We started the year with 103 students.

They department offers nearly 40 graduate courses on a wide range of topics each year and students further participate in numerous weekly seminars where faculty, students, and other researchers from UBC and the world over share their work and learn from each other.

Graduate student hike (2013)

A few highlights of this year's graduate experience:

Graduate students at the Institute of Applied Mathematics (IAM) enjoyed their annual scientific research retreat after the winter term. They presented their current projects to their colleagues and the IAM faculty members. It is expected that graduating MSc students will present the results that will be forming their thesis. This year's retreat was, for the first time, held in collaboration with graduate students from Simon Fraser University and held at the SFU Harbour Centre in downtown Vancouver.

Two departmental projects in undergraduate education crucially rely on graduate students. First is the Math Learning Centre (MLC), a safe space where all undergraduates can go to receive help with their mathematics courses from trained graduate student TAs. This longstanding programme has recently undergone a transformation: not only is it staffed by graduate students, but also administered by them. Student-driven changes include course-specific TA allotment for upper year courses (so that advanced undergraduates can have dedicated resources) and an express service for students looking for a bit of quick guidance. Kyle Hambrook and Cindy Blois served as Heads of the MLC in the first and second term, respectively, with special support by Bernhard Konrad, Marc Carnovale, and Malcolm Rupert. The expertise, commitment, and professionalism of all the math graduate students working in the MLC led to a very successful year and will ensure the MLC continues to improve.

Second is a new resource provided by our graduate students: the Math Exam Wiki, curating problems and solutions from past UBC math final exams at all levels (with an emphasis on first-year courses). Often multiple solutions are provided if different techniques are available to solve a problem. In addition to solutions, hints are provided for many questions in order to guide the student towards self-discovery of the methods and answers. Currently over 500 completed solutions are available on the wiki, which may be found at *http://wiki.ubc.ca/Science:Math_Exam_Resources*

The Math Graduate Committee (MGC) represents all math graduate students. It advocates for students in individual and community matters in the Math Department and in UBC as a whole. Scientifically, it organizes a regular graduate student seminar where students share interesting mathematics and enjoy a free pizza lunch. It also organizes social events where students can relax and get to know each other. ■

Iain Moyles   Kyle Hambrook

Departmental Seminars

Roger Donaldson, UBC math alumnus and Visiting Scientist, speaking at SCIAM seminar

Mathematics department activities go far beyond the numerous course offerings. The department offers a wide variety of vibrant seminars throughout the year. These include more than a dozen weekly seminar series covering a broad range of research in pure and applied mathematics, a weekly seminar on mathematics education, a graduate student seminar and the weekly colloquium of more general mathematical interest (Fridays at 3, with coffee and treats at 2:45).

There are also several special lectures during the year which bring the most outstanding mathematicians from around the world to UBC. These include the IAM-PIMS Distinguished Colloquium Series and the PIMS-UBC Distinguished Colloquia (see page 20). Of special interest to the general public are the Hugh Morris Lecture on November 1 (see page 5), an IAM Distinguished Alumni Lecture on November 18 and the Ivan Niven Lecture on graduation day in May.

Notices of departmental seminars and special lectures are posted on: *http://www.math.ubc.ca/Dept/Events*

New Alumni

MSc Graduates

Graduate	Thesis / Interest	Supervisor	Life After UBC
Carnovale, Marc	Gowers Norms for Measures	Laba/Pramanik	Continued to PhD at Ohio State University
Cheek, Caleb	Towards a Classification of descent multiplicity-free compositions	van Willigenburg	
Delgado Carrillo, Monica	Two Mathematical Approaches to a Study of TCell Motion and Activation in the Lymph Node	Coombs	Working at U. of Guanajuato in math outreach with schools
Fraser, Robert	On the number of prime solutions to a system of quadratic equations	Magyar	Continued to PhD at UBC
Herrera Ryes, Alejandra	Mathematical models for immunodeficiency virus; post-treatment and memory activation	Coombs	Continued to PhD at UBC
Hiller, Rebecca	Mathematical modeling of maltose uptake system in E.Coli using nanodisc fluorescence quenching data	Cytrynbaum	
Hoskins, Jeremy	The application of symmetry methods and conservation laws	Bluman	PhD in U. Michigan
Keet, Adrian	The Kervaire Invariant	Adem	Working for Nvidia (Silicon Valley)
Koch, Christina	Families of forbidden configurations	Anstee	working for tutoring service in Vancouver
Kolesnik, Brett	Expander graphs	Angel	Continued to PhD at UBC
Leppanen, Samuli	On the Crossing Number Inequality and Two-Dimensional Complex Plane	Solymosi	Continued to PhD at ETH
Martel, Justin	Geometric retracts of Siegel's upper half space	Silberman	Continued to PhD at UofT
Milnor, Thomas	On the Orbifold Fundamental Group	Rolfsen	
Moulding, Erin	Spectral properties of matrices arising from primal-dual interior-point methods for convex quadratic programs	Greif	Teaching at Columbia College
Richardson, James	Inradius Bounds for Stable, Minimal Surfaces in 3-Manifolds with Positive Scalar Curvature	Fraser	Technical Analyst for UBC Center of Operations Excellence
Robson, Lance	Shalika Germs are Motivic	Gordon	Law School at UBC
Rupert, Malcolm	Extending Erdos-Kac and Selsberg-Sathe to Beurling primes with controlled integer counting functions	Martin	PhD student, University of Idaho
Vo, Huan	Three-manifold Constructions and Contact Structures	Rolfsen	Continued to PhD at UofT
Yu, Hang	On the minimal degrees of complex linear representations of classical groups over finite local rings	Silberman	
Yu, Wing Wa	Inversion of airborne electromagnetic data in 2.5D	Haber	Working at EOS UBC
Zaman, Asif	Escape of mass on Hilbert modular varieties	Silberman	Continued to PhD at UofT
Zukewich, Joshua	Space Matters: evolution and ecology in structured populations	Hauert/Doebeli	

PhD Graduates

Graduate	Thesis / Interest	Supervisor	Life After UBC
Abbaspour, Hesameddin	Arithmetic theory of symmetrizable split maximal Kac-Moody groups	Casselman	Grad school in Ottawa
Bennoun, Steve	Localization in weak bialgebras and Hopf envelopes	Carrell/Brosnan	Swiss civilian service
Fazly, Mostafa	m-Liouville theorems and regularity results for elliptic PDEs	Ghoussoub	Max Wyman Assist. Professor, University of Alberta
Hamieh, Alia	Special values of anticyclotomic L-functions	Vatsal	Postdoc at Queen's University
Harland, Nicholas	The Iterated Carmichael lambda function	Martin	Instructor, University of Manitoba
Koo, Eva	On global properties of solutions of some nonlinear schrodinger-type equations	Gustafson/Tsai	Postdoc at U. Iowa
Mejia Miranda, Yuri	The critical points of lattice trees and lattice animals in high dimensions	Slade	
Rozada, Ignacio	Topics in the stability of localized patterns for some reaction-diffusion systems	Ward	Working at BCIT
Timmers, Dennis	Phase transitions in the neighbourhood of mean field theory	Brydges	Intern at Metafor Software
Wong, Erick	Structure and randomness in arithmetic settings	Martin	Google, Mountain View, CA

Postdoctoral Fellows

Name	Supervisor	Years at UBC	Where To
Bond, Matthew	Laba	2	
Das, Raibatak	Coombs/Keshet	7 (PDF & RA)	Assistant Professor, Dept of Biology, University of Colorado, Denver
Ghigliotti, Giovanni	Feng	2	Postdoc, University of Nice
Ito, Tetsuya	Rolfsen	1	Assistant Professor, Research Institute for Mathematical Sciences (RIMS), Kyoto University, Japan
Kitagawa, Jun	Ghoussoub/Kim	2	Postdoc, University of Toronto
Li, Martin	Fraser	2	Postdoc, Department of Mathematics, MIT
Mansour, Hassan	Yilmaz/Friedlander	3	Member of research staff in the multimedia group, Mitsubishi Electric Research Laboratory, Boston, MA
Nec, Yana	Coombs/Ward	3	1-Yr Assistant Professor, Mount Allison University, Sackville, NB
Oyarzua, Ricardo	Schoetzau	1	Assistant Professor, Universidad del Bio-Bio, Chile
Sheshmani, Artan	Bryan/Behrend	1	Postdoc, Max Planck Institute, Germany
Steinberg, David	Bryan	1	Teaching position, University of Oregon, Eugene
Wang, Qiming	Feng	2	Postdoc, York University
Yurasovskaya, Katya	CTLT/Kuske	1	Instructor, Seattle University
Zwiers, Ian	PDE Group	3	Research Analyst, Atomic Energy Canada (AECL)

Report from PIMS

2013 marked PIMS' first full year in its new home in the state-of-the-art Earth Sciences Building. The institute took full advantage of its new facility and the space it provides!

In April, PIMS held a reception to announce the opening of The Unravelers: Mathematical Snapshots, an original exhibit provides an intense and remarkable glimpse into the culture, experiences, and people of the Institut des Hautes Études Scientifiques (IHÉS), a world-class centre for scientific research in France. The nearly 100 attendees included the Directors of PIMS (Alejandro Adem), BIRS (Nassif Ghoussoub), CRM (François Lalonde), The Fields Institute (Edward Bierstone) and
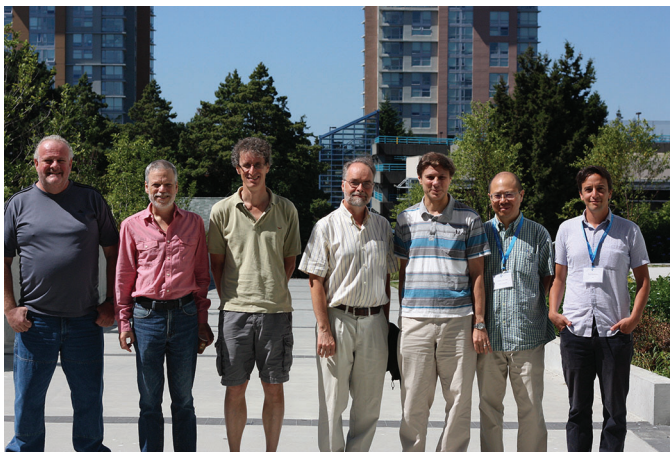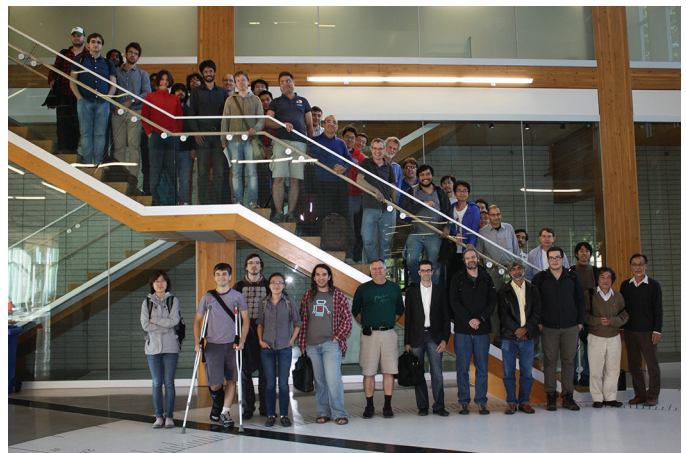

N. Ghoussoub at his birthday conference

IHÉS (Jean-Pierre Bourguignon), the Consul General of France in Vancouver (Mme Évelyne Decorps) and the French scientific attaché (Didier Marty-Dessus), as well as faculty, students and staff from UBC and SFU. The exhibit was displayed for the first time in Canada at UBC, in the Pacific Museum of the Earth Gallery.

In summer 2013 PIMS hosted multiple conferences, receptions and special guests. These included conferences and workshops on High Dimensional Data Analysis, Automata Theory and Symbolic Dynamics, Recent Advances in Hodge Theory and Numerical Linear Algebra and Optimization; the latter was in

M. Barlow, E. Perkins and the organizers of their birthday conference

honour of Michael Overton's (from NYU) 60th birthday. PIMS also hosted conferences in celebration of UBC Math professors' 60th birthdays: Analysis and Partial Differential Equations in honour of Nassif Ghoussoub and Recent Trends in Stochastic Analysis, in honour of Ed Perkins and Martin Barlow, and 70th birthdays: the Cascade Topology Seminar, in honour of Dale Rolfsen and Complex Fluids and Flows in Industry, in honour of PIMS deputy Director, Bud Homsy.

B. Homsy's birthday conference

Special Guest lecturers in 2013 included Margot Gerritsen discussing "How does Google Google?", Avi Widgerson on "Cryptography: Secrets and Lies, Knowledge and Trust" and Ivar Ekeland (former PIMS Director) with a two-part lecture on "The Mathematics of Planet Earth". Please see page 5 of this newsletter for the poster announcing the Hugh Morris Lecture to be given by Phillip Holmes on November 1. ∎

PIMS Conference: Recent Advances in Hodge Theory

Please Tell Us

Please tell us some news about yourself, comments on this UBC Mathematics Newsletter, and/or any articles you would like to see in the future.

E-mail to: *newsletter@math.ubc.ca*

Outreach Activities

General Activities

Problem solving workshops: This year the Math Department held 87 problem solving workshops at schools throughout the Lower Mainland. More than 30 undergrads as well as several grad students, postdocs and faculty members participated.

Math Mania: This is a popular alternative math education event that has been presented in elementary and (more recently) middle schools of greater Victoria and the Lower Mainland since 1997. All age levels are welcome, although it is particularly suited to students in grades 4-7. Math Mania presents a variety of interactive demonstrations, puzzles, games and art. These activities are designed to demonstrate to students - and their parents - fun ways of learning both math and computer science concepts. This year we held 19 Math Manias. We visited Port Alberni, Sointula, Alert Bay, Tahsis, Sooke, Surrey, UBC (3 times), Coquitlam, Lytton, Chilliwack, Hope (5 sessions), Williams Lake, Clinton, Port Renfrew. We were able to reach out to more than 1000 children, their parents and teachers with this wonderful event. We also provided care packages for parents to play math games with their children. UBC students and faculty have been an integral part of this event.
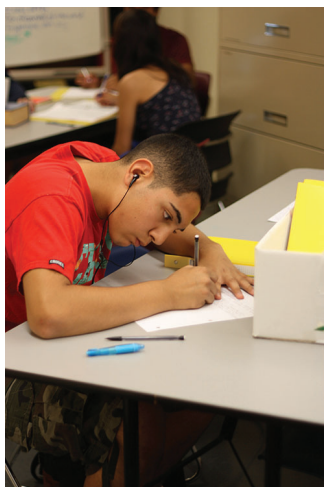
Summer Camp (2013)

Teacher Workshops: A variety of workshops designed to help elementary and secondary school teachers build their math skills for the classroom are supported by PIMS and the math department. We reached out to more than 500 teachers this year. Teachers received didactical materials during and after workshops to support their practice as well as information as to where they could obtain further support.

A Coordinated Peer Mentorship program: Teachers recruit some of their best students to become peer mentors either at their high school or to provide help at one of their feeder elementary schools. The pay for a peer mentor is $125 per month to mentor 3 to 4 students for 3 to 4 hours a week for 8 months; for $1,000 a year we are able to make a difference in the lives of 4 to 5 people. This year we had 25 peer mentors: 6 students working at Port Alberni Secondary, 10 students working at Edward Milne Community School, and Belmont Secondary School, 1 student at Port Renfrew, and 8 students in East Vancouver. This program touched the lives of 104 kids.

Vancouver Summer Camps: Five-week Emerging Scholars Aboriginal Summer Camp in Vancouver: Students attend 5 days a week to take courses in math and English in the morning; three afternoons per week, they work with a member of the University community in an area of their choice, and on

Alan Reid (2nd from right), recipient of the PIMS Math and Science Scholarship

Thursdays they meet in a circle with various members of the Aboriginal community to learn about their culture, and discuss career possibilities among other things. In 2012, 24 students attended this camp. In 2013, 30 students attended this camp

Five-week Transitional Summer Camp for Aboriginal students in Vancouver: This camp is for students transitioning from elementary school to high school; they take one and a half hours of math, and one and a half hours of English, and two hours of sports every day. Once a week, they have a cultural mentorship lesson with Elders. In 2012, 21 students attended this camp. In 2013, 20 students attended this camp.

School partnerships: During the last six years, PIMS and the mathematics department have developed a partnership with Britannia Secondary, Windermere Secondary, Templeton Secondary, VanTech Secondary, Point Grey Secondary, John Oliver Secondary and MacDonald Elementary in Vancouver. These schools have a large number of aboriginal students and at risk students. Together with the Mathematics Department at UBC, we have been coordinating mentorship programs and Math clubs at these schools which are open to all students. PIMS is also coordinating a scholarship program to support the neediest of students attending our programs. This year we were able to reach out to more than 100 kids at these schools. Since 2007 we have been providing scholarships to some students at these schools.

Emerging Scholars , Summer Camp (2013)

Two students in our program will be attending the Mini-Med school at the Child and Family Research Institute.

At least 10 out of 17 students who attended our transitional summer camp graduated from high school. All of them will be continuing their studies and training. Two of these students were accepted at UBC (one of them will be coming to UBC with the intention of studying mathematics, and the other one has deferred her entrance to attend a college for a year in the United States), four will attend Langara, two will attend Douglas college and two will attend BCIT. ■

Melania Alvarez
PIMS BC Education Coordinator

Melania Alvarez

UBC Math Circle

The 2013 UBC Math Circle was held on campus each Monday from 5-7pm, from January 14th to April 8th. Approximately 50 Metro Vancouver high school students attended. Students were invited primarily based on performance on the Canadian Open Mathematics Challenge (COMC), sponsored by the Canadian Mathematical Society (CMS). Other students were invited based on their own applications or teacher recommendations. During the first hour of each Circle meeting, there was a presentation by a UBC professor from Mathematics, Physics or Computer Science. Following a pizza break, there were problem-solving sessions run by outstanding UBC undergrads. Students could choose between applied or Olympiad-level problem-solving sessions.

Reception honouring top performing students in Canadian Open Mathematics Challenge

Due to a generous donation from a UBC Math alumnus, we now offer scholarships to recruit outstanding BC high school Math students to UBC — a $15,000 scholarship was awarded to Maxwell Allman (Point Grey HS) to attend UBC starting in September 2013. Scholarship winners can choose any field of study at UBC.

In 2013, the UBC student volunteers were led by Ron Estrin and Paul Liu. The volunteers included Shamil Asgarli, Bill Chen, Karlming Chen, Ronnie Chen, Behrooz Ghorbani,

George Bluman

Junghoo Kim, Eric Naslund, Kristina Nelson, Jonathan Shen, Foster Tom, and Allen Zhang.

High school students are welcome to apply to participate in the next UBC Math Circle starting in mid-January 2014. For further information check our website: *http://outreach.math.ubc.ca/sch_olympiad.html*

George Bluman,
2013 UBC Math Circle Coordinator

UBC-PIMS Distinguished Postdoctoral Fellowship

The UBC-PIMS Distinguished Postdoctoral Fellowship is a new highly prestigious fellowship awarded to the most talented postdoctoral scholars. The inaugural recipient is **Tim Hulshof** who obtained his PhD at Eindhoven University of Technology under the supervision of Prof. Remco van der Hofstad. His area of expertise is high-dimensional percolation and his recent work involves the study of geometric and stochastic properties of the so-called "incipient infinite cluster" in high dimensions. Dr. Hulshof is a rising star in this area of high visibility and intense activity.

Tim Hulshof

Staff News

In late August, the department bid a fond farewell to **Yvonne Diamond** at a reception in her honour. Yvonne has served with dedication as Math administrator since 2000. She is originally from Hong Kong and earned her BA from UBC. Before coming to Math, she worked in several UBC departments including Asian Studies and Medicine. Yvonne is moving on to a position as Manager of Administration in the departments of Sociology and Anthropology. Yvonne, we will miss you!

Yvonne Diamond

Our new department administrator is **Marlene Tecson-Golfinopoulis**. Marlene is originally from the Phillipines and earned her BA in History from UBC. She has worked for five UBC departments since 2000. We trust that Marlene will find UBC mathematicians every bit as charming as others at UBC. Welcome to Math!

Marlene Tecson-Golfinopoulis

Faculty Awards and Honours

Alejandro Adem, **Martin Barlow**, **David Boyd**, **Jim Carrell**, **Bill Casselman**, **Ailana Fraser**, **Nassif Ghoussoub**, **Izabella Laba**, **Zinovy Reichstein**, **Maurice Sion** and **Gordon Slade** were announced as Inaugural Fellows of the American Mathematical Society.
See: *http://www.ams.org/profession/ams-fellows/ams-fellows*

Neil Balmforth has been awarded the 2013 CAIMS Research Prize. This prize is awarded for outstanding contributions in applied mathematics.
See: *http://www.caims.ca/news/caimsscmai-research-prize-2013*

Kai Behrend, **Izabella Laba**, and **Jun-cheng Wei** have received prestigious invitations to speak at the International Congress of Mathematicians in Seoul, Korea in August 2014.
See: *http://www.icm2014.org/en/program/scientific/section*

James J. Feng has been appointed as a Peter Wall Distinguished Scholar in Residence for the coming year. The Peter Wall Institute supports research in a collaborative, interdisciplinary environment.
See: *http://pwias.ubc.ca/programs-awardees/national-programs/distinguished-scholars-in-residence/*

Dragos Ghioca received a 2012-13 Killam faculty teaching prize, recognizing outstanding contributions made by teaching faculty.
See: *http://science.ubc.ca/faculty/awards/killam*

Nassif Ghoussoub has been awarded a Queen Elizabeth II Diamond Jubilee Medal to honour significant contributions and achievements.
See: *http://www.gg.ca/document.aspx?id=14019&lan=eng*

Rachel Kuske has been selected by the Association for Women in Mathematics (AWM) as one of ten recipients of their inaugural AWM Service Award.
See: *https://www.dropbox.com/s/xr4hemb7tjts4o2/PR%20AWM%20Service%20Awards.pdf*

Zinovy Reichstein was the recipient of the 2013 CMS Jeffery-Williams Prize for outstanding research contributions in mathematics. This is the top research prize given by the Canadian Mathematical Society to senior mathematicians.
See: *http://cms.math.ca/MediaReleases/2013/jw-prize*

Tai-Peng Tsai has been awarded the Morningside Silver Medal of Mathematics from the International Congress of Chinese Mathematicians (ICCM) 2013. Up to six medals are awarded every three years to outstanding young mathematicians of Chinese descent.
See: *http://iccm.tims.ntu.edu.tw/#@MorningsideAwards*

Jun-cheng Wei has been awarded a NSERC Discovery Accelerator Supplement. This program provides substantial additional research support for superior research programs.
See: *http://www.nserc-crsng.gc.ca/Professors-Professeurs/Grants-Subs/DGAS-SGSA_eng.asp*

UBC faculty also serve the university, beyond the department, in many important ways. Richard Anstee and Philip Loewen serve on the Faculty Senate. Nassif Ghoussoub is a member of the Board of Governors and the Presidential Search Committee. Rachel Kuske is Senior Advisor to the Provost on Women Faculty. Mark MacLean is Vice President of the Faculty Association. ■

Fellowships

NSERC Doctoral Awards: **Matthew Coles**, **Justin Martel**, **Athena Nguyen**, **Kelly Paton**, **William Thompson**, and **Asif Zaman**.

NSERC MSc Awards: **Leo Hus** and **Connor Meehan**.

Four Year Fellowships: **Maxime Bergeron**, **Nishant Chandgotia**, **Ka Fai Li**, **Zheng Li**, **Stilianos Louca**, and **Vasu Tewari**.

Two Year Fellowships: **Hannah Cairns**, **Niki-Myrto Mavraki**, and **Byeongju (Wordsobe) Mun**.

Affiliated Fellowships: **Michael Lindstrom**.

PIMS IGTC (Internal Graduate Training Centre) Fellowship: **Jia Gou**, **Alejandra Herrera Reyes** and **Stilianos Louca**.

MITACS Globalink: **Jiaxing Wang**.

Killam Doctoral Fellowship: **Brett Kolesnik**.

Postdoctoral, and Graduate Student Teaching Awards

The Department Teaching Awards were awarded to one postdoctoral fellow, **Enrico Au-Yeung**, and to three graduate students, **Kelly Paton**, **Carmen Bruni** and **Cindy Blois**. As well, Math Learning Center Tutor Awards were given to **Vanessa Radzimski** and **Chao (Otto) Pang**.
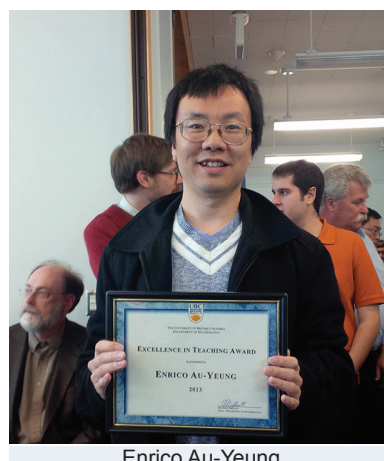
Enrico Au-Yeung

Carmen Bruni was also the recipient of a 2012-13 Killam graduate teaching prize, recognizing outstanding contributions made by a graduate student. See *http://science.ubc.ca/faculty/awards/killam*.

David Kohler was awarded a 2013 Science Achievement Award See: *http://science.ubc.ca/faculty/awards/achievement*.

PIMS/UBC Distinguished Colloquia

All lectures begin at 3:00 pm in Earth Sciences Building (ESB) 2012
The University of British Columbia
Preceded by a reception in PIMS Lounge (ESB 4133) at 2:30 pm

6 September, 2013

Yuval Peres, Microsoft Research

Yuval Peres is a Principal Researcher in the Theory group at Microsoft Research, Redmond. His research encompasses many areas of probability theory including random walks, Brownian motion, percolation, point processes and random graphs, as well as connections with Ergodic Theory, PDE, Combinatorics, Fractals and Theoretical Computer Science. Yuval is a fellow of the American Math Society and of the Institute of Mathematical Statistics. Peres has received the Rollo Davidson Prize, the Loeve Prize and has been both an ICM and ECM invited speaker.

20 September, 2013

Ulrike Tillmann, University of Oxford

Ulrike Tillmann specializes in algebraic topology and has made important contributions to the study of the moduli space of algebraic curves. She is titular Professor of Mathematics at the University of Oxford and a Fellow of Merton College. In 2004 she was awarded the Whitehead Prize of the London Mathematical Society, in 2008 she was elected a Fellow of the Royal Society and in 2013, a Fellow of the American Mathematical Society.

28 February, 2014

Jaroslav Nešetřil, Charles University

Jaroslav Nešetřil's research areas include combinatorics (structural combinatorics, Ramsey theory), graph theory (coloring problems, sparse structures), algebra (representation of structures, categories, homomorphisms), posets (diagram and dimension problems), computer science (complexity, NP-completeness). He has more than 300 publications and is a corresponding member of the German Academy of Sciences. He is chairman of the Committee of Mathematics of Czech Republic and in 2012, received the Medal of Merit of the Czech Republic.
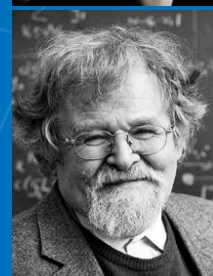
14 March, 2014

Robert Guralnick, University of Southern California

Robert Guralnick works in group theory and representation theory with applications to algebraic geometry and number theory. He was managing editor of the Transactions and Memoirs of the AMS from 2005 until 2013. He was the G. C. Stewart Fellow at Caius College in Cambridge in 2009 and a Simons Foundation Fellow for the 2012 academic year. He is also an AMS fellow. He was a plenary speaker at the annual AMS meeting in 2012 and has been invited to speak at the next International Congress in 2014.

28 March, 2014

Linda Petzold, UC Santa Barbara

Linda Petzold is a Professor and Director of the Computational Science and Engineering Program at the University of California, Santa Barbara. She has been a member of the Applied Mathematics Group at Sandia National Laboratories in Livermore, California and was Group Leader of the Numerical Mathematics Group at Lawrence Livermore National Laboratory. Dr. Petzold is a member of the US National Academy of Engineering and a Fellow of the ASME and the AAAS. She was awarded the Wilkinson Prize for Numerical Software, the Dahlquist Prize, and the AWM/SIAM Sonia Kovalevski Prize.

Department of Mathematics
University of British Columbia

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                                                      (*as needs arise*)

School Outreach Fund: $ _____   **Other**: $ _____
(*Olympiad Circle, Canadian Open Mathematics Competition, Elementary and High School Workshops*)

* You are most welcome to contact the Department to establish a named endowment.

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Michael Bennett, Head
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