Mathematics Newsletter

2014

Message from the Head, Mike Bennett

Department Head, Mike Bennett

Dear Friends, Colleagues, and Alumni of UBC Mathematics:

The year 2014 was a good one for the UBC Department of Mathematics, despite our continuing challenges arising from chronic underfunding coupled with ever-increasing enrolment. On the faculty level, we saw success from our senior colleagues, such as Leah Keshet (elected a SIAM fellow) and Kai Behrend (awarded the CRM-Fields-PIMS prize, the top research award for a mathematician in Canada), as well as our junior, with Omer Angel winning UBC's Charles A. McDowell award for excellence in research, and Sabin Cautis being awarded both an NSERC Discovery Accelerator Supplement and the Andre Aisenstadt Prize from the CRM. Our graduate students have gone on to exciting new roles, in academics (postdoctoral fellowships at, for example, NYU, Harvard and Princeton, in the past year alone) and outside (jobs in Data Science and more general IT, and civil service positions in Ottawa). For more notable achievements and highlights, please visit our awards page, updated regularly.

Regarding our instructional mission, this year, as anticipated, we taught in excess of 18000 undergraduate and graduate students, in more than 200 sections. Our Undergraduate and Graduate Chairs, Mark MacLean and Dan Coombs, respectively, deserve much praise for their exceptional performance in steering these programs forward. As a bridge between them, Fok Leung continued his remarkably successful graduate student teaching training and certification program.

2014 was also a year of change in the Department, with retirements of long-standing colleagues, and arrival of new faces. We continued with our "flexible learning" initiatives and our development of online resources, including textbooks, for our undergraduate courses. The latter of these will, starting next year, enable us to become the first sizeable university in Canada (and possibly North America) to entirely replace expensive commercial textbooks in our full Calculus sequence with free online alternatives, produced "in house".

In other news, our building situation continues as before, with little hope for improvements beyond basic renovations dictated by safety requirements. The University's goal of greatly increasing international students numbers, while possibly driven by financial necessity, continues to place the Department under disproportionate strain, as we teach a far higher percentage of these students than other departments in the Faculty of Science. On the plus side, we have a strong and engaged cohort of Faculty and Staff ready to meet these challenges.

Keep in touch with us! We're always happy to hear from you, via email or phone, or you could just check out our webpage http://math.ubc.ca. If you're in town, think about dropping by to catch a seminar or colloquium, or to attend an alumni event. We'd love to know what you're up to. ■

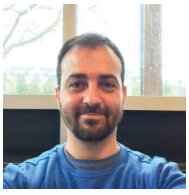
Contents

Editors: Roseann Kinsey, Lior Silberman

New Faculty

James Colliander joins us as Professor, and as the new Deputy Director of the Pacific Institute for the Mathematical Sciences (PIMS). James completed his PhD. with Fields Medalist Jean Bourgain at Illinois, and following postdoctoral positions in Berkeley and Chicago, he has been a professor at the University of Toronto since 2001. He is a leading authority on the mathematics of nonlinear waves, a research area bridging pure and applied mathematics with deep connections to harmonic analysis, Hamiltonian systems, and the physics of wave phenomena and turbulence. James is also founder and CEO of an educational technology startup company. ■

Shawn Desaulniers received his PhD in abstract harmonic analysis in 2008 under the supervision of Tony Lau at the University of Alberta. He subsequently taught Mathematics at Okanagan College in Penticton, before joining the UBC Mathematics Department as an Instructor in 2014. Desaulniers will also be working in Mathematics outreach and education. He has a particular interest in aboriginal education, and has organized a number of major initiatives in this area. Shawn and his wife Linda recently welcomed into their family their first child, Matthew Lucien. ■



Yaniv Plan received his PhD in Applied and Computational Mathematics in 2011 under the supervision of Emannuel Candès at the California Institute of Technology. The emphasis of his work was on Compressed Sensing. From there he continued to the University of Michigan for a postdoctoral position, before joining the UBC Mathematics Department in 2014 as an Assistant Professor, where he holds a Tier II Canada Research Chair in Data Science. Plan is interested in the theoretical underpinnings of Data Science. He is also interested in related mathematics such as random matrix theory and dabbles in applications in Learning Analytics. With him in Vancouver are his wife and two children. He and his family are enjoying exploring lovely Vancouver. ■

UBC Math Circle

The 2014 UBC Math Circle was held on campus each Monday from 5-7pm, from January 13th –April 7th. Approximately 50 Metro Vancouver high school students attended. Students were invited primarily based on performance on the Canadian Open Mathematics Competition 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 & Astronomy, 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.

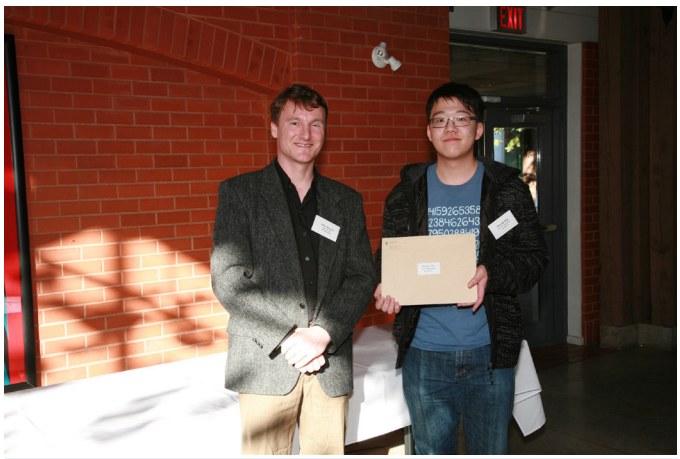
Due to a generous donation from a UBC Math alumnus, we now offer scholarships to recruit outstanding BC high school Math students to UBC who participate in the Circle—a scholarship was awarded to **Dong Xing (David) Yin** (New Westminster Secondary School) to attend UBC starting in September 2014. Scholarship winners can choose any field of study at UBC.

In 2013, the UBC student volunteers were Shamil Asgarli, Sasha Averline, Maxwell Allman, Donald Chacon-Taylor, Ron Estrin, Farzad Fallahi, Paul Liu, Kristina Nelson and Foster Tom.

Dragos Ghioca

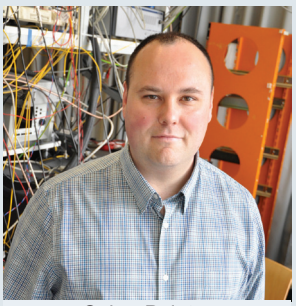
High school students are welcome to apply to participate in the next UBC Math Circle starting in mid-January 2015. For further information check our website: *http://outreach.math.ubc.ca/sch_olympiad.html.*

Dragos Ghioca,
2014 UBC Math Circle Coordinator



Michael Bennett (Department Head) with Dong Xing Yin of NWSS

Interview with Alumnus Oskar Painter


Oskar Painter

Oskar J. Painter is the John G. Braun Professor of Applied Physics at the California Institute of Technology (Caltech) and a co-director of the Max Planck Institute for the Science of Light in Erlangen, Germany. In 2000 he helped found Xponent Photonics, an optical start-up company developing surface-mount photonics for telecom and data networking applications. His research interests include nanophotonics, quantum optics, and optomechanics for applications in precision measurement and quantum information science.

He received his BASc in Electrical Engineering from UBC in 1994.

Prof. Painter was interviewed by UBC undergraduate Alejandro Mendoza.

Alejandro: Why did you choose to study at UBC?

Oskar Painter: I probably wasn't that aware and didn't really put in a huge amount of effort into evaluation of what undergraduate school I would go to. But I had, in high school, followed the UBC basketball team quite a bit. So I knew a little bit of the school and liked the campus. I didn't know much about the engineering program, which is what I ended up entering, but I had heard some good things about Engineering Physics at UBC. That was probably the main reason I decided to study in UBC.

Alejandro: Why did you choose electrical engineering?

Oskar Painter: I had always been very interested in building things. When I was pretty young, I had a small workshop up in my room and I would tinker with various electronics and build things … It was more of a hobby at that time but … It's clearly something I could make a living at. But, in terms of the academic and intellectual things that excited me, certainly math and physics were the things that got me most interested intellectually. Naively, I thought that in engineering I would be able to continue to learn all of the basic math and all of the basic physics, the fundamental physics, and then be able to apply this to practical problems. And of course that's true but the education that you get as an undergraduate in engineering is not necessarily focused on all of these fundamental things. So even though I was an engineer I was still very much drawn to the math department and the physics department.

Alejandro: Is that why you took the Honours Math option?

Oskar Painter: Yeah, that's right. I had a number of really good friends who were in physics and math at UBC at the time. Mark Van Raamsdonk, who's now a professor at UBC in Physics, was on the same floor in student housing with me for a couple of years. David Amundsen, who's now a professor at Carleton University, on the east coast, he was also on the same floor. So I sort of followed their lead a bit, but through them and through my own interests I got involved with the Honours Math program and decided that's something I would try to do in addition to the electrical engineering classes I had to take.

Alejandro: I noticed a lot of your research is focused on manipulating light. Why that particular focus or area of research?

Oskar Painter: As I said, I was always drawn to the classes in electrical engineering that were more fundamental. There were a number of classes on solid state and semiconductor physics by a fellow named David Pulfrey – he's now Emeritus – and he was one of the best professor I've ever had. He taught a series of classes that I took and was tremendously inspired by. So, when I was looking at graduate schools, I was mostly looking at places that worked with semiconductor systems. But, in the mid-nineties doing electronics was, I won't say passé but certainly, it was much more of an engineering effort in graduate school. Work on laser physics and semiconductor lasers was still a very hot topic at that time. So when I came to Caltech I got involved with photonics and quantum optics and semiconductor lasers. All that came from these amazing classes that David Pulfrey taught.

Alejandro: One of your most famous achievements – it was even featured in a PhD Comics video – is the Heisenberg Microscope. You explain in the video that several people had ruled it out as impossible but you and your student Amir weren't aware of this and actually managed to build it. How did that happen?

Oskar Painter: I hadn't really worked in this area of cavity optomechanics or precision optical measurement of mechanical objects. There had been work done by Russian theorists who were heavily involved in the development of the LIGO (Laser Observatory for Gravitational Waves) here in the US. They had developed many amazing fundamental concepts about what can and cannot be measured. One of their conclusions, if you read it superficially, seems to indicate that one should be able to use these optical techniques to measure the quantumness of a mechanical object. A mechanical object, if it had quantum behaviour, would have "zero-point fluctuations". Amir and I started discussing what sort of measurements we could do and we realized that we could measure these zero-point fluctuations. This isn't usually considered a definitive measurement quantum behaviour but it certainly is a strong indication and something that you wouldn't expect from a classical theory. So, being somewhat ignorant of these early papers we proceeded to do this measurement. When I first presented it a number of people in the field were very nice and kind and said this looked like good work but I think that, amongst themselves, they were wondering that

maybe the measurements were wrong. It turned out that if you read the original papers carefully, their conclusions were only valid under certain limitations and the type of measurement we were doing were not limited in the same way, and in the end it turned out that the measurements we did were completely valid and this is a technique that a lot of people have used to measure this quantum motion of a mechanical object. It was a really fun time and exciting and a little bit stressful where you're doing something that is completely new and not necessarily a well-trodden area of science. It's easy to be wrong, that's why all the stress, but at the same time it's exciting to do things that are new. It was one of the first times in my career where I had that experience; it was a lot of fun.

Working with Jorge Cham – the cartoonist behind PhD Comics – was a really great experience. It was amazing. That little video is based on a three-hour interview that we did non-stop: he taped us as we talked and then put it all together. You can tell that the dialogue is a little bit choppy but it was all in one take.

Alejandro: You mention how you can, in a sense, extend this quantum nature to macroscopic objects. I guess there are some limitations as to how much you can extend that, right?

Oskar Painter: Well, it's not clear. And the thing people still wonder: should we expect to see anything new? And I think when we wrote this paper, based upon these measurements I just mentioned, we sort of commented on it. We said, this result is probably not surprising to most physicists. It's a little bit like, if you think about a mechanical object like a bouncing basketball, we don't think about those things as quantum objects. The everyday person is not going to think about them as having quantum behaviour like being able to be in two places at once, things of this nature. So, that's what's always, I think, captured people's interest about doing quantum mechanics with mechanical objects, because they've been, for the most part, everyday objects. But, you know, I think you have to be very careful about whether you're really exploring new areas of physics and whether you expect to see anything new because, if you have a big object and it has Avogadro's-number degrees of freedom and you isolate one of those degrees of freedom and then study it's quantum behaviour then maybe it's not surprising that it behaves like a quantum object. So, you have all these atoms jiggling around and if you're studying the common motion of one of them, the fact that that's quantum-mechanical is maybe not surprising. But there are people that believe that these experiments are interesting if you scale them up because if you have a massive object and it couples to gravity then the question of how you take the theories we have for gravity and how they melt together with the quantum theories we have of the microscopic, then there may be some interesting things to learn. I'm not so sure that I've seen theories or ideas for experiments that really look compelling and would allow us to explore this regime, but certainly the thing you hear is that the fact that we're dealing with massive objects with which their mass would couple to a gravitational field as the same time as they would be quantum-mechanical, if those effects could be simultaneously observed then maybe you'd learn something about quantum gravity, for instance.

I am content to think about that problem and think about whether there are some interesting experiments that could be done that are attainable but it's certainly very challenging. There are people at Caltech that are even more crazy–or more serious, depending on your vantage point–about doing this. Independent of finding out new physics it is very interesting to think about how to control all of these degrees of freedom

> *"...you may not know why you're learning some of the mathematics you're learning, but you'll regret it if you don't learn it carefully, so learn it well."*

as you scale something up, to manipulate the quantum state in a way that we just don't observe in classical physics. Doing that would allow you to simulate interesting quantum systems. For instance, there's this idea of quantum simulation where you use a quantum computer to simulate a quantum field theory that may be hard to solve. From an engineer standpoint, taking off my physics hat and putting on my engineer's hat, for me, what's most inspiring is that even if we don't learn something new about fundamental physics there is this really great challenge and really great opportunity to try to control larger quantum systems. And these may not be things that have more mass but they really may be just more complex quantum systems, because the behaviour becomes more interesting and more rich when you have more degrees of freedom to play with in quantum mechanics; the Hilbert space grows so enormously. So, for me, at least, that's a grand challenge and a really exciting thing to continue working on. And that may have applications to new types of quantum hardware for doing computation or communication. It might have intellectual benefit in the sense that we might learn something new about quantum mechanics.

Alejandro: It seems that a lot of these results could be transferred to quantum computing.

Oskar Painter: One goal we're really pursuing in my group right now is to use mechanical elements to interchange quantum information. It may be in a superconducting quantum circuit–these are the things that D-Wave works on in Burnaby. One of the problems with those systems–or one of the opportunities–is that one would like to maybe network these different quantum nodes together and it's very hard to do that over microwave cables. But if you're able to convert those quantum bits of information into optical photons then one could network these systems and distribute the quantum network, and one of the most interesting ways to do that is via mechanical elements. But those mechanical elements have to be quantum themselves and that's where our work comes in. We've been able to take mechanical elements and remove all the thermal energy so we really can manipulate them as pure quantum objects and

Cont'd on Page 5

interface them to a superconducting quantum circuit or a microwave one and produce this interface that would allow us to produce photons, flying qubits that carry this information and allow us to network these different systems together.

I would say that's going to happen in the next six or nine months. Not necessarily out of my group, but out of other groups. That's a short-term opportunity; these superconducting quantum circuits are really powerful already–they're almost at the point where you could imagine doing fault-tolerant quantum computing, where you could correct for the errors of the quantum gauge. Once that's possible you could really scale those sorts of quantum computing systems. So being able to have a quantum optical interface to do that quantum computing node would make it that much more powerful. And that's something that's going to happen in less than a year.

I'm not saying there's going to be a quantum computer in a year; I think there's still a huge number of challenges and technical difficulties to overcome. But I would say that mechanical elements behaving as quantum objects might actually play a role in the new technology.

Alejandro: How does math play a role in your research?

Oskar Painter: Obviously in everything, but there are a couple of really important things I'm glad I did. The first was the Honours Math program. It was really inspiring. The most important person, other than David Pulfrey, was a fellow named Lon Rosen. Lon was a mathematical physicist at UBC–he's also Emeritus at this point. He got me to join the Honours Math program and to really try to pursue some of these higher math classes. That was really valuable because my technical skills were much, much better than they would've been if I had just taken the standard math classes, which was really important because by the time I got to graduate school it allowed me to take classes and to focus on the physics, as opposed to trying to get through the math.

The second thing I did was that, when I was a graduate student, because I had this math background, I got really into mathematical physics. I got really hooked into learning as much as I could in group theory, and I wouldn't have been able to do that if I hadn't taken the classes I did at UBC. That really was the opening tool to some of the more practical things I did. Although I've never thought I was that good at math because I had others around that were clearly wired a different way and were really amazing at mathematics, I was good enough to allow me to really appreciate the physics that I was studying. That was very, very important.

Group theory turns out to be one of the best ways of understanding physics in general. If you want to understand physical phenomena or nature, then you should understand symmetry. You can go from there to understand the different states of matter and particles, so that was very important for me because once I studied group theory I really had a much better perspective for physics, and specifically for applied physics. A lot of applied physicists that learn solid state physics, or quantum mechanics ,they do so from a very practical standpoint, and I think you miss out tremendously. But if you do it from a group theory standpoint, you have this much bigger vision of what it is you're doing and what these physical objects are and a better appreciation. So that really allowed me to broaden my understanding and my perspective and has allowed me to study all sorts of areas of physics that I wouldn't have been able to get into if I didn't have that background.

The most useful classes were taught by the most useful professors. And that's really honest. I mean, I learnt a lot. I had J. J. Fournier for Calculus 100 or 101, David Boyd for Complex Analysis–they're both Emeritus. I had a really great linear algebra class from Rajiv Gupta who was really good. Classes I really enjoyed and found very difficult and challenging were 226 (multivariable calculus) taught by Lon Rosen and Real Analysis and Real Variables, 420 and 320. For me they were more "Can I do them?", they were more challenging, and I spent hours and hours thinking about the problem sets and thinking about these theorems, but it taught me to be more rigorous in the mathematics I did.

For me, it was really about being inspired by the teachers. I've always liked mathematics, I love the puzzles, I love the games, and I love being able to apply it. But it was really about being around these professors and learning from them; I just thought there was infinite knowledge out there and I was just trying to absorb as much as I could, so I always gravitated towards the best teachers and those are the classes I remember the most.

One or two years I tried to write the Putnam contest and, again, Lon Rosen or Rajiv Gupta were our trainers, and I really enjoyed that part. Lon was really important to my career because at that time he was very involved with the students. He looked out for the top students, and he got us together, we would go have dinner at his house and he would spend extra days teaching us tricks and practicing with us. He just loved mathematics and I think he loved everything about solving problems. So that was for me the richest part of my whole experience with the math department, what Lon did.

Alejandro: Any tips for students?

Oskar Painter: The obvious one, which is, one: you may not know why you're learning some of the mathematics you're learning, but you'll regret it if you don't learn it carefully, so learn it well; no matter what you go into, you'll find that it's applicable. And the other thing is: find that inspirational mentor, and that'll make all the difference in the world. So if you find teachers that you really enjoy learning from, then try to take as many of their classes as possible. I think UBC's math department is really, really good. I was certainly very well prepared. You have no clue how well prepared you are compared to other people at other universities. UBC Math, I can say, stands up against some of the best mathematics training you'd get in China or in Europe or in Israel. Coming to graduate school at Caltech, with the best people from all over the world, I was very well prepared. Take advantage of it.


Alejandro Mendoza

Alejandro: Thank you very much for this.

Oskar Painter: Yeah, my pleasure. Thanks for doing this. ■

Report from the Undergraduate Chair

Our undergraduate program is vast and undergoes continual evaluation and revision. Here are some statistics:

- 2014 Summer and Winter total enrolment is just under 19,000, of which 21% are international students. Total enrolment in 2008 Summer and Winter was just under 15,000, of which 12% were international students.
- Mathematics is one of nine departments in the Faculty of Science, but does about 22% of its undergraduate teaching.
- Mathematics teaches over twice the number of international undergraduate students as any other department in Science.
- Breakdown by course type: First-year courses 46%, Second-year courses 22%, remaining more advanced third and fourth year courses, many aimed at Math Major and Honours students 32%.

We have the challenge of constantly providing both quality first and second-year teaching on a large scale and teaching advanced courses for some of UBC's very best undergraduates (as detailed below).

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

Course Development and Pedagogical Innovation

Maintaining effective courses is a continual process, with particularly high activity in the past few years.

The department continues to participate in the Carl Wieman Science Education Initiative (CWSEI), a Faculty-of-Science-wide program started by its Nobel-Laureate namesake to improve undergraduate education by performing scientific, evidence-based study of teaching and learning. Recent projects have focused on many core second year courses like multivariable calculus, differential equations, vector calculus, matrix algebra, and mathematical proofs. The Director of the MATH-CWSEI partnership is Costanza Piccolo.

Members of the Mathematics Department have also been successful in recent Teaching and Learning Enhancement Fund (TLEF) grant competitions. Mark Mac Lean was awarded a Flexible Learning TLEF grant for MATH 104/184, and a team of our graduate students was awarded a Flexible Learning TLEF grant for the Math Exam Resources wiki. Mac Lean is also the Principal Investigator for a TLEF grant to support an adaptive comparative judgment project with faculty members from across several departments in Arts and Science.

The Mathematics Department is participating in UBC's new Vantage College, and Fok-Shuen Leung is leading the development of an innovative implementation of some of our first-year calculus courses to be taught to a group of international students with strong mathematics skills, but with English language learning needs.

Our Programs

The Mathematics Department offers Majors and Honours degrees to students in Science and Arts. In addition, there are Applied Science students pursuing a "Minor in Honours Mathematics." About 100 students graduate each year with a degree in Mathematics.

Our programs are diverse, with many variants, including Combined Honours (e.g. some common ones are Physics/Math and Computer Science/Math), Double Majors, Combined Major, and a Co-op option. These options support a variety of directions after graduation, ranging from graduate school to a range of public and private sector jobs, and teaching careers. The Dual Degree Program in Mathematics and Education was created in 2008. This program allows prospective teachers to simultaneously take courses in these two disciplines, instead of first completing a Mathematics degree and then enrolling in Education. We also actively participate in two special programs for first-year students: Science One and the Coordinated Science Program.

Our Excellent Students

Our students are some of the most talented at UBC:

- **Ron Estrin**, in Honours Mathematics and Computer Science, won the Governor General's Silver Medal as the head of the graduating class for the Faculty of Science in 2014.
- **Behrooz Ghobani,** in Mathematics and Economics, won the Governor General's Silver Medal as the head of the graduating class for the Faculty of Arts in 2014.
- 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

Our students also do well in comparison with students across North America: in the past decade, in each year the UBC team has placed in the top 20 in the annual Putnam Mathematics Competition, involving around 400 universities and colleges across North America. Participants attend weekly training sessions led by Greg Martin. Our undergraduates also get together at the Undergraduate Mathematics Colloquium, which is under the guidance of Fok-Shuen Leung.

A number of scholarships and prizes are awarded to Mathematics students each year. Students who have won these awards in the past year are listed alphabetically below. Two of these awards, the Collison and Palliser-Wilson scholarships, were established within the past four years.

- James A. Moore Memorial Scholarship: **Maxwell Allman**
- G. C. Webber Memorial Prize: **Shamil Asgarli**
- Reginald Palliser-Wilson Scholarship: **Max Boyko**
- Reginald Palliser-Wilson Scholarship: **Ning Ding**
- Dr. R. D. James Medal in Mathematics: **Ron Estrin**

- Lawrence Roberts Putnam Prize: **Farzad Fallahi**
- Lorraine Schwartz Prize in Statistics and Probability, Reginald Palliser-Wilson Scholarship: **Deshin Finlay**
- Reginald Palliser-Wilson Scholarship: **Caroline Lemieux**
- Ralph D. James Prize: **Liran Li**
- John Collison Memorial Scholarship in Mathematics: **Sarah Li**
- Lawrence Roberts Putnam Prize: **Ursula Anne Lim**
- Daniel Buchanan Scholarship in Mathematics: **Ian Macdonald**
- Reginald Palliser-Wilson Scholarship: **Kristina Nelson**
- Reginald Palliser-Wilson Scholarship: **Alec Theriault**
- W. H. MacInnes Scholarship in Physics and Mathematics: **Foster Tom**

Our undergraduate students as a whole also have a strong involvement in the local mathematical community. Just a few of their activities are:

- Our undergraduates (under the direction of Dragos Ghioca in 2014) voluntarily lead the UBC Math Circle, bringing roughly 40 talented students from Metro Vancouver for weekly faculty presentations and 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 Instructors and Staff

Teaching around 19,000 undergraduate students a year requires the hard work not only of the approximately 90 instructors who teach around 200 undergraduate course sections but also of our efficient staff. The involvement of graduate students and PDFs in our undergraduate teaching program is a critical part of their professional development, and we provide a range of training activities for them. They assist in teaching large first-year courses and large second-year courses under the supervision of an experienced faculty member.

Over the past decade, nine Mathematics Department faculty members have received the UBC Killam Teaching prize, including most recently Dragos Ghioca in 2013 and Fok-Shuen Leung in 2012. The Mathematics Department also annually awards teaching prizes to outstanding postdoctoral fellows and graduate students; see *http://www.math.ubc.ca/Dept/Awards/index.shtml* for these awardees.


Mark MacLean

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 both invaluable, effective, and ever-patient in their support of students and instructors.
~ Mark MacLean ~


Deshin Finlay receiving his prize

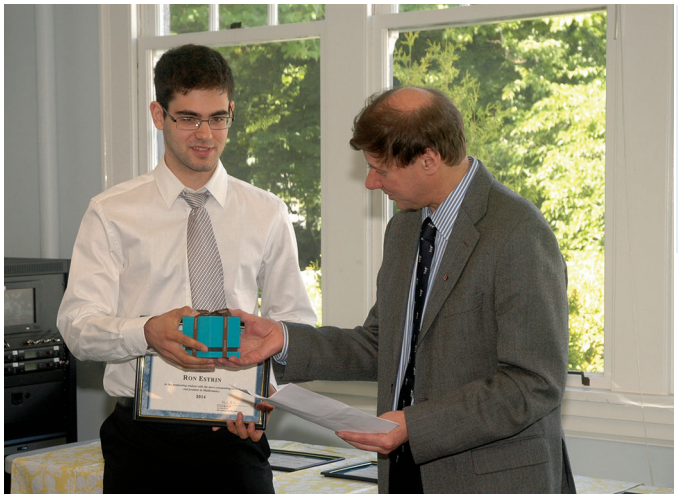
Performance of UBC Team & Students in Putnam Competition

Year	Team Rank	Students in Top 200 and Rank
2013	32	Farzad Fallahi (183), Ursula Anne Lim (202)
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

Governor General's Silver Medalists (from Math) in Science, 2000–2014

Year	Name	Program
2014	Ron Estrin	Combined Honours Computer Science and Mathematics
2014	Behrooz Ghorbani	Combined Economics and Mathematics
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



Ron Estrin, in Honours Mathematics and Computing, wins Governor General's Silver Medal as head of the graduating class in Science

Shamil Asgarli, winner of G.C. Webber Memorial Prize

Winner of the Lawrence Roberts Putnam Prize is **Ursula Anne Lim**

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 $3,500 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 : 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: 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 $6,475 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 Goverment 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 in enormously valuable for students contemplating Graduate School.

This was another successful summer for the USRA seminar.

NSERC USRA student hike (2014)

Participants included the 12 USRA students, international visitors (two from England and one from France) and some former USRA students. The usual format of two 1/2 hour student talks was followed with socializing and sports (very few coffee amongst this crowd). The talks were of a high quality of exposition. A very interesting talk by Winnie Miao explored the (claimed) proof of the ABC Conjecture (an important Number Theory result) by Shinichi Mochizuki. Two years after its appearance, it has yet to be verified but no holes in the long proof have been noted. Other talks explored some Mathematical Curiosities and Genetic Algorithms as well as expositions of students research progress.

A hike to Black Mountain was done in blissful if somewhat hot sunshine on July 29. A word game of note was played with great enthusiasm, perfect for a group hike. Someone chooses a hidden word and then reveals the first letter to the others. A round carries on until the hidden word is discovered. During the round, participants guess a word with the same starting letters as the hidden word and give out a cryptic hint. When you are ready to guess a word you yell Contact 1,2,3! and then reveal your guess. If two (or more) people (not the one with the hidden word) successfully guess the word, then the person with the hidden word reveals one more letter (in sequence). Great fun while hiking. ■

Richard Antsee

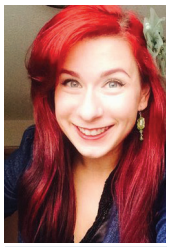
Summer 2014 USRA Recipients

Student Name	*Year/Program*	*Supervisor*	*Research Project*
Allman, Maxwell	1st / BSc	Anstee	Families of Forbidden Configurations
Brandts-Longtin, Alex	2nd / BSc (Ottawa)	Silberman	Topology of Modular Links
Dauvergne, Duncan	4th / BSc	Edelstein-Keshet	PDE Models of Molecular Motors
Finlay, Deshin	4th / BSc	Bluman/ Reichstein	Using Lie Algebra Properties and Differential Equations to Solve Equations in Lie Groups
Lindfield Roberts, Quentin	2nd / BASc (UBC-O)	Frigaard/Alba	Complex Fluid Invasion Experimentation and Apparatus Design
Miao, Wen Ling (Winnie)	1st / BASc	Martin	ABC Triples
Theriault, Alec	2nd / BSc	Peirce	Novel Approximation Schemes to Model Hydraulic Fracture
Thrasher, Samuel	2nd / BSc	Gustafson	Stability of Solitons
Tom, Foster	2nd / BSc	Silberman	Eigenfunctions of the Laplacian on Triangles
Tyhurst, Emily	1st / BSc	Kalle/Leung	Spiderwire: Visualizing Calculus
Wamer, Kyle	2nd / Arts & Sci (Toronto)	Gustafson	Stability of Solitons
Zhu, Yi Hang (Ian)	2nd / BSc	Coombs	Hindering Malaria Spread with a Fungus

Summer 2014 - Other Summer Research Students

Student Name	Year/Program	Supervisor	Research Project
Bhaskar, Dhananjay	4th / BSc	Edelstein-Keshet	Simulations of Epithelial Cell Monolayer
Gaulhiac, Sylvain	4th / Sci (France)	Reichstein	Simplifying Polynomials in One Variable Using Quadratic Form Theory
Louie, Christopher	3rd / BSc	Edelstein-Keshet/ Cytrynbaum	Modernizing the Life-Science Calculus Experience at UBC
Merchant, Brian	3rd / BASc (Toronto)	Feng	Development of a Cell Motility Model Coupling Rho GTPase Interactions with Geometry
Uchida, Rodolfo	4th / Math (Brazil)	Bluman	(no report)

Graduate Student Report


Vanessa Radzimski

The graduate program in the UBC Mathematics Department continues to provide a highly sought-after opportunity for young researchers in mathematics. The department admitted 28 new graduate students in the fall of 2013, of which 13 were enrolled in the MSc program and 15 in the PhD program. We are excited to welcome 16 new MSc students and 15 new PhD students to our graduate program in 2014! Moreover, three of our graduating MSc students continued their mathematical studies in our PhD program. In total, the number of graduate students in the department increased from 105 to 109.

The department offers students mentoring by leading researchers, as well as a selection of roughly 30 graduate courses each year and many seminars.Outside the classroom, there are social events where students can get to know their peers and faculty.

A major initiative by our graduate students is the Math Exam Resources wiki (*http://wiki.ubc.ca/Science:Math_Exam_Resources*), an online database of solutions (and hints!) to problems from past exams. This is provided as a free study guide to all undergraduates in the department, and in addition to exam problems includes how-to videos, topic summaries, and other goodies. Development of the wiki was helped by post-editing games nights, where students could wind down and play some board games over dinner. The graduate students plan to scientifically study how undergraduates use this resource in order to improve it further.

In June 2014, Mathematics and Statistics graduate students organized and hosted the 11th PIMS Young Researchers Conference. The conference provided a unique opportunity for young researchers in mathematics and statistics from Western Canada and the Pacific Northwest to come to UBC, meet their peers and discover the wide range of research they conduct. More than 60 participants had the opportunity to build personal and professional relationships, improve communication skills, and gain experience in a scientific conference. There were also presentation workshops, and talks related to non-academic career paths.

The Mathematics Graduate Committee organizes social and scientific events, striving to bring a strong sense of community to the graduate students in the department. Anyone interested can contact them at *mgc@math.ubc.ca*. ■

Grad students relaxing after TA Training

New Alumni

MSc Graduates

Graduate	*Thesis / Interest*	*Supervisor*	*Life After UBC*
Cairns, Hannah	Ellipse Packing	Nachmias	PhD student at Cornell
DuTot, Meghan	Comparing cell polarization models using local perturbation analysis	Keshet	Private Tutor; Mathematics, Statistics
Ghadermarzy, Navid	Using prior support information in compressed sensing	Yilmaz	Continued to PhD Math at UBC
Hargreaves, Brock	Sparse Signal Recovery; Analysis and Synthesis Formulations with Prior Support Information	Yilmaz	Software Analyst at Fotech Solutions, Calgary
Hormozi, Sarah	Transport and dispersion of particles in visco-plastic fluids	Frigaard	Postdoc at Ohio
Liao, Laura	Signaling in single cell wound healing	Keshet	PhD student at Ryerson
Lu, Hongliang	Critical probability of half space percolation	Nachmias	Working at GGY AXIS, Toronto
Luo, Yuwen	On the Regularity of Navier-Stokes Equations in the weak-L3 spaces	Tsai	Continued to PhD Math at UBC
Mavraki, Myrto	Variation of the Canonical height in a family of rational maps	Ghioca	Continued to PhD Math at UBC
Mohyedin Kermani, Ehsan	The behavior of the Hilbert scheme of points under the derived McKay correspondence	Bryan	MSc program in Computer Science at UBC
Montazer, Mohammad	Effect of geometry on the behavior of steady Newtonian fluid in a multiply connected domain	Homsy	Unknown
Mun, Byeongju	Harnack inequality for nondivergent linear elliptic operators on Riemannian manifolds: a self-contained proof	Kim	Studying for actuarial exams and running a tutoring business
Qin, Tong	An exactly divergence-free finite element method for non-isothermal flow problems	Schoetzau	PhD student at Brown University
Radzimski, Vanessa	Points of small height on plane curves	Ghioca	Continued to PhD Education at UBC
Sargent, Pamela	Minimal hypersurface of the round sphere	Fraser	Contined to PhD Math at UBC
Zou, Chenglong	On a generalization of Waring's conjecture	Bennett	PhD student at McGill

PhD Graduates

Graduate	*Thesis / Interest*	*Supervisor*	*Life After UBC*
Bauerschmidt, Roland	Decomposition of free fields and structured stability of dynamical systems for renormalization group analysis	Slade	Postdoc at Princeton
Cernele, Shane	Essential Dimension and Linear Codes	Reichstein	Has position with the Canadian Government in Ottawa
Chen, Yu-Ting	Stochastic models for spatial populations	Perkins	Postdoc at University of Montreal
DeGiuli, Eric	Continuum limits of granular systems	Balmforth	Postdoc at New York University
Edwards, Mclean	On monotone operator classes and the Borwein-Wiersma decomposition: with demonstrations using low dimensional examples and the construction of decompositions	Loewen	President at Syndemetic
Folz, Matthew	Adapted Metrics and random walks on graphs	Barlow	Data Scientist at Yammer

Ghadermarzi, Amir	Thue equations	Bennett	Unknown
Heumann, Jay	Modular symbols; Eisenstein series and congruences	Vatsal	Teaching at U.of Wisconsin-Stout
Kanazawa, Atsushi	Study of Calabi-Yau geometry	Behrend	Postdoc at Harvard
Kohler, David	Alon's second eigenvalue conjecture: simplified and generalized	Friedman	Academic Director, RED Academy
Okay, Cihan	Homotopy colimits of classifying spaces of finite abelian groups	Adem	Postdoc at University of Western Ontario
Pang, Chao	Uniqueness of Larangian mean curvature flow and minimal immersions with free boundary	Chen/Fraser	Postdoc in Korea
Yang, Zhengzheng	Nonlocally related partial differential equation systems, the nonclassical method and applications	Bluman	Masters in Finance at Waterloo

Postdoctoral Fellows

Name	*Supervisor*	*Years at UBC*	*Where To*
Au-Yeung, Enrico	Yilmaz	3	Assistant Professor, DePaul University, Lincoln Park Campus, Chicago
Burda, Yuri	Reichstein/ Ghioca	2	Postdoctoral Fellow, Fields Institute
Davila, Gonzalo	Kim	2	Unknown
Dixit, Harish	Homsy	3	Assistant Professor, Dept of Mechanical Engineering, Indian Institute of Technology, Hyderabad, India
Doerksen, Kevin	Number Theory	1	Data Scientist, BC Emergency Health Services
Eerdun, Buhe	Bluman	1	Professor, Department of Mathematics, Hohhot University for Nationalities, China
Gonzalez, Jose	Karu	3	Gibbs Assistant Professor, Yale University
Gordeliy, Lisa	Peirce	3	Research Scientist, Schlumberger Research, Boston
Gurel-Gurevich, Ori	Probability	3.5	Assistant Professor, Hebrew University of Jerusalem, Israel
Huruguen, Mathieu	Karu/ Reichstein	2	Postdoctoral Fellow, École polytechnique fédérale de Lausanne (EPFL), Lausanne, Switzerland
Levy, Alon	Ghioca	2	Postdoctoral Fellow, KTH Stockholm
Nguyen, Dong Quan	Bennett/Vatsal	2	Postdoctoral Fellow, University of Texas, Austin TX
Rath, Balazs	Probability	2	Postdoctoral Fellow, Department of Stochastics, Budapest University of Technology & Economics (BME)
Richmond, Ed	Carrell/van Willigenburg	4	Assistant Professor, Oklahoma State University, Stillwater, OK
Sadel, Christian	Froese/ Feldman	2	Postdoctoral Fellow, Institute for Science and Technology, Klosterneuburg, Austria
Valesin, Daniel	Probability	3	Assistant Professor, University of Groningen, Johann Bernoulli Institute for Mathematics & Computer Science, The Netherlands
Wiedemann, Emil	Kim/ Ghoussoub	2	Postdoctoral Fellow, Hausdorff Center for Mathematics, Bonn, Germany

Outreach Activities

The following report is for outreach activities delivered during the period of July 1, 2013 to August 30, 2014. Funding was provided by the Vancouver Foundation, UBC, the First Nations House of Learning, the BC Provincial Government, Van City, the Actuarial Foundation of Canada, and private donations.

General Activities

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. 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 Math Manias were held in Burnaby, Victoria, Vancouver, Port Alberni, Hope, Chilliwack, Sointula, Alert Bay, Gold Bridge, Shalalth, Duncan, Mount Currie, Williams Lake, Clinton, Lytton, Coquitlam, Kamloops, Thasis, Port Renfrew and Surrey.

ELMACON: The Elementary Mathematics Contest is a yearly event held at UBC open to students in Grades 5 to 7 from Lower Mainland schools. ELMACON gives them the chance to experience mathematics as an exciting sport. This year 300 students participated in this event which was held on May 3.

UBC/PIMS Math Workshops: These workshops in Lower Mainland schools aim to excite Grade 6-12 students about mathematics by exposing them to interesting and challenging problems and interesting math people. In the case of Grade 12 students, careers and university programs in the mathematical sciences are also discussed. The workshops are conducted by faculty and student volunteers from the UBC Mathematics Department, and are coordinated by Melania Alvarez the Outreach Coordinator. This year 87 workshops were conducted all over the Vancouver metropolitan area.

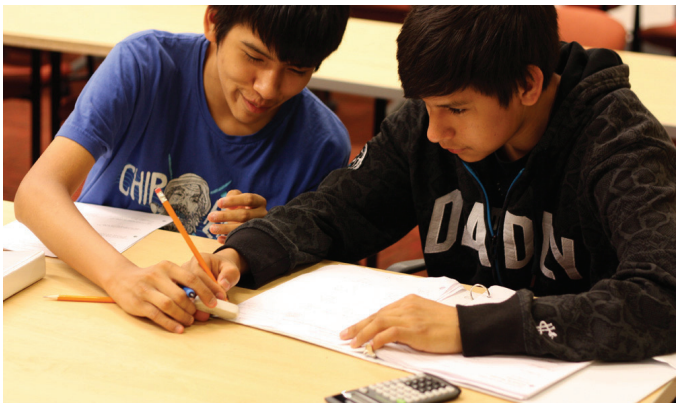
Teacher Workshops: A variety of workshops designed to help elementary and secondary school teachers build their math skills for the classroom are supported by our institution. This year we delivered five teacher workshops in the Vancouver metropolitan area.

Aboriginal Outreach

PIMS and the Math Department have developed a partnership program with First Nations schools, seeking to serve as a resource for enhancing the teaching of mathematics at their schools. We have also partnered with the Vancouver School Board, the Burnaby School Board, and the Urban Native Youth Association (UNYA) to provide enhanced opportunities for aboriginal students in the Lower Mainland. Over the past seven years, our activities have been able to reach out to approximately 1300 First Nations /Aboriginal students and over 250 teachers working at First Nations schools and public schools in Vancouver, Burnaby, Port Alberni, and Sooke with a high percentage of aboriginal students attending. These programs were funded by the BC Government, the Federal Government, the Vancouver Foundation, the Actuarial Foundation of Canada and private donors. PIMS and the Math Department have been able to jointly develop programs with the various Aboriginal communities according to their needs. Here is a description of some of our programs

Teacher Training/Math Development Sessions: sessions where mathematicians and educators provide lessons for teachers to help them assimilate teaching material for their mathematics courses. Sessions have been held at more than 45 First Nation schools in British Columbia. A sample of some of the locations we visited include: Kamloops, Lytton, Barriere, Port Alberni, Vernon and Merritt. Stein Valley Nlakapamux School at Lytton, Neqweyqwelsten School at Barriere, First Nations Elementary and Secondary schools at Bella Bella, First Nations Elementary School in Port Alberni (Vancouver Island), and the Xit'olacw Community School in Mount Currie.

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 a week they work with a member of the University community in an area of their choice, and on 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. This year 29 students attended this camp.



Cont'd on top of Page 15

For more information about this year's summer camp go to:
http://www.pims.math.ca/news/pims-emerging-aboriginal-scholars-summer-camp

School partnerships: During the last seven years, PIMS and the Math Department have developed a partnership with Britannia Secondary, Windermere Secondary, Templeton Secondary, VanTech Secondary, Kitsilano Secondary , Point Grey Secondary, Killarney Secondary, Tupper Secondary and MacDonald Elementary in Vancouver, which have a large number of Aboriginal students and at risk students. We have been coordinating mentorship programs during the school year at those schools. Through these mentorship programs we weekly reach out to more than 150 students throughout the academic year. ■


Melania Alvarez

Melania Alvarez
PIMS BC Education Coordinator

Report from BIRS

The Banff International Research Station (BIRS) has been described as the "jewel in the crown of Canadian Mathematics." Inaugurated in 2003, BIRS is a joint Canada-US-Mexico initiative and the result of a remarkable and concerted effort led, at the outset of the new millennium, by the mathematics department at UBC. The Station, where the scientific activities occur, is located at The Banff Centre in Alberta. Every year it receives over 2000 visits from researchers from 400 institutions in more than 60 countries, who participate in over 70 different programs. The leadership and headquarters of BIRS are located at UBC, where the scientific program is developed, reviewed and implemented, and where all the logistics of the operation are managed.

BIRS is nothing short of being a gift of the mathematics department at UBC to the world mathematical sciences community. Indeed, the Station was conceived and developed in this department, which continues to offer considerable support to BIRS, especially in terms of the continuous presence of its members on its Scientific Advisory Board. Most faculty members of the UBC Mathematics Department have contributed to this important task, either as panelists or as reviewers in this thorough and rigorous review process. Many of them also contribute to the BIRS programs by competing and –when successful—by organizing world-class workshops and summer schools at BIRS involving the very best in their fields.

In 2014, UBC mathematical scientists were involved in the organization of a number of BIRS' 52 weekly workshops, namely:

- Dynamics in Geometric Dispersive Equations and the Effects of Trapping, Scattering and Weak Turbulence
- Geometric Aspects of Semi-linear Elliptic and Parabolic Equations: Recent Advances and Future Perspectives
- Mathematics of the Cell: Integrating Genes, Biochemistry and Mechanics
- Probability on Trees and Planar Graphs
- Sparse Representations, Numerical Linear Algebra, and Optimization
- Geometric Scattering Theory and Applications
- Particle-Based Stochastic Reaction-Diffusion Models in Biology
- Motivic Integration, Orbital Integrals, and Zeta-Functions


Dynamics in Geometric Dispersive Equations and the Effects of Trapping, Scattering and Weak Turbulence workshop at BIRS (May 2014)

A particularly compelling 2-day workshop, "Connecting Women in Mathematics Across Canada" was co-organized by our colleague, Malabika Pramanik.

The department is particularly proud of its role in initiating this unprecedented North American scientific collaborative effort. In 2014, this collaboration reached a new level when the Government of Mexico awarded an infrastructure grant of 43-million pesos, for the construction of a BIRS-affiliated research facility in Oaxaca. Like BIRS, the new facility, Casa Mathematica Oaxaca (CMO) is located in a place of high culture, the Centro de las Artes de San Agustín Etla, also known as CASA. The international BIRS Scientific Advisory Board applies the same rigorous peer review process when selecting the additional 25-30 workshops that will occur each year, which are scheduled to begin at CMO in June of 2015. ■

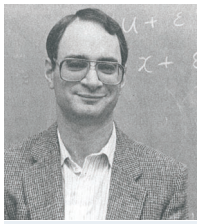
Please Tell Us

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***

Retiring Faculty

Retirement luncheon photos



George Bluman, circa 1992

Professor George Bluman formally retired in July 2014, remaining active and present in the department as ever. With five books and over 70 other publications to his credit, he continues research on symmetries and differential equations. He is currently working on a revision of his co-authored 2010 book, and hosting visitors as well as accepting invitations to visit internationally.

Prof Bluman has been a longstanding member of the UBC community,starting from his BSc in Honours Math and Physics (1964). He then completed a PhD in Applied Mathematics at Caltech in 1967 before returning as a full-time faculty member in the Department of Mathematics at UBC. At UBC he has served in many capacities, including as the first Undergraduate Chair, Department of Mathematics Head, as well as two terms on Senate and even on the UBC Medical School Admissions Committee, all while maintaining an active research program and outreach activities.

Prof Bluman has been editor of several mathematical journals, including Journal of Mathematical Analysis and its Applications (Associate and Division Editor), Journal of Engineering Mathematics, Communications in Mathematics, and World of Mathematical Equations. He has supervised 17 graduate students and numerous postdoctoral fellows, many of whom are co-authors on books or publications.

George Bluman has been one of the most active faculty members in outreach to K-12 mathematics education in BC and across Canada, winning the prestigious PIMS Education Prize (2000) and the CMS Adrien Pouliot Prize (2001). He has served as a vice-president of the Canadian Mathematical Society as well as a member of the BC Provincial Board of Examiners for K-12. He initiated a long-standing program of mathematics workshops in BC high schools, and organized the volunteer corps of faculty and students to take part in such activities. For over three decades, he organized the Euclid Mathematics Competition marking and prize ceremonies, involving many excellent BC mathematics teachers, as well as UBC faculty and students. For about 20 years, he was a member of the national committee that set the Euclid Contest paper. Bluman helped to form and organize the Mathematics Circle (a program of mathematics problem-solving activities at UBC for talented high school students), and gave countless talks and seminars for interested honours students, far beyond his normal teaching load. His style has always been to take personal interest in the development and flourishing of students who show an interest in mathematics.

Prof George Bluman has invested many years and continual energy in the goal of improving the BC K-12 Mathematics Education, a goal that remains close to impossible to achieve in the local political climate. He has appeared on CBC radio, local and national television, as well as national news media (e.g., Globe and Mail) on the gulf between the practices of the Ministry of Education and the attainment of school excellence in mathematics, promoting the superior performance of students from BC public schools compared to those from independent schools, and the need for highly trained and mathematically competent teachers and young people for Canada's future. He has also collected years of data on the performance of schools in the province dating back to 1974.

Prof Bluman has several important activities aside from mathematics. Most notably, he is involved with the history of the holocaust, with a particular emphasis on the role of Chiune Sugihara, the Japanese vice-consul in Lithuania (1939-1940) who, contrary to repeated Japanese government orders, issued over 2000 lifesaving transit visas, including one to his parents. George Bluman has served on the Vancouver Kristallnacht Committee (organizing the program for this Commemorative yearly event) since 1996, first as a member, and more recently as chair. ■

George Bluman, 2014

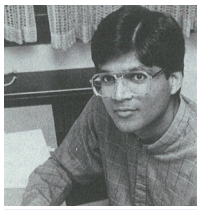
Retiring Faculty Continued


David Brydges

David Brydges received his BA in Experimental Physics from Cambridge University in 1970 and his PhD in Mathematics from the University of Michigan in 1976. He then spent two years at Rockefeller University before moving to the University of Virigina in 1978, where in 1996 he was named Commonwealth Professor.

In 2001, David moved to UBC to assume the position of Tier I Canada Research Chair in Mathematical Physics, which he held until his retirement in 2014. David's roots in physics have always driven his research, where he has made major contributions to mathematical physics, especially to quantum field theory, its connections with random walks in probability theory, and its analysis via rigorous renormalisation group methods.David has served in many capacities for mathematical organisations and institutes, including as President of the International Association of Mathematical Physics during 2003-05, and Deputy Director of the Pacific Insitute for the Mathematical Sciences during 2008-09. He held a Sloan Fellowship 1982-84 and was elected Fellow of the Royal Society of Canada in 2008.

In late 2014, David and his wife Betty Lu will take up residence in Damariscotta, Maine. ■


Rajiv Gupta, circa 1992


Rajiv Gupta, 2014

In high school, **Rajiv Gupta** won the Canadian Mathematics Olympiad Contest in 1976 and went on to the University of Waterloo, graduating in 1979 with the Gold Medal (top student) in Mathematics. He did his PhD. at MIT under Harold Stark in Number Theory in the area of Elliptic Curves.

Rajiv was hired by UBC in 1983 and arrived in 1984 after spending a year at the Institute for Advanced Study in Princeton. His interest in contests manifested itself in longstanding help with various contests (e.g Euclid Contest, COMC) at UBC and many problem sessions for students. Rajiv was Undergraduate Chair from 2004-2012 doing positive things for our thousands of students. His organization of a multisection exam in SRC is legendary.

He has a great interest in astronomy. When taking astro photographic images, exposure times of an hour are common! Rajiv is patient. With David Hare, he created a commercial computer program called Registar to do image processing for star pictures, namely aligning astronomical images. He used it for aligning black/white images taken with different colour filters to obtain a colour image. While at UBC, he took on the presidency of the Royal Astronomical Society of Canada for a two year term. Asteroid *14654 Rajivgupta* is named in his honour.

His retirement gives him more time with his wife Anu and son Rohin and also some time stargazing in Arizona. ■


Bud Homsy

Bud Homsy received his BS from Berkley in 1965 followed by graduate work at University of Illinois and a Postdoc at Imperial College, before joining the faculty at Stanford in 1970, where he stayed for 30 years in the Chemical Engineering department. He came to UBC in 2009 after 9 years at UCSB in Mechanical Engineering.

Over this timespan Bud served as department head, dean and many other positions. Bud enjoyed a prolific research career,touching many aspects of fluid mechanics and leaving a trail of well-cited publications. He was particularly well known for his work on porous media displacement flows, on interfacial instabilities and on viscoelastic fluids.

He was honoured as a member of the US National Academy of Engineering, as a Fellow of the American Physical Society, was awarded an honorary doctorate from University Paul Sabatier, Toulouse, France and the APS Fluid Dynamics Prize in 2003. Special meetings celebrating his career were held at the AIChE in 2008 and at UBC in 2013. He also pioneered novel aspects of fluid mechanics education through leading the development of "Multimedia Fluid Mechanics" (CUP, 2000).

Most notable however is Bud's role in mentoring younger engineers and scientists: not only his own students, but nearly everyone he interacted with benefited from his calm demeanour and well-considered advice.

At UBC Bud served as deputy director of PIMS,providing strong leadership and enhancing PIMS' profile in engineering and science. His time at UBC was relatively short, but appreciated by his colleagues and by many students.

He left in 2014 for a "second retirement" at University of Washington. ■

Department of Mathematics

Pacific Institute *for the* Mathematical Sciences

2015 Niven Lecture

May 25, 2015
1:15 pm

Math. Annex, room 1100
1986 Mathematics Road
The University of British Columbia

SPEAKER: **Ingrid Daubechies** (Duke University)

Surfing With Wavelets

Wavelets provide a mathematical tool that emerged in the 1980s from a synthesis of ideas in mathematics, physics, computer science and engineering. They are now used in a wide range of mathematical applications, and provide a mathematical way to "zoom in" on details, without losing track of the large picture. The talk will describe some of the essential features of the approach, and illustrate with examples.

FOR MORE INFORMATION VISIT:
WWW.PIMS.MATH.CA/SCIENTIFIC-EVENT/150525-NLID

ABOUT THE NIVEN LECTURES

Ivan Niven was a famous number theorist and expositor; his textbooks won numerous awards, have been translated into many languages and are widely used to this day. Niven was born in Vancouver in 1915, earned his Bachelor's and Master's degrees at UBC in 1934 and 1936 and his Ph.D. at the University of Chicago in 1938. He was a faculty member at the University of Oregon from 1947 until his retirement in 1982. The annual Niven Lecture Series, held at UBC since 2005, is funded in part through a generous bequest from Ivan and Betty Niven to the UBC Mathematics Department.

www.pims.math.ca @pimsmath facebook.com/pimsmath www.mathtube.org

Faculty Awards and Honours

Omer Angel has won the Charles A McDowell Award for Excellence in Research for 2013, a prize for a young UBC faculty member who has demonstrated excellence in pure or applied scientific research.
See:*http://www.research.ubc.ca/vpri/faculty-research-award-recipients*

Kai Behrend has won the 2015 CRM-Fields-PIMS prize. This is the top award for a research mathematician in Canada.See:*http://www.pims.math.ca/news/2014-crm-fields-pims-prize-winner-kai-behrend*

Sabin Cautis was the recipient of the 2014 Andre Aisenstadt Prize given by the CRM (Montreal), which recognizes outstanding research achievement by a young Canadian mathematician.
See: *http://www.crm.umontreal.ca/prix/prixAA14_an.shtml*

Leah Edelstein-Keshet has been elected a SIAM fellow. This is a recognition by the Society for Industrial and Applied Mathematics of her distinguished contributions to the discipline.
See: *http://fellows.siam.org/index.php?sort=year&value=2014*

James J. Feng has been elected as a Fellow of the American Physical Society, recognizing his exceptional contributions to research in physics.

Fellowships

NSERC Doctoral Awards: **Curt DaSilva**, **Brett Kolesnik**, **Frederic Paquin-Lefebvre**, and **Pamela Sargent**.

NSERC MSc Awards: **Catherine Byrne**, **Daniel Gomez**, and **Thomas Hughes**.

Four Year Fellowships: **Malcolm Bowles**, **Hon To Hardy Chan**, **Matthew Coles**, **Juan Fiallo**, **Kyle Hambrook**, **Alistair Jamieson-Lane**, **Alessandro Marinelli**, **Myrto Mavraki**, **Alexander McAvoy**, **Kateryna Melnykova**, **Kelly Paton**, **Alexander Tomberg**, and **Zichun Ye**.

Two Year Fellowships: **Zoe Hamel**, and **Alma Hernandez Torres**.

IAM Fellowship: **Frederic Paquin-Lefebvre**.

Graduate Student Research Awards


Michael Lindstrom

Starting this year, the department will recognize two graduate students (one each in applied and pure mathematics) for their excellence in research. The inaugrual winners of the Graduate Research Award were **Michael Lindstrom** (applied) and **Vasu Tewari** (pure).

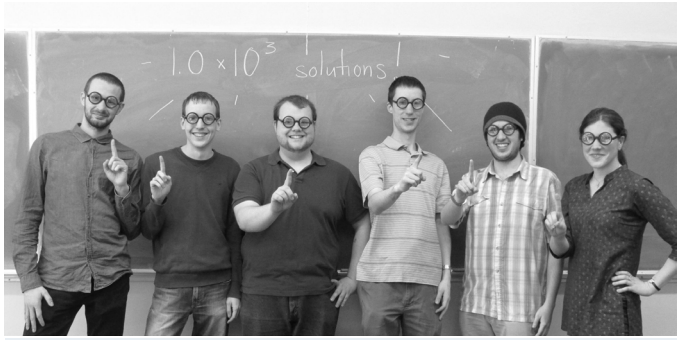

Vasu Tewari

They will each give a colloquium lecture, where they will describe their work to the rest of the department.

UBC-PIMS Distinguished Postdoctoral Fellowship


Khoa Nguyen

The UBC-PIMS Distinguished Postdoctoral Fellowship is a highly prestigious fellowship awarded to the most talented postdoctoral scholars. This year, **Khoa Nguyen** obtained this fellowship. Khoa obtained his PhD in 2014 from UC Berkeley under the supervision of Thomas Scanlon (jointly with Paul Vojta, and Thomas Tucker from the University of Rochester). Khoa's research spans various different avenues in arithmetic geometry: from diophantine geometry to arithmetic dynamics. With his prolific and strong research, Khoa establishes himself as one of the leading young researchers in arithmetic geometry. ■



Some of the MER wiki people. Celebrating (1111101000)_{2} reviewed solutions! *http://wiki.ubc.ca/Science:Math_Exam_Resources*

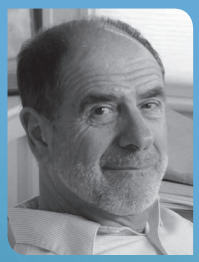
PIMS/UBC Distinguished Colloquia

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

19 September, 2014
Alexander Lubotzky, Hebrew University of Jerusalem

Alexander Lubotzky is a former head of the Mathematics Institute at the Hebrew University of Jerusalem, where he holds a Maurice and Clara Weil Chair in mathematics at the Einstein Institute of Mathematics. He is known for contributions to geometric group theory, the study of lattices in Lie groups, representation theory of discrete groups and Kazhdan's property (T), the study of subgroup growth and applications of group theory to combinatorics and computer science (expander graphs). He has received the Erdös Prize and twice, received the Sunyer i Balaguer Prize from the Institut d'Estudis Catalans.

10 October, 2014
Benedict Gross, Harvard University



Benedict Gross is the George Vasmer Leverett Professor of Mathematics at Harvard University and former Dean of Harvard College. He is known for his work in number theory, particularly the Gross–Zagier theorem on L-functions of elliptic curves. Gross was elected as a fellow of the American Academy of Arts and Sciences in 1992 and as a member of the National Academy of Sciences in 2004. He, Zagier, and Dorian M. Goldfeld won the Cole Prize of the American Mathematical Society in 1987 for their work on the Gross–Zagier theorem. In 2012 he became a fellow of the American Mathematical Society.

31 October, 2014
Liliana Borcea, University of Michigan

Liliana Borcea is the Peter Field Collegiate Professor of Mathematics at the University of Michigan. Her research interests are in stochastic methods with application to wave propagation and imaging in random media, in inverse problems and in the multi-scale analysis of diffusion in high contrast media. She is a member PIMS' Scientific Review Panel, a member of the SIAM council, has served as chair of the SIAM Imaging Science activity group and is on the Scientific Advisory Board of the National Academy of Finland, for the Center of Excellence in Inverse Problems Research.

30 January, 2015
Tom Hou, Caltech

Thomas Yizhao Hou specializes in numerical mathematics. Since 2004 he has been the Charles Lee Powell Professor of Applied and Computational Mathematics at Caltech. His research focuses on multi-scale analysis, adaptive data analysis and numerical hydrodynamics. He received the James H. Wilkinson Prize, is a fellow of the American Academy of Arts and Sciences and was a Sloan Fellow. He is the founding editor of the SIAM Journal on Multiscale Modeling and Simulation and is co-editor and co-founder of Advances in Adaptive Data Analysis. He has been editor of Mathematical Modeling and Numerical Analysis as well as co-editor of the SIAM Journal of Numerical Analysis.

13 March, 2015
Jill Pipher, Brown University

Jill Pipher is a past-president of the Association of Women in Mathematics and the first director of the Institute for Computational and Experimental Research in Mathematics. At Brown, she served as chair of the Mathematics Department from 2005 to 2008. Pipher's research focus is in harmonic analysis, Fourier analysis, partial differential equations, and cryptography. In 1996, Pipher, along with Jeffrey Hoffstein, Daniel Lieman and Joseph Silverman, founded NTRU Cryptosystems, Inc. to market their cryptographic algorithms, NTRUEncrypt and NTRUSign. She is a fellow of the American Mathematical Society.

Pacific Institute *for the* Mathematical Sciences

UBC Department of Mathematics