



Mathematics

Newsletter

2011

Message from the Head, Rachel Kuske

Dear Friends, Colleagues, and Alumni of UBC Math,

This year might be characterized by “The world comes to UBC Mathematics”. Two major conferences have come to Vancouver, the Winter Canadian Mathematics Society Meeting (December 2010) and the International Congress of Industrial and Applied Mathematics (July 2011). Our department has been involved at all levels, including co-chairing the conferences, working on steering committees, organizing sessions, running satellite meetings, providing financial and in-kind support, and of course, participating broadly in plenary talks and sessions.



In addition to our regular colloquium and seminar series, the new Pacific Institute for Mathematics (PIMS)-UBC Mathematics Distinguished Colloquium Series has brought in high profile speakers from a range of areas of mathematics. We have also raised the profile of the Niven Lecture Series, including it with the spring convocation activities. The department continues to benefit from other speaker series at the Institute of Applied Mathematics and PIMS, as well as series co-sponsored with other departments.

Of course UBC Mathematics has also gone to the world this year, with a strong presence from our department at the International Congress of Mathematicians in Hyderabad, India, last August, an increased presence at the Canadian Mathematics Undergraduate Conference, and a very active participation in conferences, workshops, lecture series, and collaborations across the globe. Our outreach activities keep us connected with our local world, with expanded workshop and afterschool tutorial activities, and students coming to UBC through our UBC Math Circle and Euclid Days.

The world continues to come to UBC Mathematics through the expansion of our graduate and postdoctoral programs, now with 115 graduate students and 52 postdocs and research associates. Our active visitor program brings plenty of long and short term visitors to the department, year-round. UBC has also seen increased international recruitment in our undergraduate populations. With students from all Faculties taking mathematics courses, we see a rich mix of international and domestic students in all of our programs. Our recent faculty recruitment has also attracted mathematicians to join us from around the world.

Hosting the world continues to be a priority as we plan for the future, exploring new building possibilities, improving present meeting and tutorial facilities, and developing technological support for online instructional tools, videoconferencing, and web activities. This year saw the birth of our UBC Mathematics Building Fund, and we thank our donors for their generous donations to this program as well as to our outreach and scholarship programs. We look forward to hearing about your part of the world, so please keep in touch with us, through our website, this newsletter, and upcoming UBC Math Events. Whether or not you’ve seen us lately, please come by for a visit, either in person or online: <http://www.math.ubc.ca>. ■

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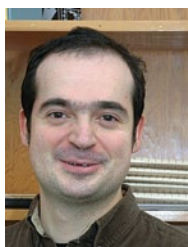
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New Faculty



In 2010, **Sujatha Ramdorai** joined UBC as Professor of Mathematics and Canada Research Chair. Prior to that, she worked as a Professor at the Math Department, Tata Institute of Fundamental Research, Bombay. Her research interests are in the areas of Iwasawa Theory and Motives. She served as a Member of the National Knowledge Commission between 2007-2009, a high level advisory body to the Prime Minister of India.



Dragos Ghioca received his PhD in 2005 from UC Berkeley, where he worked with Professor Thomas Scanlon. Ghioca is a number theorist working in arithmetic geometry and algebraic dynamics. Before arriving at UBC, Ghioca was an Assistant Professor at the University of Lethbridge and a post-doctoral fellow at McMaster University. He has written over 30 papers on a variety of subjects in arithmetic algebraic geometry.

Retiring Faculty



Ivar Ekeland studied at the Ecole Normale Supérieure, and got his PhD from the University of Paris 6 in 1970. He became a professor at the Université de Paris-Dauphine the same year, and stayed there until 2003, when he left for UBC to become Canada Research Chair in Mathematical Economics. His early work was on optimization and control: he coauthored with Roger Temam a book which has become a classic, *Convex Analysis and Variational Problems*. He then moved to Hamiltonian mechanics, and his work with Helmut Hofer was one of the cornerstones of symplectic topology. He was president of Paris-Dauphine from 1989 to 1994, and his interests changed to microeconomics and finance, where he has been active ever since. Aside from his scientific activity, he has written books for laymen, the latest one being *The Best of All Possible Words*, and for children, *Cat in Numberland*. He became a fellow of the Royal Society of Canada in 2008.



Robert Israel received his bachelor's degree from the University of Chicago in 1972, and his PhD from Princeton in 1975, joining the UBC Mathematics faculty in the same year. Robert is an expert in equilibrium statistical mechanics and author of the well known book *Convexity in the Theory of Lattice Gases*. With Robert Adams, he co-developed the MG software program used to produce all of the illustrations in the Adams' Calculus text. A recognized Maple guru, Robert is the Director of the "Maple Advisor Database" and author of *Calculus: The Maple Way*. He was a winner of the "The SIAM 100-digit Challenge" together with teammate Gaston Gonnet, co-founder of the research group that produced Maple. Robert is also one of the most well known solvers of problems that have appeared in Crux Mathematicorum.

Department Dinner 2011



Photo: UBC Math Department



Photo: UBC Math Department

Distinguished Colloquia

Distinguished Colloquium Series

This year PIMS and the UBC Mathematics Department have launched a new Distinguished Colloquium Series. Its purpose is to bring to UBC leading research mathematicians with a track record of giving clear talks for general mathematical audiences. In 2010-11 we scheduled 5 speakers:



John Coates (University of Cambridge, number theory)

Alexander Merkurjev (UCLA, algebra)



Ronald Graham (UC San Diego, discrete mathematics)

Alexander Razborov (U. Chicago, theoretical computer science)



Gregory Forest (U. North Carolina, applied mathematics)

So far the series has been a great success. The Distinguished Colloquia have been well attended by students, postdocs and faculty; some have drawn mathematicians from other universities as far away as Seattle. We plan to continue this series into the future. Confirmed speakers for 2011-12 include:



Jean-Michel Bismut (U. Paris-Sud, Orsay, probability/geometry)

Emmanuel Candes (Stanford University, mathematics/statistics)



Grigory Margulis (Yale University, ergodic theory)

Dusa McDuff (SUNY at Stony Brook, geometry/topology)



Karl Sigmund (University of Vienna, mathematical biology)

Niven Lectures at UBC

Ivan Niven was a famous number theorist and expositor. His textbooks won numerous awards, have been translated into many languages and are still widely used. 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. After his death in 1999, his family made a monetary donation to our department. In honor of their generous support the department established "The Ivan and Betty Niven Distinguished Lectures Fund".

In the first four years, the subject matter of the UBC Niven Lectures was limited to number theory. The first four Niven speakers were:

2004-05: **Carl Pomerance** (Dartmouth College)

2005-06: **Chin-Li Chai** (University of Pennsylvania)

2006-07: **Fernando Rodriguez-Villegas** (University of Texas)

2007-08: **Ram Murty** (Queen's University)

In 2009 PIMS became a cosponsor of this series, and the format changed to include all areas of mathematics, with the lectures aimed at a general mathematical audience. These lectures have been incorporated into the departmental graduation festivities in May. The 2009 and 2010 Niven lectures, delivered by the Fields medalist Efim Zelmanov of UCSD and the famous mathematician/statistician/magician Persi Diaconis of Stanford, respectively, were very well attended. In particular, last year there was standing room only at Diaconis' lecture.

2009: **Efim Zelmanov** (UC San Diego, algebra)

2010: **Persi Diaconis** (Stanford, probability and statistics)

Upcoming Niven lectures are:

2011: **Ravi Vakil**
(Stanford, algebraic geometry)

2012: **L. Mahadevan**
(Harvard, applied mathematics)



Zivony Reichstein

Interview with Alumnus Richard T. Lee



Richard T. Lee is the MLA for the riding of Burnaby North. Before being elected to the Legislature, Richard was a programmer analyst at TRIUMF, Canada's national particle research facility. In 1976 he earned a Combined Honours B.Sc. degree from UBC in physics and mathematics and in 1980 a M.Sc. (UBC) in Applied Mathematics.

Richard was first elected as the MLA in 2001 and was re-elected in May 2005 and 2009. He was appointed Parliamentary Secretary for Multiculturalism in March 2011.

Richard is a member of the new Cabinet Committee on Open Government and Engagement.

Previously, Richard served as Parliamentary Secretary for the Asia-Pacific Initiative (2005-2011), vice-chair of the Special Committee to Appoint a Merit Commissioner and Chair of the Government Caucus Asian Economic Development Committee.

He was also member of the Cabinet Committee on Climate Action and Clean Energy, the Legislative Select Standing Committee on Education, the Select Standing Committee on Legislative Initiatives, the Select Standing Committee on Public Accounts, the Select Standing Committee on Finance and Government Services, the Legislative Special Committee to Review the Police Complaint Process, the Special Committee to Appoint a Police Complaint Commissioner, the Government Caucus Committee on Economy and Government Operations and the Government Caucus Committee on Multiculturalism and Diversity.

Eric: Let's start near the beginning, what brought you to math at UBC?

Richard Lee: When I was a student, I attended half a year at Britannia Secondary School. Before that I was from Macau. During my high school years I became interested in math, especially trigonometry, geometry and some of the applications of calculus. We had a whole year of calculus in grade 12 in Macau. Math is a very fascinating area. I was just inside a world of the beauty of mathematics during my high school years. Math in high school led me to take further action and to enrol in math at University.

Eric: Did you ever have a favourite course or topic in math at UBC?

Richard Lee: Of course calculus, first year calculus because I had a strong background there already, and did quite well. That's the only course in which I got over 100%. Also, I believe calculus is fundamental to everybody in math and science, and I have always believed that.

There was a saying, "Math is the Queen of science and physics is the King of science," so at the time I wanted to master those two areas. That was my ambition, to apply mathematics. Even in my high school years sometimes I would sit down by myself and just do the exercises. I would do all the questions, not for homework, but just because I wanted to understand something. It was to get away from the world around me, to the world you go into, and then enjoy the closeness of the system. You have the axioms, and then you could derive the whole thing in order. Just using logic to derive a multitude of conclusions, which is fantastic, is something I really like.

Eric: What in particular made you decide to go into applied mathematics for your master's degree?

Richard Lee: I always think of math as a way to understand the physical world, and to use math as a tool to gain a better understanding of the world around us. Physics is describing the world, and math is a way to understand the physics principles. By chance I was taking the ordinary differential equations course in my second year at University. The professor was very good, Dr. Frederick Wan. I asked a lot of questions in class, and got a lot of answers as well. That summer I was offered a job under the summer job program, so I worked helping professor Wan develop models, and carried out calculations on economic development in the city and its relationship with transportation systems based on the Robert Solow model. We modeled how to optimize transportation and economic development in the city. With no roads no one can come in, so there is no economic development, and if you use all the urban land for roads then no one can live in the city. Of course there are some assumptions, a lot of assumptions in this model. I wrote computer programs using numerical methods to solve some equations. Every summer then since second year, I worked for a professor in the math department, helping them to do calculations. My interest continued after I graduated with my bachelor degree, so I entered a master's degree program in applied math.

I also took numerical analysis in computer science. I took a computer language course in my first year of university. At that time it was just the beginning of computer science.

The first computer program that I did was four lines, a Basic language program. The high school teacher found us a computer, and I remember that there were only two computers in all the high schools in the Province of British Columbia. One was in Point Grey, so we went over there, and punched the cards which were input into a card-reader to produce a paper tape. Then you run the paper tape into a machine and get output, e.g. just one line printing your name. This was my first encounter with programming.

Eric: What led you to work in particle physics?

Richard Lee: Well it's a long story. My interest in TRIUMF, the meson facility on the UBC campus, started from a teacher, and a field trip in grade 12. It was our physics teacher at Britannia Secondary, in 1972, and it was the physics class field trip. At that time, they had just started building TRIUMF. I saw the control room taking shape. There were a lot of people working on the site, doing construction, and also people playing table tennis. I thought to myself, "If in an organization people at their leisure can play some kind of sports, it must be a good place to work." In my first year of physics, they were building this machine and using some students to take out those plates, the iron plates, in order to trim the magnetic field of the machine. It was the shimming and trimming program. They needed a few first year physics students to help, and I became one of the students getting the opportunity to get into the heart of the structure and getting even more interested, "This is a big machine, it can do a lot of things. It would be fascinating to work in TRIUMF." So when I was close to finishing my master's thesis, I looked in the newspaper and they were looking for someone to be a programmer in the area that I wanted to go into. I was accepted to the position in the summer of 1979. It was my first full-time job out of university, and lasted until 2001. Over 22 years at TRIUMF, first as a programmer, then as a programmer analyst, doing calculations in areas around TRIUMF. For example solving the Maxwell equations in numerical magnetic field and electric field; supporting the beam dynamic group and the computing services group, and also seeing how different devices put into the cyclotron affect the magnetic field; studying how the beam of H-ions moves inside the cyclotron and predicting its behaviour. It's a group of particles traveling around the machine. When an H-ion hits a target, two of its electrons get stripped out and it becomes an H⁺ion (proton) going outside of the machine, traveling through the beam lines. I also helped scientists at TRIUMF by developing programs to help them get the data, analyse the data and interpret it graphically. At that time I also reverse-engineered some of the UBC computing graphics packages to adapt to the TRIUMF computing environment. For example I still remember analyzing a database on fonts and writing programs and subroutines to create and modify fonts. So, it was a way for me to learn about computing science, to learn about math, and to use math and numerical analysis to serve the scientific community.

Eric: What influenced your decision to go into politics?

Richard Lee: At that time I was participating in quite a few organizations in my community. I had moved to Burnaby in 1986 after I got married. Locally I started participating in the parent groups, the Burnaby Multicultural Society, the Civic Education Society, the Heritage Language Associations and eventually I was sitting in over 10 nonprofit organizations as a member of the board to serve the community. I became more interested in community service, and so eventually people asked me to run so I could spend 100% of my time for the community. Under some consideration, in 1993 I joined the local political organization of Burnaby North. I then was nominated, and ran in 1996 for the first time. I didn't get elected but it was close, I lost by about 750 votes. In 2001 I ran again and was elected, so this is my 10th year of service. I enjoy this opportunity, and I am honored to serve the community. It's a way to listen to what people want, and also to engage in the policy making process to make people's lives better. We are in a democratic society, and in some countries people are actually fighting to get a system like ours. So, when we have the chance of participating in this democratic process, we should. Not too many people are that interested in running for political office, but I think someone has to do it, so that's what I did.

Eric: How does mathematics play a role in the decisions you make?

Richard Lee: Of course statistics has a lot of application in politics. Even in a survey of popular opinions they need to design the questions in a way that really reflects true feelings. Of course for our voting systems, some mathematicians actually study some possible processes, e.g. the preferential ballot, those kinds of systems have mathematical models. Logic has a lot to play in decision making, and a lot to play in policy, what kind of policy, and the consequence of a policy. In a way, political parties depend a lot on axioms. They are built on certain beliefs, and from that we derive different actions or policies. Some political party has a particular axiom, say free enterprise should be defended. So free enterprise is the axiom, and the goal is to encourage investment and encourage people to succeed individually. Another party has another system, a different axiom, say equality. Based on that you derive policy to maximize the probability of equality. Then if you have more money we tax you much more. There are systems in between, and across the political spectrum.

Eric: In what ways does politics impact science?

Richard Lee: Of course funding is obvious. We have to make sure that research and development receive proper attention in the political system. It's important to demonstrate that it really is an economic generator. We need to get more people with advanced education and high skill training. More research and development, and more innovation to do things. The society has some obligation in general to develop human resources, to help the citizens, and to further their education and careers, making the society better in general. I think research and devel-

opment should have higher priority in all governments. If we don't have some niche in the world market, we will be falling behind. We have to increase our productivity to maintain our living standard. How to make society better, I think that's the ultimate goal.

Eric: In what ways do you see that government is trying to improve science in either education or research?

Richard Lee: By supporting innovation, supporting clean energy industries, and supporting research and development. I think we have so many areas in BC locally. For example we have the clean energy sector and the high-tech sector, where we certainly have a lot of research companies. In Burnaby we have a lot of people doing research and development, and even manufacturing to some degree on clean energy devices. Of course as I said, it is never enough in terms of government support for science and research. The policy of getting more universities in BC over the last few years has encouraged more people to go into post-secondary studies. I think some research shows that over 75% of future jobs will really depend on post-secondary education. The government recognizes that, which is why over the last 4 years they have tried to provide more resources for students, so that they have a better opportunity to go into university and get an education. I think that's an improvement over the years. Sometimes we forget that 10 years ago the number of seats in universities had a negative effect on some of the students trying to get an education.

Eric: What would you say is one of the most important things you learned throughout your career?

Richard Lee: The most important thing I learned is to follow your passions. Go into something you like, something you enjoy. Even in high school when you do work, mathematical work, you can go into your own world, a perfect world, where you can deduce things orderly, and enjoy it. Follow your interests, and then the career will follow. The world contains a lot of opportunities, and as long as you follow your passion, you can create a career out of that.

One career is probably not for life. That is why an education prepares you for a lot of areas, and can open up a lot of opportunities. I think that life is a process, you set different goals and at a certain stage you find something particularly important to you. This is your axiom, from that you derive your actions around you.

Eric: Do you have any regrets?

Richard Lee: No, except I would've liked to do more graduate studies. Sometimes you get sidetracked into other interests, and follow some passion.

Eric: What do you feel is your greatest accomplishment?

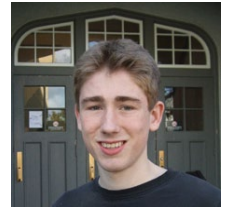
Richard Lee: The greatest? I think it is the ability to work under not so favourable conditions, and still keep your belief and working towards your goal. Don't give up if there are certain setbacks in life, that could be just another foundation for building up some later achievements. Life is never perfect.

Eric: Are there any individuals you would identify as having a significant impact on your life?

Richard Lee: I think, my teachers. The Choi Ko Middle school teachers in Macau, and in UBC Professors Fred-eric Wan, George Bluman, Colin Clark and Jim Varah all played some major roles in showing me that math is really interesting and has many applications in the real world. Of course in another dimension my family is also important in my life.

Eric: If you could give an undergraduate one piece of advice what would it be?

Richard Lee: Don't just do the homework. Go into some area where you are interested. Find something that interests you, something that you can actually master. Four years of university for an undergraduate is a very short time. Follow what you want to do, and the world of the future will probably utilize some of your studies, but prepare yourself for more. There are many jobs that people won't realize will be available in the future, and you may be working in an area that you never dreamt of working in. ■



Eric Naslund

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Visit the UBC Math Department webpage:

www.math.ubc.ca

Mathematics Conferences in Vancouver

Vancouver has long been an attractive setting for mathematical meetings. This tradition continued this past year with the 2010 National Winter meeting of the Canadian Mathematical Society (CMS) held in downtown Vancouver. National meetings are held twice a year in locations throughout Canada and typically attract 400-500 participants, mainly from North America, but also from other parts of the world. This summer, the 7th International Congress on Industrial and Applied Mathematics (ICIAM 2011) will be held in the Vancouver Convention Centre, along with many satellite workshops on UBC and other Canadian campuses. The quadrennial ICIAM congresses are the major international conferences in applied mathematics, and attract up to 3,000 participants from all over the world. Vancouver follows the host-cities Zurich (ICIAM 2007) and Sydney (ICIAM 2003).

In the following two articles, Brian Marcus reports on the 2010 CMS meeting, while Bud Homsy provides an outlook on the many exciting activities in the upcoming ICIAM 2011.

2010 CMS Meeting



Brian Marcus

Jozsef Solymosi

The 2010 National Winter Meeting of the Canadian Mathematical Society was hosted by the UBC Math Department and held at the Coast Plaza Hotel in downtown Vancouver, December 4-6. The meeting attracted 435 participants,

mostly from North America, but also many from other parts of the world. The meeting was co-chaired by UBC faculty Brian Marcus and Jozsef Solymosi.

The special sessions included a broad array of research topics, many of which were organized by UBC faculty members. There were sessions on history and philosophy of mathematics, as well as mathematics education. The latter included talks on education initiatives in BC mathematics departments, a panel discussion on creativity by students and a talk by a secondary school math teacher.

In addition there were several outstanding plenary lectures.

- David Aldous (Berkeley) gave a talk on scale-invariant networks with connections to effectiveness of route-finding algorithms.
- Carl Wieman (Nobel laureate, on leave from UBC) described techniques, making use of technology, and discussed the effectiveness of these techniques, for teaching undergraduate mathematics.
- Sujatha Ramdorai (UBC) gave a survey, including recent results, on noncommutative Iwasawa theory.
- Peter Sarnak (IAS, Princeton) discussed the development of a theory connecting expander graphs with intriguing questions regarding prime numbers.

- Tamar Ziegler (Technion) gave an overview of work on patterns in primes, focusing on a recent result, joint with Green and Tao, and connections with dynamics on nilmanifolds.
- Finally, David Donoho (Stanford) gave a comprehensive survey of recent work on the theory of compressed sensing, highlighting the important role of mathematics in the development of important applications of this theory.

A major highlight of the meeting was the Public Lecture given by Ron Graham (UCSD), who talked about a wide variety of topics involving theory and application of networks. His lecture, which was co-sponsored by the Vancouver Institute, generated a great deal of enthusiasm from a packed house of conference attendees and the general public.

Another highlight was the Student Poster Session. This was the second such session at a CMS meeting. This setting gave 17 students the opportunity to present their research work to the mathematical community in an interactive way. Posters were judged by a panel of faculty and students, and the following students were awarded prizes: Peter Bell (UBC), Garret Flowers (U. Victoria),



Stephanie van Willigenburg introducing plenary speaker Sujatha Ramdorai

Photo: Aliana Fraser

and Brittany Froese (SFU). This successful innovation will be continued at future CMS meetings.

The National CMS meetings provide an opportunity for the community to recognize winners of CMS awards, with the following given at this meeting:

- Adrien Pouliot Award - Miroslav Lovric (McMaster)
- David Borwein Distinguished Career Award - Nassif Ghousseub (UBC)
- Doctoral Prize - Benjamin Young (KTH Stockholm)
- G. de B. Robinson Award - Andrew Toms (Purdue), Wilhelm Winter (Nottingham, UK)
- Graham Wright Award for Distinguished Service - Robert Woodrow (Calgary)
- Krieger-Nelson Prize - Lia Bronsard (McMaster)

The Adrien Pouliot, Doctoral Prize, and Krieger-Nelson Prize winners all gave prize lectures.

In addition to the traditional scientific activities, there were several panels of interest to the mathematical community: a panel on employment for graduate students, a town hall meeting on CMS activities and policies, a forum on long-term strategy for mathematical sciences at NSERC, and a panel discussion on current operating practices for adjudication of NSERC grant applications. The latter featured lively debate between our guest, Isabelle Blain of NSERC, and the community of mathematicians.

Overall, the meeting seemed to run smoothly. There were some glitches, including an occasional computer projector failure. Perhaps the most significant problem was the location of a few sessions in 2-bedroom suites on the upper floors of the hotel. The elevator capacity was inadequate to enable participants to switch between sessions on these floors and those in the main conference area. The silver lining, however, was the remarkably beautiful views, from these upper floors, of the English Bay and the north shore on unusually sunny winter days.



Brian Marcus, Johnny Cao, Gertrud Jeewanjee

The national meetings are held twice a year in different locations across Canada and are supported in part by funding from AARMS, CRM, Fields, MITACS, PIMS, and local universities (the 2010 winter meeting was support-

ed by UAlberta, UBC, UVic and SFU). The next national meetings will be held in Edmonton in June and Toronto in December. ■ Brian Marcus



CMS attendees mingling during coffee break

Photo: Ailana Fraser

ICIAM 2011



Ivar Ekeland, ICIAM's Scientific Program Committee Co-chair

Photo: UBC Math Department

Vancouver will be host to the 7th International Congress on Industrial and Applied Mathematics (ICIAM 2011), July 18-22, 2011. ICIAM is a major conference that is expected to attract 3000 participants from around the world. The ICIAM conference is held every 4 years and has not been held in North America since 1991, when it was in Washington, D.C. ICIAM 2011 will be a major attraction for applied mathematicians from North

America, particularly since it also takes the place of the SIAM Annual Meeting that normally occurs in the summer and that attracts up to 1200 participants. Two other major international conferences will be in Canada during the weeks right before and after the ICIAM: the Scientific Computing and Differential Equations (SCICADE 2011) in Toronto, July 11-15, and the 10th International Conference on Mathematical and Numerical Aspects of Waves (WAVES 2011) in Vancouver, July 25-29. SIAM is also holding the Gene Golub SIAM Summer School 2011 at UBC. Further information is available on the ICIAM website at <http://www.iciam2011.com>.

The local applied math community is taking advantage of the influx of visitors and top researchers by hosting a number of satellite meetings organized by faculty at various universities in the Northwest and elsewhere. These have been aided by funding from PIMS, BIRS, MITACS, and NSF. They include meetings on Advances in the Numerical Solution of Constrained Differential Equations; Complex Fluids in Industry & Nature; Delay Differential Equations in Applications: Common Themes and Methods; Numerical Methods for Incompressible Flow; Nu-

merical Ricci Flow in Computer Science, Geometry, and Physics; Reproducible Research: Tools and Strategies for Scientific Computing; Seismic and Medical Imaging; Mathematical Biology Workshop and IGTC Summit; Applied Analysis and Applied PDEs; Mathematical Challenges from Spatial Ecology: Environmental Variability; Localized Pattern Formation; and Stability and Instability of Coherent Structures and Patterns. Further information on these workshops and other embedded and satellite meetings is available on the ICIAM 2011 website. ■



Bud Homsy



Photo: UBC Math Department

Ivy on Mathematics Department building

Graduate Student Report

The UBC Mathematics Department owes its reputation not only to its fine faculty, postdocs and staff but also to its graduate students who are a fundamental and lively part of our department. As in the past year, we have grown again and now number 115 graduate students (MSc: 46, PhD: 69) up from 109 (MSc: 43, PhD: 66) students in 2009-10. Graduate students support the department's teaching mission by marking assignments, teaching undergraduate courses, and helping out in the Tutorial Centre.

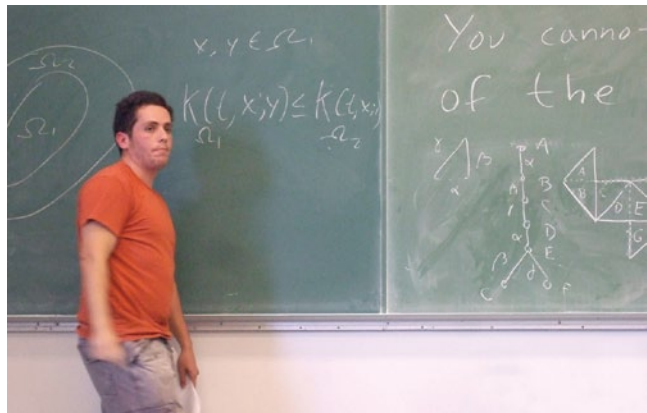


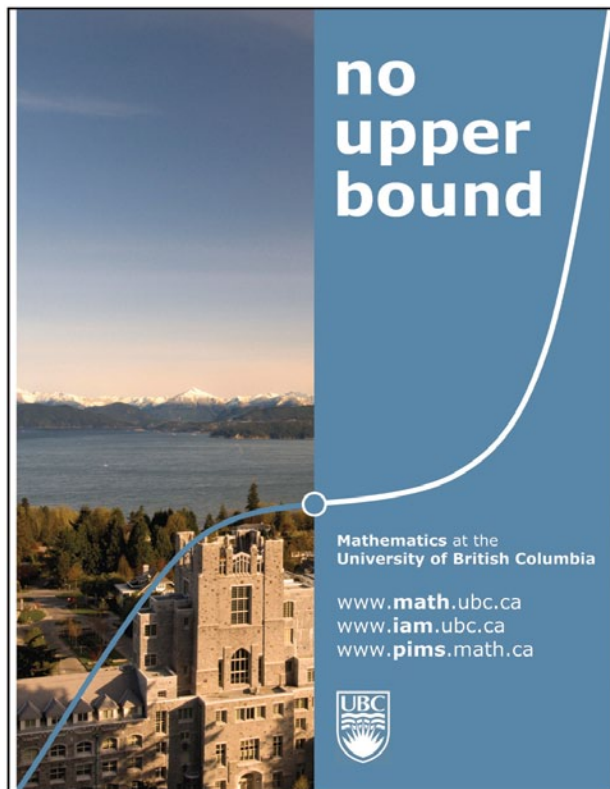
Photo: David Kohler

Ramon Zarate Saiz talks in the Graduate student colloquium

The Math Graduate Committee (MGC) is the place to go for organizing social events like game nights, movie nights, or pub nights; discussing issues concerning us as graduate students; and giving us a voice on a global university-wide level, e. g., the GSS (Graduate Student Society, mostly related with the Koerner's Pub).

In what is becoming more and more of a tradition, the MGC invited all of us to a first get-together in The Wolf and Hound pub, on Broadway and Alma, to taste some appetizers and sip some drinks.

During the term, the Graduate Student Seminar served as a regular meeting place for graduate students to listen to 25-minute talks by graduate students and to enjoy pizza and pop. Talks were given by: Dennis Timmers (Random



Mathematics graduate recruitment poster, designed by Fok-Shuen Leung, the winner of the 2010-2011 competition.

Graphs), Simon Rose (Why generating functions are cool), Kyle Hambrook (The state of art of the Twin Prim Conjecture), David Kohler (What to learn from the Pythagorean Theorem), Tyler Helmut (What is Percolation), Maxim Stykow (What is Cohomology), Cameron Christou (Conjugate Duality), Eugene Barsky (UBC Library), Andrew Morrison (Counting Boxes) and Alexander Duncan (About decidability). Thanks to all speakers for their support. For questions and volunteering contact Robert Klinzmann.

A big upcoming event in the spring (May 2-5 2011) will be the 8th PIMS Young Researchers Conference (PIMS YRC) which is organized by UBC graduate students. The PIMS YRC is a unique and important opportunity for

young graduate students in mathematics and statistics from PIMS universities to meet their peers and discover the wide range of research currently undertaken in Western Canada and the Pacific Northwest. For more information visit the website (<http://www.math.ubc.ca/~YRC>).

Finally, since September 2009, UBC graduate students support the idea of the Hungarian mathematician Alfréd Rényi to produce theorems out of coffee (although, this idea often is attributed to his colleague Paul Erdős) by providing fresh high-quality espresso, milk and sugar for a fair price in the

MATH lounge (MATH 125). The surplus is used to provide some extra refreshments and food for social events or Pub nights.

The committee invites all interested students to attend our future

meetings to share ideas and creative input. Right now our team consists of David Kohler (President), Hesam Abbasour (Ombudsperson), Karsten Chipeniuk (Grad Affairs

Committee), Cameron Christou (Social Events), Tyler Helmuth (TA Union representative), Robert Klinzmann (Graduate Student Seminar, Espresso Machine), Simon Rose, Andrew Staal (Treasurer), David Steinberg (Facilities representative), Maxim Stykow (GSS representative) and Dennis Timmers (GSS representative). Want to be more involved? Write an email to mgc@math.ubc.ca. ■



Robert Klinzmann



Pumpkin carving during halloween

Photo: David Kohler



Jim Bryan at postdoc forum

Photo: UBC Math Department

List of Recent Graduates and Placements

Graduate	Thesis / Interest	Supervisor	Pgm	Life After UBC
Allard, Jun	Mathematics and biophysics of cortical microtubules in plants	E. Cytrynbaum	PhD	Postdoc at University of California, Davis
Clarkson, James Price	Group actions on finite homotopy spheres	J. Smith	Ph.D	Assistant Professor of Mathematics at the University of Charleston in the Department of Natural Sciences & Mathematics
Clay, Adam	The Space of Left Orderings of a Group with Applications to Topology	D. Rolfsen	PhD	Postdoc at the University of Montreal
Cowan, Craig Thomas	Regularity in second and fourth order nonlinear elliptic problems	N. Ghoussoub	PhD	Postdoc at Stanford University
Duman, Ali	Fusion Algebras and Cohomology of Toroidal Orbifolds	A. Adem	PhD	Teaching at a private institution in Ontario
Goodman, Jesse Alexander	Invasion percolation on regular trees : structure, scaling limit and ponds	G. Slade	PhD	Postdoctoral researcher at Eindhoven University of Technology, a probability research institute in the Technische Universiteit Eindhoven
Lindsay, Alan Euan	Topics in the asymptotic analysis of linear and nonlinear eigenvalue problems	M. Ward	PhD	Postdoc at the University of Arizona
Loudior, Erez	Capacity of multidimensional constrained channels : estimates and exact computations	B. Marcus	PhD	Software Engineer at Google
Meyer, Aurel Nathan	Essential dimension of algebraic groups	Z. Reichstein	PhD	At the University Paris-Sud
Moradifam, Amir	Hardy-Rellich inequalities and the critical dimension of fourth order nonlinear elliptic eigenvalue problem	N. Ghoussoub	PhD	Postdoc at University of Toronto
Morin, Matthew	Schur-Positivity of Differences of Augmented Staircase Diagrams	S. van Willigenburg	PhD	Lecturer at Fairleigh Dickinson University (Vancouver)
Soo, Terry	Coupling, matching, and equivariance	O. Angel / A. Holroyd	PhD	Postdoc at University of Victoria

Zarate Saiz, Ramon	Inverse And Homogenization Problems Via Selfdual Variational Calculus	N. Ghoussoub	PhD	Intern programmer at Ayogo Inc.
Zhu, Liang	Robust a Posteriori Error Estimation for Discontinuous Galerkin Methods for Convection Diffusion Problems	D. Schoetzau	PhD	Working at RBC in Toronto
Chan, Ian Hiu Fung	Parametric Subharmonic Instability and the beta-Effect	N. Balmforth	MSc	Continued to PhD at the University of Toronto
Cernele, Shane	Maximal Representation Dimension For Groups of Order pn	Z. Reichstein	MSc	Continued to PhD at UBC
Dixon, Kael Nicholas	Collapsing Fibres Under Kähler Ricci Flow on Hirzebruch Manifolds	A. Chau	MSc	Continued to PhD at McGill University
Garcia Ramos Aguilar, Felipe	Mass Transport and Geometric Inequalities	N. Ghoussoub	MSc	Continued to PhD at UBC
Geng, Xin	Markov Chains and Mixing Times Introduction and Examples	M. Barlow/ D. Brydges	MSc	PhD student in Economics/ Sauder School of Business
Kang, Yicheng	Well-posedness of 2D Navier-Stokes equations	E. Perkins	MSc	PhD student at the University of Minnesota
Khomenko, Mari	Viscous fluid instabilities under an elastic sheet	A. Peirce/ N. Balmforth	MSc	Unknown
Kroc, Edward Mario	The Kakeya Problem	M. Pramanik	MSc	Continued to PhD at UBC
Lefebvre, Jerome	IARAs; The finite-dimensional Case	B. Casselmann	MSc	Continued to PhD at UBC
Lindstrom, Michael Robert	Asymptotic and numerical modeling of magnetic field profiles in superconductors with rough boundaries and multi-component gas transport in PEM fuel cells	B. Wetton	MSc	Continued to PhD at UBC
Morrison, Jennifer Susanne	Deciphering multi-state mobility within single particle trajectories of proteins on the plasma membrane	D. Coombs	MSc	Continued her studies in Faculty of Education (SFU)
Raghoonundun, Avishka	Models for Electricity Prices	I. Ekeland	MSc	Lecturer in the Department of Economics and Statistics at a University of Mauriti
Thompson, William Frederick	Stochastic phase dynamics of noise driven synchronization of uncoupled conditional coherent oscillators	R. Kuske	MSc	Will continue to PhD at UBC
Wan, Andy Tak Shik	Finding conservation laws for partial differential equations	G. Bluman	MSc	Continued to PhD in Montreal
Wang, Li	Term Structures of Defaultable Bonds	I. Ekeland	MSc	Financial Analyst for Genus Capital Management (Vancouver)
Wong, Thomas Kai Shik	Enumeration problems in Baumslag-Solitar groups	A. Rechnitzer	MSc	Continued to PhD at UBC
Zhang, Siliang	Can Investors Profit from the Daily Timing Strategy?	I. Ekeland	MSc	Financial Analyst for Seaspan (Vancouver)

Postdocs 2009-10

Name	Supervisor	Years at UBC	Where To
Walid Abou Salem	Ghoussoub/Feldman/Froese/Brydges	1	Asst Professor at University of Saskatchewan
Stewart Chang	Coombs	1	Postdoc at University of Washington
Sander Dahmen	Bennett	2	Faculty, University of Utrecht
Neville Dubash	Balmforth	2	Research Associate - Dept of Mech. Eng
Mohammed El Smailey	Ghoussoub	2	Postdoc Assoc, Dept of Mathematical Sciences, at Carnegie Mellon University, Pittsburg, PA
Tobias Lamm	Chen / Fraser	2	Faculty, University of Frankfurt
Robert Masson	Probability Group	2	working in Chicago, IL
Ronald Pavlov	Marcus	3	Faculty, University of Denver
Tuoc Van Phan	Gustafson	3	Teaching at University of Tennessee
Thomas Seon	Frigaard	2	Postdoc at University of Chile
Alan Stapledon	Karu/Carrell	1	working in private sector, New York state
Hamid Usefi	Blake	4	Postdoc in Dept of Mathematics, University of Toronto

Outreach Activities

The Math Department has expanded its outreach activities, including increased activities in our after school tutorials, teacher workshops, and the UBC Math Circle. We continue to have very active participation in the Euclid contest and Euclid Day.

Afterschool Tutorials

The UBC Mathematics Department has broadened its presence in after school math tutorial activities. Our efforts have been concentrated in schools with larger Aboriginal and First Nations student populations. Thanks to the efforts of Melania Alvarez and George Bluman, there have been 12 students working in 6 after school programs.

The students working in the after school programs this year are Alexandra Bella, Euweng Chan, Cathleen Childs, Hannah Dahlquist-Axe, Rebecca Ferguson, Steven Luscher, Caitlin Leahy, Tae Yoon Lee, Matthew Liu, Raluca Mic, Sina Motalebi, and Yolanda Zhang.

They have covered programs at Britannia Secondary, Britannia alternative program, Templeton Secondary, MacDonald Elementary, Windermere, and finally Point Grey Secondary, where the after school program is a joint UBC Math-Musqueam-UBC Longhouse effort.

We thank our donors who have supported our expanded efforts in this direction.

School and Teacher Workshops

This year we have expanded our school workshop program, running roughly 55 workshops over the two regular terms.

The workshops in the Fall term, organized by Melania Alvarez and Paul Ottaway, were primarily connected with Math 414, Mathematical Demonstrations, taught by Andrew Adler.



Photo: Liz Barrett

Teachers at the JUMP workshop

There have also been a number of events for students and teachers at UBC. For example, in January, students



Photo: UBC Math Department

January 2010: Paul Ottaway guides students through a series of games, where they found strategies for winning using mathematics.

from JN Burnett Secondary School (Richmond) attended a calculus class and a games strategy session.

In September the Math department hosted teachers' workshops on How to Reach and Teach Every Child, based on the JUMP program and presented by John Mighton and Liz Barrett. A total of 48 teachers attended the two workshops.



Photo: UBC Math Department

Eric Naslund and Omer Angel work with UBC Math Circle students

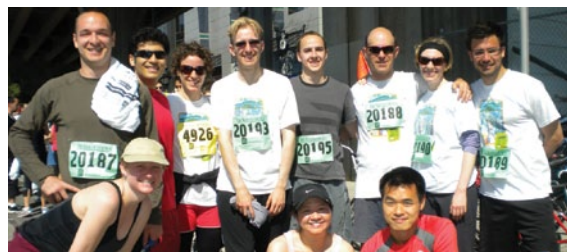
UBC Math Circle

The Math Circle has expanded to about 50 students from Metro Vancouver area high schools. These students meet undergrads, grads, and faculty at UBC for math problem solving, lectures and pizza most Mondays in Term 2. This year the student volunteers running the Math Circle are Mohammad Bavarian (4th yr Honours Math), Daniel Brox (now Electrical Engineering grad student), Aram Ebtekar (3rd yr Honours Math/Comp Sci), Simon Foreman (4th yr Honours Math/Physics), Richard Lei (3rd yr Honours Math/Stats), Eric Naslund (3rd yr Honours Math), Maya Perry (2nd yr, Math Major), Owen Ren (3rd yr Honours Math), Noa Rippel (1st yr Science), Yuqi Zhu (1st yr Science).

Euclid Contest and Euclid Day

UBC has for over 30 years hosted the marking of the national Euclid Mathematics Contest, which is written by over 2600 secondary school students and marked by 30 top secondary school mathematics teachers, together with 40 UBC faculty, graduate students, and industrial mathematicians. This helps us maintain close connections with teachers from the best schools in the province (from which we recruit about half of our students). The marking day provides an important opportunity for us to hear from teachers on issues such as the transition from high school to university. The follow-up, on Euclid Day, celebrates the top 75 students in BC on the Euclid Con-

test: these top students spend a day exploring opportunities in the UBC Faculty of Science. ■ Rachel Kuske



Department Sun Run Team, "Running Average", 5th place Education Corporate Category Team.

The Math CWSEI Program

Since 2008, the Mathematics Department has taken part in the Carl Wieman Science Education Initiative (CWSEI), a Faculty of Science program designed to improve undergraduate science education using research-based teaching strategies. Initially, efforts were focused on improving the first-year Calculus Workshops program, and supporting the development and integration of computational course activities such as computer labs, computer-based assignments and in-class demos in a variety of courses in linear algebra, differential equations, and calculus.

In 2010, thanks to the generous donation of Prof. David Cheriton, UBC alumnus and now Professor of Computer Science at Stanford University, the program has undergone a major expansion. Among other activities, new projects have been developed that aim at tracking and improving key skills throughout the curriculum, incorporating technology into the classroom, and supporting the development of new project-based courses. Currently involved in more than ten different courses, the Math-CWSEI team has grown from Costanza Piccolo, the first Science and Teaching Learning Fellow (STLF) and current Director of the Math-CWSEI program, to include three more STLFs: Warren Code, Joseph Lo, and Sandi Merchant. Working closely with faculty members, the STLFs assist instructors in carrying out their educational improvement efforts and gathering data on students' learning. Here are a few examples of their work. More information about all the Math-SEI projects is available at <http://www.math.ubc.ca/~cwsei>.

Tracking and Improving Key Skills in Mathematical Proofs: Math 220

Required for most Mathematics and Combined Majors, as well as Statistics Majors, Math 220 is a critical course in the undergraduate math curriculum, so it was chosen

for extensive assessment and improvement. Interviews with past instructors and students helped to identify difficulties and topics to target for new material development; common errors on exams were analysed to guide future instruction, and problem-solving sessions are being conducted to further probe students' difficulties and provide feedback. Another important first step in course transformation has been the development of detailed learning goals, now under revision by Math and Statistics instructors. Student surveys and post-lecture interviews conducted by the STLFs have provided useful feedback to the instructor. A new diagnostic tool to assess logic and proof skills as well as basic computation skills is under development; the test will be used to track learning gains and retention. Furthermore, students' attitudes towards learning and doing mathematics have been studied to determine if and how attitudes in this course are changing.

Incorporating Computational Skills: Matlab Programming for Novice Engineers

In a multi-year project that is coming to a close, measurements indicate that the new computer labs developed for the first course in linear algebra for engineers (Math 152) are resulting in better retained learning of basic Matlab syntax and programming concepts. The new labs were designed to be well-aligned with the course material (previously, they had drifted apart) and with more attention to the novice programming level of most students. Results from lab pre/post tests show substantial learning gains at the end of the course. Moreover, by tracking students into the integrated second-year Mechanical Engineering program (MECH 2), we measured significant increases in retention of these skills compared to similar data collected before the lab transformation. Finally, data also show that incoming Matlab skills in MECH 2 are now substantially stronger for those students arriving from Math 152 as opposed to those transferring from other schools or programs.

Problem-solving Workshops in First-year Calculus: Math 180 and 184

The Calculus Workshops program, now in its third year of extensive implementation and assessment, has undergone major changes in organization, management, and content, resulting in measurable improvements of students' attitudes and engagement in the problem-solving activities. At the organizational level, a more efficient structure featuring distinct roles for management and content development has been implemented. Content has been revised for better alignment with lectures, and more effective problem-solving strategies and assessment methods have been incorporated in the workshop activities. Results from student surveys continue to show positive attitudes toward the workshops, while statistical analysis has revealed increased correlations between students' performance in the course and their activities in the workshops. A further TLEF grant in 2010 allowed us to develop a problem database to facilitate future preparation of workshop material.

In addition to specific course transformation projects, the Math-CWSEI program also supports activities targeted at the wider teaching community of the department. A joint effort of the STLFs, Fok-Shuen Leung and Skylight associate Djun Kim, the Lunch Series for Teaching and Learning provides an opportunity for all members of the de-



Photo: UBC Math Department

Problem solving at the blackboard

partment to discuss issues related to teaching and student learning. Based on the excellent response so far, this lunch series will hopefully become a more regular fixture in the department seminar list in 2011. ■



Warren Code

Math Club



Photo: UBC Math Department

Math Club Lecture Series talk by Alex Ng on "High-Dimensional Biology: From Data Scarcity to Information Overload"

Stop by the Math Club this year, and you'll see lots of new activities. With our increase in the number of active members, we have been stepping up our range of academic services within the Club this year, from helping out with information sessions for math students applying to gradu-

ate school, to increasing opportunities for math tutors to advertise their services through us. The Math Club Lecture Series, which consists of talks given by Math Club members, continues to be active; this year we've covered topics ranging from the economics of famine aid to the Gödel incompleteness theorem.

As part of our commitment to philanthropy, this past year we have made donations to the African Institute of Mathematical Sciences, the BC Civil Liberties Association, the Canadian Mental Health Association, Engineers Without Borders Canada, the Vancouver Rape Relief and Women's Shelter, and the Vancouver Public Library. These organizations were all nominated and voted upon by our members, and any surplus we have this year is planned to be donated this way. We've also continued our practice of giving microloans to individuals and small businesses in the developing world through Kiva, a nonprofit microfinance organization.

We had new carpets installed this summer, and have been quite excited about them. We also reorganized the room completely, working to optimize important parameters such as seating orientation and fridge accessibility. And we've been having far more people stop by Math Club on a regular basis, coming in to study, or play games.

Our social events have been quite successful, from our board games to our pub nights at Koerner's Pub. We had our first movie night in a long time, showing the mathematical thriller π . Our tradition of open house sushi luncheons seem to be growing in fame as shown by the fact that more and more students flocked to our offering of free sushi at the beginning of the year. Coming up in the New Year, we've got plans for more social events, new T-shirts, and are in the process of organizing travel funds for Math Club members to go to mathematics conferences this summer. It's been a great year so far, and we're looking forward to the next term. ■



E. Patitsas



Photo: UBC Math Department

Monthly "Math Club Board Games Night" in the Math Club room features fun board games, good company and free pizza

Awards, Events, and Accolades

In August, 2010, **David Brydges** and **Zinovy Reichstein** gave invited lectures at the International Congress of Mathematicians in Hyderabad, India. This is an extremely prestigious honour; only a handful of mathematicians receive these invitations.

Bud Homsy was awarded an honorary doctorate by University Paul Sabatier in Toulouse, France. This award included citations for both his research and educational activities in the field of fluid mechanics.

Benjamin Young, UBC PhD in Mathematics (2008) with **Jim Bryan** and **Rick Kenyon**, was the recipient of the 2010 CMS Doctoral Prize (<http://cms.math.ca/Prizes/info/dp/>) recognizing outstanding performance by a doctoral student.

Michael Ward has been selected as the recipient of the 2011 CAIMS Research Prize. This award is given for innovative and exceptional research contributions in an emerging area of applied or industrial mathematics. The citation recognizes Michael's significant successful combination of singular perturbation techniques and numerical methods to analyze boundary-value problems arising in a wide range of applied fields. <http://www.aims.ca/Awards/Rprize.html>

Four faculty were awarded NSERC Discovery Accelerator Supplements: **Omer Angel** and **Ailana Fraser** in the 2010 round, and **Juan Souto** (joining UBC in July 2011) and **Ozgur Yilmaz** in the 2011 round. These highly competitive awards provide research resources to capitalize on outstanding research programs. There have been ten DAS awards to UBC Math faculty members in the last five years.

The James A. Moore Entrance Scholarship, a \$10,000 major entrance scholarship, has been established by **The James A. and Donna-Mae Moore Foundation** to support a student entering the Faculty of Science with outstanding academic achievement, preferably in Mathematics. An additional opportunity for a higher valued scholarship is available to the recipient if they choose to pursue a Combined Honours Degree in Mathematics and either Chemistry, Physics or Biology. Mr. Moore was an alumnus of UBC, Double Honours BSC in Math and Chemistry 1932 and MA in 1939. An enthusiastic teaching pioneer of the BC Community College System, he dedicated his career to helping students to realize their academic potential.

UBC's 2010 Putnam Team of **Mohammad Bavarian**, **Karliming Chen**, and **Ronnie Chen**, coached by **Greg Martin**, placed 6th among the 442 universities and colleges having Putnam teams - tied for our best showing in the past 23 years. **Mohammad Bavarian** was the UBC high scorer, earning an Honourable Mention by placing in the top 50 in the entire competition (out of a total of 4,296 participants). A second UBC student, **Yuqi Zhu**, placed in the top 200 participants.

At the 2010 CAIMS meeting in St. John's, the Early Career Award Lecture, the Industrial Math Prize Lecture, and one of the plenary lectures were given by **Dan Coombs**, **Brian Wetton**, and **Michael Ward**, respectively. <http://www.aims2010.ca>

In 2010-2011 we have broad representation across UBC by our faculty: **Richard Anstee** has been acclaimed as elected to UBC-V Senate as Joint Faculties Representative for a second three year term. **Nassif Ghoussoub** has been re-elected to the UBC Board of Governors for a second three year term. **Philip Loewen** was appointed as Associate Dean, Graduate Policy & Program Review, in the UBC Faculty of Graduate Studies. **Mark MacLean** has been acclaimed to serve as UBC Faculty Association Vice President for 2011-12.

In the recent IMO, **Robin Cheng**, a member of our UBC Math Circle (<http://outreach.math.ubc.ca/>) for the past three years, was Canada's highest placing student.

Anfanny Chen and **Dallas Clement**, both Combined Math/Physics Honours students (3rd year) have received Math in Moscow fellowships for the January-April 2011 term.

David Kohler was selected as the recipient of the 2009/10 UBC Graduate Teaching Assistant Teaching Award, recognizing a select group of graduate students making outstanding contributions to teaching and learning at UBC.

Mar Ness, **Warren Code** and **Rajiv Gupta** won the 2009/2010 UBC Faculty of Science Achievement awards, recognizing exceptional service contributions, in the areas of staff, students, and faculty, respectively.

2011 Niven Lecture

The Mathematics of Doodling

Guest speaker Ravi Vakil (Stanford University)

1:30pm May 30, 2011

GEOG 100, University of British Columbia

Doodling has many mathematical aspects: patterns, shapes, numbers and more.

Not surprisingly, there is often some sophisticated and fun mathematics buried inside common doodles. I'll begin by doodling, and see where it takes us.

It looks like play, but it reflects what mathematics is really about: finding patterns in nature, explaining them and extending them. By the end, we'll have seen important notions in geometry, topology, physics, and elsewhere; some fundamental ideas guiding the development of mathematics over the course of the last century; and ongoing work continuing today.



ABOUT RAVI VAKIL

Ravi Vakil is a Professor of Mathematics at Stanford University where he is also the Robert K. Packard University Fellow and the David Huntington Faculty Scholar. He was the 2009 Earle Raymond Hedrick Lecturer at Mathfest. He has received numerous awards for both his research and his teaching including an AMS Centennial Fellowship, a Frederick E. Terman Fellowship, an Alfred P. Sloan Research Fellowship, a National Science Foundation CAREER grant, and the Presidential Early Career Award for Scientists and Engineers (PECASE). Ravi is also Canadian and has received both the Coxeter-James Prize from the CMS and the André-Aisenstadt Prize from the CRM. Ravi is an informal advisor to the useful website, mathoverflow.net.



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.



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The UBC Mathematics Department welcomes donations*. If you wish to make a donation to any of the following activities, please indicate the amount.

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

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