

Mathematics



Department of Mathematics

University of Toronto

February 2006

Greetings from the Chair



Prof. John Bland, Chair

Much has taken place since I last wrote to you and it is my distinct pleasure to bring you up to date. Last year, I took a sabbatical after my first term as Chair and Jeremy Quastel served as Acting Chair in my stead. He accomplished so much in my absence that it is hard to give adequate recognition. Perhaps the most significant achievement

was Phase I of the move of the Department to our new location on the 6th floor of the Bahen Centre for Information Technology, located directly behind the Fields Institute. With invaluable help from the Dean's Office, Jeremy was involved in every aspect of the move, from space design to furniture selection to office assignment to logistics of the move proper. Everybody has done a spectacular job, and the new location is winning accolades from all quarters. Drop by to see us next time you are in town. There is underground indoor parking and easy access to elevators.

When Jeremy was not directly occupied by the move, he was busy recruiting Giovanni Forni as our newest Senior Canada Research Chair, Sergey Arkhipov as tenure track Assistant Professor specializing in algebra, or the over twenty postdoctoral fellows to round out our teaching and research faculty for the coming year. The icing on the cake was the birth of Jeremy's second child Elias, brother to Sophie, on May 5, 2005. To nobody's surprise, Jeremy spent the fall on paternity leave and is now enjoying his well-deserved and long overdue sabbatical. All of us are very grateful to Jeremy for doing such a spectacular job and accomplishing so much in one short year.

In the future, the Department of Mathematics would like to establish an *H.S.M. Coxeter Assistant Professorship*. This name carries honour, obligation, and gives immediate worldwide recognition. Named professorships have become a hallmark of first-rate

CONTENTS

Greetings from the Chair	1
Our New Home	2
On the Move	3
Coordination --- Chaos --- Calm	
Excerpts from Dexter's Marvellous Memos	
Fabulous Front Office	5
The Glass House Library	6
Alumni News	6
Our New Address	
Coveted Prize for Ravi Vakil	
Theatre and Mathematics --- JUMP!	
A Great Canadian Moment	
News from Recent Ph.D. Graduates	
Call for a Beatty Trustee	
Giving	9
Prizes in Honour of former U of T Math Professors	9
Gilbert de B. Robinson (1906--1992)	
Kenneth O. May (1915--1977)	
Frederick V. Atkinson Honoured	9
Problem Proofs	10
Our Undergraduates	11
Putnam Competition	
U of T Undergraduate Contest	
Putnam Lecture	
DeLury Award (TA)	
Books by Faculty	12
Insight from the Outside	13
TVO's "Big Ideas" Contest	13
New People in the Department	13
Awards for Faculty	15
From the Graduate School	15
2005 Ph.D.'s	
Donation Form	16

EDITORS

Erich W. Ellers, George A. Elliott

CONTRIBUTORS

Edward J. Barbeau, Edward Bierstone, John Bland, Ida Bulat, Christie Darville, Bruce Garrod, David Hamilton, Megumi Harada, Beverley Leslie, Dexter Roberts, Jeffrey S. Rosenthal, Luis A. Seco, Catherine Sulem, Ray Westcott

universities and they attract first-rate candidates. Our excellent and world-renowned faculty provides a stimulating environment in which young colleagues can further develop their talent.

This academic year we are proud to have the presidents of three of the most prestigious mathematical societies in our midst. Jim Arthur, *University Professor* at the University of Toronto, is the President of the AMS (American Mathematical Society); Martin Golubitsky, *Dean's Distinguished Visiting Professor* at the University of Toronto, is *Cullen Distinguished Professor of Mathematics* at the University of Houston and currently President of SIAM (Society for Industrial and Applied Mathematics); Barbara L. Keyfitz, at present Director of the Fields Institute, is *Moore's University Scholar* at the University of Houston and currently also President of the AWM (Association for Women in Mathematics).

J.B.

Our New Home

When we learned in the fall of 2004 that the sixth floor of the Bahen Centre would become part of the future home of the Mathematics Department, few of us would have expected to be working in our bright new offices already less than a year later. Sixth Floor Bahen is Phase One of the University of Toronto's plans for the Mathematics and Statistics Departments. Phase Two will involve the construction of a short connecting bridge to 215 Huron Street, where Statistics and the remainder of Mathematics will occupy several of the top floors. We are delighted that the University is committed to a substantial overall increase in our space to accommodate the needs of our strong and growing faculty and student populations.

Up to now, the Department of Mathematics has been housed in Sidney Smith Hall, since that building opened in the early 1960's. We soon outgrew our original space and, over the years, expanded to offices scattered on several floors of Sid Smith and several other campus locations --- University College, New College, Spadina Circle, and even the old Tip Top Tailors building at College and Spadina. When I joined the Mathematics Department as a young faculty member in the early 70's, I had an office (with fireplace, not working, and private bathroom) in a charming Victorian house on Spadina south of Harbord, that was later torn down to make room for the new Athletic Centre.

Several members of the Department still have offices in the



“Greenhouse” --- a wing of the Earth Sciences Complex on Huron Street north of the Bahen Centre. Housing the students in our expanding Graduate Program has been particularly difficult during the last several years. Our new graduate student accommodation in the Bahen Centre is excellent, but many of our students still have office space in Sid Smith, Sanford Fleming, Spadina Circle, and University College. So we are looking forward to the speedy completion of Phase Two!

The Bahen Centre for Information Technology, at 40 St. George Street just north of College, opened in October, 2002. The sixth floor remained unfinished until it was completed for the Mathematics Department. As a result, we have had a large hand in designing the space to best serve the needs of our Department. Our faculty, administrative, and student offices are located mainly around the periphery. We have an inviting circular lounge, several smaller nooks for discussion, and spacious seminar rooms. One of the best features of our new home is the centrally located glass-walled library, housing the Mathematics and Statistics collections.

As one of several Department members involved in the planning and design of our new space, I've been





in a position to really appreciate the commitment and hard work that made it possible to realize our project so well in such a short time. Dean Pekka Sinervo has been steadfast in his commitment to the Department. Jeremy Quastel, our Acting Chair in 2004-2005, worked tirelessly on the design and implementation --- the result is largely due to his vision. Monica Contreras, Assistant Dean and Director of Planning and Information Technology for Arts and Science, has been a driving force. Her taste and sense of design, as well as that of Inessa Chapira (Senior Designer in Planning and Information Technology) are reflected in the layout, furnishings, colour, and other details that make our new quarters so inviting. Steve Miszuk, Senior Project Manager, has played an expert role in the implementation of the project.

Every project of this scope is bound to have some bugs! Moving into Sixth Floor Bahen in time for the beginning of fall classes meant that things were not quite finished. Some of the temporary quarters for our graduate students (awaiting Phase Two) were ready only in the last month. So we can't say that our patience hasn't been tested on occasion! But we have a great new home, and most of the remaining small details should be completed over the Winter Holidays. The University's current plans are for completion of Phase Two within the next two years. Our new facilities make the Department an exciting place for work, study, and discussion. They are a fitting recognition of the stature of the Mathematics Department in the University and in Canada. Come up and see us sometime!

E.B.

On the Move

COORDINATION --- CHAOS --- CALM

Excerpts from Dexter's Marvellous Memos

WED, 10 AUG 2005:

AN URGENT EMAIL FROM DEXTER, YOUR MOVING COORDINATOR ---
PLEASE READ

Official news regarding our move to the Bahen Centre.

Dear Friends:

If you have had a chance to visit, you can see that, clearly, the 6th floor will not be ready for occupancy in time for the original move dates of August 12 through to 18.

The move dates have been pushed back to begin on Tuesday, August 16 at 4 p.m. and end on Friday, August 19, in order to accommodate the arrival of our furniture and radiant heating panels whose installation will begin today.

WHAT THIS MEANS TO YOU:

You will be living out of your boxes for a few more days yet. Our student packers, Brandon, Dimitri, and Jeremy, have done a fantastic job at ensuring that everyone is packed by Friday. Despite the change in the initial move date, we will not slacken our schedule and will continue packing as if the move were to begin on Friday. This is a moot point if you are already packed and labeled.

I appreciate your patience with the move. Please realize that you are not the only department adversely affected by this change.

In the meantime, you can help us (and yourselves) by remembering a few things:

1. Don't complain about the move. It won't help you either pack or unpack your boxes any faster. We're moving. End of story.
2. Do NOT rely on (or contribute to) second-hand information. Gossip instills unnecessary panic and uncertainty in the department that spreads like wild-

fire. Please refer all inquiries to me and I will direct them to the proper individual, if necessary.

3. Remain positive. We are ALL doing our best, from the Planning and Information Technology team, to the tradespeople, to the packers, to ensure that the move is completed with minimum stress.
4. Expect tiny mistakes and inconveniences. Has a condominium ever been built on time? Has a house purchase or renovation ever gone on without a hitch? Once again, we are trying our very best to make the transition as smooth as possible. We are well aware you have registrations and beginning of term duties to do. You will help all of us by remaining positive --- it will only be a few more weeks.

Any questions, please let me know.

Kind regards, dr

MON, 15 AUG 2005:

What is happening on the day of the move.
Please read.

Finally, the week we've all been waiting for (or dreading, depending on your point of view) is upon us. We begin the move process TOMORROW, so please read this e-mail thoroughly to understand what is expected of you while your articles are being transported to the Bahen Centre/Earth Sciences.

1. Your phones will be offline as of tomorrow and you will not have access to them physically until at least Thursday. If you have voice mail, this would be a good time to inform your callers of the move and that you will not be in until Thursday, Friday or Monday, depending on your move date.
2. Your computers will be moved on the day of your move. YOU ARE NOT TO BE IN YOUR OFFICE ON THE DAY OF YOUR MOVE. You can be most helpful by staying out of the way of the movers. Thank you. If you have any questions, please direct them to me. I will get back to you as soon as I can.
3. Once you are in your new location, please be sensible about what you should wear. Heels are not appropriate; the sixth floor will still be a construction zone with contractors and noise. There's simply

no getting around it. It would be a great opportunity to wear your "grubbies" until the semester begins.

4. Once again, do not expect perfection. I'm telling you now: there have been delays, but we've been working hard to make sure you will not be overly inconvenienced.
5. Once you are physically in your office, your first responsibility should be to unpack your bins. These bins are rented, not bought, so your articles cannot be left in there indefinitely. We will find a space on the 6th floor for you to leave them. If you need assistance, please let me know.

FRI, 26 AUG 2005:

"Another friendly note from your Moving Coordinator ... the light at the end of the tunnel grows larger ... "

Dear All:

What a difference a few days makes ... while Monday was what I would call controlled chaos, the end of the week has turned out to be relatively issue-free and many of you are happily ensconced in your new offices on the sixth floor. Challenges continue to spring up, to be sure, but we are solving them one at a time. We thank you for your patience as we work towards making the sixth floor the jewel in BCIT's crown. Enough with the flowery language. Here are the details that you need to take note of:

DEFICIENCIES (things that are not right in your office:)

After a meeting with your esteemed Chair, concerned administrative staff, members of Planning and Information Technology, and furniture suppliers, it was decided that all issues regarding BLACKBOARDS, FURNITURE, INCLUDING CHAIR REQUESTS AND THE LIKE should now be forwarded to Jemima, and not me.

Just so you know, the following have NOT been delivered:

- * overhead shelving units
- * 2-high filing units
- * guest chairs

They will come either today or during next week.

UNPACKING:

I encourage you STRONGLY to complete, if not, begin the unpacking of your office. We have students who will be more than happy to help you out. All you need to do is ask. If you wish, you can email me to book a time during the coming days, including this weekend.

Please please please separate your plastic from your cardboard. Recycling rules apply in the Bahen Centre, too. Garbage bins and bags will be made available tomorrow and regular caretaking duties will commence this coming Monday. I have been made aware of the disposal problem in the ladies' washroom, so no further discussion is necessary.

WINDOWS AND ALLERGIES TO BEE STINGS:

This is of concern to those faculty members in the SE wing of Bahen that have openable windows. I know the weather is absolutely beautiful right now, but there are no screens on the windows, so do not be tempted to open the windows in your offices as there are people not only on the sixth floor, but throughout the building who are highly allergic to bee stings. If you want to smell the roses, take the elevator to the ground floor.

THANK YOUS!

Let's face it, moves are stressful for everyone. A lot of hard work has gone into making this project work in such a short period. There remains a lot to be done, but before complaining about all the things that are WRONG, let's focus on those things that have gone right. Please remember those (and I'm not talking about myself here) who have tried to be as accommodating as possible in the face of huge challenges. It doesn't hurt to articulate your thanks from time to time ... it's amazing what a single word can do ...

Now it's my turn ... thank you! dr

D.R.

Fabulous Front Office

Life in the Department of Mathematics revolves around teaching and research, professors and students. But we couldn't function without our administrative staff. The staff is involved in all aspects of our activities, from day-to-day operations to financial administration, advising students, and human relations. We are fortunate to have an office staff that makes our professional lives so much easier. The administrative staff serves the Department with patience and dedication. We sometimes take their work for granted!

Some of our staff have been working in the Department for over twenty years and are well known to many readers. Annette Yu retired as Financial Administrative Assistant last summer, after serving the Department and putting up with us for more than thirty years. Pat Broughton retired in 2002 as Secretary to the Chair, after almost nineteen years in the Department.

Many of our alumni will be happy to read that Marie Bachtis, Ida Bulat, and Beverley Leslie are still with the Department. If you are planning to visit us, don't hesitate to say hello to them.

Beverley has been the Departmental Manager since 1986, and sets the tone for our administrative team. She is Administrative Assistant to the Chair, responsible for the administrative, financial, and personnel management of the Department. The seven Department Chairs with whom she has worked all feel that they could not have survived without her.

We are truly fortunate that Marie and Ida have been with us since the mid-eighties. They serve as Administrative Assistants to the Undergraduate Chair and Graduate Co-ordinator (respectively). Their work over the years has evolved from student administrative matters to include academic and sometimes personal counselling! Many readers who have been students in the Department will fondly remember Marie's or Ida's help and care. By contributing so much to the life of our students, they make the work of all of us more pleasant.

The more recent members of our staff are Joanne Kearney, Diana Leonardo, Jemima Merisca, Seeta Parker, and Miranda Tang. Joanne has taken over from Annette Yu as Financial Administrative Assistant, and Seeta is Secretary to the Chair. Diana, Jemima, and Miranda all work in the front office.

Some aspects of secretarial work in the Department

have changed in the last ten or fifteen years. Most faculty members (and all younger members) now type their own manuscripts using TeX or LaTeX, the standard mathematical word-processing tools. But our relatively small administrative staff has so many duties that it's hard to think of them all. Financial accounting, job applications, administration of grant applications, promotion and postdocs, exams, typing and reception are just a few. And the staff still manages to deal personally with all of us, providing efficient help and kind smiles (if they're not provoked). If you visit our Department, they will be happy to welcome you.

E.B.

The Glass House Library

GREAT ENTHUSIASM ABOUT
A MAGNIFICENT NEW LIBRARY!



The Mathematical Sciences Library has moved into its newly renovated home on the 6th floor of the Bahen Centre for Information Technology. Encompassing more than twice the area of the original, the new MSL has not only doubled the number of public work stations, but with the addition of study carrels and lounge chairs, patron seating has increased twofold as well. With this increase in space the Library has been able to include on site those periodicals and monographs that were formerly held in storage in the Sidney Smith Building --- while at the same time enough free shelf space has been created to allow for the future growth of the collection. The sparse modern industrial design of the new MSL, complete with visible ceiling pipes and architec-

tural concrete, has been combined with a custom built circulation desk, sleek Italian furniture, Italian crafted book shelves and --- the focal point of the Library's three floor-to-ceiling curved glass walls running the length of the hallway, to create a fresh, open and airy study space which has been received enthusiastically by all in the Mathematics and Statistics Departments who had grown grudgingly accustomed to the dark, dank, and peeling facility of a time now best forgot.

The MSL Library Committee would like to thank all involved with the move, especially Mathematics Department Chair John Bland for spearheading the enterprise and Acting Chair Jeremy Quastel for overseeing the project.

B.G.

Alumni News

To all our alumnae and alumni, PLEASE send us NEWS about yourselves that you would like to share! Send it to the Chair at

Our NEW ADDRESS:

The Chair
Department of Mathematics
University of Toronto
Bahen Centre
40 St. George St., Room 6290
Toronto, Ontario M5S 2E4

COVETED PRIZE FOR RAVI VAKIL

We are pleased to announce that an alumnus of 1992, Ravi Vakil, was given the 2004-2005 *André Aisenstadt Prize*, a very highly valued award administered by the CRM (Le Centre de recherches mathématiques), University of Montreal. Ravi Vakil works in algebraic geometry, investigating the enumerative geometry of projective algebraic curves. His exceptional achievements throughout the barely ten years of his career so far have been recognized through several prizes and honours, including an *NSF Career Fellowship*, a *Sloan Research Fellowship*, an *AMS Centennial Fellowship*, and the *G. de B. Robinson Prize*. Ravi is now Associate Professor at Stanford University in California.

THEATRE AND MATHEMATICS -- JUMP!



John Mighton and JUMP

A review of JOHN MIGHTON's publication on computing certain polynomials ends with the words, "This interesting idea is well described in this paper." Although there are many well-written mathematical publications, comments on the quality of their presentation are rare. So one suspects something special --- and there is: John Mighton is a celebrated playwright. In 2005 he won the *Governor General's Literary Award* for his acclaimed drama "Half Life" which also earned him the *Eleanor and Lou Siminovitch Prize in Theatre*.

John Mighton got his Ph.D. in mathematics at our department in 2000, he is an adjunct professor at the University of Toronto, and recently he has been named a *Fellow of the Fields Institute*. He founded the program "JUMP" (Junior Undiscovered Math Prodigies), a very successful tutorial mathematics program for children from grades 3 to 6. He is "convinced that math can be the easiest subject for kids who struggle."

E.W.E.

RAY WESTCOTT, alumnus and now mathematician in the finance business, discovers the magic in numbers and winter, by creating for his children

A GREAT CANADIAN MOMENT!

I've had occasion in the last several years to wonder about the continuing value of a mathematics education. And recently, while shoring up a decidedly ad hoc backyard skating rink, I began to think that maybe I would have been better off with something more applied, like engineering courses. With pieces of rotting plywood from under the back porch leaning against old lawn chairs, a shed and a sandbox, I was beginning to think that maybe it would have been better to have paid closer attention while an old roommate was calculating coefficients of stress on the apparatus he'd had to design for his engineering design class.

Getting the tarp on the ground and the boards together, however, was the easy part. And it really wasn't too difficult to get the mini-wading pool full of water. With the warm weather we've been having it was easy to get the water running, and pretty soon there was, as a friend called it, a wading pool for raccoons. And then there was a cold snap, and I had a tantalizing 1 cm of ice on top of the wading pool, and I started again down the road of wishing for a more practical engineering-style education.

Mostly, I started to realize how fragile the ice was, and wondered if, even when frozen, I would be taking one step on the ice to hear the cracking that it was easy to produce on the thin ice with the palm of a hand and some gentle pressure. And, one midnight, falling and putting half an arm through the ice, it was easy to wonder how much ice was needed to support 90 kg of clumsy mathematician. So, once dried out, I did some quick arithmetic (feeling that at least this was part of the way down the road to mathematics) and guessed I had about 3 cubic metres, or 3,000 kg, of water (and ice) at depths ranging from 3 to 4 cm to about 15 cm.

It felt good to do some computations, even if they weren't particularly useful. Consequently, I was feeling that 3,000 kg of ice should withstand 90 kg of clumsy father and 60 kg of less clumsy children, when a co-worker (with an engineering masters, of course) pointed out that a "live" load should be factored up by roughly 150%. This was not useful information to me, as I couldn't do any of the needed calculations, whatever they would be, at 100%, but it did serve to further my doubts about the ultimate success of the project.

And then there was an honest cold snap, and a few more last-minute adjustments. For instance, the north-side boards changed from kayak and shed to plywood and shed

--- I've never tried to do it, but I expect it's ridiculously difficult to bail water from a kayak, and I figure ice feels awfully sharp if you're the side of a cheap kayak in sub-zero weather. I figured I had done all that was reasonable under the circumstances and went to work on Monday morning wondering if the ice was thick enough and whether there would be a chance to skate before the inevitable warming.

Of course, my children are unencumbered by doubts, and realized that the whole thing was more an exercise in faith than in engineering in the first place. So when they woke up on Monday after I'd left the house, they simply went downstairs and grabbed skates, sticks, gloves, helmets and puck. And then they simply went for a skate, and from all the evidence they had a great time. And this to me is maybe closer to the spirit of mathematics than the practical things I was worried I was missing: the sense that a decent idea, a little bit of planning, the judicious examination of special cases, a few leaps of faith, a little luck and the right amount of enthusiasm are enough to not just solve problems but maybe create a little magic. Next year the rink will look nicer, because I've learned some things, but I think it will have lost a bit of the sense of the improbable, and therefore also lost a bit of the magic.

R. W.



Emma and Douglas Westcott, after waking up their mother at an unearthly hour in the morning to go skating in the backyard, but --- could she deny them "A great Canadian moment"?

(Photo credit to Judith Armour)

News from RECENT PH.D. GRADUATES

Here is an update on the success of Ph.D. graduates from 2004 and earlier:

Maritza BRANKER (2004) is a Postdoctoral Fellow at Syracuse University;

Oliver CHEN (2004) is a Visiting Fellow at the Department of Mathematics and Centre for Financial Engineering of the National University of Singapore;

Marcos ESCOBAR AÑEL (2004) is a Postdoctoral Fellow at RiskLab Toronto, University of Toronto;

Cristian IVANESCU (2004) is an Assistant Professor at the University of Northern British Columbia;

Valentina KIRITCHENKO (2004) is a *James H. Simons* Instructor at SUNY at Stony Brook;

Alexey KUZNETSOV (2004) is a Postdoctoral Fellow at McMaster University;

Stephan LAWI (2004) is a CNRS Postdoctoral Fellow at Laboratoire Probabilité et Modèles Aléatoires, Paris;

Ana SAVU (2004) is an Instructor at the University of Northern British Columbia;

Joon-Hyeok SONG (2004) is teaching at a private school;

Vladlen TIMORIN (2004) is a Lecturer and Postdoctoral Fellow at the Institute for Mathematical Sciences, SUNY at Stony Brook;

Janusz ADAMUS (2003) is currently an NSERC Postdoctoral Fellow at the Fields Institute and from July 2005 Assistant Professor at the Jagiellonian University in Krakow, Poland;

Wolfgang STAUBACH (2003) is a Leonard E. Dickson Instructor at the University of Chicago;

Ivan SOPROUNOV (2002) is a Visiting Assistant Professor at the University of Massachusetts, Amherst.

I.B.

Call for a BEATTY TRUSTEE

Samuel Beatty (1881-1970) was J. C. Fields's graduate student and in 1915 became Canada's first mathematician to obtain a Ph.D. degree. He served the University of Toronto as Lecturer, Professor, Dean, and finally as Chancellor 1953-1959. At his retirement as Head of the Mathematics Department and Dean of the Faculty of Arts and Science in 1952, the Samuel Beatty Fund was established by alumni and friends.

The Samuel Beatty Fund supports mathematics education in the province of Ontario through grants, scholarships, and awards. We are seeking nominations or volunteers to fill a vacant position on the Board of Trustees.

If you are interested in volunteering or would like to nominate someone, for details please contact David Hamilton, dhamilton@firstfolio.com .

D.H.

Giving

We have received recently two substantial donations to the Graduate Scholarships described on page 16.

Prizes in Honour of former U of T Math Professors

2005 GILBERT DE B. ROBINSON PRIZE

Gilbert de Beauregard Robinson (1906-1992) was Professor of Mathematics at the University of Toronto for more than forty years and Vice-President (Research) from 1965 to 1971. The *G. de B. Robinson Prize* recognizes an outstanding paper published in the *Canadian Journal of Mathematics* or the *Canadian Mathematical Bulletin*.

The Canadian Mathematical Society (CMS) awarded the 2005 G. de B. Robinson Prize to YU-RU LIU of the University of Waterloo. Liu was honoured for her two papers "A Generalization of the Turán Theorem and its Applications" and "A Generalization of the Erdős-Kac Theorem and its Applications", both published in the *Canadian Mathematical Bulletin* in 2004.

From a CMS announcement

2005 KENNETH O. MAY PRIZE

Professor Kenneth O. May (1915-1977) was the founding chair of the *International Commission for the History of Mathematics* (ICHM) and the founding editor of the international journal *Historia Mathematica*. Born in the United States, he studied mathematics at the University of California at Berkeley but spent most of his career teaching history of mathematics at the University of Toronto. After his death, the 'Institute for History of Science and Technology' at the University of Toronto and the 'International Commission on History of Mathematics' honoured his memory with an international prize to be awarded every four years to scholars who have made significant lifetime contributions to the history of mathematics. The award consists of a certificate and a medal cast in bronze.

The ICHM has awarded the *2005 Kenneth O. May Prize and Medal* to HENK BOS of the University of Utrecht. The May Prize honours outstanding contributions to the history of mathematics. According to the prize citation, Bos's studies of the work of Descartes and his contemporaries and predecessors are "an exploration of what counted as good mathematics in a particular period ... Henk Bos has, through his deep and insightful research, fundamentally shaped present-day understanding of the mathematics of the seventeenth century ... Bos gives to this seventeenth-century material the kind of careful attention it was given by the experts when it was new."

From the *Notices of the American Mathematical Society*, December 2005, Volume 52, Number 11; Karen Parshall, University of Virginia, on behalf of the ICHM

Frederick V. Atkinson Honoured

Derick ATKINSON was professor in our department since 1960 and Chair from 1975 to 1981. He died in 2002.

The Mathematische Nachrichten, a mathematical journal of high reputation, published a volume in honour of F. V. ATKINSON (Volume 278, Nos. 12-13 (2005)).

The introductory article, "A glimpse into the life and times of F. V. Atkinson", contains a personal account of Derick's life as friend, teacher, and mentor and gives a

detailed description of his prolific and seminal work. This article was written by Angelo Mingarelli, a former Ph.D. student of Derick's, now himself Professor of Mathematics at Carleton University in Ottawa. We mention a few highlights here.

Derick Atkinson's work on the Riemann zeta function still has an impact on the area. His papers on Turán's problem keep gathering interest. One of his results was even used in connection with black-hole geometries. Distinct papers referencing at least one of Atkinson's papers number over 1200.

One of the most enduring articles of his early days (1949) on the Sommerfeld radiation condition led to what is now called the *Atkinson-Wilcox Theorem*. It asserts that the solution of the wave equation outside a surface is uniquely determined by its boundary values and some conditions at infinity.

Derick Atkinson's most influential mathematical achievement was in the field of Hilbert space theory, where his fundamentally new approach to the theory of Fredholm operators and Fredholm index, now known as *Atkinson's Theorem*, underlays all later work in index theory (including that of Atiyah and Singer). More recent results have seen applications to medicine.

E.W.E., G.A.E.

Problem Proofs

Like everybody else, the mathematicians have problems. When a proof is found, the problem is solved, but occasionally the proof is the problem. A moment's reflection will reveal that it is not obvious what constitutes a proof. Clearly, a proof has to be reproducible and there has to be a consensus among the experts that the proof is acceptable. Three famous problems have been solved recently, or at least there is a strong claim that a proof for them is available.

The first one is the *four-colour problem*. Here the question is if every map can be coloured using just four colours.

The second question is concerned with the efficiency of the *stacking of cannon balls* or, perhaps more importantly, of oranges; does your supermarket manager use the most economical way to pile them up?

Third, the desire to *enumerate all finite simple groups* sparked an organized activity of countless group theorists around the world. The most vocal of the crowd, Michael Aschbacher of Caltech (California Institute of Technology), declared the problem solved.

One devil in all three cases is the computer. The validity of complicated and extremely long computer manipulations is at present virtually impossible to verify. The other obstacle is the sheer length of the proof which in case of the finite groups, for instance, has been written by a team of experts, each working on his special expertise so that no single mathematician can understand the whole proof.

Brian Davies* writes, "In 1875 every sufficiently able mathematician could fully absorb the proof of most theorems that existed within a few months. By 1975, a year before the four-colour problem was proved, this was not even close to being true, but it was still the case that some mathematicians fully understood the proof of any known theorem. By 2075 many fields of pure mathematics will depend upon theorems that no mathematician could fully understand, whether individually or collectively."

The availability of computers with their enormous calculating capacity and the active search for knowledge of a large force of mathematicians have solved many problems, but they have also created new ones. The solution poses a challenge for the next generation of mathematicians who will have to elevate our understanding and insight to a new and higher level.

The speaker in our Colloquium on the 8th of December 2005 was Professor Tom Hales of the University of Pittsburgh. He submitted a proof of Kepler's famous cannon ball conjecture in 1998 to a prestigious mathematical journal, *The Annals of Mathematics*. Although a great effort has been made by a whole team of referees, they could not yet confirm the correctness of all parts of the proof. Professor Hales described the difficulties that they faced and gave a vivid account of his quest to establish his proof.

* Professor of mathematics at King's College, London, in "Whither Mathematics?", *Notices of the American Mathematical Society*, December 2005, Vol. 52, No. 11

E. W. E.

Our Undergraduates

CONGRATULATIONS are due to our undergraduates! Again, they have done well in mathematical competitions.

THE PUTNAM CONTEST ACADEMIC YEAR 2004-2005

The Putnam contest is a long-established mathematical competition for undergraduate students in North America. This year it took place for the 65th time.

The University of Toronto team of **Robert Barrington Leigh**, **Roger Mong**, and **Jacob Tsimerman** received honourable mention, ranking in the 6th to 10th position.

Robert Barrington Leigh and Jacob Tsimerman ranked individually between 6th and 15th inclusive.

Tianyi David Han received honourable mention.

U OF T UNDERGRADUATE CONTEST 2005

The fifth annual University of Toronto Undergraduate mathematics competition was written on Saturday, March 12, 2005. There were twenty-one candidates from the Faculties of Arts & Science and Applied Science & Engineering.

The following students received top ranking:

Robert Barrington Leigh (II Arts and Science, Mathematics)

Jacob Tsimerman (I Arts and Science, Mathematics)

Garry Goldstein (III Arts and Science, Mathematics)

The following students, listed here in alphabetical order, received honourable mention:

Ali Feizmohammadi (II Engineering Science), Tianyi David Han (Engineering Science), Samuel Huang (Engineering Science), Emily Redelmeier (Arts and Science, Mathematics), Ilya Sutskever (IV Arts and Science, Computer Science).

This is an open competition, any undergraduate at the University of Toronto may write it.

I am indebted to Professor Man-Duen Choi for checking the ranking of the top papers.

The questions and solutions to the problems are posted on www.math.utoronto.ca/barbeau/. You will need an Acrobat Reader.

PUTNAM LECTURE 2005

The First Annual Putnam Talk was held last spring on April 12, 2005. This time it was supposed to recognize the achievement of the students who did well in the University of Toronto Undergraduate Mathematics Contests in 2004 and 2005.

The speaker was a distinguished former University of Toronto student and Putnam competitor, now Moores University Scholar at the University of Houston, Texas, Director of the Fields Institute, and recently also President of the Association of Women in Mathematics, *Dr. Barbara L. Keyfitz*.

She gave a lively and inspiring talk with the enticing title "Can partial differential equations help when you are stuck in traffic?"

Abstract: "The use of partial differential equations began when people started to describe the behaviour of fluids and other continua. From this emerged many branches of analysis and algebra. Now we know that at an atomic scale fluids are not really continua, but the model can still be useful. In the same way, it turns out that it can be useful to model things that are obviously not continuous on the scale of everyday life, like cars on a highway, by partial differential equations. When we do, the equations we get are interesting in themselves. Furthermore, solving them seems to explain some puzzling things about traffic flow.

In this talk, I will describe how one finds the solution by rather elementary analysis, and what it says about traffic patterns. I will also show how a very simple extension of the model leads to equations that are not well understood at all and lie at the edge of current mathematical research".

E.J.B.

2005 DELURY AWARDS

I am happy to announce that this year's winners of the *DeLury Teaching Awards* for excellence in TA (Teaching Assistant) work are **Andrew Douglas**, **Geoff Lynch**, and **Leonel Robert Gonzalez**.

The selection committee consisted of Abe Igelfeld, Mike Lorimer, and me.

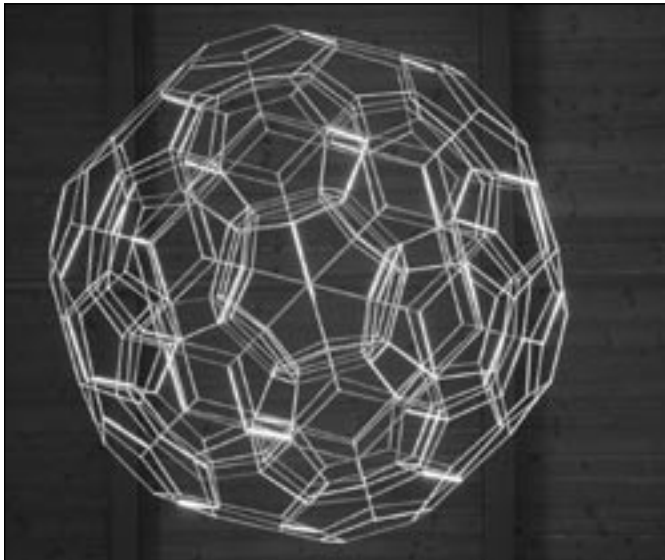
We would like to congratulate the winners and also to say that we think that there is a lot of excellent work being done by our TAs.

A small reception took place in March 2005 in the Math Lounge of Sidney Smith Hall to present the awards to the recipients.

C.S.

Recent Books by Faculty

Chandler Davis and Erich W. Ellers, editors, *The Coxeter Legacy: Reflections and Projections*. AMS/Fields 2006.



The “front” face of a 4D polytope with 120 dodecahedral faces (made by Marc Pelletier) as seen from below. *The Fields Institute*, February 2002.

(Photo credit to Dror Bar-Natan)

Donald Coxeter infused enthusiasm, even passion, for mathematics in people of any age, any background, any profession, any walk of life. Enchanted by Euclidean geometry, he was interested in the beauty, the description, and the exploration of the world around us. His involvement in art and with artists earned him admiration and friends in the intellectual community all over the globe. Coxeter’s devotion to polytopes and his interest in the theory of configurations live on in his students and followers. Coxeter groups arise in various subjects in applied mathematics, and they have a permanent place in some of the most demanding and fascinating branches of abstract mathematics, such as Lie algebras, algebraic groups, Chevalley groups, and Kac-Moody groups. This collection of articles by outstanding researchers and expositors is intended to capture the essence of the Coxeter Legacy. It is a mixture of surveys, up-to-date information, history, story-telling, and personal memories; and it includes a rich variety of beautiful illustrations.

E.W.E.

Jeffrey Rosenthal, *Struck by Lightning: The Curious World of Probabilities*. HarperCollins 2005.

Without requiring any mathematics background, the book informs readers about such topics as coinci-

dences, casinos, card games, medical studies, lotteries, opinion polls, chaos, and using probability to block spam e-mail. It explains why some pair of people at a party probably have the same birthday, why you should switch doors in the Monty Hall problem, and whether you are more likely to win a lottery jackpot or to die in a car crash on your way to purchase your ticket --- all through entertaining stories and amusing anecdotes. Laugh while you learn!

As one reviewer wrote in the *Winnipeg Free Press*: “Even for the math challenged among us, Rosenthal makes numbers understandable. He has written *Probability Theory for Dummies*, if you will, or a Canadian version of *Freakonomics*. ... He has likely got English majors lining up for his courses. Rosenthal’s goal is to help us all ‘make better choices and harness uncertainties for our own purposes’. He succeeds in spades. ... Rosenthal explains with clarity and precision key terms such as p-value ... and the various ways drug trial data can be shaded using biases in sampling, reporting or publication. Rosenthal’s style is highly readable. He explains each principle, illustrates the meaning by way of real life examples, then drives home the point with humorous, sometimes corny anecdotes. ... Numbers and logic and probability are not topics you’d think could be made lively or entertaining. But the probability that it can be done well by Rosenthal is pretty high.”

For more information, see [Bhttp://probability.ca/sbl/](http://probability.ca/sbl/)

J.R.

In addition, here is an expository article on a hot topic.

Luis A. Seco, *Hedge Funds: Truths and Myths*. Submitted for publication to ‘*Revista de Economia Financiera*’ (2005).

Abstract: Hedge funds have enjoyed increasing levels of popularity coupled with mysticism, opacity, and obscurity, yet they are a trillion dollar industry worldwide. This paper aims to present some facts about the hedge fund sector, and to reflect on some of its myths. The paper reviews the industry, its products, its risks, and proposes a way of thinking about them from the investor’s viewpoint which takes into account their nature, very different from traditional investments.

For the full text see www.risklab.ca/seco/publ.htm and click on ‘Hedge Funds: Truths and Myths’

L.A.S.

Insight from the Outside

MARGARET ATWOOD is not a mathematician, but she, too, writes books. You can find a surprising perspective of mathematics in her writing.

ON ARITHMETIC

"Arithmetic had entered the picture, with its many legs, its many spines and heads, its pitiless eyes made of zeroes. Two and two made four, was its message. But what if you didn't have two and two? Then things wouldn't add up. And they didn't add up, I couldn't get them to; ... this was how the numbers behaved. ... but what could you expect? The numbers were only numbers. They had no choice in the matter."

ON GEOMETRY

"None of this happens, of course. Or it does happen, but not so you would notice. It happens in another dimension of space."

Margaret Atwood, *The Blind Assassin*, McClelland & Stewart Ltd., 2000

E.W.E.

TVO's "BIG IDEAS" SHOW

MEGUMI HARADA in the TOP TEN!



Photo: [Bhttp://www.math.toronto.edu/~megumi](http://www.math.toronto.edu/~megumi)

Yes, our own MEGUMI HARADA, a postdoctoral fellow at the Department of Mathematics, was recently one of ten finalists in the "Best Lecturer in Ontario" competition sponsored by TV Ontario.

A high point of the competition was Megumi's public lecture in September 2005. She had an attractive topic, *Symmetry: Nature, Art, and Mathematics*, and two airings of the lecture at the end of October on TV Ontario's "Big Ideas" show. Immediately after each airing the audience could vote.

About her teaching, Megumi says,

"I believe that my varied intellectual history --- I seriously studied cultural anthropology, East Asian studies, philosophy, and physics before finally coming around to mathematics in my final year at university --- is one of my strengths when it comes to reaching out to a broader audience. I have a lot of respect for different ways of looking at, and engaging with, the world. Mathematics is just one of those many ways. So even in my classroom, I try to always give a lot of examples, to 'tell a story' --- to show how the math is used in different contexts and to encourage the students to see the fun in mathematics.

"I also bring a personal touch to the classroom: even when lecturing to a large class, I always make a great effort to learn the names of my students. I really want to have a two-way, active conversation. It makes such a difference to be able to call on a student by saying, 'What's confusing you, Katie?' rather than the anonymous 'Yes, do you have a question?' Students respond to that. A couple of years ago, I got the highest average teaching evaluation score in the Department of Mathematics at the University of Toronto, garnering an average of 6.8 out of a possible 7.0 score.

"I look forward to a long career of bringing the joy of mathematics to a wide audience. As a first step, I will also be appearing in TV Ontario's *More 2 Life* program, speaking about mathematics in everyday life. My first appearance was aired on 10 November 2005, and more segments are scheduled. So tune in, and share the fun!"

E.W.E., M.H.

New People in the Department

Faculty --- Our Department of Mathematics is growing every year. It seems that more and more students want to study mathematics or feel they should do so since the technical world around them is in a state of rapid development. We are happy that we could again interest six highly qualified mathematicians to join us

as members of the Faculty. They contribute to an ever greater variety in the expertise of our department. We also welcome two distinguished Visiting Professors in our midst.

Professor Sergey Arkhipov comes to us from *Yale University*, where he has been a Gibbs Assistant Professor for the last three years. He is working on geometric representation theory and modern algebraic geometry. Professor Arkhipov received his university education from *Moscow State University* and the *Independent University of Moscow*. From the mid-nineties he spent much of his time in Europe and the United States, at the *École Polytechnique* in Paris, at the *IHES* in Bures-sur-Yvettes, at the *University of Freiburg* in Germany, and at the *School of Mathematics of the Institute for Advanced Study* in Princeton, NJ. He was awarded a three-year NSF grant by the United States and has produced an impressive number of mathematical publications.

Professor Valentin Blomer has accepted a position at UTM (University of Toronto at Mississauga). He works on analytic number theory. He was recently awarded the prestigious *Heinz Maier-Leibniz Prize*, open to researchers in all fields under the age of thirty-three. The *Deutsche Forschungsgemeinschaft* in Germany selects only six individuals from all the nominations that they receive. Professor Blomer was educated in Germany at the *University of Mainz* and the *University of Stuttgart*. He held postdoctoral fellowships in Stuttgart and in Toronto and has received several impressive awards for his outstanding scientific achievements.

Professor Almut Burchard works in analysis. She comes to us from the *University of Virginia*. She received her mathematical education at the *University of Heidelberg* in Germany and the *Georgia Institute of Technology* in Atlanta, Georgia. Professor Burchard previously has had positions at the *Courant Institute*, *Princeton University*, and the *University of Virginia*. She has received a number of prestigious awards, among them the coveted *Alfred P. Sloan Research Fellowship*.

Professor Giovanni Forni comes to Toronto from *Northwestern University* in Illinois. He works in dynamical systems and has been appointed to a *Canada Research Chair* (CRC). He received much of his mathematical education in Italy and obtained the Ph.D. degree from *Princeton University*. Professor Forni has held a number of teaching and research positions, in

Bologna, Italy, in Paris and Lille, France, at the *Newton Institute* in Cambridge, England, and at *Princeton University*. Among several honours bestowed on him is an *Alfred P. Sloan Research Fellowship* and the invitation to speak at the *International Congress of Mathematicians* (ICM) in Beijing in 2002.

Professor Konstantin (Kostya) Khanin has accepted a Full Professor appointment at UTM (University of Toronto at Mississauga). His area of study is probability theory, ergodic theory, and statistical mechanics. Kostya has worked at several universities in Russia, Israel, the United Kingdom, and North America. He now comes to us from the *Heriot-Watt University* in Edinburgh, Scotland.

Professor Charles Pugh joins our department from the *University of California at Berkeley*. He works on smooth dynamical systems. Professor Pugh has had a distinguished career as professor at UC - Berkeley for more than forty years. During that time he also was visiting professor and researcher at many universities in the US, Brazil, Britain, and France, and also at Toronto. He has received major awards and honours, has been invited to talk at important events, has supervised twenty-four Ph.D. students and produced more than sixty mathematical papers. We are delighted that he decided to join our team.

It is great that two distinguished colleagues have agreed to be with us this year as Visiting Professors.

Professor Martin Golubitsky, who is currently President of SIAM (Society for Industrial and Applied Mathematics), is visiting us from the *University of Houston*. He works on equivariant dynamical systems and bifurcation theory.

Professor Enrique Pujals is visiting from IMPA (*Instituto Nacional de Matemática Pura e Aplicada*, Rio de Janeiro, Brazil). He works in dynamical systems.

Administrative Staff --- We welcome Joanne Kearney who joined us last summer as Administrative Assistant, responsible primarily for financial matters. She took over this position from Annette Yu who retired after more than thirty years of valuable service in our department.

E.W.E.

Awards for Faculty

Congratulations to our colleagues on their prestigious awards!

We are very pleased to report that Professor Yael KARSHON is the recipient of the 2005 *McLean Award*. This award, established in 1996, administered by the Connaught Committee, and based on peer review, recognizes outstanding researchers in the natural sciences and engineering at the University of Toronto early in their careers with a \$100,000 endowment.

We are delighted to pass on to you the news that Professor ROBERT MCCANN was awarded the 2005 *Coxeter-James Prize*. The Coxeter-James Prize was instituted to recognize young mathematicians who have made outstanding contributions to mathematical research. Robert's presentation of the 2005 *Coxeter-James Prize Lecture* took place at the CMS (Canadian Mathematical Society) Winter Meeting at the University of Victoria in December 2005.

In 2005, Professor LISA JEFFREY was named a *Fellow of the Fields Institute for Research in Mathematical Sciences* in recognition of outstanding contributions to the Fields Institute and its activities. It is a lifetime appointment.

In 2004, Professor GEORGE A. ELLIOTT was appointed to the position *Honorary Professor* at the *University of Copenhagen*.

From the Graduate School

This year 43 new graduate students joined the department, 20 in the Ph.D. program (11 of these from our M.Sc. program), 21 in the M.Sc. program, and 2 visiting students.

Here are our 2005 Ph.D. Graduates, their Positions After Graduation, and their Awards:

DE LOS SANTOS, Alejandro ---

Supervisor: Luis Seco (Partial Differential Equations, Mathematical Finance) --- Thesis: Liquidity risk estimation: non-gaussian AR models and quantile expansions.

Alejandro is an Associate Researcher at the Banco de Mexico, Mexico City.

HAMILTON, Mark ---

Supervisor: Yael Karshon and Lisa Jeffrey (Symplectic Geometry) --- Thesis: Singular Bohr-Sommerfeld leaves and geometric quantization.

Mark will start a two-year postdoctoral position at the University of Calgary in January 2006.

NIU, Zhuang ---

Supervisor: George A. Elliott (Operator Algebras) --- Thesis: A classification of certain tracially approximately subhomogeneous C^* -algebras.

Zhuang is a Postdoctoral Fellow at the Fields Institute, Toronto.

Zhuang Niu has been chosen as this year's winner of the *Malcolm Slingsby Robertson Graduate Award*.

PATANKAR, Vijay ---

Supervisor: Kumar Murty (Number Theory) --- Thesis: Splitting of abelian varieties.

Vijay is a Postdoctoral Fellow at the Cold Spring Harbor Laboratory in New York (a centre for research in cancer biology, plant genetics, genomics, bioinformatics, and neurobiology).

POLLANEN, Marco ---

Supervisor: Luis Seco (Partial Differential Equations, Mathematical Finance) --- Thesis: Evaluation of low discrepancy sequences in probability spaces.

Marco is an Assistant Professor at Trent University.

I.B.

DEPARTMENT OF MATHEMATICS GREAT AWARDS FOR GREAT STUDENTS

U of T is committed to ensuring that qualified undergraduate and graduate students have access to the highest quality university education regardless of their financial circumstances. To support the university in this commitment, many alumni, friends, faculty and staff have chosen to establish scholarships. These awards recognize academic excellence or proficiency in a particular discipline while making university education a reality for many undergraduate and graduate students.

It is in part due to the strong support of our friends and alumni that the department is able to attract and retain the academic talent that is the foundation of our community. We thank you for your commitment and we look forward to your continued involvement in the University of Toronto.

HOW CAN I SUPPORT STUDENT AWARDS?

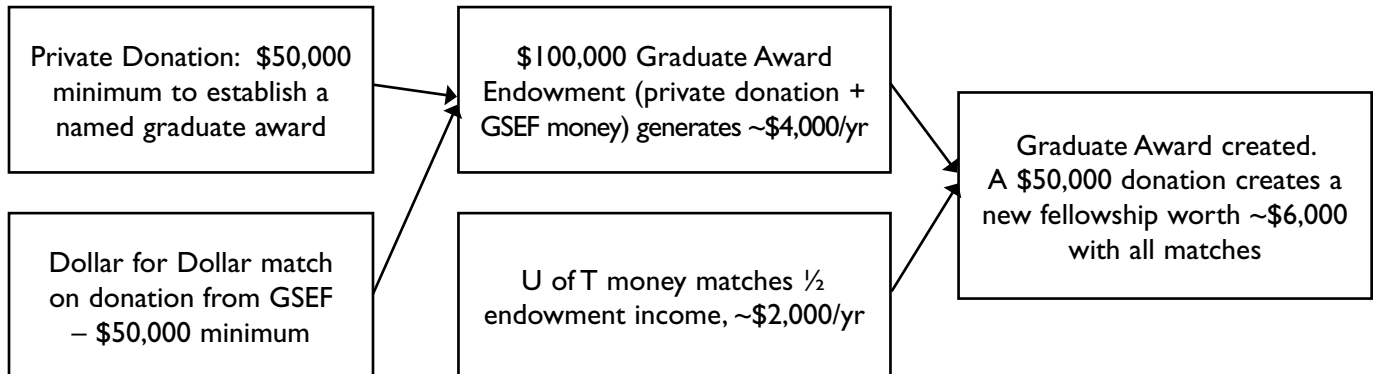
You may direct your donation towards general support for student awards, in either a particular program or a department, or to an established award. Alternatively, you can establish a new named award.

HOW CAN I CREATE A NEW NAMED AWARD?

An award may be funded by a single donor with either one donation or through annual donations over a period of time. New awards can be established at any time of year. Your schedule of payments will determine how quickly the fund can generate awards for students. An award can also be funded by multiple donors. For example, in honour awards are often funded by friends, family and colleagues. Once established an award can be built up through future contributions, which may increase both the value and number of awards made to students each year.

GRADUATE SCHOLARSHIP DONATION OPPORTUNITIES:

There is currently a remarkable leveraging opportunity that will effectively triple the impact of donations made in support of graduate student awards. Donations of (or totaling) \$50,000 will be matched 1:1 through a special **Graduate Student Endowment Fund** established at the U of T by the Province of Ontario. The annual payout on the resultant \$100,000 endowment will then be augmented by the University to create a named scholarship of approximately \$6,000 per annum to benefit graduate students, in perpetuity.



If you wish to support student awards at the Faculty of Arts & Science please contact:

Christie Darville, Senior Development Officer
Office of Advancement, Faculty of Arts & Science
100 St. George Street, Suite 2032
Toronto, ON M5S 3G3
Tel: 416/946-5192
Fax: 416/946-7057
Email: cdarville@artsci.utoronto.ca

The University of Toronto respects your privacy. We do not rent, trade or sell our mailing lists. If you do not wish to receive future Department of Mathematics newsletters, please contact us at 416-978-2139 or address.update@utoronto.ca. Charitable reg. BN 108162330-RR0001 ** A receipt for income tax purposes will be issued for all donations.