MATH IS POWER

Letter from the Chair, Dan Rockmore

Welcome to the first newsletter of the Department of Mathematics. We hope to publish this newsletter annually, and perhaps more often. As this is a work in progress we welcome input and news from all parties. This newsletter is intended to reach out to all members of the Dartmouth College Mathematics Department including but not limited to: current department members, past faculty, graduate alumni and undergraduate math majors/minors alumni.

In September it will be 2 years since we moved out of Bradley and into Kemeny Hall. We are enjoying the new facilities and, more importantly, having the department all under the same roof. If you have not visited the campus in the last 2 years please plan a visit and stop by for a tour of the new Math Department digs. We love to show off the new building and after 2 years it is very hard to remember that Bradley was an arm's length away from where the new patio and courtyard now reside. To view photos of the new building access our website and select the "Extras" button on the lower left hand column to view the gallery. In addition, at the top left of the math department home page is a link to our new Department Brochure. We are also in the process of revamping our webpage to make the department more visible to the world and provide a website with a wealth of information, for both alumni and future alumni.

[Graeco-Latin Squares in Bradley Hall before demolition]   [Graeco-Latin Squares in new home – Kemeny Hall]

We have a lot of news to share and have had a very successful year. We hope you enjoy the newsletter. If you have news to share or know of others who might enjoy our newsletter please email Tracy Flynn-Scott (tfscott@dartmouth.edu). Please keep in touch and visit our web page for more information.
www.math.dartmouth.edu

Dan Rockmore
John G. Kemeny Parents Professor of Mathematics
Department Chair

Faculty Highlights

Congratulations to faculty members **Scott Pauls** and **Vladimir Chernov**, who were tenured and promoted this past year.

As the Mathematics Department was celebrating a year in the new building, we welcomed new assistant professor **Sergi Elizalde** (MIT 2004), who studies enumerative and algebraic combinatorics with applications to computational biology, and two new John Wesley Young postdoctoral instructors: **Meera Mainkar** in geometry (Tata Institute of Fundamental Research, Mumbai, India 2005) and **Joe Mileti** in mathematical logic (University of Illinois at Urbana-Champaign, 2004).

Vince Vatter will begin this summer as a John Wesley Young Instructor. Vince comes to us from the University of St. Andrews in Scotland, where he has held a postdoctoral position since receiving his Ph.D. in 2005 from Rutgers. His thesis, written under the supervision of Prof. Doron Zeilberger, is entitled "The Enumeration and Structure of Permutation Classe." Most of Vince's research is on pattern avoidance and permutation classes; he has also written papers on graph theory, partially ordered sets, and algebraic combinatorics.

Stephanie Treneer and **Owen Dearricott** leave their 2 year JWY positions this summer to advance their careers. Stephanie Treneer has accepted the position of Assistant Professor of Mathematics at Western Washington University in Bellingham, WA and Owen Dearricott as Visiting Assistant Professor, Department of Mathematics, University of California, Riverside.
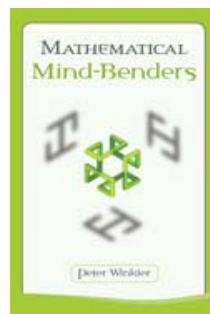
Carl Pomerance was a featured speaker at the Joint AMS/MAA National Meeting in San Diego this past January. During this past year he served as First Vice President of the MAA and the Mathematics Section Chair of the American Association for the Advancement of Science.

Dan Rockmore was the SIAM I.E. Block Community Lecturer at the 2008 Society for Industrial and Applied Mathematics Annual Meeting in San Diego. In addition, Dan was the director of the Santa Fe Institute Summer School.

Sergi Elizalde, **Rosa Orellana** and **Pete Winkler** hosted the "Discrete Mathematics Day at Dartmouth" Conference on October 27th.

Craig Sutton (shown above) has been awarded a prestigious research fellowship from the Woodrow Wilson Foundation for the 2008-2009 academic year. The award, a Career Enhancement Fellowship, offers pre-tenure assistance and mentoring for junior faculty from underrepresented groups, as well as for those committed to promoting cross-racial understanding. The program gives recipients a one year paid sabbatical and includes a monetary stipend as well as a stipend for research, travel, and publication. Past Dartmouth winners of this fellowship have included Darren Ranco, assistant professor of environmental sciences and Native American studies, and Tanalís Padilla, assistant professor of history (both in 2006); Rosa Orellana, assistant professor of mathematics (2003); and Steve Swayne, associate professor of music (2002).
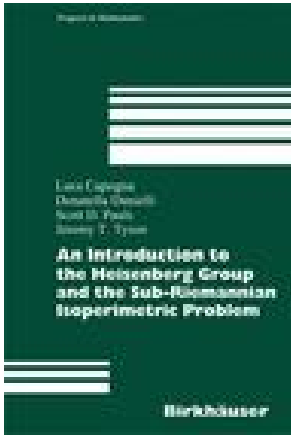

Pete Winkler published a book, "Mathematical Mind-Benders"

Dana Williams recently published a new book on "Crossed Products of C*-Algebras" and hosted the first "New Hampshire Operator Algebra Symposium" on November 15th.

Scott Pauls co-authored his first book, "An Introduction to the Heisenberg Group and the Sub-Riemannian Isoperimetric Problem."

January 2008 cover of the Notices of the AMS, for which **Alexander Barnett** has computed all eigenmode and random-wave images.

Dorothy Wallace was the faculty lecturer on two alumni trips. The fall trip to Chianti featured talks on the Black Death, remote sensing of grapevine health, and Galileo's heretical discoveries. Her spring trip from the Canary Islands to Nice included medieval Islamic algebra, the geometry of Moorish tilings, Islamic astronomy and (when near Florence) Galileo. You can see what other alumni trips are available at: http://www.alumni.dartmouth.edu/travel
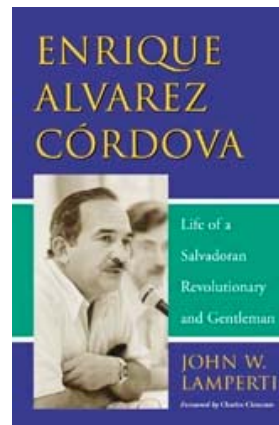
Jody Trout presented a talk to the alumni on June 13th titled: PERSONAL ENRICHMENT: Worlds of Wonder: Flatland and the Fourth Dimension

Alex Barnett created a set of images featured on the cover of the January 2008 issue of *Notices of the American Mathematical Society*. The images show high frequency modes in 'quantum chaos,' that is, the behavior of waves trapped in systems where the reflection of rays is chaotic. The cover's background image shows random waves, which are a conjectured statistical model for such modes. Apart from its mathematical interest, quantum chaos has applications in nano-scale physics, optics, and quantum computing. Barnett has pioneered numerical methods that compute modes at dramatically increased speeds. He also works in numerical methods for partial differential equations, medical imaging (in particular diffuse optical imaging and Bayesian methods), and mathematical ecology. At Dartmouth, he teaches Introduction to Applied Mathematics, Chaos!, and The Mathematics of Music and Sound.

Robert Norman, Emeritus, was honored for sponsoring WISP interns for 15 years. Bob has also given a number of talks at meetings on voting methods.

Laurie Snell, Emeritus, is keeping busy managing the Chance News. http://www.dartmouth.edu/~chance/

John Lamperti, Emeritus, spent a month in Cambodia teaching real variables. John also wrote an article jointly with Arlene Ash about one election where vote counting went disastrously wrong; the paper appeared in the Spring 2008 issue of *Chance* magazine, published by the American Statistical Association. You can read it online; go to http://www.amstat.org/publications/chance/index.cfm?fuseaction=issue199 and then click just below "Featured in this issue."

Enrique Alvarez Córdova
Life of a Salvadoran Revolutionary and Gentleman
John W. Lamperti

Colloquia, Seminars, and Meetings

The 2007-2008 **Kemeny Lecture Series** in April featured Daniel Goldston, San Jose State University. Professor Goldston presented 3 lectures: "Primes and Twin Primes," "Small Gaps Between Primes," and "Problems Related to Primes." To view past and future Kemeny Lectures go to: http://www.math.dartmouth.edu/~colloq/kemeny-lectures/

The 2007-2008 **Reese Prosser Memorial Lecture** in October featured J. Brian Conrey, Executive Director, American Institute of Mathematics. Brian lectured on: "The Riemann Hyposthese, Unsolved Mysteries of the Primes!" To view past and future Prosser Lectures go to: http://www.math.dartmouth.edu/~colloq/prosser-lectures/

Colloquia are held on most Thursdays during the Fall, Winter and Spring Terms. Department Seminars are held weekly. Visit the Math webpage to view the calendar, for more specific information click on the left hand tab labeled *Colloquia, Seminars, and Meetings*.
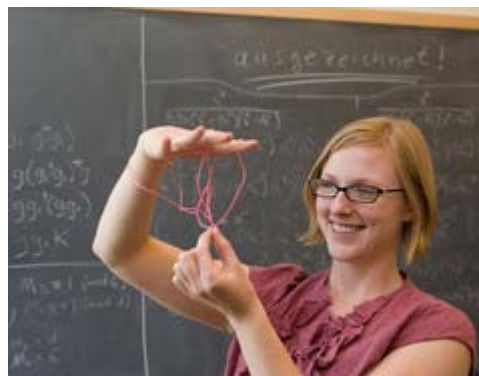
On April 19th **Pete Winkler** hosted "Mechanical Puzzles Day at Dartmouth", featuring some of the world's top puzzle designers and puzzles from the Slocum Collection.

"**Math and a Movie Night**" was an added feature to our term calendar this year. We kicked the year off showing *Fermat's Last Tango* in the Fall Term. The Winter Term featured a film by our very own Dan Rockmore, *The Math Life*. Spring Term featured 2 short films, *4D Man* and *Flatland*. Math and a Movie Night is open to all, access the calendar on our webpage for future dates.

Graduate Student Highlights

Congratulations to our 6 new Ph.D. graduates. **Brooke Andersen** (Marcia Groszek, advisor) has accepted a tenure track position at Framingham State College in Framingham, MA. Brooke's thesis is titled: "Distinguishing complete sets with respect to strong notions of reducibility." **Jonathan Bayless** (Carl Pomerance, advisor) has accepted a tenure track position at Husson College in Bangor, ME. Jonathan's thesis is titled: "Carmichael's Conjecture and the Unit Group Function." **John Bourke** (Marcia Groszek, advisor) has accepted a visiting position at Bucknell University in Lewisburg, PA. John's thesis is titled: "Results on off-branch numbers." **Allison Henrich** (Vladimir Chernov, advisor) has accepted a tenure track position at Oberlin College in Oberlin, OH. Allison's thesis is titled: "A Sequence of Degree One Vassiliev Invariants for Virtual Knots." **Martin Malandro** (Dan Rockmore, advisor) has accepted a tenure track position at Sam Houston State University in Huntsville, TX. Martin's thesis is titled: "Fast Fourier Transforms for Inverse Semigroups." **Paul Pollack** (Carl Pomerance, advisor) has been awarded a prestigious NSF Mathematical Sciences Postdoctoral Fellowship and will be a J.L. Doob Research Assistant Professor at the University of Illinois at Urbana/Champaign. Paul's thesis is titled: "Prime Numbers and Prime Polynomials." To read abstracts go to: http://www.math.dartmouth.edu/people/theses/

Allison Henrich won this year's Filene Teaching Award and the Arts and Sciences Graduate Community Award.

Congratulations also to those graduate students who were invited to give research talks at conferences: **Brooke Andersen**, **Jonathan Bayless**, **Allison Henrich**, **Marty Malandro**, **Paul Pollack**, and **Enrique Trevino**.

In September we welcome 5 incoming students to our Ph.D. Program. **Elizabeth Gillaspy** from Macalester College, **Natalie Komarov** from Carnegie Mellon University, **Katherine Kinnaird** from Wellesley College, **Asa Levi** from the University of Chicago and **Michael Wijaya** from the University of Rochester.

Math Majors and Minors

This years annual Math Majors/Minor BBQ was hosted on the newly finished patio of Kemeny/Haldeman, being the first official event held in the new space. It was a beautiful day and as you can see by the pictures the new space is perfect and fun was had by all.

In 2008, 35 Math Majors and 10 Minors graduated. In addition, the following students presented honors theses. To read abstracts go to: http://www.math.dartmouth.edu/people/theses/

- Evarist Byberi (Vladimir Chernov, advisor) "Virtual Bridge Number One Knots"
- Chetan Mehta (Alex Barnett, advisor) "Investigations in Diffuse Optical Tomography"
- Geoffrey S. Scott (Rosa Orellana, advisor) "Characterizing Graphs with Equal Chromatic Symmetric Functions"
- Robert C. Taintor (Dan Rockmore, advisor) "Fast Hermite Transforms"

Geoffrey Scott has also published the following:

- "Coefficients of the Ihara Zeta Function" Geoffrey Scott, Christopher Storm

- "A generalization of Thue freeness for partial words" F. Blanchet-Sadri, Robert Mercas, Geoffrey Scott
- "Counting Distinct Squares in Partial Words" F. Blanchet-Sadri, Robert Mercas, Geoffrey Scott

Association for Women in Mathematics (AWM)

http://www.awm-math.org/

Our chapter of the **Association of Women in Mathematics (AWM)** at Dartmouth continued to thrive this year under the leadership of Amelia Glover (president) and other officers Emily Marshall, Grace Moy, Kate I. Schnippering, Jessica Wheeler and Melinda Wilson. We currently have over one hundred members in our mailing list. The website for our association is http://math.dartmouth.edu/~awm.

During the fall term the association concentrated on social events to create a sense of community among the first year new members and the older members. Our first event "Greet and Meet" was well attended. At this event, the AWM provided dinner and upper class women provided information for the first year students, advice on courses and coping with the first term at Dartmouth. Our next big event was the "Mathematics Game night" co-sponsored by the Dartmouth Math Society, the main attraction was a Sudoku competition; the first prize was a copy of Peter Winkler's "Mathematical Puzzles: A Connoisseur's Collection". During the fall we also organized the grad-undergrad mentoring program. This program seeks to vertically integrate undergraduate and graduate women through regular small group meetings of undergraduate students with one or more graduate students. The AWM recognizes and thanks the graduate students that made the mentoring activities of the AWM a success: Allison K. Henrich, Brooke M. Andersen, Annalies Vuong, Sarah Wright, Patricia R. Cahn, Paige E. Rinker, and Lauren A. Thompson.

Other activities this year included a talk by Prof. Alex Barnett from Dartmouth on "Math and Music". We also hosted at talk by Prof. Maura Mast from U Mass, Boston, on "Math and Voting", this was a very popular event attracting lots of students. Under

the leadership of graduate students Allison Henrich and Sarah Wright, the AWM also became involved in outreach activities. During the winter term Amelia Glover, Allison Henrich and Sarah Wright gave a workshop at an Expanding Your Horizons conference in Southern New Hampshire and during the spring term Allison Henrich, Sarah Wright and Emily Marshall '09 gave presentations at local high schools on Penrose Tilings

The AWM activities have also concentrated in encouraging undergraduate women to consider further math studies with presentations from graduate students Allison Henrich and Brooke Anderson about their Ph.D. thesis research to the AWM members. The AWM also co-sponsored, with the Dartmouth Math Society, an information session on research experiences for undergraduates (REU) to encourage undergraduates to apply for these research opportunities. During the winter and spring term we continued hosting social events that included a dinner and mentoring night and a movie night.

The AWM is very excited about the coming year, we hope to continue some of the activities we had this year as well as start new ones. The new officers have been elected, kudos to Emily Marshall (president), Grace Moy and Jessica Wheeler (co-vice presidents), Katherine Roddy (secretary) and Olivia Liu (treasurer).

Outreach involvement in 2008:
- April 5, Expanding Your Horizons workshop for Middle School girls, 3 presentations by Sarah Wright and Amy Glover (undergrad, AWM pres).
- May 8, Hanover High, 3 classes (Cynthia Sanschagrin-2 geom classes, Bill Hammond-1 senior non-calc math class), presentations by Allison Henrich and Sarah Wright
- May 20, Hartford High, 1 class (Warren Tucker-Calc), presentation by Allison Henrich, Sarah Wright and Emily Marshall (undergrad in AWM) [observed by Jon Brown and Nancy Serrell, director of Outreach at Dartmouth]
- May 21, Hartford High, 1 class, math panel with panelists Alex Barnett, Rebecca Weber, Peter Doyle, Dorothy Wallace, Matt Mahoney, Michael Wijaya (incoming grad student) and Allison Henrich

- May 29, Richmond Middle School, 2 classes (John Kitzmiller-honors geom), presentations by Sarah Wright, Allison Henrich and Jon Brown; possible observations by/help from Enrique Trevino, Paige Rinker, Carolyn Gordon

Math Society

http://www.math.dartmouth.edu/~mathteam/

There is a thriving "mathematical community" on campus. **The Dartmouth Math Society** has regular meetings with activities that include lectures, movies, and pizza parties, as well as research lectures from its members. Dartmouth sponsors a student chapter of the Association for Women in Mathematics. There are also various mathematical competitions: the department sponsors a Dartmouth team for the national Putnam Mathematical Competition which is held in early December. "Training sessions" are held all fall (you need not compete in order to train - and eat pizza!). The 2006 team placed 20th in the nation – Dartmouth's best showing since 2001. In 2006 the Dartmouth team took first place at the Collegiate Mathematical Competition held by the Northeastern Section of the Mathematical Association of America. The 2007 results showed that the Dartmouth Putnam Team was placed 44 nationwide. Great work! Congratulations to the three person official Dartmouth Putnam Team: Aria Anavi, Ian Hayes, and Yong Su.

Some statistical data: 3753 students from 516 institutions in Canada and in the US participated in the 2007 Putnam Competition. There were teams from 413 colleges and universities.

For over a hundred years the Department has conducted the Thayer Prize Mathematical Exam for first-year students. The names of the winners are put on a plaque in the undergraduate lounge in Kemeny Hall.

2008 Winners:
Aria Anavi 1st place
Alan C. Faubert 1st place
Kamil M. Adamczewski 3rd place
David Qian 3rd place
Valentin Yanev, Honorable Mention

Curriculum News

Current listing of courses offered by the Math Dept can be reviewed in the ORC online at: http://www.dartmouth.edu/~reg/courses/desc/

We have revamped courses and added a new minor of "**Mathematical Finance**" with the addition of Math 86 and 96 (Mathematical Finance I and II). Within the applied world the department has recently added several new courses: Math 27 (Mathematical Biology), Math 46 (Intro to Applied Math), Math 53 (Chaos!), Math 66 (Topics in Mathematical Physics), Math 75 (Applied Topics in Number Theory and Algebra), Math 76 (Topics in Applied Math). There is also Math 17 (An Introduction to Mathematics Beyond Calculus).

Five graduate students, who recently received their Master of Arts in Mathematics from Dartmouth, completed the "**Teaching Seminar**", a six week two credit intensive course in the teaching and learning of mathematics that includes two weeks of practice teaching. The class this year had an international flavor, with students from four countries participating: Amir Barghi, Greg Petrics, Ralf Rueckriemen, Enrique Trevino, and Paige Rinker.

The goal of the seminar is to prepare students to teach their first Dartmouth class and to give them tools for ongoing professional development as teachers. In addition to Mathematics Department faculty members and guests from the Dartmouth Center for the Advancement of Learning, the First Year Dean's Office, the Academic Skills Center and Student Accessibility Services, the graduate students also benefited from a session with presentation coach Eliza Bergeson.

As part of their preparation the students in the seminar organized and ran two week-long "Exploring Math" camps for local middle and high school students arranged in advance through the Center for Mathematics and Quantitative Education (http://math.dartmouth.edu/~mqed/). Over 15 local participants attended each of the two sessions, coming from Hanover, Lebanon, Enfield, and Plainfield, New Hampshire as well as Thetford, Norwich, Sharon, Post Mills, Wilder and Weathersfield, Vermont. Topics included the geometry of origami and Archimedean

solids with emphasis on proof (in the first session) and graph theory (in the second session).

In addition to benefiting Dartmouth graduate students and the undergraduates they teach, this summer experience provides a valuable link between our department and the communities in which we live and work.

Digital Library for Alumni

As Dartmouth college alumni, you have probably heard that the Dartmouth College Library offers the Digital Library for Alumni. This digital library includes the following resources:

* ***Academic Search Alumni Edition***: provides full text for more than 1,500 publications, and indexing and abstracting for over 8,000 publications.
* ***Business Source **Alumni Edition***: provides full text for approximately 6,700 publications as well as indexing and abstracting for over 9,000 publications
* ***Regional Business News***: This database provides comprehensive full text coverage for regional business publications. Regional Business News incorporates coverage of 75 business journals, newspapers and newswires from all metropolitan and rural areas within the United States.
* ***Newspaper Source***: Newspaper Source provides selected full text for nearly 30 national (U.S.) and international newspapers. The database also contains full text television & radio news transcripts, and selected full text for more than 200 regional (U.S.) newspapers.

Many mathematics titles are in this package, including top ranked journals such as Journal of the American Mathematical Society, Inventiones Mathematicae, and Journal of the European Mathematical Society. Alumnus/-a need to obtain a special Digital Library for Alumni user identification and password to access this licensed resource. For more information and instructions to obtain a special Digital Library for Alumni user identification and password, go to http://www.dartmouth.edu/~library/home/services/alumni/.