MATH IS POWER

Department of Mathematics
Dartmouth College - Hanover, NH
September 2011

Letter from the Chair, Dan Rockmore

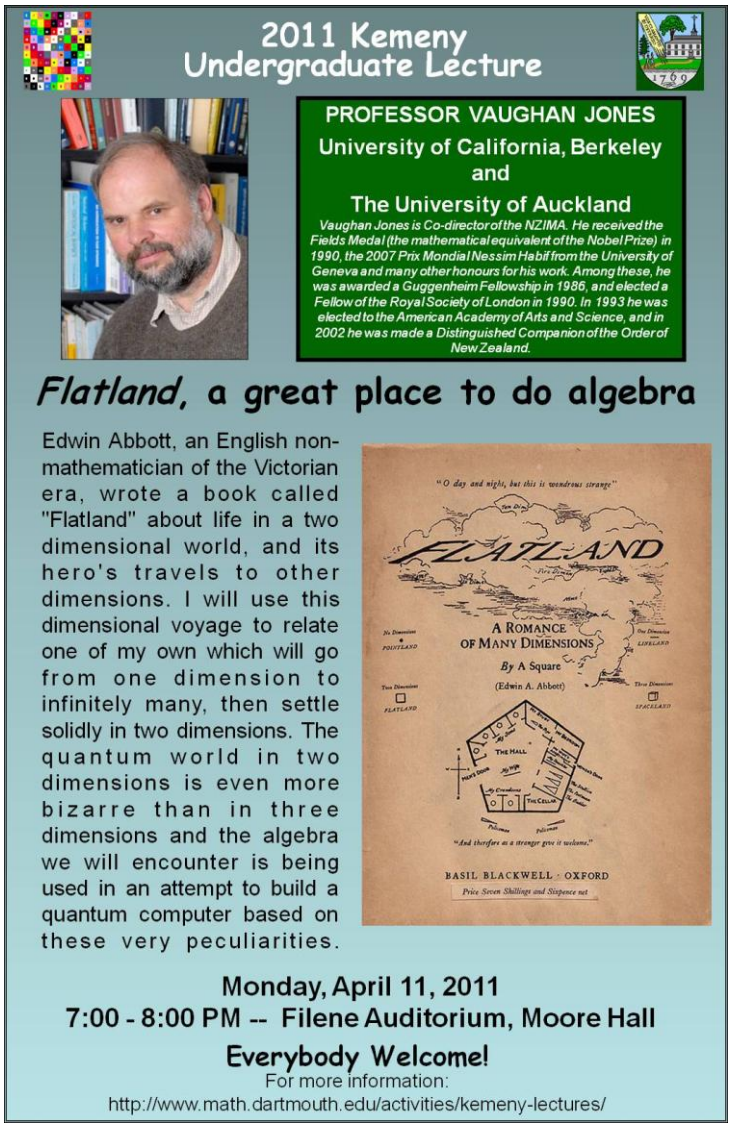
Welcome to the fourth annual newsletter of the Department of Mathematics. This newsletter is intended to reach out to all members of the Dartmouth College Mathematics Department, including but not limited to: current department members, past faculty, graduate alumni and undergraduate math majors/minors alumni.

The department had a very productive year. First and foremost, we are happy to announce the promotions of Alex Barnett, Craig Sutton, and Rebecca Weber to the rank of Associate Professor with Tenure. Other highlights include several new research grants, many more publications including a few books, some media attention, a 2011 class of 41 majors, 8 minors, and 3 senior theses. We have also been extraordinarily busy on the conference side, as we hosted the **International Conference on Spectral Geometry** in July 2010, the **Eighth Conference on Permutation Patterns** in August 2010, and the **East Coast Operator Algebra Symposium** in October 2010, each of which had over 70 participants from around the world. For more information on these conferences, please visit our website: http://www.math.dartmouth.edu/activities/conferences/. In addition, once again we hosted a very successful Johns Hopkins Center for Talented Youth Program. Other outreach activities included our annual Reese T. Prosser Lecture and Kemeny Public Lecture (and Lecture Series) scheduled for the fall and spring respectively. The posters from these events are below and more information can be found at: http://www.math.dartmouth.edu/activities/. These activities (and others) are supported by generous contributions from various friends and alumni of the department. Directed gifts like these help make the department among the most vibrant on campus.

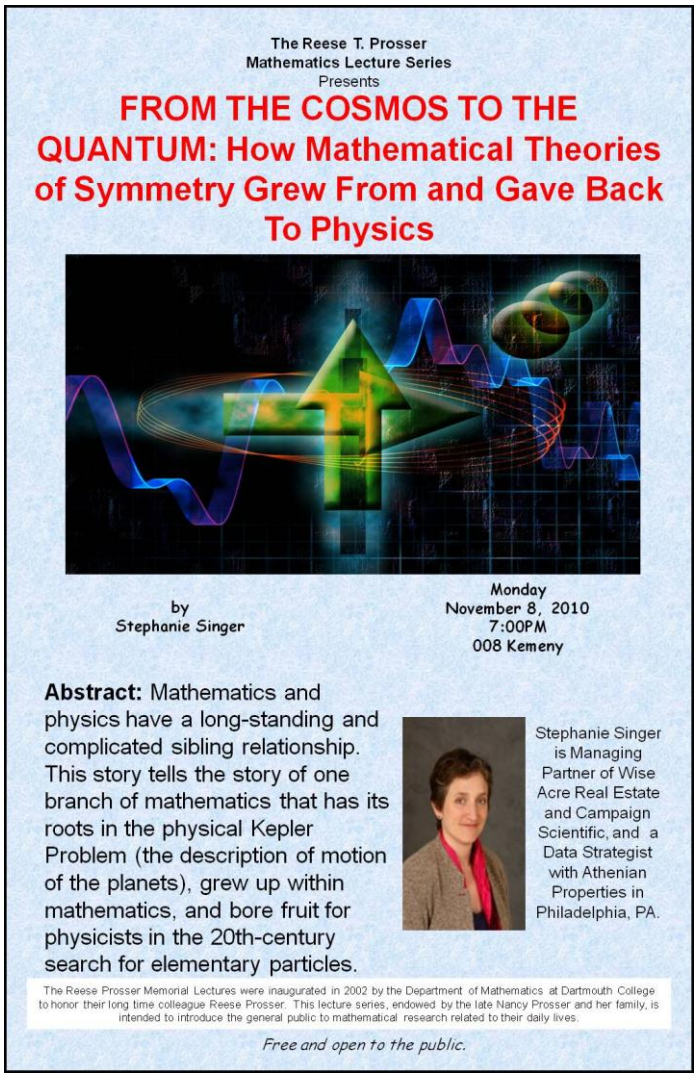
We hope you enjoy the newsletter. We are hoping to enlarge our alumni section for next year, for you to share any updates (professional or personal) or news. If you have anything you wish to share, or if you know of any other alumni or others who might enjoy our newsletter please email **Stephanie Kvam** (stephanie.kvam@dartmouth.edu). We also encourage you to think of us for job postings! Please keep in touch and visit our webpage (www.math.dartmouth.edu) for more information.

With best regards and best wishes,

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



2011 Kemeny Undergraduate Lecture



2010 Reese T. Prosser Lecture

In Memory of Ernst Snapper (1913-2011) Professor Emeritus Dartmouth Colelge

Ernst Snapper was born in Groningen in the Netherlands in 1913. He came to the United States in 1938 to study at Princeton and received his Ph.D. in 1941 under the direction of J.H.M. Wedderburn. He remained at Princeton as an instructor until 1945 when he was appointed assistant professor at the University of Southern California. During his USC years, Snapper held two visiting appointments – at Princeton 1949 – 50 and at Harvard 1953 – 54. He was promoted to full professor in 1953.

In 1955 Snapper was named the Andrew Jackson Buckingham Professor of Mathematics at Miami University of Ohio. A few years later, in 1958, he accepted a position as professor at Indiana University. Then, in 1963, he moved to Dartmouth College where he was named the Benjamin Pierce Cheney Professor of Mathematics in 1971, a position he held until his retirement in 1979.

Snapper's research made significant contributions in commutative algebra, algebraic geometry, cohomology of groups, character theory and combinatorics.

An early sequence of papers extended the Steinitz field theory to completely primary rings using ideas from the work of Krull. During his visits at Princeton and Harvard he studied algebraic geometry and the homological and sheaf-theoretic methods of Serre and Grothendieck . Later he applied those methods in several important papers on the polynomial properties of the Euler characteristic associated with divisor classes of an irreducible normal projective variety. He continued using homological methods in a sequence of papers in which he extended the classical cohomology of groups to the cohomology of arbitrary permutation representations of finite groups. Snapper then applied these methods to obtain a classical result on Frobenius kernels.

In the area of combinatorial mathematics, Snapper extended de Bruijn's theory of the cycle index of a finite group to that of an arbitrary permutation representation. A subsequent paper coauthored with Arunas Rudvalis extends this cycle index to a generalized cycle index of a permutation representation paired with a class function. They then obtain the theorem of Frobenius that every simple character of the symmetric group is an integral linear combination of transitive permutation characters.

In 1971, Snapper coauthored the text *Metric Affine Geometry* (Academic Press) with Robert J. Troyer - a text for upper level undergraduates and graduate students. It reflected their conviction that geometry for both high school and college students should be based on a foundation of linear algebra. Their book was inspired by the classic text *Geometric Algebra* by E. Artin.

Snapper was an outstanding lecturer much in demand by the MAA, and he taught in numerous summer institutes for both high school and college mathematics teachers. He also had a long time interest in the foundations of mathematics. For his beautiful paper, *The Three Crises in mathematics: Logicism, Intuitionism and Formalism,* Snapper was awarded the Carl B. Allendoerfer Award from the MAA in 1980.

During his career, Snapper mentored fifteen Ph.D. students. His students valued his lucid lectures, which frequently challenged them with open questions. Both at Indiana University and at Dartmouth College, Snapper and his wife Ethel hosted numerous gatherings for visiting speakers, which were well attended by faculty and graduate students. When graduate students were unable to go home during vacations, the Snappers invited the students to their home for holiday meals. Snapper loved outdoor activities, from sailing on the lakes near Bloomington to walking in the woods near Hanover and hiking in the White Mountains of New Hampshire, and he enjoyed many adventurous summer trips with his two sons.

Joseph Buckley
Professor Emeritus
Western Michigan University
April 2011

In Memory of J. Laurie Snell (1925-2011) Professor Emeritus Dartmouth College

J. Laurie Snell, ASA Fellow and Benjamin Cheney Professor of Mathematics Emeritus, Dartmouth College passed away on March 19, 2011. He was 86 years old. He taught at Dartmouth College for 51 years and was an inspiration and friend to many a mathematician and statistician. Snell was widely known for an outstanding body of research in probability and its applications in the social sciences; for exemplary expository writing; and for curricular innovation and inspirational leadership as a teacher of probability and statistics extending over five decades. Snell received his Ph.D. in mathematics from the University of Illinois under the direction of D. L. Doob and was a Fine Instructor at Princeton University before being recruited away to Dartmouth by John Kemeny. With that he began a long and fruitful collaboration and friendship with Kemeny, which produced, among many other things, two classic textbooks, "Introduction to Finite Mathematics," (co-authored with Gerald Thompson) and "Finite Markov Chains," which was for years the classic and standard text in the field. Snell was widely known for introducing new technologies into teaching, from the significant use of BASIC in early editions of "Introduction to Probability," to what was at the time, a revolutionary use of the Web in his distribution of the widely read "Chance News," initiated in 1992 as a monthly newsletter containing interesting exegeses of statistically relevant news items. Before passing away, Snell migrated Chance News to Wiki format and it is now available and constructed as a Wiki (see www.causeweb.org/wiki/chance/). While many people thought that Chance News must have had a full staff behind it, it was in fact mainly the product of Snell's tireless efforts. Chance News grew out of the NSF-funded "Chance Project," a novel and successful attempt to teach statistics through the use of news articles. His energy, friendship, and intellect will be missed.

Faculty Highlights

Martino Arkowitz gave a colloquium lecture at the University of California – Santa Barbara entitled "Comultiplications in Algebra and Topology" (January 2011).

Alex Barnett was invited to give talks at several conferences including: Integral Equation Methods, Fast Algorithms and Applications (IMA workshop, MN, August 2010); a conference in honor of Eric Heller's 65th birthday (ITAMP, Harvard, October 2010); Applied Mathematics and Computational Science Colloquium (U. Penn, January 2011); Numerical Analysis and Scientific Computing Seminar (Courant Institute, NYU, January 2011); CSC Seminar, SFU (Vancouver, BC, March 2011); and New England Numerical Analysis Day (UMass Dartmouth, April 2011).

Vladimir Chernov gave numerous talks this past year including: "Refocussing and Y x-manifolds" at the Moscow - St Petersburg seminar of Low-dimensional Mathematics, POMI, St Petersburg, Russia (June 2010); "Causality in space-times, Low conjecture and the partial order on Legendrian spheres" at the International Conference "Geometry, Topology, Algebra and Number Theory, Applications" dedicated to the 120th anniversary of Boris Delone, Steklov Mathematical Institute, Moscow, Russia (August 2010); "Legendrian linking, refocussing and causality in spacetimes" at the Center for Dynamics and Geometry Seminar, Pennsylvania State University, PA (September 2010); "Causality, Low Conjecture and the partial order on the space of Legendrian spheres" at the Gauge Theory and Topology Seminar, Harvard University (September 2010); "Causality, Low Conjecture and the partial order on the space of Legendrian spheres" at the Analysis-Geometry Seminar, Northeastern University (November 2010); "Causality, Low Conjecture and globally hyperbolic spacetimes" at the Topology Seminar, Brandeis University (February 2011); and "Causality in spacetimes and Legendrian linking" at the Thursday Seminar on Topology, at SUNY Stony Brook (March 2011).

Eugene Demidenko, Adjunct Professor, gave a lecture at Isaac Newton Institute of Mathematical Sciences, Cambridge, England as an invited speaker at the workshop "Optimum Design for Mixed Effects Non-linear and Generalized Linear Models" (August 2011). His presentation can be viewed at http://www.newton.ac.uk/programmes/DAE/seminars/081009301.html Also he gave a talk at the American Statistical Association Meetings entitled "Random effect coefficient of determination for mixed and meta-analysis models" (July 2011).

Sergi Elizalde was a member of the Program Committee of the International Conference in Formal Power Series and Algebraic Combinatorics, FPSAC (Aug 2010). He was also invited to give talks at the SIAM Conference on Discrete Mathematics, Austin, TX (Jun 2010); AMS Fall Eastern Section Meeting, Syracuse, NY (Oct 2010); Simon Fraser University Discrete Math Seminar (Mar 2011); Pacific Permutation Patterns Workshop (Mar 2011); University of British Columbia Discrete Math Seminar (Apr 2011); University of Pennsylvania Combinatorics Seminar (Apr 2011).

Johanna Franklin, Visiting Professor, has accepted a postdoctoral position at University of Connecticut. Best of luck!

Carolyn Gordon presented the Annual Martha Davenport Heard Lecture, Wellesley College Mathematics Department (October 2010), Twenty-minute talk in Special Session on Spectral Problems at Canadian Mathematical Society Annual Meeting (December 2010), Annual Sulski Memorial Lecture, Holy Cross Math Dept. (March 2011), Colloquium at MIT (March 2011), and Colloquium at Bucknell University (March 2011) which was in conjunction with a one week "Distinguished Visiting Professor" appointment.

Marcia Groszek presented "Reverse Mathematics and Ramsey Properties for Trees" at the Logic Seminar at University of California - Berkeley (October 2010), served on the MSRI Sponsor's Day panel on "Preparing Graduate Students to Teach" (March 2011), and presented " Ramsey Properties of Partial Orderings and Arithmetic Comprehension" at the AMS Sectional Meeting, special session on Computabilty Theory and Applications (April 2011). Professor Groszek co-organized the Joint Math Meetings special session segment on "Logic in the Undergraduate Curriculum" with former Dartmouth JWY Tami Lakins. She also served as a program committee

member for the Third International Congress on Tools for Teaching Logic in Salamanca, Spain (June 2011).

Meera Mainkar leaves her JWY position this summer to advance her career as an Assistant Professor in Mathematics at Central Michigan University. We wish her all the best!

This past year, **Rosa Orellana** gave a variety of talks including a mini-symposium on Enumerative Combinatorics at the SIAM Conference on Discrete Mathematics in Austin, Texas, (June 2010), and a talk on Lie Algebras and Representation Theory at the Eastern Section Meeting of the AMS, Syracuse University, NY (October 2010). She also gave talks at the International Conference on Non-Commutative Rings and Combinatorial Representation Theory at Pondicherry University, India (September 2010); the Mathematics Department Seminar Talk, Middlebury College, VT (November 2010); CombinaTexas 2011: Combinatorics in the South-Central U.S., Houston, TX (April 2011); and a plenary talk at Banff International Research Station in Calgary, Canada (May 2011). She also co-organized with Cristina Ballantine a session in "Combinatorial Representation Theory" for the American Mathematics Society during the sectional meeting in Worcester, MA. (April 2011).

Scott Pauls was an invited speaker to the AMS Special Session in Worcester, MA (April 2011). Professor Pauls also serves as the vice-chair for the Department of Mathematics (2007-present) and is the First Year Advisor for Mathematics for the entire incoming class.

Carl Pomerance was invited to give a number of talks this past year including: "Fibonacci integers," Banff Conference (June 2010); "Fixed points for discrete logarithms," plenary lecture at Algorithmic Number Theory Symposium (ANTS-IX), Nancy, France (July 2010); "Elementary number theory," "Finite cyclic groups," "Fibonacci integers," and "Counting fields," Rademacher Lecture Series, U. Penn. (September 2010); "Two problems in combinatorial number theory," Number Theory and Applications, Debrecen, Hungary (October 2010); "Elliptic curves: applications and problems," First Abel Conference in Honor of John Tate (January 2011); "Order and chaos," Members Seminar, Mathematical Sciences Research Institute, Berkeley (February 2011); "Order and chaos," Hudson River Undergraduate Mathematics Conference at Skidmore College (April 2011); and "Order and chaos," 14th Quebec Student Conference at U. de Montreal (May 2011). He was a Research Professor at the Mathematical Sciences Research Institute in Berkeley, CA during the spring term, participating in the program "Arithmetic Statistics." He served on various committees for the Mathematical Association of America, including the Haimo Award Committee, the Robbins Prize Committee, the Gung-Hu Award Committee, and the Invited Paper Sessions Committee. He is on various editorial boards, and continues as co-editor in chief of Integers.

Dan Rockmore continues as Chair of the Department and in September also will be the Director of the Neukom Institute for Computational Science. In March of 2011 he was invited to the National Science Foundation as a Distinguished Lecturer where he gave a lecture to the Division of Mathematical Sciences on "Marketing Math and Selling Science - Challenges, Successes, and Opportunities." Also in March, he organized the "Computational Cultural Evolution - Working Group" at the Santa Fe Institute, NM. In the Fall of 2010 he received a five-year $2.5M grant from the National Science Foundation for developing science outreach materials for rural libraries. This was covered in the local press.

Tom Shemanske was invited to the 25th Annual Automorphic Forms Workshop at Oregon State University where his joint paper "Constructing Simultaneous Hecke Eigenforms" was presented, and he served as a panelist for "Navigating Career Transitions in Mathematics" (March 2011).

Craig Sutton gave talks at the International Conference on Spectral Geometry, Dartmouth College (July 2010), Séminaire du CIRGET en géométrie et topology, UQAM (September 2010), Special Session on Geometry of nilpotent Lie groups, AMS Sectional at Holy Cross University (April 2011), Special Session on Geometric and Topological Problems in Curvature, AMS Sectional at Holy Cross University (April 2011), and the Pacific Northwest Geometry Seminar, Univ. of Washington (May 2011). This past year Craig also became a faculty advisor to the Dartmouth Argentine Tango Society and co-taught a PE class in Argentine Tango.

Jody Trout gave talks "Asymptotic Morphisms and the spinc-Dirac operator on the Cotangent Bundle" at the Applied Math Seminar and "The Fourth Dimension Across the Curriculum" at the Math Department Colloquium both at Northern Arizona University (November 2010).

David Webb served on the scientific committee of the conference "Approaches to Group Theory" at Cornell University, October 2010. He assisted with selecting speakers, planning, and acting as co-PI in writing an NSF grant proposal to secure conference funding.

Rebecca Weber gave several talks over the past year including: "Sets automorphic to low sets," a Computability Theory Special Session Invited Talk, AMS sectional meeting, University of Notre Dame (November 2010); "Introduction to model theory 1 and 3," Introductory Logic Seminar, Dartmouth College (January & February 2011); and "Automorphisms, invariance, and lowness 1-3," Logic Seminar, Dartmouth College (January & February 2011). Rebecca organized the logic seminar continually since Spring 2010 with participation from undergraduates.

Dorothy Wallace gave a plenary lecture at the Society for Mathematical Biology meeting in Rio de Janeiro in Summer 2010. Dartmouth students Nicole Johns '10, Jocelyn Drexinger '12, and Zoe Lawrence '10 gave talks at the meeting. This summer Dorothy spoke at the Society for Mathematical Biology meeting in Krakow, as did her students Erin Dauson '11, and Chelsea Liddell '11. She also participated in a workshop at the NIMBIOS institute at the University of Tennessee on modeling the epidemiology of malaria.

This summer she is developing curriculum in financial literacy for use in two year colleges and informal education as part of the Center for Mathematics and Quantitative Education at Dartmouth in conjunction with the Financial Literacy Center. She co-edits the peer reviewed open access online journal Numeracy.

Dana Williams gave the colloquium talk "The Equivariant Brauer group" at the University of Nebraska (January 2011). He was a visiting scholar at the University of Wollongong in Wollongong, NSW, Australia (February 2011), and a visiting scholar at the University of Otago in Dunedin, New Zealand (March 2011). Professor Williams also serves as the department's "Advisor to Majors;" he handles all major and minor advising for the Math Department as well as all transfer credit questions. He enjoys the opportunity to mentor and provide pre-major advising to our undergraduate students.

Pete Winkler gave 23 invited addresses at various institutions around the world including Technische Universitaet Wien, San Francisco State U., McGill, U. of Washington, Cornell, Brown, Emory, Clemson, Illinois Institute of Technology, DePaul, Stony Brook, Columbia, and Dartmouth itself. Subjects included statistical physics, combinatorics, probability, and both mathematical and mechanical puzzles.

Professor Winkler also served as poster judge and organizer of a Swedish Lottery at Dartmouth's 2010 Computer Science Research Symposium (September 2010); and as Tournament designer and moderator at the Northeast Regional Ethics Bowl hosted by Dartmouth College (November 2010).

Publications

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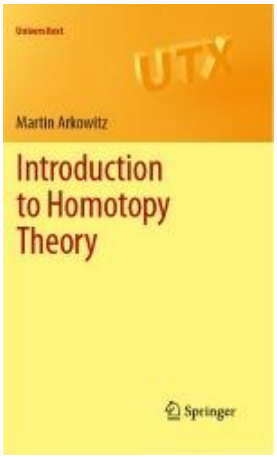

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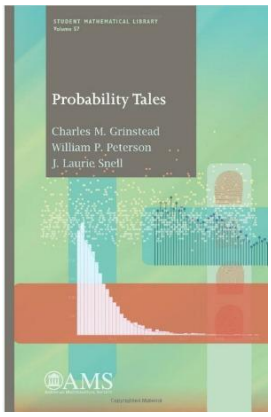

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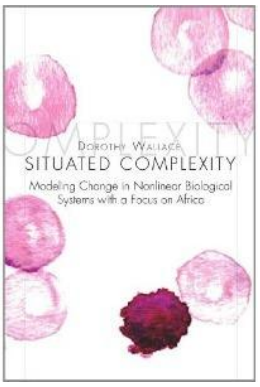

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Fellowships, Grants and Awards

Alex Barnett was awarded the 2011 Karen E. Wetterhahn Memorial Award for Distinguished Creative or Scholarly Achievement from Dartmouth College. Congratulations Alex!

Eugene Demidenko was awarded 1st place in the contributed paper presentation category at the Annual Joint Statistical Meetings in Vancouver, CA for his paper entitled "Statistical Modeling of Tumor Regrowth and the Assessment of Drug Synergy in Animal Experiments."

Marcia Groszek received the grant "Graduate Assistantships in Areas of National Need" which provides five graduate fellowships for three years each, PI, 2009-2010, 2010-2011, and 2011-2012.

Carl Pomerance received a grant "Topics in number theory" from the NSF, PI, DMS-1001180, 2010-2013.

Dan Rockmore received several grants this past year. From the NSF: "Pushing the Limits: Building Capacity to Enhance Public Understanding of Math and Science (5 years), from the Alfred P. Sloan Foundation: "Network Models of Systemic Risk" (2 years), and another 2 year grant from the Kress Foundation.

David Webb received a grant from the National Science Foundation, "Problems in Geometric Analysis." Co-PI.

Dorothy Wallace, with Seattle Central Community College and California State University in Monterey Bay, received a grant from the NSF, "Collab Res: Six Short Weeks, a classroom strategy for promoting undergraduate research in mathematical biology." PI, 2008-2010.

Also, collaborating with Annamaria Lusardi and **Kim Rheinlander**, she received a grant from the Social Security Administration, "Building Financial Literacy Content in College Courses." 2009-2011.

Pete Winkler was awarded the 2011 Robbins Prize by the Mathematical Association of America (announced January, 2011) for "innovative work on two papers: Overhang, American Mathematical Monthly 116, January 2009; Maximum Overhang, American Mathematical Monthly 116, December 2009. The two papers together solve, to within a constant factor, the classic problem of stacking blocks on a table to achieve the maximum possible overhang, i.e., reaching out the furthest horizontal distance from the edge of the table."

He also received a grant from the NSF, DMS-0901475, "Combinatorial Methods for Random Structures in the Plane." PI, 2009-2012.

Colloquia, Seminars, and Meetings

The 2010-2011 **Kemeny Lecture Series** in April featured Professor **Vaughan Jones**, Co-director of the New Zealand Institute of Mathematics and its Applications (NZIMA) at University of Auckland and Professor of Mathematics at University of California, Berkley. Professor Jones presented three lectures: "Flatland, a great place to do algebra," "The Onset of Wildness," and "Random matrices, von Neumann algebras and (2+1)-dimensional topological quantum

field theories." To view past and future Kemeny Lectures go to: https://www.math.dartmouth.edu/activities/kemeny-lectures/

The 2010-2011 **Reese T. Prosser Memorial Lecture** in November featured **Stephanie Singer**, Managing Partner of Wise Acre Real Estate and Campaign Scientific, and a Data Strategist with Athenian Properties in Philadelphia, PA. Professor Singer lectured on: "From the Cosmos to the Quantum: How Mathematical Theories of Symmetry Grew From and Gave Back to Physics." To view past and future Prosser Lectures go to: https://www.math.dartmouth.edu/activities/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 *Activities* tab.

The Fall 2010 Colloquia talks were:

- **Johanna Franklin**, Dartmouth College "Describing randomness"
- **Robin Pemantle**, University of Pennsylvania "Huge Complexity upper bound for a sieving algorithm"
- **Richard Schwartz**, Brown University "Outer billiards and polygon exchange maps"
- **Cristina Ballantine**, College of the Holy Cross "Powers of the Vandermonde determinant, Schur functions and the dimension game"
- **Tatiana Shulman**, University of Copenhagen "Lifting problems in C*-algebras and best approximation by compact operators"
- **Mark Lyon**, University of New Hampshire "Efficient solutions to PDEs on complex domains: Fourier Continuation - alternating direction methods"
- **Jennifer Balakrishnan**, MIT "Heights on hyperelliptic curves"
- **Greg Galloway**, University of Miami "On the topology of black holes"
- **Po-Shen Loh**, Carnegie Mellon University "Connectivity in discrete random processes"
- **Greg Friedman**, Texas Christian University "Stratified Spaces and Intersection Homology"

The Winter 2011 Colloquia talks were:

- **Erik van Erp**, Dartmouth College "Noncommutative techniques in topology"
- **Francisco Santos**, University of Cantabria "A counter-example to the Hirsch conjecture"
- **Paul Baum**, The Pennsylvania State University "Atiyah-Singer Revisited"
- **Heiko Enderling**, Tufts University "Modeling cancer stem cells and tumor growth - what can we learn"
- **Peter Zvengrowski**, Calgary University "The Borsuk-Ulam Theorem, Some History, Applications, and Generalizations"
- **Moira Chas**, Stony Brook University "Self-intersection of curves on surfaces"
- **Jure Leskovec**, Stanford University "Tracking and Predicting the Flow of Information through Networks"
- **Alejandro Uribe**, University of Michigan "On the spectra of classically periodic systems and their perturbations: Direct and inverse problems"

The Spring 2011 Colloquia talks were:

- **Oleg Musin**, The University of Texas at Brownsville "The kissing and other problems in distance geometry"
- **Luca Capogna**, University of Arkansas "Extremal quasiconformal mappings"
- **Vaughan Jones**, University of California, Berkeley "The Onset of Wildness"
- **Vaughan Jones**, University of California, Berkeley "Random matrices, von Neumann algebras and (2+1)-dimensional topological quantum field theories"
- **Denis Ilyutko**, Lomonosov Moscow State University "Steiner problem in normed planes"
- **Judith A. Packer**, University of Colorado at Boulder "Probability measures on solenoids and induced representations"
- **Penny Haxell**, University of Waterloo "Edge colouring multigraphs"
- **Dorothee Schueth**, Humboldt University "Inaudible curvature properties of closed Riemannian manifolds"
- **Andrew Yang**, Dartmouth College "Distribution questions surrounding number fields"
- **Chantal David**, Concordia University "Fluctuations in the number of points of curves over finite fields"

- **Marc Noy**, Universitat Politecnica de Catalunya "Counting planar graphs"
- **Clyde Martin**, Texas Tech University "Random Walks on Groups, Switching Systems and Limiting Distributions"

Shapiro Visitors

The Shapiro Visitor Program in Mathematics is funded through the generosity of Ed Shapiro (1916--2003), long-time friend and supporter of the Department of Mathematics. Shapiro Visitors for the 2010-2011 academic year were:

- Paul Baum (The Pennsylvania State University)
- Luca Capogna (Universtiy of Arkansas)
- Emily Dryden (Bucknell University)
- Siegfried Echterhoff (University of Muenster)
- Daniel Sean Fitzpatrick (UC Berkeley)
- Angelos Georgakopoulos (Graz University of Technology, Austria)
- Charles Grinstead (Swarthmore)
- Penny Haxell (University of Waterloo)
- Denis Ilyutko (Moscow State University, Russia)
- Marius Ionescu (Colgate University)
- Klaas Landsman (Radboud University, Nijmegen, Netherlands)
- Clyde Martin (Texas Tech University)
- Paul Pollack (University of Illinois at Urbana-Champaign)
- Aiden Sims (Wollongong, NSW, Australia)
- Erik Smith (Santa Fe Institute)
- Christina Sormani (CUNY)

Graduate Student Highlights

Congratulations to our 6 new Ph.D. graduates. **Amir Barghi** (Pete Winkler, advisor) has accepted a visiting professor position at SUNY New Paltz in New Paltz, NY. Amir's thesis is titled: "Firefighting on Geometric Graphs." **Jared Corduan** (Marcia Groszek, advisor) has accepted a position in private industry. His thesis is titled: "Coloring Posets and Reverse Mathematics." **Gregory Petrics** (Scott Pauls, advisor) has accepted a tenure track position at Johnson State College in Johnson, VT. His thesis is titled: "Roto-Translation Space and the Visual Cortex." **Paige Rinker** (Dan Rockmore, advisor) has accepted a tenure track position at John Carroll University in University Heights, OH. Her thesis is titled: "A Mallows Model for Coxeter Groups and Buildings." **Ralf Rueckriemen** (Carolyn Gordon, advisor) has accepted a postdoctoral position at Cardiff University in Cardiff, Wales, UK. His thesis is titled: "The Bloch Spectrum of a Quantum Graph." **Enrique Treviño** (Carl Pomerance, advisor) has accepted a visiting professor position at Swarthmore College in Swarthmore, PA. His thesis is titled: "Numerically Explicit Estimates for Character Sums." To read abstracts go to: http://www.math.dartmouth.edu/graduate-students/theses/

Amir Barghi gave talks "Firefighting on Geometric Graphs" at the Theory Seminar at RPI CS, Troy, NY (April 2011), "Fighting Fires on Flat Terrains" at the SMC/UVM Joint Combinatorics Seminar, Colchester, VT (April 2011), "Firefighting on Random Geometric Graphs" at the Joint Mathematics Meeting, New Orleans, LA (January 2011), and "Firefighting on Random Geometric Graphs" at the AMS Eastern Sectional Meeting, Syracuse University, Syracuse, NY (October 2010).

Jonathan Bloom was recognized by DCAL (Dartmouth Center for the Advancement of Learning) as an "Outstanding Graduate Student Teacher" from an undergraduate perspective for his work in Math 13. He submitted "Modified Growth Diagrams, Permutation Pivots, and the BXW map Phi*" co-authored with Dan Saracino, to the Journal of Combinatorial Theory Series A (March 2011). He also spoke at the 2011 Permutation Patterns Conference held at California Polytechnic State University.

Patricia Cahn was the recipient of the 2011 Kenneth P. Bogart Teaching Award, given annually to the fourth-year graduate student in Mathematics at Dartmouth College who best exemplifies outstanding dedication to and excellence in advancing the educational mission of the department. Patricia presented her research at Knots in Washington XXXI, the Special Session on Knot Theory at the Joint Mathematics Meetings, and at the Moscow State University Seminar on Knots and Representation Theory (over Skype). She also gave undergraduate-level research talks at Smith College, the EDGE (Enhancing Diversi-

ty in Graduate Education) Program at North Carolina State University, and St. Michael's College.

Elizabeth Gillaspy attended three workshops in 2010-11: the Summer School for Operator Algebras and Noncommutative Geometry at the University of Victoria (June 2010). She reconnected with some of the people she met at Victoria when she attended the School and Workshop on Topics in Operator Algebras in Madrid, Spain (September 2010), and again at the East Coast Operator Algebra Symposium (ECOAS) hosted at Dartmouth in October. She also attended the Noncommutative Geometry and Operator Algebras (NCGOA) Spring Institute on Index Theory and Hopf Algebras at Vanderbilt University (May 2011), the Permutation Patterns conference held at Dartmouth (August 2010), and the Spectral Geometry Workshop and Conference also held at Dartmouth.

Zach Hamaker, along with undergraduates **Yinghan Ding**, **Tim Xu '14**, and **Andy Clay '12**, wiped out Harvard, MIT, Penn and the University of Chicago to reach the intercollegiate finals in bridge. This earned them an all-expense-paid trip to the North American Bridge Championships in Toronto this summer (July 2011).

Playing in top form, the Dartmouth team scored only one narrow loss (to Brandeis), a stunning performance for a school that is only in its second year of intercollegiate competition. The team is coached by Professor **Pete Winkler**.

Katie Kinnaird received a Community Service Award in honor of her leadership in helping to create a graduate student community while also teaching and doing research.

Ben Linowitz was invited to give a talk at Wesleyan University's Algebra seminar (September 2010). He received a travel grant to give invited talks at two conferences in Chile. The first was "Workshop on the Arithmetic of Quadratic Forms and Integral Lattices" at Universidad de Talca; the second was a special session at the First Annual Joint Meeting of the AMS and Sociedad de Matematica de Chile (December 2010). He gave a talk at the 25th Automorphic Forms Workshop at Oregon State University (March 2011). Lastly, he gave a talk at the First Annual Upstate New York Number Theory Conference (May 2011).

Paige Rinker was one of the three Filene Graduate Teaching Award Winners in 2011. Congratulations Paige! This year also marked her third and final year serving on the Future Faculty Advisory Board to the Dartmouth Center for the Advancement of Learning (DCAL).

Ralf Rueckriemen gave a talk "The Bloch spectrum of a quantum graph" at the Graduate Student Topology and Geometry Conference, Michigan State University (April 2011).

Lola Thompson gave several conference talks over the past year, including: "Phi-practical numbers" at the Canadian Number Theory Association conference in Wolfville, Nova Scotia and at the Quebec-Maine Number Theory Conference in Quebec City; and "Variations on the practical numbers" at the Upstate Number Theory Conference in Ithaca, NY. She also gave an invited talk on "Artin's primitive root conjecture" at MIT's Seminar on Topics in Arithmetic, Geometry, Etc. Lola participated in two workshops through a semester-long program on Arithmetic Statistics at MSRI. She also attended an AMS workshop on The Pretentious View of Analytic Number Theory in Snowbird, Utah and worked on a coding project at Sage Days 26: Women In Sage in Seattle, Washington. In addition to her research activities, Lola worked as a calculus instructor at the Summer Institute for the Gifted; facilitated the Math Department's Ethics Training sessions for first-year graduate students; and gave a talk on "Number Theory and Security in the Digital Age" at the Ross Mathematics Program, a number theory summer camp for high school students.

Enrique Treviño gave invited talks at the AMS/MAA Joint Meetings in the AMS/SIAM Special Session on Mathematics of Computation (January 2011), Swarthmore College (March 2011), and was the "Invited Graduate Student Speaker" at the Palmetto Number Theory Series XIV held in the University of South Carolina (December 2010). He also gave talks at the Quebec-Maine Number Theory Conference (Oct. 3 2010) and at the Underrepresented Students in Topology and Algebra Research Symposium (USTARS 2011) conference (April 2011). He participated as an accompanying professor at the Mexican Mathematical Olympiad in Ensenada, Baja California (November 2010). His paper "The least inert prime in a real quadratic field" was accepted for publication in the journal Mathematics of Computation. He also

served as a "consultant" on Kamil Adamczewski's '11 undergraduate honors thesis.

Sarah Wolff was awarded a prestigious NSF Graduate Fellowship. **Zeb Engberg** received an honorable mention.

In September we welcome 6 incoming students to our Ph.D. Program: **Emma Chiappetta** from Bowdoin College, Brunswick, ME, **Donato Cianci** from University of Arizona, **Jonathan Epstein** from New York University, **Jeffery Hein** from Purdue University, Calumet, IN, **Ewa Infeld** from London School of Economics and Political Science in the UK, and **Nicolas Petit** from Universita degli Studi di Torino in Italy.

Alumni News

Kristin A. Tennent '80 graduated with a minor in Math. After 25 years managing software development projects, she changed to the career she had always wanted: to be a high school math teacher. She is now in her third year of teaching at Westhill High School, a large, urban school in Stamford, CT and working harder than ever. Kristin had many great math professors at Dartmouth, including John Kemeny, who passed on their love of mathematics to her and which she hopes to pass on to her own students, regardless of the careers they choose.

If you have news (personal or professional) that you would like to have included in the Alumni section of next year's newsletter, please email Stephanie Kvam (stephanie.kvam@dartmouth.edu), Administrative Assistant of the Math Department. Thank you.

International Conference on Spectral Geometry

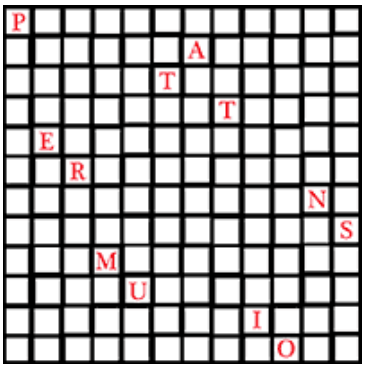
On July 19-23, 2010 Dartmouth College hosted the International Conference on Spectral Geometry. It attracted approximately 80 participants from around the world. The conference focused primarily on the following two topics: quantum unique ergodicity (featuring a pair of plenary lectures by Peter Sarnak, Princeton University), and inverse spectral geometry on compact manifolds and orbifolds (featuring a pair of plenary lectures by Victor Guillemin, MIT). An additional focus was quantum graphs (where the one-dimensional Laplacian acts along edges, and waves scatter at vertices). The conference was preceded by minicourses aimed to prepare non-experts, especially graduate students and recent Ph.D.s, for the primary conference content. **Carolyn Gordon** gave a minicourse on obifolds.

But it wasn't all presentations and talks, social activities were planned including a group hike up Mt. Moosilauke, a friendly game of soccer, and kayaking on the Connecticut river.

Some participants enjoying a hike

This conference was funded by a grant from the National Science Foundation (DMS-1005360). Special thanks to **Alex Barnett** (Dartmouth College), **Carolyn Gordon** (Dartmouth College), Peter Perry (University of Kentucky), and Alejandro Uribe (University of Michigan) for organizing this event with help from **Tracy Moloney** and her assistants. Thanks also to **Sarunas Burdulis** for help with website development.

For more information about this conference, please visit our website: http://www.math.dartmouth.edu/~specgeom/index.php



Permutation Patterns 2010

August 9-13

The Permutation Patterns conference began in 2003 by the University of Otago Theory of Computing Group. Since then the conference has been held annually at universities around the world.

The eighth conference on Permutation Patterns, PP2010, was held at Dartmouth College and had over 65 participants from 7 countries for a program of 34 talks.

Two Plenary talks were given: one by Nik Ruškuc (University of Saint Andrews, UK) on "Grid Pattern Classes" and one by Richard P. Stanley (MIT) on "Products of Cycles."

The "Permutation Patterns 2010 Proceedings" will be published as a special issue of the journal *Pure Mathematics and Applications*, with guest editors Robert Brignall, **Sergi Elizalde**, and **Vince Vatter**.

Permutation Patterns 2010 was made possible by the hard work of the Organizing and Scientific Committee: **Sergi Elizalde**, Co-Chair (Dartmouth College), **Vince Vatter**, Co-Chair (Dartmouth College), Michael Albert (University of Otago), Robert Brignall (University of Bristol), Alexander Burstein (Howard University), Luca Ferrari (University of Firenze), Rebecca Smith (SUNY Brockport), Einar Steingrímsson (Reykjavik University), **Rosa Orellana** (Dartmouth College), and **Peter Winkler** (Dartmouth College); and the support of the Dartmouth College Department of Mathematics, the Dartmouth College Provost's Office, and the National Science Foundation (via grant DMS-1003908).

For more information about this conference, please visit our website: http://www.math.dartmouth.edu/~pp2010/index.html

East Coast Operator Algebras Symposium

October 23-24, 2010

The eighth annual East Coast Operator Algebras Symposium took place at Dartmouth College in October 2010. It was established to promote the growth of operator algebras on the east coast and provide a forum for graduate students, postdoctoral scholars, and faculty to interact within the region.

We were privileged to have 13 distinguished speakers and over 75 participants both from the US and from abroad.

Special thanks to organizers **Dana Williams**, **Jody Trout**, and **Erik van Erp** for all their hard work in making this conference a success.

Funding for this conference came from a grant by the NSF (DMS-1000499), Dartmouth College and the Edward Shapiro fund. It would not have been the success that it was without the hard work of both **Tracy Moloney** and **Sarunas Burdulis**.

For more information about this conference, please visit our website: http://www.math.dartmouth.edu/~ecoas/index.php

John Hopkins University Center for Talented Youth Odyssey Series Mathematics Program

On May 22, 2011 Dartmouth College hosted the Odyssey Series Mathematics program for the John Hopkins University Center for Talented Youth (CTY) students and their parents.

Last year Dartmouth only hosted a math session and had about 75 participants. This year there were 200 participants for the CS sessions on Saturday and 130 for the Math sessions on Sunday! Kemeny/Haldeman was overflowing with eager students and their parents!

Pete Winkler kicked off the math session with the keynote address "Puzzles You Think You Must Not Have Heard Correctly." The plenary session was given by **Alex Barnett**, "The Musical Overtones of Mathematics."

Three breakout sessions were designed and presented by some of our Dartmouth College graduate students: "Hiding Messages in Numbers" by **Lola Thompson**, **Avram Gottschlich**, and **Nathan McNew**; "Constructive Geometry" by **Elizabeth Gillaspy**, **Enrique Treviño**, and **Michael Wijaya**; and "Penrose Tiling" by **Ian Adelstein**, **Patricia Cahn**, and **Natasha Komarov.**

Math Majors and Minors

In 2011, 41 Math Majors, 7 Minors and 1 Modified Minor graduated. In addition, the following students presented honors theses. To read abstracts go to: https://www.math.dartmouth.edu/undergraduate/honors/

- **Kamil Adamczewski '11** (Carl Pomerance, advisor) "'Smoothed' Character Sums"
- **Kathleen Champion '11** (Alex Barnett and Amy Gladfelter, Biology, co-advisors) "Markov Chain Monte Carlo for Automated Tracking of Genealogy in Microscopy Videos"
- **Katherine Roddy '11** (Rosa Orellana, advisor) "The Kronecker Product of Two Monomial Symmetric Functions"

Presidential Scholars

The James O. Freedman Presidential Scholars Program was initiated in 1988 and provides opportunities for juniors to work as research assistants with Dartmouth faculty. These opportunities are intended to prepare students for undertaking senior honors theses.

The following students received math Assistantships:

- **Alyssa L. Eisenberg '12** (Peter Doyle, advisor) "Application of Markov Chain Techniques to Visualizing Large Networks"
- **Kamisha K. Hyde '12** (Craig Sutton, advisor) "Network of Volume Weighted Average Prices"
- **Michael A. Katz '12** (Peter Doyle, advisor) "Computations in Discrete Probability"
- **Gregory W. Troderman '12** (Rosa Orellana, advisor) "Graphs and Polynomials"
- **Philip G. Winsor '12** (Dorothy Wallace, advisor) "Nonlinear Modeling and Simulation of Tumor Growth"
- **Hee-Sung Yang '12** (Carl Pomerance, advisor) "The Values of Olson's Constant in the Groups of the Form Z_n+Z_n"

Women in Science Program (WISP)

http://www.dartmouth.edu/~wisp/

Dartmouth College established WISP in 1990 to address the under-representation of women in science, mathematics, and engineering. Dartmouth designed WISP with a focus on retaining women in science and an emphasis on women in their first year.

In the Winter 2011 and Spring 2011 terms five WISP interns worked on research projects in the Mathematics Department. **Bo Wei Deng '13** and **Alison Levens '14** worked with Professor Emeritus Bob Norman on the project "Comparing Voting Systems," **Kanoka Hayashi '13** worked with Professor Dorothy Wallace on the project "Mathematical Modeling in Biology or Medicine, **Hanh Nguyen '14** worked with Professor Alex Barnett on the project "Accurate Evaluation of Layer Potentials up to the Boundary," and **Qian Zhang '13** worked with Professor Sergi Elizalde on the project "Forbidden Patterns in Financial Time Series."

WISP interns typically work in their winter and spring terms which end in the culminating experience of the Karen E. Wetterhahn Science Symposium in May where interns make and display science posters from their internship research projects. This year's symposium coincided with the WISP 20th Anniversary Celebration. The keynote speaker was WISP alumna Amy Palmer Ph.D. '94, Assistant Professor of Chemistry and Biochemistry at the University of Colorado, Boulder and former advisee of the late Karen Wetterhahn, co-founder of WISP.

Professor Emeritus Bob Norman with WISP interns Alison Levens '14 and Bo Wei Deng '13

[photo courtesy of Flying Squirrel Graphics]

Association for Women in Mathematics

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

The Association for Women in Mathematics encourages women to pursue their interests in mathematics. The Dartmouth student chapter had a very active year, meeting weekly for informal discussions, holding course advising sessions, enjoying "lunch buddies" and meeting with women graduate students who serve as mentors.

The series "Dinner with a Professor" enabled them to meet informally both with Dartmouth mathematics professors and with research visitors from outside Dartmouth. For example, they enjoyed a lively discussion contrasting German and American higher education with Dorothee Schueth, Harris Visiting Professor, from Humboldt University in Berlin.

Most notably, the student chapter had an especially active group of first year student officers.

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 by invited faculty members, graduate and undergraduate students, information sessions and mathematics related movies.

In the 2010-11 academic year the Executive Board of the Math Society are **Zachary B. Stolzenberg '11**, President, **Kamil Adamczewski '11**, Vice President, and **Yi-Jie Wang '13**, Treasurer. The faculty advisors for the DMS are Professors Rosa Orellana and Vladimir Chernov.

Listed below are some of the activities of the DMS for the 2010-2011 academic year.

Talks by Mathematics Department regular and visiting faculty:

- Professor **Vladimir Chernov** "Smooth structures on spacetimes," Oct 4, 2010
- Professor **Devin Balkcom**, Computer Science "Robots and geometry: robot geodesics, pushing string, and grasping cloth," Oct 11, 2010
- Professor **Alex Barnett** "Computing waves in photonic crystals," Oct 18, 2010
- Professor **Thomas Shemanske** "Pythagorean Triples, Congruent Numbers and Rational Points on Curves," Nov 1, 2010
- Professor **Andrew Yang** "A brief history of primes," Nov 20, 2010
- Professor **Johanna Franklin** "Unwrapping the riddle of the Enigma," Jan 24, 2011
- Professor **Rebecca Weber** "On the Uses of Linear Algebra," Feb 7, 2011
- Professor **Rosa Orellana** "Young Tableaux," May 9, 2011

Talks by our graduate students:

- **Lola Thompson** and **Jennifer Shellenbarger** "Math REU/Graduate School Panel," Oct 25, 2010
- **Paige Rinker** "Analysis of Rank Data: A Combinatorial Approach," Mar 2011
- **Asa Levi** "An Introduction to Spacetime and Some of Its Paradoxes," Apr 25, 2011
- **Natasha Komarov** "A Survey of Results About Random Walks on Graphs," May 23, 2011

Talks by Dartmouth alumni:

- **Paul Kinson '81** "Actuary Profession," Feb 21, 2011

Additional events:

- "Cube," Math Movie Night, Nov 15, 2010
- Field trip to the SUMS Symposium for Undergraduates in Mathematical Sciences at Brown University, Providence RI, Mar 5, 2011

Thayer Mathematics Exam

The Thayer Prize Mathematical Exam is an annual tradition for the Mathematics Department. The exam is an excellent opportunity for first-year students to test their problem solving skills. The names of the winners are put on a plaque in the undergraduate lounge in Kemeny Hall. Professor Vladimir Chernov and Professor Sergi Elizalde served on the Thayer Exam Committee.

2011 Winners

Hanh Nguyen '14, 1st place
Sean Griffin '14, 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 now have 7 math minors with the addition of minors in: **Mathematical Biology**, **Mathematical Logic**, **Mathematical Physics** and **Mathematical Finance**. In addition, we have added a new **Modified Major in Mathematics and Philosophy**.

Five graduate students, who recently received their Master of Arts in Mathematics from Dartmouth, completed the "**Teaching Seminar**," a seven week two credit intensive course in the teaching and learning of mathematics that includes two weeks of practice teaching. Occasionally students from outside our department have taken the course, and we have recently formalized this option. This year's class, **Elizabeth Gillaspy, Katherine Kinnaird, Asa Levi, Natasha Komarov, Michael Wijaya** and a recent Dartmouth physics PhD who took the course in preparation for a tenure track job, chose to focus on "The Four Color Theorem" and "Bijections and Infinity" for the two weeks of practice teaching.

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, there were guests from the Dartmouth Center for the Advancement of Learning, the First Year Dean's Office, the Academic Skills Center and Student Accessibility Services.

As part of their preparation the students in the seminar organized and ran two week-long "Exploring Mathematics" camps for local middle and high school students. Over 20 local participants attended each of the two sessions, coming from Hanover, Lebanon, Grantham and Concord, New Hampshire as well as Norwich, Sharon, White River Junction, Northfield and Strafford, Vermont; Ridgefield and New Canaan, CT; Dix Hills, NY; Sylva, NC; San Jose, CA; and Polo, Italy.

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.

Last year, Dartmouth announced a new program agreement between **Dartmouth Graduate Studies** and **The Tuck School of Business**, paving the way for a Dartmouth PhD to obtain an accelerated MBA degree. For more information on this program go to: http://www.dartmouth.edu/~gradstdy/programs/dartmouthphdmba.html.

Digital Library for Alumni

http://www.dartmouth.edu/~library/alumni/

The Alumni Digital Library continues to be a sought after resource, just for you, Dartmouth College alumnus/alumna. The recently redesigned alumni webpage includes a single search box to find articles in all of the databases your status allows you to search remotely. Through special arrangements and funding, alumni have remote access to a selection of full-text articles in hundreds of newspapers and magazines. Mathematics titles accessed recently from this collection include International Journal of Mathematics, Inventiones Mathematicae, and Journal of Mathematical Sciences.

Don't forget that you have lifetime access to all of our library resources onsite including access to our thousands of licensed digital resources from any of the libraries, either at computers provided or by connecting to the Dartmouth Library Public wireless network.