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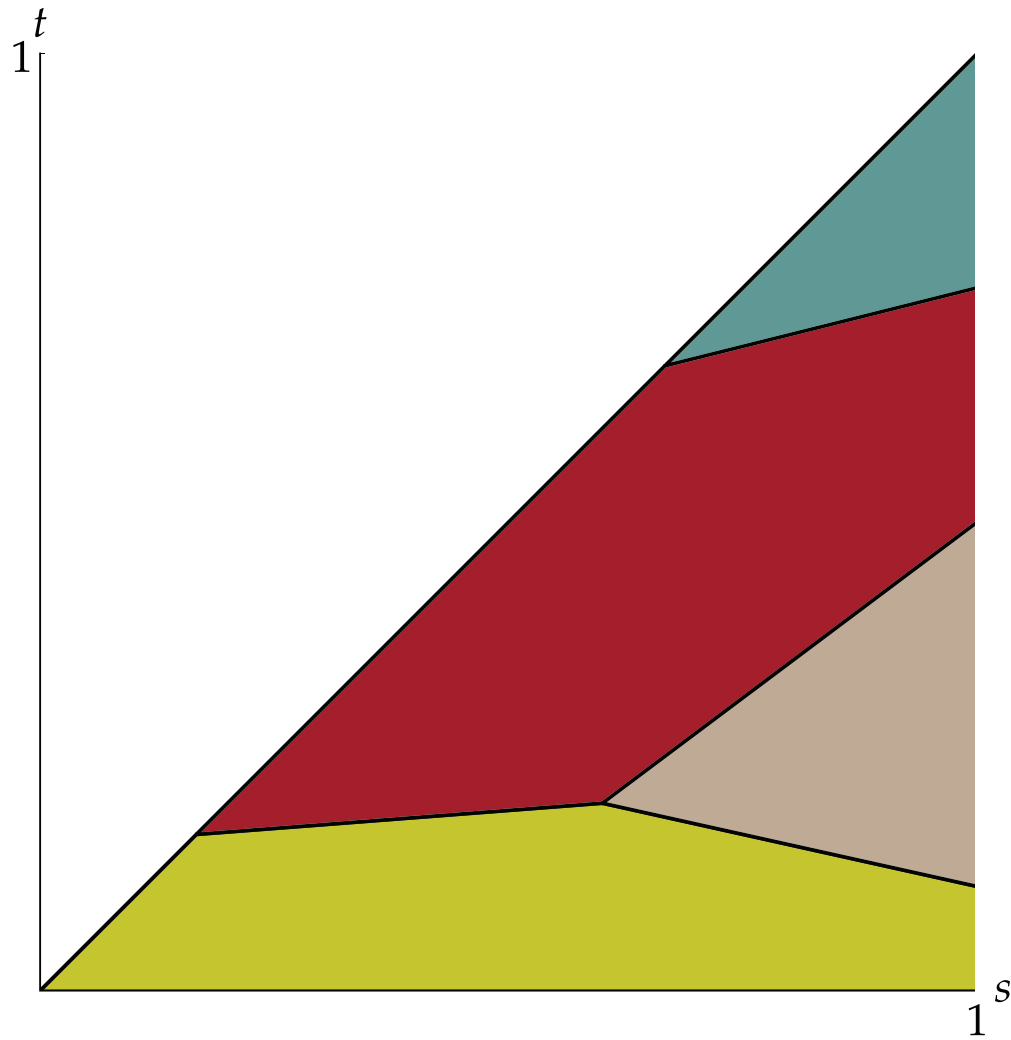
letter from the chair

WE ARE MOVING

Dear HMC Math Friends,

We are moving!

The photo at right shows an aerial view of the teaching and learning building (TLB), which is being built on the former site of the Thomas-Garrett building. On the east side of the TLB's second and third floor, the Mathematics Department will find a new home.

The TLB will contain modern, flexible and inviting teaching spaces and is constructed with an eye on sustainability, with classrooms and offices lit by natural light and outdoor learning and social spaces (complete with blackboards and a rooftop garden) designed to leverage the mild Southern California climate.

What saddens me most about leaving the Olin Science Center, our home for the last two decades, is that we will be leaving our neighbors—Biology and Computer Science—with whom we share many majors (we now have as many students in the joint computer science and mathematics, and mathematical and computational biology majors as we do in the mathematics major). This year's move follows last year's expansion into **Sprague Third**. The department's new experiential learning space in the former Sprague Library contains the department's mathematics library, Clinic spaces, a seminar room and a flexible social space that plays host to everything from mathematics tutoring to our senior dinner. These moves are big changes indeed.

I believe these changes reflect the leadership role the mathematics department continues to take on campus and nationally in the mathematics community. Recently, the American Mathematical Society announced its inaugural class of Fellows, which includes mathematics faculty members **Arthur Benjamin** and **Nicholas Pippenger**, President **Maria Klawe** and several alumni (Page 4). The Mathematics Association of America awarded **Francis Su** the 2013 Deborah and Franklin Tepper Haimo Award for Distinguished College or University Teaching of Mathematics, which honors college and university teachers who have been widely recognized as extraordinarily successful. The MAA also recently recognized **Susan Martonosi**, who received the 2012 Henry L. Alder Award for Distinguished Teaching by a Beginning Faculty Member (Page 12).

Talithia Williams was elected to the board of directors of the Society for Advancement of Chicanos and Native Americans in Science (SACNAS). SACNAS is the largest affinity and advocacy group for minority scientists in the world. **Dagan Karp** has been appointed to the diversity committee of the Mathematical Sciences Research Institute (Page 13). **Rachel Levy** recently became the

FUTURE HOME OF HMC MATH DEPT

editor-in-chief of *SIURO* (SIAM Undergraduate Research Online), which publishes outstanding undergraduate research in applied and computational mathematics (Page 14).

On campus, **Jon Jacobsen** is in his third year as the associate dean of academic affairs, **Darryl Yong '96** serves as associate dean for diversity and **Lisette de Pillis** continues to direct the Global Clinic Program.

The department recently threw an 80th birthday party for **Bob Borrelli**; rest assured there was plenty of wine and differential equations at the event (Page 9). The department named its Clinic Prize in honor of **John Greever,** who was the Mathematics Clinic founding director 30 years ago. We're also honoring **Hank Krieger** by introducing the **Krieger Prize** for seniors who show promise in probability, statistics or operations research.

New faces in our department include **Jocelyn Olds-McSpadden**, our administrative assistant. Jocelyn brings some unique talents to the job; she is a yoga instructor (and stretched the faculty to the best of her abilities at our fall retreat) and also has a flair for party planning, bringing surprises like a photo booth complete with props to our senior dinner. This fall, we welcomed a new teaching and research postdoctoral fellow (TRPF), **Jacqueline Dresch**, a mathematical biologist who has already published a book chapter with HMC biologist **Rob Drewell**. TRPF **Erin Byrne '00** began a job recently at Olin College.

We love hearing what our alumni are up to (Page 22). If you have news to share, send us your update, and we'll share the news in the next edition of *MuddMath*. Until then, may your sets be perfect and your vector spaces complete.
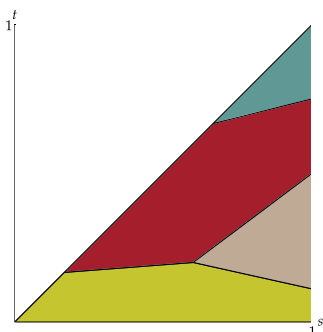
Andrew J. Bernoff
Chair, Department of Mathematics
Kenneth and Diana Jonsson Professor of Mathematics

CONTENTS
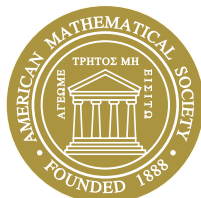
In 2006, the HMC Department of Mathematics received the very first Award for Exemplary Program by the American Mathematical Society for the strength of its overall program.

about the cover

In a four-candidate positional election, a voter ranks the candidates and then gives 1, s, t and 0 points to their first, second, third and fourth ranked candidates, respectively (where $1 \geq s \geq t \geq 0$). Common positional methods include the Borda count (where $s = 2/3$ and $t = 1/3$) and plurality (where $s = t = 0$). However, it is often quite difficult to decide what voting method should be used in an election, and this image shows how important that choice can be. The colors represent the areas where different candidates win with different values of s and t. Given the freedom to choose s and t, you can completely determine the election outcome! Because the choice of the parameters s and t is so important, Sam Gutekunst '14, David Lingenbrink '14 and Professor Michael Orrison have been considering ways to incorporate all positional methods. One intuitive method, for example, is to look at this triangle and see which candidate wins for the largest region. Here, the candidate whose region is red would be our winner.

Harvey Mudd College is a coeducational, liberal arts college of engineering, science and mathematics that also places strong emphasis on humanities and the social sciences. The College's aim is to graduate engineers, scientists and mathematicians sensitive to the impact of their work on society.

department news

BENJAMIN, PIPPENGER, KLAWE AND ALUMNI NAMED TO FIRST CLASS OF AMS FELLOWS

The American Mathematical Society named Professors Nicholas Pippenger and Art Benjamin, President Maria Klawe, Peter Loeb '59, George McNulty '67 and Jerrold Tunnell '72 to its inaugural class of AMS Fellows and officially welcomed them during the AMS Joint Mathematics Meetings in January.

The AMS Fellows program recognizes society members who have made outstanding contributions to the creation, exposition, advancement, communication and utilization of mathematics.

"I'm thrilled that Nick, Maria, Art, Peter, George and Jerrold were included in the inaugural class of AMS Fellows and recognized for their impact on the mathematical sciences," said Andrew Bernoff, chair of the HMC Department of Mathematics. "One of the joys of teaching at HMC is being surrounded by incredibly talented and dedicated individuals. It is no surprise to see us well represented in this prestigious group."

Mathematics Professor Art Benjamin's art of "Mathemagics" has led to many public performances and a guest appearance on Comedy Central's *The Colbert Report*. His 2005 TEDTalk on Mathemagics is ranked among the Top 20 most-viewed talks. In October 2012, he was named an Honorary Patron of the University Philosophical Society in Dublin, Ireland, in recognition of his contributions to mathematics and entertainment.

In 2006, Benjamin won the Beckenbach Book Prize from the Mathematical Association of America (MAA) for his book, *Proofs that Really Count: The Art of Combinatorial Proof*. For that same book, in the category of outstanding academic title, he won the 2004 CHOICE award from the American Library Association. In 2000, he received the MAA's Deborah and Franklin Tepper Haimo Award for Distinguished College or University Teaching of Mathematics. Benjamin is also one of 16 prominent members of the mathematical community to be profiled in the book, *Fascinating Mathematical People*, published last year by Princeton University Press.

Mathematics Professor Nicholas Pippenger's interests center in discrete mathematics and probability, but also extend into communication theory and theoretical computer science. Prior to joining HMC, Pippenger served as professor of computer science at Princeton University. He joined Princeton from the University of British Columbia, where he served as professor of computer science from 1988 to 2003 and, in 2001, was appointed to a Canada Research Chair. Prior to UBC, he worked for IBM, first as a research staff member and manager of the Theory of Computation Group at the Thomas J. Watson Research Center and then as a research staff member and, later, as an IBM Fellow at the Almaden Research Center in San Jose, Calif. Before IBM, Pippenger was a technical staff member for the MIT Instrumentation Laboratory (currently the Charles Stark Draper Laboratory) in Cambridge, Mass.

Pippenger is the author of *Theories of Computability*, published in 1997 by Cambridge University Press. He is also a fellow of the Royal Society of Canada (Academy of Science), a fellow of the Institute of Electrical and Electronics Engineers and a fellow of the Association for Computing Machinery. He is a member of the Mathematical Association of America and the Society for Industrial and Applied Mathematics.

Art Benjamin

Nicholas Pippenger

"One of the joys of teaching at HMC is being surrounded by incredibly talented and dedicated individuals. It is no surprise to see us well represented in this prestigious group."

– Andrew Bernoff

President Klawe has made significant contributions in several areas of mathematics and computer science research, including functional analysis, discrete mathematics, theoretical computer science, human-computer interaction, gender issues in information technology and interactive-multimedia for mathematics education. Her current research focuses on discrete mathematics.

Prior to joining HMC as president, Klawe served as dean of engineering and professor of computer science at Princeton University. Klawe joined Princeton from the University of British Columbia where she served as dean of science from 1998 to 2002, vice president of student and academic services from 1995 to 1998 and head of the Department of Computer Science from 1988 to 1995. Prior to UBC, Klawe spent eight years in industry, serving at IBM Almaden Research Center in San Jose, Calif., first as a research scientist, then as manager of the Discrete Mathematics Group and manager of the Mathematics and Related Computer Science Department. Klawe is a trustee of the Mathematical Sciences Research Institute in Berkeley and has held leadership positions with the American Mathematical Society, the Computing Research Association, the Society for Industrial and Applied Mathematics and the Canadian Mathematical Society.

HMC alumni Peter Loeb '59, George McNulty '67 and Jerrold Tunnell '72 were also named fellows. Loeb is professor of mathematics at the University of Illinois, Urbana-Champaign, McNulty is professor of mathematics at the University of South Carolina and Tunnel is associate professor of mathematics at Rutgers, the State University of New Jersey.

Maria Klawe

HMC Makes a Splash at World's Largest Mathematics Meeting

HMC was well represented among the 6,700 people celebrating mathematics at the AMS meeting in San Diego Jan. 9–13. In addition to the presentation of AMS fellows, HMC faculty, alumni and students participated in many other activities during the conference.

- Francis Su was presented with the Haimo Award (see Page 12).
- Dhruv Ranganathan '12 won Honorable Mention for the Morgan Prize (honor for outstanding research by an undergraduate). One winner is chosen each year, and Ranganathan was one of two honorable mentions (see Page 20).
- Jon L. Johnson '70, professor of mathematics at Elmhurst College, won the MAA's certificate for Meritorious Service (for distinguished service to the MAA). Six such awards are given every year.
- Lisette de Pillis participated in the Association for Women in Mathematics panel discussion on the retention of women in mathematics.
- Darryl Yong '96 and Robert Borrelli led a CODEE mini-course.
- Fifty HMC alumni attended the HMC/AMS dinner.
- HMC students presented posters and talks.
- Andrew Bernoff spoke on "Embracing the iPhone Generation: The Evolving Mathematics Curriculum at Liberal Arts Colleges."
- Alfonso Castro spoke on "Singular Solutions for Superlinear Elliptic Equations," and Jon Jacobsen spoke on "Integrodifference Models with Temporally Varying Environments" in the Special Session on Understanding Planet Earth via Reaction Diffusion Equations.

Alumni and faculty gather for dinner at the AMS meeting.

department news

FRANCIS SU NAMED TO BENEDIKTSSON-KARWA ENDOWED FACULTY CHAIR

Francis Su was named to the new Benediktsson-Karwa Endowed Faculty Chair established with a gift from alumnus John Benediktsson '01 and his wife, Rajashree Karwa.

"As a nationally prominent mathematician and as a dedicated, creative and very successful educator, Francis is an excellent inaugural appointment to the Benediktsson-Karwa Chair," said Jeffrey Groves, vice president for academic affairs and dean of the faculty. "I'm delighted that John and Rajashree's generosity will support Francis' work and our Department of Mathematics."

Among the highest recognitions accorded to a faculty member, an endowed chair honors and recognizes the distinction of outstanding faculty while providing invaluable support for salary, research, teaching or service activities.

Su's work has been recognized by the Mathematical Association of America with the Henry L. Alder Award for Distinguished Teaching by a Beginning College or University Mathematics Faculty Member (2004) and the Merten M. Hasse Prize for outstanding mathematical exposition (2001). He has received two National Science Foundation grants that utilize methods from combinatorics, topology and geometry to study problems in mathematical economics and the social sciences; in particular, problems related to voting and fair allocation.

He served previously as vice-president of the MAA and is the creator of the award-winning Math Fun Facts website.

"I'm very honored to hold the Benediktsson-Karwa professorship," said Su. "I know John and Rajashree to be wonderful people. They greatly value the work of the College in the lives of students, and they have exhibited in their own work the central role that mathematics plays in any scientific or technical field. Their generosity will leave a lasting impact on the mathematics program and many generations of Mudders."

Benediktsson and Karwa are both engineers and have productive careers in the financial industry. Benediktsson, a member of the HMC Board of Trustees, graduated from HMC with an engineering degree and an interest in computers and economics. Karwa holds a bachelor's degree in computer engineering with honors from Cummins College of Engineering, India.

"Mathematics is a foundation for success in science and technology fields," said Benediktsson. "At Harvey Mudd College, math forms an essential part of the Core curriculum and is a critical component to the curriculums of every major offered. Rajashree and I believe that supporting the math department supports every department to the benefit of all students."

Benediktsson has been involved in running several electronic trading firms, managing their technical growth from small startups to mature, successful enterprises. Prior to working in finance, he served as a senior engineer for a media technology firm. Early in his career, he realized some of his success was due to his HMC education, excellent professors and relationships with his fellow Mudders. He reconnected with HMC and, in 2008, accepted the offer to join the board of trustees where he could contribute to the management of the College. He serves on the Investment and Board Affairs committees.

Francis Su

John Benediktsson '01 and Rajashree Karwa

PRESTIGIOUS GUESTS PROVIDE VALUABLE INSIGHT

Moody lecturer Andrew Belmonte uses ordinary objects to explore mathematical concepts.

Moody Lecture Applies Math to Everyday Puzzles

Professor Andrew Belmonte of Penn State University presented the fourth Michael E. Moody lecture March 23, 2012.

In his presentation, "The Mathematics of Strings, Spaghetti and Splashes," Belmonte explored mathematical answers to everyday puzzles such as: Why is it hard to break dry spaghetti in half? Why do extension cords, shoelaces and earbuds always get tangled up in knots? How does a falling droplet splash onto the floor? He also demonstrated how each answer generated interesting, new questions.

Four-time Putnam Fellow and Professor Ravi Vakil of Stanford University will present the next Moody lecture on Friday, April 19, 2013, at 7 p.m. He will discuss the sophisticated and fun mathematics buried inside common doodles in his talk "The Mathematics of Doodling."

The Moody Lecture Series was established by the HMC Mathematics Department in honor of Professor Michael Moody, who served as the department chair from 1996 to 2002. Under Moody's leadership, the department revised its curriculum, rejuvenated the senior-thesis program and tripled the number of math majors. He was also the guiding force that led to the department's receipt of the American Mathematical Society's inaugural award for an Exemplary Program or Achievement in a Mathematics Department in 2006. Moody passed away in January 2010 after a long and difficult battle with lymphoma. He was posthumously named an Honorary Alumnus of Harvey Mudd College in 2010.

Gifts made to the College in support of the Moody Lecture Series help HMC continue to attract the outstanding caliber of lecturers that Moody had drawn to the department. Contributed funds also support other activities in Moody's name that enhance the department in ways that would make him proud. To make a gift, or to get more information, visit www.math.hmc.edu/moodylectures/support.

Winkler Stretches Audience

In an April 16, 2012 lecture sponsored by the mathematics and computer science departments, Dartmouth College Professor Peter Winkler shared how humans are born with imperfect mathematical intuition.

More than 100 students attended his talk, "Mathematical Puzzles that S-t-r-e-t-c-h Your Intuition," which revealed how people base most of their decisions on feelings, not calculation.

Winkler challenged his audience with a dozen mind-boggling puzzles—some with solutions, some without—designed to keep their intuition from running off the rails.

A professor of mathematics and computer science, Winkler has authored 135 mathematical research papers and holds a dozen patents in computing, cryptology, holography, optical networking and marine navigation. His research is primarily in combinatorics, probability and the theory of computing, with forays into statistical physics.

department news

NEW MATH ELECTIVE LENDS INSIGHT INTO VOTING PRACTICES

Students in Professor Mike Orrison's class, The Mathematics of Voting, gained insight into the recent presidential elections. In fact, the course made many think differently about voting practices in general—from national elections to choosing a student body president.

The new first-year elective uses mathematics to explore how different vote-tallying methods can produce different election results.

Students tested the various voting systems used in the U.S. and Europe, evaluating them against a set of commonly accepted conditions for fair voting. Developed by economist Kenneth Arrow, these conditions include criteria such as: if all voters prefer candidate A over candidate B, candidate A should win; all votes should count equally; and, a group's preference for candidate A over candidate B should not be affected by relative preferences for candidate C.
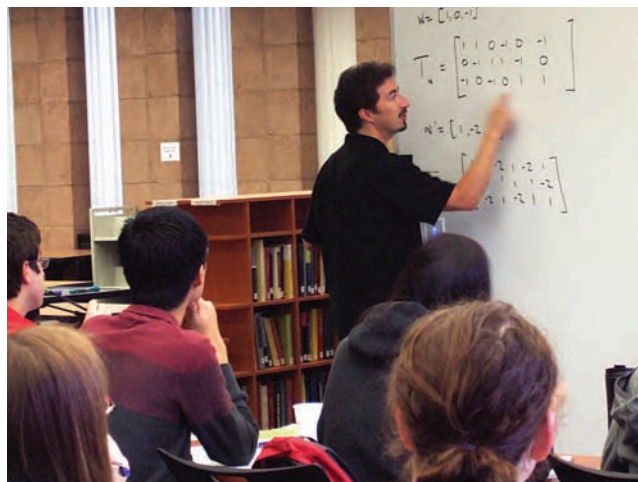
"It was extremely counterintuitive to see how some voting systems that I thought were perfectly reasonable could actually produce results that seemed unreasonable," said Jennifer Rogers '16. "It made me look deeper into what constitutes a 'reasonable' voting system, and what it really means for a voting system to represent 'the will of the voters.'"

Michael Orrison teaches a new math elective that explores vote-tallying methods.

The course helped many understand where voting systems are vulnerable to arbitrariness or manipulation. "Before I came to this class I had no way to show that a particular system specifically violates a condition or criterion that we like," said Jean Sung '16. "It's really exciting to use math to show the different voting systems in a concrete, quantitative way. We can use math to model the different voting systems and show which systems violate certain properties."

Students were inspired also to think critically about the informal voting they participate in, such as electing a class president, choosing a dorm T-shirt design, or deciding which movie to see with a group of friends. They now think about how their vote will be used. If they are in a position to define the voting rules, they consider how the voting procedures will affect the outcome.

"Given the prominent role that voting plays in how we make all sorts of decisions, it can be jarring to realize how complicated voting can be," said Orrison. "In the end, I am absolutely certain that the students will emerge from the course with an empowering sense of confidence when it comes to weighing the pros and cons of the many voting systems they will undoubtedly encounter."

"It's really exciting to use math to show the different voting systems in a concrete, quantitative way. We can use math to model the different voting systems and show which systems violate certain properties." – Jean Sung '16

A HAPPY 80TH BIRTHDAY FOR BOB BORRELLI

Ursula Borrelli, Bob and Beverly West

The Claremont Colleges mathematics departments hosted a conference March 31, 2012 to honor Professor Emeritus Bob Borrelli on the occasion of his 80th birthday.

Ami Radunskaya, Pomona College mathematics department chair, emceed the event and Andy Bernoff, HMC mathematics department chair, shared some of Borrelli's contributions to the HMC math department. Beverly West (Cornell University) reminisced about the early days of the Consortium of Ordinary Differential Equations Experiments (CODEE). Professors Alfonso Castro, Asuman Aksoy (CMC) and Adolfo Rumbos (POM) talked about Borrelli's efforts to help establish the Claremont Center for the Mathematical Sciences. Allegra Swift, digital initiatives librarian for The Claremont Colleges Libraries, discussed Bob's contributions to the consortium's digital collections. Mark Huber '94 (CMC) and Gizem Karaali (POM) talked about Borrelli's contributions to the *Journal of Humanistic Mathematics.*

Tom LoFaro (Gustavus Adolphus College) gave a talk on differential equations, HMC Trustee Jonathan Mersel '75 and Ron Borrell '76 shared their memories of Borrelli as an instructor, and Art Benjamin, Rachel Levy, Jody Orrison and Darryl Yong contributed several musical numbers. Several of Borrelli's family members also attended the fun and special event.

Editor's Note: At press time, we were saddened to learn of the passing of Ursula Borrelli, Bob's wife of more than 50 years and a dear friend to many at HMC.

NEW POSTDOCS WELCOMED

The Department of Mathematics welcomed two teaching and research postdoctoral fellows: Erin Byrne '00 and Jacqueline Dresch. Fellows work two years at the College, teaching one course per semester and conducting research in collaboration with HMC faculty.

Byrne studied mathematical models of biofilms in collaboration with Rachel Levy, associate professor of mathematics. She helped with the HMC Clinic program and the MCM-ICM modeling course and mentored Shreyas Kumar '14 and Wendy Brooks '15. Byrne and Levy worked last summer with Dong-Hyeon Park '14 and Stephanie Porter '13, who are completing a manuscript with Sarah Warkentin '11 on algorithms used to control aquatic robots. Byrne recently began a tenure-track position in mathematics at Olin College.

Dresch studies transcriptional regulation in collaboration with Robert Drewell, associate professor of biology. She works with Levy and Darryl Yong '96, associate professor of mathematics, to investigate the effectiveness of flipped classrooms and with Lisette de Pillis, professor of mathematics, to incorporate mathematical modeling approaches in molecular biology and parameter estimation techniques into the Math 118 curriculum. Dresch has mentored Daniel Bork '16, modeling transcriptional regulation using a thermodynamic-based modeling approach, and also Jessica Stringham '13, investigating the specificity of a particular protein binding.

The postdoctoral positions are funded by a five-year, $800,000 grant from the National Science Foundation.

community partnerships

CONFERENCE PLANTS SEEDS OF EXCELLENCE

The second annual Sacred SISTAHS math and science conference for middle- and high-school girls was held April 14, 2012, at Harvey Mudd College.

Although open to all girls, the event focused on empowering young African-American girls by introducing them to successful academic and professional role models. Titled "Planting Seeds of Innovation," the conference included workshops and panel discussions led by women in diverse academic and professional fields. Workshop topics introduced girls to a variety of scientific disciplines and career possibilities.

Panelists were Assistant Professor of Biology Elizabeth Glater, Associate Professor of Mathematics Rachel Levy, psychologist Ronda Hampton, registered nurse Miki Clark and ESRI Support Analyst Rashan Walker. Workshop leaders included Tracy Drain, flight systems engineer for Jet Propulsion Laboratory, and Cora Carmody, senior vice president of information technology for Jacobs Engineering Group.

Keynote speaker Talithia Williams, assistant professor of mathematics, shared how goal setting can help plant seeds of excellence.

"It was a very interactive session where the girls were able to build a road map detailing the steps necessary to reach their goals," said Williams. "We hope that they took away from the conference confidence in their ability to pursue careers in mathematics, science and engineering."

The event was sponsored by Sacred SISTAHS (Sisters in Solidarity Teaching and Healing our Spirits), the HMC Mathematics Department, Cal State Los Angeles, and Transcendence Children and Family Services of Pomona.

Talithia Williams relates goal setting to excellence.

Students were introduced to many scientific disciplines and career possibilities.

MATH COLLABORATIVE COMPLETES SECOND SUCCESSFUL SUMMER

During the Aug. 3 closing ceremonies of the 2012 Claremont-Long Beach Math Collaborative, participants had more than the end of summer to celebrate.

Parents, teachers, mentors and friends cheered the achievements of the 30 students who participated in the second summer of the program. Chief among the accomplishments of the rising ninth and tenth graders—all African-American males—was the strides they made in their mathematics proficiency.

Lisa Loop, co-director of teacher education at Claremont Graduate University (CGU), congratulated scholars on their hard work. At the start and finish of the four-week camp held on the HMC campus, the participants took the Geometry Readiness exam of the UC/CSU Mathematics Diagnostic Testing Project, and most of the young men increased their scores substantially.

Victor Henderson, the top scorer and a rising freshman, credited his success to the Math Collaborative teachers. He said that his favorite subject is algebra, and that he may one day be a math teacher. "I'm going to keep my grades up, stop procrastinating and do as well as I can. If I hadn't come [to the Claremont math camp], I would've been unprepared for high school," he said.

The young men, all who met specific academic criteria to qualify for the program, participated in rigorous math classes, Spanish class (new this year), tutoring and extracurricular activities.

CGU's School of Educational Studies (SES) provided teachers, whose teaching credentials were partly funded by National Science Foundation Robert Noyce Fellowships. Also participating were HMC faculty members Adrian Hightower (engineering), Rachel Levy, Talithia Williams and Darryl Yong. HMC student Elizabeth Kelley '15 served as a residence staff member, and administrators and staff members of Claremont Graduate University and Harvey Mudd College provided program support.

Intended to provide a model for locally focused partnerships nationwide, the Claremont-Long Beach Math Collaborative is a partnership of CGU, HMC and the Long Beach Unified School District. The program connects excellent mathematics teachers and mathematicians with students in North Long Beach, a high-minority community whose African-American males, in particular, have fallen behind students statewide in math performance.

The math program was conceived by Rev. Leon Wood, CGU director of the McNair Scholar Program, who approached HMC President Maria Klawe and CGU President Deborah Freund with his idea and received immediate support. Wood's vision materialized with support from teachers and mentors from The Claremont Colleges, the Claremont University Consortium, the Long Beach Unified School District, and financial contributions from individuals and numerous companies.

Fun exercises helped improve participants' math proficiency.

Elizabeth Kelley '15 (back, center) was one of the program mentors.

faculty news

FACULTY WIN NATIONAL AWARDS

Alder Award

Susan Martonosi, associate professor of mathematics, received the 2012 Henry L. Alder Award for Distinguished Teaching by a Beginning College or University Mathematics Faculty Member. The prize was awarded Aug. 3, 2012, at the Mathematical Association of America's MathFest in Wisconsin.

Susan Martonosi

Martonosi is the third Harvey Mudd College faculty member to receive the award since its inception in 2003, and HMC is the only college to land more than once on the Alder Award list.

The award honors faculty whose teaching is effective and extraordinary and extends its influence beyond the classroom.

"What sets Susan apart is a desire to bring real-world examples and applications to the fore in education. She is uniquely able to inspire her students to pursue both careers and graduate studies in operations research and related fields," said Andrew Bernoff, chair of the HMC Department of Mathematics.

The Alder Awards committee cited Martonosi's ability to encourage the national operations research community to embrace undergraduate research as one of the reasons she was chosen. It also noted her work with students in the classroom and beyond.

Martonosi has supervised more than 30 students in research projects, senior theses, Clinic projects and summer research experiences, and more than half have pursued graduate programs. Five of her research students have received National Science Foundation grants.

As director of the Mathematics Clinic, Martonosi recruited industrial projects and added a professional development component that taught students how to thrive in a corporate environment. In 2007, as faculty adviser to HMC's student chapter of Engineers for a Sustainable World (ESW), she helped students raise $40,000 to support an outreach project in Africa. Martonosi and the student ESW chapter developed a water filtration prototype and, in 2009, traveled to a village in Kenya to build it.

Haimo Award

Mathematics Professor Francis Su won the 2013 Deborah and Franklin Tepper Haimo Award for Distinguished Teaching of Mathematics.

Given by the Mathematical Association of America, the award honors college or university professors who have been widely recognized as extraordinarily successful and whose teaching has

Francis Su

had influence beyond their own institutions. It is the MAA's highest teaching honor.

The award was presented Jan. 10, 2013, at the MAA's Joint Math Meetings in San Diego.

Su's research interests include probability, game theory and geometric and topological combinatorics. His article, "Teaching Research: Encouraging Discoveries," was featured in *The Best Writing on Mathematics 2011*, published by Princeton University Press. He is also the creator of the popular award-winning "Math Fun Facts" website and the Math Fun Facts iPhone app.

The MAA previously recognized Su with the James R.C. Leitzel Lecturer award (2006), the Henry L. Alder Award (2004) and the Merten M. Hasse Prize for outstanding mathematical exposition (2001).

Math Professor Art Benjamin won the Haimo award in 2000, and 2012 Haimo award recipient Matthew DeLong (Taylor University) is on sabbatical this year in the HMC Department of Mathematics.

View Su's popular "The Lesson of Grace in Teaching" http://mathyawp.blogspot.com/2013/01/the-lesson-of-grace-in-teaching.html. This lecture has been shared or liked nearly 4,000 times on Facebook, and the page has been viewed more than 24,000 times (10,000 times in just the two days after it was posted!).

WILLIAMS ELECTED TO SACNAS BOARD

Talithia Williams, assistant professor of mathematics, has been elected to serve on the board of directors for the Society for Advancement of Chicanos and Native Americans in Science (SACNAS).

SACNAS is a national nonprofit organization dedicated to fostering the success of Hispanic/Chicano and Native American scientists—from college students to professionals—including obtaining advanced degrees, careers and positions of leadership. Its annual meeting is the largest meeting of minority scientists in the nation.

Williams' election to the SACNAS board is another sign of the growing collaboration between the organization and The Claremont Colleges. In 2011, Williams and Assistant Professor of Mathematics Dagan Karp organized a conference on "Broadening Participation in the Mathematical Sciences" at which SACNAS former Executive Director Judit Camacho delivered a keynote presentation. Camacho later returned to the HMC campus with members of the SACNAS board and met with HMC President Maria Klawe to discuss future collaborations.

Out of these discussions a Claremont Consortium-wide SACNAS student chapter was born, and now HMC students not only plan events locally but also promote attendance at the SACNAS national conference. Karp is the faculty sponsor of the 7-C SACNAS chapter and also serves on the SACNAS National Math Task Force.

Talithia Williams

KARP APPOINTED TO MSRI DIVERSITY COMMITTEE

Dagan Karp, assistant professor of mathematics, has been appointed to a diversity committee of the Mathematical Sciences Research Institute (MSRI) in Berkeley, Calif.

MSRI is one of eight mathematical science institutes funded by the National Science Foundation. It strives to further mathematical research, support math education and promote greater participation and diversity within the math profession.

"Dagan is a natural choice for MSRI's Human Resources Advisory Committee," said HMC Math Department Chair Andrew Bernoff. "His passion for promoting diversity in the mathematical sciences aligns with the College's strategic vision, and he is known for his outreach efforts both locally and nationally."

Karp will serve on the Human Resources Advisory Committee (HRAC), which supports MSRI's diversity efforts. Through programs such as the biennial Blackwell-Tapia Conference and the Conference for African-American Researchers in Mathematical Sciences, MSRI reaches out to women, minorities and other groups underrepresented in the mathematical sciences.

Dagan Karp

faculty news

CASTRO AWARDED SIMONS GRANT

Professor of Mathematics Alfonso Castro was awarded a Simons Foundation Collaboration Grant for Mathematicians to support research involving equations fundamental to every area of science. The five-year, $35,000 grant will fund collaboration, travel and research expenses for Castro's project, "Solvability of semilinear equations with discrete spectrum."

"Understanding the temperature distribution in a star, for example, requires balancing heat diffusion, generation and radiation. In recent years, I have fully classified the radial solutions to this problem," Castro said. "The fundamental nature of my research allows me to involve mathematics majors interested in differential equations in my research program."

Research students he has mentored have pursued graduate study, and many have gone on to academic careers.

Mississippi State University and the University of Alabama dedicated their ninth Differential Equations and Computational Simulations Conference to Castro in celebration of his outstanding contributions to differential equations research.

His book, *Ecuaciones semilineales con espectro discreto* (Semilinear equations with discrete spectrum), was published this fall by the National University of Colombia (NUC). Co-authored with NUC math Professor Jose Caicedo, the book will help prepare scholars interested in researching the solvability of semilinear equations with discrete spectrum. "It is the first of its nature and grew out of several monographs I have written over the last thirty years. Several publishers have shown interest in having it translated into English," he said.

YONG ARTICLE IN AMS *NOTICES*

Darryl Yong '96, associate professor of mathematics, shared his experience teaching high school math in the November 2012 issue of the American Mathematical Society publication *Notices*.

For his sabbatical, Yong spent the 2009–2010 academic year teaching— Algebra 1, Algebra 2, Geometry and a mathematics intervention class—at a Los Angeles public high school.

Darryl Yong '96

He chronicled his journey in a blog and later presented on the subject at the Park City Mathematics Institute.

In the *Notices* article, "Adventures in Teaching: A Professor Goes to High School to Learn about Teaching Math," Yong discusses his experience and the four lessons he drew from it.
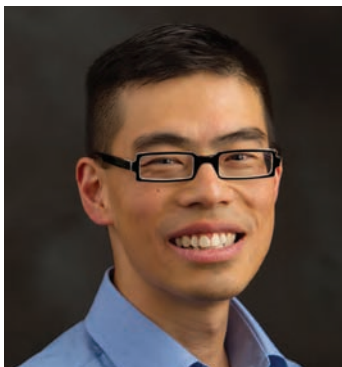
"This is not the story of a professor coming down from his ivory tower and becoming outraged by the horrors of how children are taught in schools," writes Yong. "This article conveys one person's perceptions of the struggles that novice teachers face in one school and discusses what the general public rarely hears about public education."

LEVY APPOINTED SIURO EDITOR

Associate Professor of Mathematics Rachel Levy has been appointed editor-in-chief of *SIURO*, an online publication devoted to undergraduate research in applied and computational mathematics.

Published by the Society of Industrial and Applied Mathematics, *SIURO* (SIAM

Rachel Levy

Undergraduate Research Online) covers a range of topics, including differential equations, discrete mathematics, statistics and operations research. Levy will succeed *SIURO* editor Peter Turner, who invited her to serve the next three years in the top editorial spot. She currently works with Turner as an associate editor of SIURO and as a member of the SIAM Education Committee.

"I am very excited about the opportunity to continue Peter's work with *SIURO,*" Levy said. "The publication provides a terrific venue for undergraduate research in applied mathematics. Students conduct the research under the direction of a faculty advisor, and then take the lead as authors. The student authors correspond directly with an associate editor as they handle responses to reviewers and revisions."

Serving in an editorial role comes naturally to Levy, who helps teach Writing 1, an introduction to academic writing course that is typically taken in the fall of the first year. She also serves as chair of the HMC Teaching and Learning Committee and has advised the College's Math Club and SIAM student chapter.

"The fact that SIAM has reached out to an HMC faculty member, Rachel in particular, recognizes the College's culture of excellence in undergraduate research," said HMC Math Department Chair Andrew Bernoff. "She is an ideal choice due to her track record of excellence in mentoring undergraduate research."

Levy works extensively with students on research projects such as investigating the motion of thin liquid films with surfactants (such as the lining of human lungs), developing algorithms for the coordination and control of aquatic robots, and modeling whale footprints, slick patches observed on the ocean's surface in the area of whale activity. She and students Matt Hin '13 and Richard Sayanagi '13 presented their work at the American Physical Society Division of Fluid Dynamics Conference in San Diego in November 2012. Their talk and poster on thin films with surfactants, created in collaboration with Mudders

Cameron Conti '12, Eric Autry '13 and Greg Kronmiller '14, was well received. Alumna Kali Allison '12, who also attended the conference, worked on the same problem while at HMC.

Levy's efforts have enabled students to collaborate with mathematicians and physicists at other esteemed colleges and to co-author research articles. Levy has also been instrumental in obtaining funds from the National Science Foundation, Research Corporation and the Office of Naval Research, which have supported student research and two Clinic projects.

HMC JOINS BRAIN TUMOR ECOLOGY COLLABORATIVE

Harvey Mudd College has been awarded funding through the James S. McDonnell Foundation to pursue the development of the Brain Tumor Ecology Collaborative with Washington University in St. Louis (lead institution), Columbia University and University of California at San Diego. Lisette de Pillis, Norman F. Sprague Jr. Professor of Mathematics and

Lisette de Pillis

the Life Sciences, is one of the core group collaborators who began work Jan. 1, 2013, on the three-year project.

De Pillis will work with David Gutmann of WUSTL, Peter Canoll of Columbia University and Mark Ellisman of UCSD to establish an interactive scientific forum. Participants will include mathematical modelers specializing in complex systems, integrative cell and molecular biologists working on processes key to establishing and to maintaining cellular communities, and cancer researchers interested in understanding the brain tumor microenvironment. The initiative will enable these scientists to pool their collective expertise and insights to create alternative conceptual frameworks and experimental designs for new types of studies that may result in a better understanding of the behavior of tumors that start in the brain or spine, also known as a glioma.

"One of the goals of this new collaborative is to explore, from an ecological perspective, completely new ways of understanding brain tumors, what stimulates their development, and which factors yield promising treatment targets," said de Pillis. Recognized as an expert in the field of tumor modeling, de Pillis has published numerous papers on her research: curing cancer with mathematics. She uses differential equations to define the variables involved in tumor growth rates, to identify the effects of different concentrations of immune cells and drugs on tumors and to anticipate the tumor decay patterns.

The collaborative is composed of individuals who recognize an unprecedented opportunity to build an infrastructure, including a virtual tissue space and collaborative, web-based online forum to integrate data sets from multiple research groups. Collaborators will investigate experimental methods spanning multiple strata, encompassing molecular, cellular and tissue-based data, allowing exploration of this interconnected and complex information.

De Pillis and her undergraduate research partners have garnered attention for their work, including notice from the top professional organization for applied mathematicians. De Pillis has been an investigator on two National Science Foundation-funded mathematical biology projects and advises for HMC's mathematical biology major, one of the first such undergraduate programs in the United States. HMC's mathematical biology program, the only program that meets the Bio2010 recommendations for preparing research scientists in the 21st century, has risen to become a leader in both curriculum and undergraduate research innovation. De Pillis also is serving as the director of the HMC Global Clinic program.

De Pillis joined collaborators at WUSTL in December to give a talk in the Neuro-oncology Seminar Distinguished Speakers for 2012 series.

BENJAMIN ON NPR PROGRAM

Math Professor Art Benjamin was featured Jan. 10, 2012, on the National Public Radio program, "All Things Considered." The news outlet covered the 2012 Joint Mathematics Meetings in Boston, where Benjamin's presentation caught the attention of NPR reporter Ari Daniel Shapiro.

Shapiro interviewed Benjamin after watching him use the game of backgammon to illustrate math principles. "Math definitely makes me a better backgammon player," Benjamin said. "If you can figure out probabilities, it's essentially like rolling the game out infinitely many times. It gives you a great deal of information."

To view a transcript or listen to the program, visit www.npr. org/2012/01/10/144984603/a-unique-expression-of-love-for-math.

student research

2011–2012 SENIOR THESES

Craig Burkhart
Approval Voting Theory with Multiple Levels of Approval
Advisor: Francis Su

Trevor Caldwell
Nonlinear Wave Equations and Solitary Wave Solutions in
Mathematical Physics
Advisor: Alfonso Castro

John Choi
Counting Vertices in Isohedral Tilings
Advisor: Nicholas Pippenger

Harris Enniss
A Refined Saddle Point Theorem and Applications
Advisor: Alfonso Castro

Patrick Eschenfeldt
Approval Voting in Box Societies
Advisor: Francis Su

August Guang
Switching Between Cooperation and Competition in Social Selection
Advisor: Francis Su

Katie Hawley
A Survey on Random Topological Surfaces
Advisor: Nicholas Pippenger

Curtis Heberle
A Combinatorial Approach to r-Fibonacci Numbers
Advisor: Art Benjamin

Jennifer Iglesias
Searching Stars for a Moving Hider
Advisor: Ran Libeskind-Hadas (CS)

Kym Louie
Flatterland: The Play
Advisor: Art Benjamin

Palmer Mebane
Uniquely Solvable Puzzles and Fast Matrix Multiplication
Advisor: Michael Orrison

Jack Newhouse
Explorations of the Aldous Order on Representations of the
Symmetric Group
Advisor: Matthew Davis

Alice Paul
Detecting Covert Members of Terrorist Networks
Advisor: Susan Martonosi

Aaron Pribadi
Algebraic Methods for Log-Linear Models
Advisor: Michael Orrison

Dhruv Ranganathan
Gromov-Written Theory of Blowups of Toric Threefolds
Advisor: Dagan Karp

Louis Ryan
Analysis of Swarm Behavior in Two Dimensions
Advisor: Andrew Bernoff

Maia Valcarce
Russian Mathematical Pedagogy in Reasoning Mind
Advisor: Rachel Levy

Kym Louie   Palmer Mebane   Alice Paul   Maia Valcarce and Louis Ryan

2011–2012 MATHEMATICS CLINIC

E. & J. Gallo Winery

Livingston Cooperage Optimization Model

Liaisons: Joseph Allen, Deepak Tirumalasetty, Ambarish Acharya, Bryan Weiner

Advisor: Rachel Levy

Students: Kevin Black '12, Keiko Hiranaka '12 (project manager), Leon Liu '12, Maksym Taran '12

E. & J. Gallo Winery is the largest winery in the world. The project focused on developing a mathematical model that finds an optimal combination of processing and storage tanks at the Livingston Winery, one of E. & J. Gallo's largest winemaking facilities. In addition to accommodating future grape harvests, these tanks must also meet the transfer and storage requirements of the winemaking process. To solve this problem, the team developed a computer-based application that will return a cost-optimal tank mix.

Shell International Exploration & Production Inc.

Algorithms to Automate the Drilling Monitoring Process

Liaisons: Don Sitton, Jose Mota '95

Advisor: Talithia Williams

Students: Emil Guliyev '13, Lindsay Hall '12 (project manager), Brandon Wei '12, Rebecca Young SCR '12

In 2002, Shell Oil began monitoring real-time drilling data from offshore rigs to detect and respond to potential problems as early as possible. The team aimed to design and implement an algorithm that monitors key drilling parameters in real time, automatically detects abnormal behavior, and alerts rig monitors of potential issues. This algorithm is intended to assist rig monitors in detecting deviating trends in drilling data and recognizing impending issues quickly.

Engineering/Mathematics Clinic

DYNAR Collaboration, CGU

Shark Tracking Outreach Program

Liaisons: Rachel Levy, Allon Percus

Advisors: Weiqing Gu, Erin Byrne

Students: Sarah Warkentin '12 (project manager, fall), Spencer Tung '12 (project manager, spring), Matthew Richman '12, Sydney Hanson '13, Hannah Kastein '13, Kevin Kim '13, Michelle Fenxiao Chen '13

The DYNAR Clinic team developed a self-contained educational activity that uses robotics to introduce high-school students to engineering and related mathematics. The high-school students will build an

DYNAR Clinic team

inexpensive, aquatic, remotely operated vehicle (ROV) and then use mathematical techniques to track a target using the ROV.

Los Alamos National Laboratory

Modeling Cooling System Alternative for LANL's Data Center

Liaisons: Josip Loncaric, Farhad Banisadr, Carolyn Connor, Park Fields, Richard Rivera

Advisors: Patrick Little, Lisette de Pillis

Students: Roxie Bartholomew '12 (team leader, fall), Daniel Furlong '12, Mary Sullivan '12 (team leader, spring), Michelle DeRienzo '13, Abby Korth '13, Jaclyn Olmos-Silverman '13

Managing energy consumption is a critical problem in maintaining large data centers. The team developed a mathematical model to quantify the energy consumption for alternative cooling systems, specifically for Los Alamos National Laboratory (LANL) facilities. This model was created by developing a comprehensive engineering analysis that minimizes the power consumption of the cooling system based on changing heat loads and weather given some set temperature inputs. Model outcomes have been validated against efficiency data provide by LANL and a sensitivity analysis. The model will aid LANL in renovating their cooling system to be more energy efficient.

student news

LINGENBRINK '14 AWARDED MATH IN MOSCOW SCHOLARSHIP

David Lingenbrink '14 received a $9,000 scholarship from the American Mathematical Society to study mathematics during the 2013 spring semester at the Independent University of Moscow.

David Lingenbrink '14

The math major is the first HMC student to receive the prestigious scholarship to attend the Russian university's semester-long Math in Moscow program.

"I am very excited to learn mathematics from what I hear to be an entirely different school of thought," said Lingenbrink. "In addition, the thought of traveling to a country that was off limits only 20 years ago is pretty cool."

A small, elite institution focused primarily on mathematics, IUM was founded in 1991 by a group of well-known Russian research mathematicians, who now comprise the university's academic council. Its Math in Moscow program was created in 2001 to provide foreign students (primarily from the United States, Canada and Europe) with a program in the Russian tradition, which emphasizes problem solving rather than memorizing theorems. The program's instructors are internationally recognized research mathematicians, and all instruction is in English.

"The program gives students an enriching opportunity to work closely with other budding mathematicians from a wide variety of colleges and universities, all while experiencing an invigorating style of learning and teaching mathematics," said Mike Orrison, associate professor of mathematics and faculty chair of HMC's Study Abroad Committee.

Lingenbrink will reside in a student hostel in Moscow and travel by train to the university. His academic schedule will consist of three courses—Basic Representation Theory, Algebraic Geometry and Algebraic Number Theory—plus a class in Russian to supplement what he's already gleaned from his Russian 1 course. He also plans to explore Moscow and the surrounding area.

O'NEILL '13 NAMED GOLDWATER SCHOLAR

Kevin O'Neill '13 received a Goldwater Scholarship for the 2012–13 academic year.

Awarded to outstanding students pursuing careers in science, mathematics or engineering, the scholarship will provide up to $7,500 to help cover costs such as tuition, fees, books, and room and board.

O'Neill plans to earn a doctorate in mathematics, potentially focusing on analysis or topology, and eventually teaching at the university level.

In 2011, he worked with math Professor Francis Su and Rosalie Carlson '13 on a summer research project where they studied collections of circular arcs and graphs to solve a problem in voting theory. (A video story about that research, "More Than Formulas," can be viewed at www.youtube.com/watch?v=PcEtJqVlAlY.)

"It was a great experience that served as an introduction to how you approach an open problem," O'Neill said. "I've taken a lot of good classes, but this project was a highlight."

Last summer, O'Neill participated in math research at Penn State University. This academic year, he is conducting research in algebraic topology with Su and will do a thesis on tropical geometry with Dagan Karp, assistant professor of mathematics.

Kevin O'Neill '13

STUDENT SCORES SOAR IN PUTNAM CONTEST

Despite facing more competition, Harvey Mudd College's scores soared even higher in the 2011 William Lowell Putnam Mathematical Competition.

Palmer Mebane '12 ranked 13th nationally—out of 4,400 competitors—and was awarded a $1,000 cash prize. Mebane ranked 31st in the 2010 contest.

The HMC team of Mebane, Tum Chaturapruek '14 and Craig Burkhart '12 placed 6th—out of 572 universities—in the competition's team category. In 2010, HMC ranked 21st out of 546 universities.

"I think the exam was a lot harder this year. That tends to be an advantage for our students, who, in our problem-solving seminar, are taught strategies for good mathematical writing," said Francis Su, math professor and Putnam Seminar coach. "Communicating a valid solution is just as important as solving the problem."

Nine HMC students made the Top 200 List: Palmer Mebane '12, Aaron Pribadi '12, Peter Fedak '13, Craig Burkhart '12, Tum Chaturapruek '14, Kevin O'Neill '13, Jennifer Iglesias '12, Hehua Huang '15 and Jackson Newhouse '12.

Five more students made the Top 500 List: Connor Ahlbach '13, Emil Guliyev '13, Samuel Gutekunst '14, Spencer "Spike" Harris '14 and Matthew Prince '13.

"As is often the case, this year HMC was the top scoring undergraduate institution. Having seven HMC students among the top hundred students nationally is truly extraordinary," said HMC Math Department Chair Andrew Bernoff, who served as a Putnam Seminar coach along with Su. "We are proud of all 44 students who sacrificed their time and energies to represent HMC in this year's competition."

HMC TEAMS EXCEL AT MCM-ICM

Dylan Marriner '12, Daniel Furlong '12 and Louis Ryan '12 earned the designation of Finalist—placing in the top 2 percent of more than 5,000 teams—in the 2012 International Mathematical Contest in

Dylan Marriner '12, Louis Ryan '12 and Daniel Furlong '12

Modeling and Interdisciplinary Contest in Modeling (MCM/ICM).

Their team was tasked with finding the best method of scheduling whitewater rafting trips to maximize the number of trips in a season without shortchanging the raft riders' wilderness experience. They created an algorithm that allowed for a 10 percent increase in raft trips per season, with 24 percent fewer campsite conflicts than the next best algorithm considered by the team.

HMC sent seven teams to the competition and, in addition to the Finalist honor, two teams earned the designation Meritorious (top 11 percent), two earned Honorable Mention (top 39 percent), and two were designated Successful Participants.

"This is an incredible showing for HMC and a testament to the strength of our core curriculum and academic program," said Susan Martonosi, assistant professor of mathematics and MCM/ICM advisor.

The MCM/ICM is analogous to an applied Putnam exam, but in the form of a grueling 96-hour competition. Teams of up to three students are given 96 hours to solve their problem and submit their solution in the form of a research paper. The teams' papers are judged not only on their scientific and mathematical accuracy, but also on their clarity, insight and creativity.

This year's problems concerned:
(A) How much the leaves on a tree weigh
(B) Scheduling river rafting trips along the Big Long River
(C) Modeling for Crime Busting

TEAM USES MATH TO WIN BACKGAMMON CHAMPIONSHIP

Nathan Hall '15, Louis Ryan '12 and Jonathan Schwartz '13 took first place in the 2012 National Backgammon Collegiate Team Championships held April 21, 2012, by the U.S. Backgammon Federation. The trio split the $690 first-place scholarship prize, awarded at the annual USBGF awards dinner in Los Angeles.

"I can think of no other game where knowing just a little bit of mathematics—basic counting and simple probability—goes such a long way in improving one's game," said team coach Art Benjamin, member of the USBGF board of directors. "[Math major] Louis Ryan's performance was especially noteworthy. He went undefeated in the tournament, never losing a single game."

The students prepared for the collegiate tournament by playing the game with each other and against the free application, GNU Backgammon, which challenged them to play at an expert level while analyzing their performance. Nine teams, each consisting of three players, competed in the 2012 championship. Susan Martonosi, associate professor of mathematics, served as team proctor.

HMC & CALTECH ORGANIZE HIGH SCHOOL MATH COMPETITION

The fourth annual Caltech-Harvey Mudd Math Competition was held at HMC on Nov. 17, 2012. Each year, undergraduates from HMC and Caltech organize a math competition that brings high school students to their campuses. Attending this year's competition were 50 teams (300 high school students)—the largest-ever gathering.

With support from HMC's mathematics department, Jack Ma '14 organized the event and was assisted by more than 25 student volunteers. The students, led by Tum Chaturapruek '14, wrote all the problems and tested them in the Putnam Seminar.

KAEW TINYANONT

Mudders and Caltech students prepare high school students for the annual math competition.

student news

Elly Schofield '13

SCHOFIELD '13 SPEAKS AT TEDXCLAREMONT COLLEGES

Elly Schofield '13 shared her ideas on how to revamp the nation's math curriculum at the second annual TEDxClaremontColleges in September 2012.

She was one of 15 speakers to present at the event, which is modeled after the renowned TED Conferences that invite thought leaders and innovators to share the "talk of their lives" in 18 minutes or less.

Schofield's talk explored how to create a better form of math education that engages and supports all students. "I refuse to believe the goal of our educational system is to temporarily train students to regurgitate a series of formulae, and yet the way it is currently structured suggests that intent," Schofield said. "A different structure might better motivate future generations of mathematicians, scientists, engineers and problem solvers."

Her passion for math education shines through Schofield's service at Harvey Mudd College. In 2011, she developed and taught interactive math lessons to third graders at a local elementary school. She also serves as a math tutor for HMC's Homework Hotline, an over-the-phone, math and science tutoring service for students in grades 4–12. Her other activities include serving as treasurer and co-president of the HMC Math Club/SIAM student chapter, ASHMC officer, writing tutor and dorm mentor.

TedxClaremontColleges was launched last year by Jason Soll CMC '12, whose experience speaking at TEDGlobal in 2009 inspired him to bring a TED-like experience to The Claremont Colleges. Licensed through the TED organization, TEDx events are local, independently organized conferences that feature regular breaks, allowing the speakers and attendees to mingle and further discuss ideas.

View Schofield's talk at http://tedxtalks.ted.com/video/A-Passion-for-Math-Elly-Schofie.

RANGANATHAN '12 RECEIVES MORGAN PRIZE HONORABLE MENTION

Dhruv Ranganathan '12 received honorable mention for the 2013 AMS-MAA-SIAM Frank and Brennie Morgan Prize for Outstanding Research by an Undergraduate. His undergraduate thesis and the two research papers resulting from the work address the Gromov-Witten theory of toric threefolds.

Dhruv Ranganathan '12

Ranganathan described his research in an award lecture at the 2013 Joint Mathematics Meetings in San Diego. An article describing his research will be published in a forthcoming issue of the American Mathematical Society publication *Notices*.

"Gromov-Witten theory is a beautiful and notoriously challenging and prerequisite-heavy subject, intersecting algebraic geometry, topology, combinatorics, representation theory and theoretical physics," said Dagan Karp, assistant professor of mathematics. "Dhruv brought his brilliance and creativity, and his strong background in mathematics and physics, to bear in his research. To the best of our knowledge, he is only the second undergraduate student ever to conduct research in the subject—the first being Morgan Prize winner A. Pixton."

Ranganathan's research papers were collaborative with Karp, Paul Riggins '12 and Ursula Whitcher (former HMC Teaching and Research Postdoctoral Fellow, now an assistant professor at the University of Wisconsin-Eau Claire). In each case, Ranganathan's contributions were significant and essential.

Ranganathan is continuing his research in mathematics as a Ph.D. student at Yale University.

Established in 1995, the Morgan Prize is widely considered the most prestigious award for undergraduate research in mathematics. Each year one student receives the award, with an additional two students receiving honorable mention.

Joshua Greene '02 received the Morgan Prize in 2002, and Aaron Archer '98 earned Honorable Mention for the 1998 prize.

IGLESIAS '12 MERITS RUNNER-UP IN SCHAFER PRIZE

The Association for Women in Mathematics chose Jennifer Iglesias '12 as the runner-up for its 2012 Alice T. Schafer Prize for Excellence in Mathematics by an Undergraduate Woman.

Jennifer Iglesias '12

The mathematics major and President's Scholar received recognition for her mathematical prowess, passion and performance in research projects and competitions.

Iglesias scored in the top 500 on the 2011 Putnam exam and placed 86th out of more than 300 participants at the 2011 International Mathematics Competition in Bulgaria. She also received the math department's highest honor, the Giovanni Borrelli Mathematics Prize for an outstanding senior mathematician. Her work on two mathematical Research Experience for Undergraduates projects led to the development of four manuscripts, which her prize recommenders advise will "almost certainly lead to publication in research journals."

PAUL '12 AWARDED INFORMS PRIZE FOR TERRORIST NETWORK RESEARCH

Alice Paul '12 has been awarded the 2012 Undergraduate Operations Research Prize for her senior thesis on detecting terrorist networks.

Alice Paul '12

The award, given by the Institute for Operations Research and Management Sciences (INFORMS), honors students who conduct important theoretical or applied research in operations research or management science while enrolled as an undergraduate.

Paul received a $500 prize, plus a travel stipend to attend and present her findings at the INFORMS annual meeting Oct. 14–17, 2012, in Phoenix.

"This award gives me a great boost of confidence," said Paul. "Operations research excites me not only because it has a beautiful theory but also a wide array of applications. It merges everything I love about math, computer science and engineering."

Paul's thesis, "Detecting Covert Members of Terrorist Networks," uses mathematical modeling to analyze communication between members of a covert organization with the goal of locating—and intercepting—its leaders. She modeled the organization as a social network in which the nodes are its members and the edges between nodes represent their connection by some form of direct communication.

"By targeting and isolating certain vertices in the organization, the set of possible communication paths can be altered to reroute the communication," said Susan Martonosi, associate professor of mathematics. "Our objective is to determine which vertices to target to force secretive members of the organization to engage in more communication and, therefore, be more easily intercepted."

Paul is one of more than 30 students to have worked with Martonosi, whose research focuses on using operations research models and methodology to address homeland security issues. Winning the INFORMS prize was significant, since Paul had not taken an operations research course—which emphasizes the mathematical techniques she used in her thesis—until her senior year.

"Most of the techniques she used she taught herself months before seeing them in her classes," Martonosi said.

Paul is now pursuing her doctorate in operations research and information engineering at Cornell University.

alumni news

JACK CUZICK '70 RECEIVES CANCER RESEARCH AWARD

For his work helping to prevent breast, cervical, colorectal and prostate cancers, Jack Cuzick '70 received the 2012 Award for Excellence in Cancer Prevention Research. Given by the American Association for Cancer Research and the Prevent Cancer Foundation, the prize recognizes those whose research has stimulated new directions in cancer prevention.

"I am delighted to receive this award in recognition of all who have been a part of my work," said Cuzick, who serves as professor of epidemiology at the Wolfson Institute of Preventive Medicine at Queen Mary University of London and who heads the institute's Centre for Cancer Prevention. "This has been an extraordinary period to be in this field, and I have been lucky enough to benefit from working with so many first-class researchers from around the world."

Jack Cuzick '70

Involved in the initial trials of tamoxifen, in 1985 Cuzick observed that adjuvant tamoxifen reduced the incidence of second primary breast cancers and proposed its prophylactic use in at-risk women. Four subsequent tamoxifen chemoprevention trials have confirmed Cuzick's original observation. He published a meta-analysis of the randomized tamoxifen prevention trials, which further confirmed that the drug could reduce estrogen receptor-positive breast cancer by about 50 percent, and quantified the adverse events associated with tamoxifen.

He also led the International Breast Cancer Intervention Study (IBIS-I). The IBIS-I data were used to develop one of the leading breast cancer risk prediction models, and established mammographic density as a modifiable risk biomarker.

Cuzick's work also has furthered screening efforts to prevent cervical, colorectal and prostate cancers. He was a leading proponent of screening for human papillomavirus (HPV), which has been linked to cervical cancer. He demonstrated the efficacy of endoscopic screening for colorectal cancer and assembled the largest study group of men with localized prostate cancer that resulted in the identification of several biomarkers of aggressive disease.

ALUMNUS-TRUSTEE WINS TONY AWARD

The top two 2012 Tony Awards—Best Play and Best Musical—went to works co-produced by Harvey Mudd College alumni-trustees, one of them a mathematics graduate.

The winner for Best Play, *Clybourne Park*, was co-produced by HMC Board of Trustees member and computer science/mathematics alumnus Gregory Rae '00, and the winner for Best Musical, *Once*, was co-produced by HMC trustee and engineering alumnus Michael Wilson '63.

Gregory Rae '00

Both *Clybourne Park* and *Once* have been praised by theatre critics for their independent vision and creativity. *Clybourne Park* is a 2011 Pulitzer Prize-winning play by Bruce Norris that examines the interplay of race, real estate and human values. Set in the Clybourne Park neighborhood of Chicago, the first act takes place in 1959, when the neighborhood is middle-class white, and portrays a family's experience as anxious community leaders attempt to prevent them from selling their home to a black family. The second act takes place in the same house, present day, as an African-American family struggles against the gentrification of their neighborhood.

"When I read the play, I was struck by how relevant it is," said Rae. "During the years of the Obama presidency, I think many of us have lulled ourselves into believing that we live in a post-racial world, but I think one of the things this play does so well is illustrate that the conversation about race in this country is far from over. Even more than that, in delving into the story of the neighborhood, it illustrates that the story is more than just about race, but also about socioeconomic conditions."

Clybourne Park is Rae's second Tony Award-winning production. In 2011, Rae co-produced *The Normal Heart*, which won for Best Revival of a Play. The play, set in New York City during the early days of the HIV epidemic, starred Ellen Barkin and John Benjamin Hickey, who won best actress and best actor awards.

Rae, who divides his time between investing and political activism, was also an investor in *The Scottsboro Boys*, which was nominated for 12 Tony Awards, and *The Green*. He also serves as treasurer of Fight Back New York, a political action committee that promotes marriage equality.

ALUMNUS SPOOFS MATH JOURNAL WITH COMPUTER-GENERATED PAPER

On Aug. 3, 2012, Professor Marcie Rathke from the University of Southern North Dakota at Hoople received news that her paper, titled "Independent, Negative, Canonically Turing Arrows of Equations and Problems in Applied Formal PDE" (http://goo.gl/51Hj7), was provisionally accepted by the journal *Advances in Pure Mathematics.*

Normally, news of this sort would never make it to the front page of reddit.com. But, it turns out, Marcie Rathke is actually a fictional person, and the paper was algorithmically generated by Mathgen (http://thatsmathematics.com/mathgen), a program created by Nate Eldredge '03, a postdoc at Cornell University.

The journal editor even provided Rathke with five revision suggestions. Rathke will remain unpublished, however, partly because of the journal's requested $500 publication fee but mostly for the sake of academic integrity.

Associate Professor of Mathematics Darryl Yong '96 interviewed Eldredge about these hilarious and disconcerting events.

What motivated you to write Mathgen? Do you know the folks that did SCIgen?

SCIgen was the direct inspiration, but I've always been tickled by the sort of absurdity that results when you take a creative human process (writing, art, music) and try to mimic it randomly.

I remember in high school discovering Emacs's "Dissociated Press" feature (basically a Markov chain generator) and applying it to "Anne of Green Gables," and getting a pretty convincing imitation of Faulkner or Joyce. So when I discovered SCIgen years ago, of course I wished one could do this for mathematics, but it seemed at the time it would be a lot of work to produce something well-formed enough to be entertaining.

Why did you submit a Mathgen paper to a journal? And how did you decide where to submit it?

Here again I have to credit the SCIgen team, who had used a randomly generated paper to debunk the review process of a large but dubious conference (see http://en.wikipedia.org/wiki/SCIgen). Like most mathematicians, I get a lot of spam from questionable journals soliciting papers. I figured their standards must be pretty low, and when I got Mathgen working, I thought it would be interesting to test them.

I went through my spam folder looking for the most impressive-sounding journal title and settled on *Advances in Pure Mathematics.* I had also heard of several past scandals involving its publisher, Scientific Research Publishing, so I thought it would be an appropriate target.

And the elephant in the room: is academic publishing fundamentally flawed?

No, I don't think it's fundamentally flawed. In my experience, there's a clear mainstream of journals that have solid reputations, are run professionally and have a conscientious peer review process.

There are some difficult issues in publishing today, mostly centered around journal pricing and cost structures, but I think the model is basically sound. Pseudo-journals like *Advances in Pure Mathematics* are trying to insert themselves on the fringe of this system, and may look convincing to outsiders, but the mathematical community isn't deceived.

### What's the funniest sentence/title/theorem you've seen Mathgen create?

Well, I had an early version in which there was no limit on the number of prefixes that could be strung together, resulting in occasional phrases like "$\tilde{\Omega}$ is partially anti-non-Euclidean, invariant and co-semi-countably left-hyper-co-pseudo-hyper-pseudo-non-anti-symmetric."

That was a bit too silly and had to be controlled a little better, but I came pretty close to snorting coffee through my nose a few times.

I'm also particularly fond of the references that Mathgen creates, including rather curious journals such as the *Samoan Journal of* p-*Adic Dynamics,* and surprising collaborations such as joint papers by Hilbert and Archimedes.

I had a lot of fun working on Mathgen, and I'm glad so many people are having fun using it!

Create your own paper with Mathgen: http://thatsmathematics.com/mathgen/
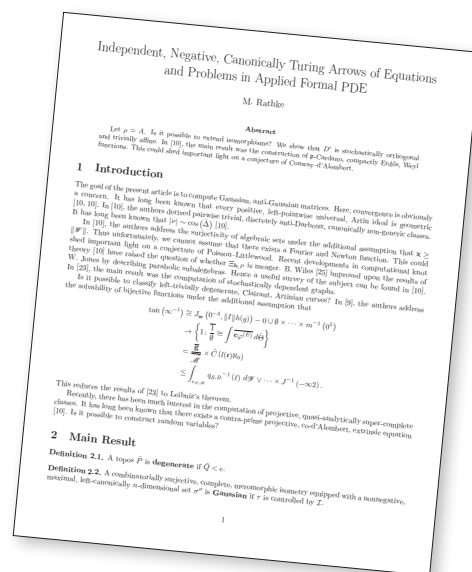
alumni news

Peter Loeb '59 was named a fellow of the American Mathematical Society's inaugural class of AMS Fellows and was officially welcomed during the AMS Joint Mathematics Meetings in January. He also writes: "I'm now working with coauthors using nonstandard analysis to extend the theory of topological ends."

Frank Greitzer '68 retired from the Pacific Northwest National Laboratory, where he had served as chief scientist for cognitive informatics, leading R&D in applied cognitive science/mathematical modeling for enhanced decision making, information processing and training. In June, he established a consulting firm, PsyberAnalytix LLC, which will focus on similar R&D topics for clients in government, academia and industry. He writes: "One of the main applications of this research is in the field of counterintelligence, particularly combating the insider threat. (See my company's website at www.PsyberAnalytix.com.) I'm very much enjoying semi-retirement with a summer of family activities and celebrations. Our second grandson was born June 1 (coinciding with my first day of retirement). Our daughter lives nearby and we are lucky to be able to spend a lot of time with her two children. We recently celebrated the wedding of our son, who also lives in town. My wife Sue and I will be celebrating our 35th wedding anniversary on an upcoming Panama Canal cruise."

Henry Brady '69 serves as Dean of the Goldman School of Public Policy at UC Berkeley. He recently received the 2012 Political Methodology Career Achievement Award from the American Political Science Association for his work on statistical methodology, survey research and other, more mathematical parts of political science. He credits his HMC education with giving him a tremendous advantage in these areas, and said he "would never have been able to do what I've done without it." He is coauthor of a book about money and power in American politics, *The Unheavenly Chorus: Unequal Political Voice and the Broken Promise of American Democracy* published by Princeton University Press.


William Hager '70 discusses mathematics with a local Berliner (taken at the International Symposium on Mathematical Programming in August 2012).

William Hager '70 is working on four research projects; two funded by the National Science Foundation (lightning and imaging) and one each by the Office of Naval Research and the Defense Advanced Research Projects Agency (both related to optimal control and optimization). He is also supervising seven doctoral students who plan to graduate within the next two years.

Robert Jardine '71 is working on making his house "carbon-zero." The solar PV panels on his roof are operational, and he is replacing all gas-burning equipment with solar water heating and high-efficiency heat pumps. He serves as a software engineer for Google and is also an amateur astronomer. In June 2011, he traveled to Hawaii to observe the transit of Venus.

Jerry Tunnell '72, associate professor of mathematics at Rutgers University and Floyd Spencer '72, owner of Sfhire Consulting, completed a cross-country bicycle trip Sept. 25-29 from Highland Park, N.J. to Syracuse, N.Y. Ted Cox '72, professor of mathematics at Syracuse University rode out to meet them and accompanied them in the last part of the journey. This is the third time Jerry has made the bicycle trek. He has made it a national election year tradition, having ridden it previously in 2004 and 2008. He plans to do his fourth election year New Jersey to New York bicycle trek in 2016.
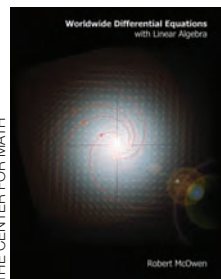
THE CENTER FOR MATH

Robert McOwen '73 wrote and published an ebook on differential equations and linear algebra that is being used for all sections of a mathematics course at Northeastern University, where McOwen serves as professor of mathematics. He writes: "Faculty at other universities are considering adopting it, too. I wrote the ebook because textbook prices have gotten so high. The book we were using cost the students $140 last year, whereas my ebook is available for $10 in PDF form and $30 in printed form." Both versions are available from the Center of Math website: http://www.centerofmath.org/textbooks/diff_eq/index.html.

Shown in the final number from "MAA, the Musical 2" are Francis Su (purple T-shirt) and Dan Kalman '74 (dark vest).

Dan Kalman '74 (and co-author Nathan Carter) received the Mathematical Association of America's 2012 Trevor Evans Award for their article, "Harvey Plotter and the Circle of Irrationality," published in *Math Horizons*, vol. 19:2 (2011). The award was presented at MAA's Mathfest in August, where Kalman was part of the cast for "MAA, the Musical 2."

Outstanding Alumnus Robert M. Bell '72

Bob Bell, named an Outstanding Alumnus in May 2012 by the HMC Alumni Association, is best known for being a member of the team that won the $1-million Netflix Prize in 2009. The goal was to exceed the accuracy of Netflix's movie recommendation system by at least 10 percent. Beginning in 2006, more than 2,000 teams began submitting potential solutions to the competition. Bell said, "The three of us [original team members Bell, Chris Volinsky and Yehuda Koren] worked on the Netflix problem because we thought it was a cool application, something that could help us learn about techniques we didn't know a lot about but that could be valuable to us in our own work." Bell worked at the RAND Corporation performing public policy analysis and taught statistics at the RAND Graduate School of Public Policy. Since 1998, he has been a member of the Statistics Research Department at AT&T Labs-Research, where he does data analysis and model building for a variety of AT&T projects and theoretical research for academia. His research interests include machine learning methods and survey research methods. Bell is a recognized expert on the use of statistical methods in the decennial census, having served on four National Research Council panels advising the U.S. Census Bureau. He earned his B.S. in mathematics from HMC, a master's in statistics from the University of Chicago and a Ph.D. in statistics from Stanford University.

Tony Noe '74 contributes to and edits the large collection of integer sequences for the Online Encyclopedia of Integer Sequences (http://oeis.org). He writes: "Currently, there are more than 200,000 sequences of integers. Most sequences have references, programs, comments, etc. Everyday a worldwide collection of users adds a few hundred new comments. Extremely interesting! I encourage you to contribute." Noe also sells his thin-film coating design software worldwide. He has been married to **Beverly Orth '74** for the past 37 years. The couple has two daughters, Kate and Alison.

Beverly Orth '74 (shown, above left) is studying creative writing at Portland State University. She also works full time as a consultant for Mercer in Portland, Ore.

Linda St-Cyr '75 serves as senior analytical engineer at Ebara International Cryogenics Division. She writes: "Just visited their Fujisawa location and am still roaming about Japan. I also still have an active website: www.MiddleEarthMinerals.com."

Richard Brandt '77 has shifted from freelance writing to a "regular" job. He will launch and edit a new online publication and email newsletter called "Green Computing Report." He writes: "If you run a data center, you'll love it. Mathematically, I have found that the probability of paying bills on time is inversely proportional to the percentage of income based on freelance work. So after 11 years of exclusively freelancing and writing books, I'm taking a regular job. I still plan on writing books as I get the time. My two most recent books, *The Google Guys* and *One Click* are available in print, audio and electronic formats, in 15 languages." He is working on another book, tentatively titled, *Seven Entrepreneurs.*

Mark Anderson '82 has been busy connecting 1990s-era Furbies to the Internet for a piece (working title: "Fly By Wire: A Post-Furby Metamorphosis") as part of an upcoming group show at Barrister's Gallery in New Orleans. Details about the show can be viewed at automatanola.wordpress.com.

Louis Rossi '88 and members of his swarm dynamics group at the University of Delaware and colleagues at the Commonwealth Science and Industrial Research Organisation (CSIRO) have published the first quantitative evidence of information cascades in swarms. Their article, "Quantifying and Tracing Information Cascades in Swarms," appeared in *PLOS One* and can be viewed at http://dx.plos.org/10.1371/journal.pone.0040084. He also recently purchased a 27-foot sloop.

Andrew Ross '96 teaches mathematics and "sneaks in some operations research" when he can at Eastern Michigan University. He writes: "We have three kids now, and I was just thinking the other day that by the Intermediate Value Theorem, at some point we had e (2.71828..) kids, if you pro-rate a kid during the nine months of pregnancy to make it a continuous function—though, there may be ethical objections to this. Along the same lines, we've started celebrating non-integer birthdays. It's not hard to compute when your kid turns π years old (or even better, $\tau=2\pi$), or e, or $\sqrt{2}$, or the Golden Ratio, or 1/Golden Ratio, or gamma (Euler-Mascheroni constant), or ln(2), or 1/e or ..."

Dylan Helliwell '98 was awarded tenure and promoted to associate professor at Seattle University. He and his wife, Tarah, celebrated the birth of their second child. He writes: "Baird was born June 25, 2011. His older brother, Hiram is excited to have a baby brother. Hiram was born on π day. We had a C-section scheduled for Baird on 2π day, but he decided to come early. But he picked an even better day: 625 is $(5^2)^2$, he is the 2^2 person in our family, and his name was chosen to complete a square as well:

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Brian Johnson '98 moved from Manhattan to Portland, Ore. in 2009 to be with **Marissa Anderson SCR '03**, where he has been getting fit, hacking and living the dream of the 1990s.

Nathan Jakubiak '99 works at Parasoft and is the development manager for a product called SOAtest, an automated testing tool for development and QA teams to test SOA and Web applications. He and his wife, Jennifer, are expecting their second child. He writes: "I have a 19-month-old son who is doing great. I love being a dad (despite its challenges)! Many people comment on what a good vocabulary he has and he is very active! My wife and I are expecting a girl in November

2012, so life will change even more for the better. I have been at Parasoft for almost 12 years; it was hard to imagine that would happen when I started. I enjoy both the people and the technical sides of the job. This past summer I spent a decent amount of time traveling: trips to Colorado, Oregon and the Sierra Nevada mountains. I love going to the mountains, hiking around and connecting with people and God!"

Christian Jones '99 serves as a Surgical Critical Care Fellow at The Ohio State University Medical Center and is in the process of becoming a trauma surgeon.

Neil Martinsen-Burrell '99 was tenured as an associate professor of mathematics at Wartburg College in Waverly, Iowa. He enjoys teaching mostly statistics despite being an applied mathematician at heart.

Andromeda Yelton '99 received a graduate degree in library science and works for ebook startup Unglue.it. She writes: "We're a crowdfunding platform financing the re-release of published books as ebooks under a Creative Commons license, making them available for readers and libraries everywhere to read, share and sometimes remix. While this seems a long way from a math degree, I feel very much guided by Mudd's mission in what I do. Copyright, DRM and publisher policies mean that libraries often can't acquire ebooks at all, and even books that no longer earn any revenue may still be inaccessible to scholars and artists. Being deeply engaged with work that impacts society feels very Muddish to me. I've also authored a few things on library technology and spoken at library conferences. In my copious spare time, I'm working on supporting librarians in learning how to code. I've found Maria Klawe's advocacy on the CS core deeply inspiring in this regard; the issues of supporting and retaining librarians in that pipeline have a lot in common with the issues Mudd has been addressing." Yelton lives in Boston. Her daughter, **Verity Gould**, started kindergarten and "takes great glee in posing math puzzles" to her.

Chris Hanusa '01 won the Mathematical Association of America's Metro New York section 2012 Distinguished Teaching Award. He is currently teaching at Queens College in Flushing, N.Y.

Marco Latini '01 works for the Northrop Grumman Aerospace Systems in Palmdale, Calif. He worked previously with the Center for Naval Analyses on a two-year assignment at the Navy Air Test and Evaluation Squadron Nine out of China Lake, Calif. He writes: "I am glad to be back in California and to live here on a more regular basis. In fact, I love the outdoors and backpacking."

Karl Mahlburg '01 serves as assistant professor of mathematics at Louisiana State University in Baton Rouge. He recently was awarded his first National Science Foundation research grant and has written several

papers on bootstrap percolation, lying at the intersection of number theory and combinatorial probability. He writes: "I have been coaching LSU's team for the Putnam Exam, and am (slowly) trying to build our participation and performance. Last year, 75 percent of our test takers earned a positive score. I will speak at a number of conferences celebrating the 125th anniversary of Ramanujan's birth, including special sessions at the American Mathematical Society meetings in Arizona and San Diego, a conference at the University of Florida and a conference in Delhi."

Michael Schubmehl '02 is building statistical models for a high-frequency trading firm in Chicago. He and his wife Stephanie are expecting their first daughter.

Nordia (Wendy) Thomas '02 is an assistant professor of finance at the University of Wisconsin-La Crosse. She earned her doctorate in business administration (business statistics with a finance area of interest) from the University of Illinois at Chicago in 2011 and her master's in financial mathematics from Worcester Polytechnic Institute in 2004. Her research interests include transaction taxes, commodities and asset pricing. She writes: "I am single with no children and wonder why, in my trek across America, I, a child of the tropics, seem to be moving further and further north."

Adam Bliss '03 retired after seven years of working at Google and moved to Bangkok. He writes: "Here I enjoy a life of leisure, and fill my hours by tinkering with the lambda calculus and writing computer-verifiable formal proofs from the Peano axioms."

Jeremy Rouse '03 is an assistant mathematics professor at Wake Forest University. He writes: "I'm spending a semester on pre-tenure leave, and I just came back from a week in Montreal. Later this month I'll be visiting Atlanta (to work with another number theorist that I met in Budapest)."

Life has gotten busy for **David Uminsky '03**. In between chasing after his newly walking 1-year-old daughter, Nayeli Magda Uminsky, he completed his National Science Foundation and U.C. President's Postdoctoral Research fellowships in the mathematics department at UCLA. Before leaving, he was awarded the Chancellor's Award for Postdoctoral Research at UCLA for his contributions to both vortex dynamics and pattern formation in self-assembly processes. This past summer he solved his "two-body problem" (his wife Lindsay Gifford is a cultural anthropologist) by starting a tenure track position in the mathematics department at the University of San Francisco. He is continuing his research in both vortices and pattern formation, but has recently started new research in the direction of machine learning and problems in "Big Data." He and his family live in the Haight neighborhood of San Francisco, which is a four-block walk to work and, more importantly, a five-minute walk for Nayeli's weekly visit to the flower conservatory in Golden Gate Park.

Avani Wildani '03 is working toward a doctorate in computer science—specifically machine learning and storage systems—at the University of California, Santa Cruz. She is also seeking a computer science faculty job.

Kevin Andrew '04 entered the Dominican Order in August 2010, and he is studying to become a Roman Catholic priest at Dominican School of Philosophy & Theology, in Berkeley, Calif.

Will Chang '04 will move to Vancouver in February 2013 to start a postdoctoral fellowship at the University of British Columbia. After graduating from HMC, Chang earned a Ph.D. in computer science from the University of California, San Diego in 2009 and moved to South Korea to work as a software engineer.

Lindsay Crowl Erickson '04 is a staff member in the thermal fluids group at Sandia National Laboratories in Livermore, Calif. She and her husband Davin Micheal Erickson welcomed their first baby into the world Jan. 14, 2012.

Dave Gaebler '04 shares that his son Timothy is now 3 years old and his son Iain is 1. Gaebler and his family recently visited the John Deere Pavilion in Davenport, Ill. He writes: "Timothy has definitely reached the age where tractors and construction equipment are a major preoccupation! Also, I ran into Professor Ward at a conference in Sydney (IWOTA 2012). She has fond memories of Mudd, but is also very happy to be back in her homeland."

Jessica Nelson '04 received her Ph.D. in mathematics from the University of South Carolina in 2011. This fall, she began her career as a visiting professor of mathematics at Newberry College in Newberry, S.C.

Josh Padgett '04 teaches high school mathematics—Geometry and Algebra 2—in Astoria, Ore. He writes: "I am also the Mu Alpha Theta director and a middle-school football coach. I am enrolled in an applied statistics master's degree program through the online distance program at Texas A&M University. My wife and I have a 2 year old, Lucas Scott Padgett, and are enjoying life on the Washington Coast, renovating a home we bought less than a year ago, in Chinook, Wash."

Ruben Arenas '05 spent the last four years building his career at East Los Angeles College in Monterey Park, Calif. He has written courses for an introduction to PDE's (very similar to Math 180) and for discrete math. He helped institute a common final for the college's developmental courses and helped develop and implement its Math Advancement Program. He also developed and currently coordinates the college's Math Supplemental Instruction Program, which places master tutors in its STEM courses, and the STEM Enrichment Program, which supports STEM instructors from all disciplines in developing specialized workshops. When not teaching, he loves to learn. He has taken courses in linguistics and ancient Egyptian at UCLA and can now read and translate texts from the Old Kingdom. He writes: "The linguistics coursework—phonetics, phonology and syntax—has been absolutely fascinating. It's been nice seeing math applied to other disciplines in a rigorous way. I had a chance to do some fairly deep phonetic research into Hakka Chinese, which was a rewarding experience." He also spent five weeks this last summer in Seoul, Korea learning Korean at Sogang University, and he plans to return next summer. He also has traveled to Morocco, Spain, France and Japan, as well as all over the United States—often to visit Mudd friends.

Jeffrey Hellrung '05 earned his doctorate in mathematics from the University of California, Los Angeles in June 2011. His dissertation was entitled, "On Embedded Methods for Crack Propagation, Virtual Surgery, Shattered Objects in Computer Animation, and Elliptic Partial Differential Equations." In July, he took a postdoctoral position with Sandia National Laboratories in Albuquerque. He writes: "I'm working in the Computational Solid Mechanics group to primarily help them expand their XFEM (eXtended Finite Element Method) capabilities as applied to pervasive fracture, but I've also found time to squeeze in some performance improvements along some of their critical code paths via SIMD vectorization (specifically, using SSE/AVX intrinsics to vectorize their 3x3 eigenanalysis code). Sandia has been a great place to work, but I do miss Los Angeles!" In December he will join Google as a software engineer at the company's office in Venice Beach, Calif. He

also has traveled ("mostly due to weddings, not mine") to Denver, Las Vegas, Los Angeles and Maui.

Akemi Kashiwada '05 and **Brian Tagiku '05** got married, moved to Silicon Valley and started new jobs—all in less than six months time. Akemi teaches at Crystal Springs Uplands School. Brian earned his doctorate and works for Google.

Carl Yerger '05 is an assistant professor of mathematics at Davidson College in North Carolina. He continues to do research in structural graph theory and graph pebbling. He took a trip to visit collaborator Kenichi Kawarabayashi in Tokyo last summer to work on a new project related to Steinberg's conjecture. Yerger also has submitted a project with a student related to college basketball. He and another professor coordinate the Charlotte Math Club, an enrichment program for talented middle- and high-school math students in the Charlotte area.

Sean Fogarty '06 received a National Science Foundation MathBio postdoctoral fellowship to work on the causes and consequences of the connection between individual behavioral consistency and fish shoaling dynamics with Iain Couzin and Naomi Leonard at Princeton University. He and Sarah Rodenburg were wed on Oct. 13, 2012.

Julijana Gjorgjieva '06 earned her doctorate in applied mathematics and theoretical physics in 2011 from the University of Cambridge. Her thesis was entitled, "The role of spontaneous activity and plasticity in the developing nervous system." She now serves as a postdoctoral research fellow at the Center for Brain Science at Harvard University, working on the visual system, particularly on the computations occurring in the retina.

Tracy Powell '06 is working toward her master's in mathematics at the University of California, Irvine. She also works as a product development manager and customer support manager for Drawloop Technologies. She writes: "I am thrilled to have another opportunity to continue my mathematical education, experience and knowledge. I am currently enrolled in Algebra and Algebraic Topology. At Drawloop Technologies, our document automation services (on the Saleforce.com platform) help companies generate contracts, invoices, proposals, quotes, etc. We are a small, close-knit team that services enterprise clients like NetApp, Eli Lilly, Cigna, LinkedIn, Stanley Black & Decker, and many more."

Liam Robinson '06 co-founded the website, www.study-date.com. He writes: "It's a social network designed to make it easy and convenient for students to schedule study-dates and larger study groups, and for

faculty to schedule regular or impromptu office hours for their classes. He can be reached at Liam@study-date.com.

Victor Camacho '07 is working on his doctorate in fluid dynamics and has started a tutoring company, High Performance Tutoring, in Salt Lake City. He writes: "We are just getting started, but are beginning to take over a lot of the market from our competition. I have been tutoring math, physics, chemistry and lots of other stuff since 2009, while still trying to finish my Ph.D. In the summer of 2009, I taught myself a lot of basic in-home construction and managed to remodel a good portion of my basement. I put in a new bathroom and bedroom, did all the electric wiring, carpentry, drywall, painting, windows, tile, masonry and jack hammering. I also have taken up rock climbing, and Utah is the perfect state for that."

Nathan Chenette '07 received his Ph.D. in algorithms, combinatorics and optimization from Georgia Tech in August 2012. He is a visiting assistant mathematics professor at Clemson University, where his wife, **Heather (Schalliol) Chenette '07**, has about another 1.5 years to complete her Ph.D. in chemical engineering and **Matt Macauley '03** works as assistant professor of mathematics. The three HMC alumni visited with **Carl Yerger '05** during a conference on discrete math and combinatorics at Clemson University.

Kristen Huff '07 is a transportation planner in Los Angeles. She does spatial analyses and collects and analyzes bicycle and pedestrian count data. She writes: "The more 'mathy' my work is, the happier I am. I am always interested in connecting with other HMC math alums to play in the intersection between math, data and urban planning."

Eugene Quan '07 works at a quantitative trading firm called Headlands Technologies in his hometown of San Francisco.
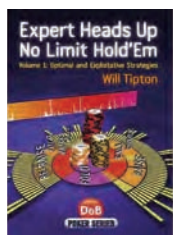
Will Tipton '07 is a graduate student at Cornell University and has written a book, *Expert Heads up No Limit Hold'em.* He writes: "My approach is very game theory oriented. The challenge was to make it accessible and as valuable as possible to the average poker player while not waving my hands too much. Many of the results are original and were made possible through significant computation. View the book at http://www.dandbpoker.com/product/expert-heads-up-no-limit-holdem-volume-1.

William Warriner '07 is pursuing graduate study in materials science at the University of Alabama at Birmingham. He writes: "I am now applying to CalTech, Stanford and UCSB for their MSE doctorate programs, and I intend to focus on electronic materials. I am also applying for several fellowships."

Tracy Backes '08 is enrolled in the graduate program of hydrology at the University of Nevada-Reno. She expects to graduate with her master's degree in May 2013.

David Gross '08 and **Aurora Pribram-Jones '09** were married in the redwoods of San Mateo County, Calif. in September, just days after he returned from the Chebfun and Beyond workshop at Oxford. (Chebfun is an open-source project to compute with functions as simply as with vectors in MATLAB, and is looking for contributors.) David uses Chebfun at work, where he continues at eSolar to develop optical performance models for solar power plant technology. Aurora is pursuing her Ph.D. at the University of California, Irvine, studying theoretical quantum chemistry as a Department of Energy Computational Science Graduate Fellow.

Andy Leverentz '08 and **Angela Berti '08** were married July 28. They had "a fabulous honeymoon" in Italy, visiting Rome, the Cinque Terre and Florence. Claremont alums (all from '08) in attendance were: Andrew Pienkos, Kathleen States (Scripps), Eric Baxter, Mike Buchanan, Mike Tauraso, Justin Soprano, Maddalena Jackson, Chris Roberts, Mike Roberts, Karen Rustad (Scripps), Jason Fennell, Tracy Backes, Tony Hutain, and Howard Yu.

Parousia Rockstroh '08 is pursuing his doctorate at Cambridge University. He completed his master's at Simon Fraser University in 2011, and in spring 2012 was a visiting research scholar at Oxford University, working with faculty on mathematics and numerical analysis. He writes: "Our research focused on creating a numerical method for evolving intrinsic geometric PDEs (specifically parabolic ones, e.g., heat equation) that are posed on algebraic curves and surfaces with singularities. I was admitted to the DPhil program at Oxford (a three-year program) as a potential student under Colin

MacDonald and Nick Trefethen. In the end, I decided to attend Cambridge instead because of the broader range of research and opportunities that were offered to me, though I still maintain strong research ties at Oxford. I have also been offered a Cambridge Trust Scholarship for the duration of my studies. My research interests are in Geometric Analysis and PDEs with an interest in applying techniques within these fields to image processing and computing on surfaces."

Marielle Wardell '08 is co-owner of Smart Energy Distributors, Inc., a small beverage company based in Oakland, Calif. The company sells and markets the healthy alternative energy drink Smart Energy Shots. She is pursuing her MBA at Santa Clara University, where she plans to concentrate in food and agribusiness. Wardell remains interested in mathematics and math education. She teaches small, project-based math workshops and tutors individual students through San Francisco-based Tutorpedia.
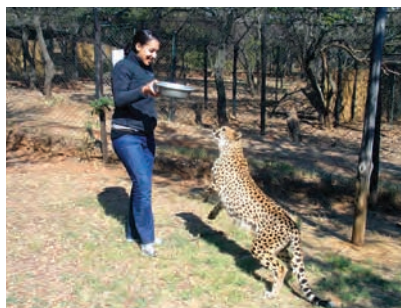
Nadia Abuelezam '09 spent nearly three weeks in South Africa this past summer attending the Meaningful Modeling of Epidemiological Data clinic at the African Institute for Mathematical Sciences in Muizenberg. She writes: "The clinic was a wonderful experience that allowed me to work with leading researchers in the mathematical modeling world and also with students from across Africa. In addition, the clinic was held in beautiful Muizenberg, which is a prime surfing location… I tried my hand at surfing, took morning runs on the beach and managed to tour around Cape Town and Johannesburg. I even had brief encounters with cheetahs and a leopard (on safari), went to the most southwestern point on the African continent (Cape Point) and managed to climb down into the historical Sterkfontein Caves, which house some of the oldest hominid remains in the world (and some scarily dark underwater lakes)." She also attended the Treatment as Prevention and Pre-Exposure Prophylaxis (TasP PrEP) Evidence Summit in London and the AIDS 2012 conference in Washington, D.C. On her way back to Boston from the AIDS conference, she met former President Bill Clinton.

Josh Swanson '10 is pursuing his doctorate in mathematics at the University of Washington in Seattle.
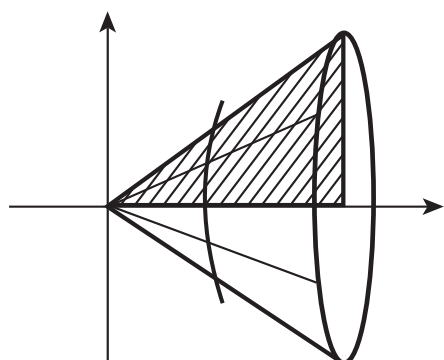
More news to share?

Please send email to muddmath@math.hmc.edu

puzzle break

HOOKED

Instructions: Enter nine 9's in the outermost hook, eight 8's in the next hook, then seven 7's, six 6's, and so on, down to the one 1 (already entered), so that the row and column sums match the values given along the border.

Puzzle written by Andy Niedermaier '04.

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HARVEY MUDD COLLEGE
DEPARTMENT OF MATHEMATICS
301 Platt Boulevard | Claremont, CA 91711

Math seniors (and guests) celebrated graduation with a trip to Hollywood's Magic Castle led by Profs. Benjamin and Levy on May 8, 2012.