MUDDMATH

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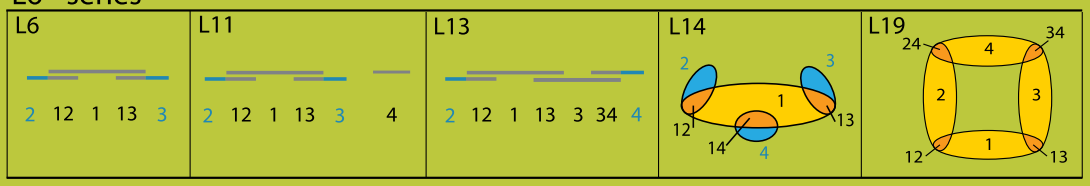

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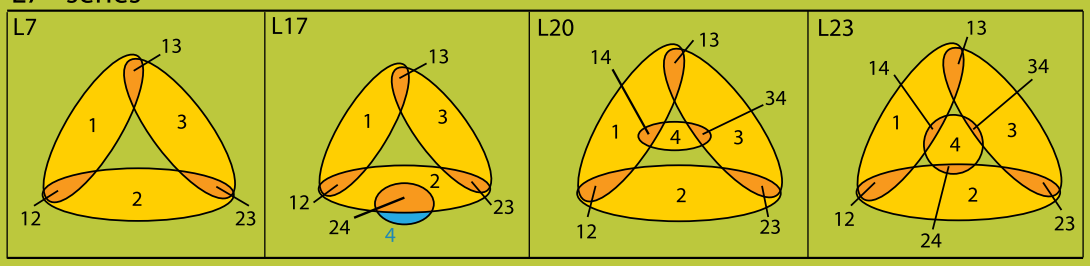

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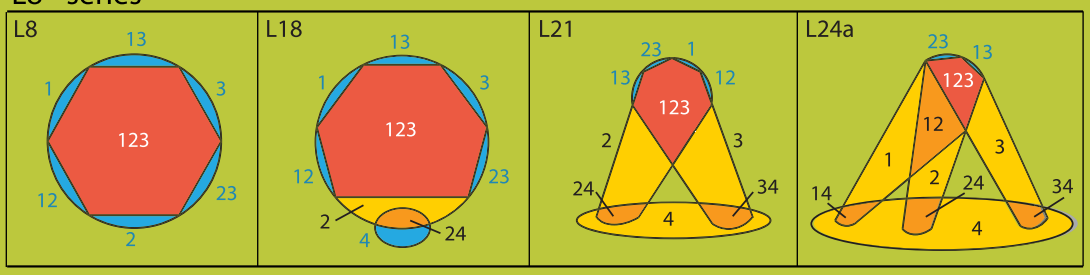

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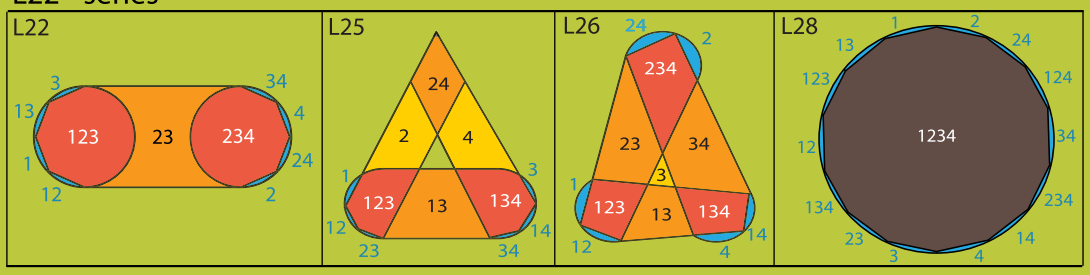

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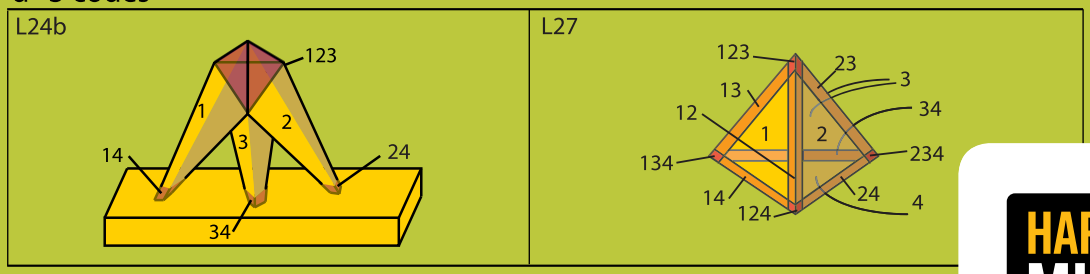


VOLUME 9 + ISSUE 1 = 2015

HARVEY MUDD COLLEGE

Letter From the Chair

Dear HMC Mathematics Friends,

The department has been incredibly busy and productive as you'll read in the articles that follow. I'd like to highlight here a few of my colleagues' accomplishments.

Andrew Bernoff completed a prolific five-year term as department chair in July 2014. We're grateful to him for spearheading multiple fundraising efforts, including ensuring the longevity of Harvey Mudd's Michael Moody Lecture Series, which features top mathematicians. In addition to his administrative accomplishments, Andy was awarded a Simons Foundation Collaboration grant to support his research on swarming.

Working with me on everything from retreat planning to course scheduling, Talithia Williams served as associate chair for 2014–2015. Newly tenured, she joins our department's esteemed group of winners of the Henry L. Alder Award for Distinguished Teaching. During 2015–2016, Talithia will spend a well-earned sabbatical as an American Council for Education Fellow in Baltimore.

Dagan Karp, now associate chair, is one of several faculty members returning from sabbatical. Rachel Levy, the recent recipient of an NSF grant to introduce mathematical modeling in the elementary grades, was appointed vice president of education for the Society of Industrial and Applied Mathematics and, with Michael Shearer, co-authored her first textbook, one which PDE enthusiasts will surely enjoy. Weiqing Gu returned from her sabbatical to take on the role of Mathematics Clinic Director, previously held by Susan Martonosi, who supervised two Clinic teams and guided six student research projects. Weiqing also guides individual student research, supervising thesis and independent study students as well as a Claremont Graduate University PhD student.

Jon Jacobsen, now the interim vice president for student affairs, is working on his calculus textbook, doing research, serving on the editorial board of *Mathematical Biosciences* and giving invited talks. Darryl Yong—now a full professor—continues his incredible work as associate dean for diversity and his innovative mathematics teaching. Darryl was awarded significant NSF funding to support a Master Teaching Fellowship Program in collaboration with Math for America, Los Angeles.

Other mathematics faculty members are also making an impact beyond Harvey Mudd. Continuing to engage and amuse with mathematics, Art Benjamin—who was named to the inaugural Smallwood Family Professorship—has co-authored *The Fascinating World of Graph Theory*, and he was quite a hit on *The Queen Latifah Show* last June. Francis Su is president of the Mathematical Association of America and travels extensively, advocating for programs that advance and increase diversity in mathematics. (Check out his op-ed piece on the gender gap in the *Los Angeles Times,* http://fw.to/YkQHnHM.) He and Michael Orrison helped organize the 2014 Mathematics Research Community conference at Snowbird (see page 5). Michael's service also extends to the advisory board of the Springer Undergraduate Texts in Mathematics book series.

In addition to the aforementioned Alder Award, other mathematics faculty members have also been honored for their work. Nicholas Pippenger, a Fellow of the AMS, the ACM, the IEEE and the RSC, was named to the IT History Society's Honor Roll in recognition of his work on extendible hashing. Nick organized our mathematics senior thesis program and advises many of our joint math-CS majors. Alfonso Castro was appointed an AMS Fellow this year, a distinction endowed upon only top-level research mathematicians. He now directs the Claremont Center for the Mathematical Sciences and seeks to strengthen its programs and resources.

Our newest department member, Mohamed Omar, completed the yearlong professional development program, Project NeXT. He has already garnered a student fan base that appreciates his terrific teaching. Mohamed supervised six summer research students on five different projects and will publish papers resulting from the work (see page 11).

And yes, I have done a few things, too. With NSF funding, I co-organized the 2014 International Symposium on Biomathematics and Ecology: Education and Research (BEER), held here on campus. I was also invited to serve as guest editor for a special issue of the *MAA American Mathematical Monthly*, which focused on research topics in mathematical biology. I continue to follow my passion in mathematical tumor-immune modeling research and was fortunate to give keynote talks on my work and publish invited book chapters and research articles.

It has been a delight to chair a department made up of such incredible people. As we reflect on our accomplishments in this publication, we look forward to an exponentially excellent year.

Lisette de Pillis
Chair, Harvey Mudd College
Department of Mathematics
and Norman F. Sprague
Professor of Life Sciences

Contents

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

MuddMath is published by the Harvey Mudd College Department of Mathematics, 301 Platt Boulevard, Claremont, CA 91711.
math.hmc.edu

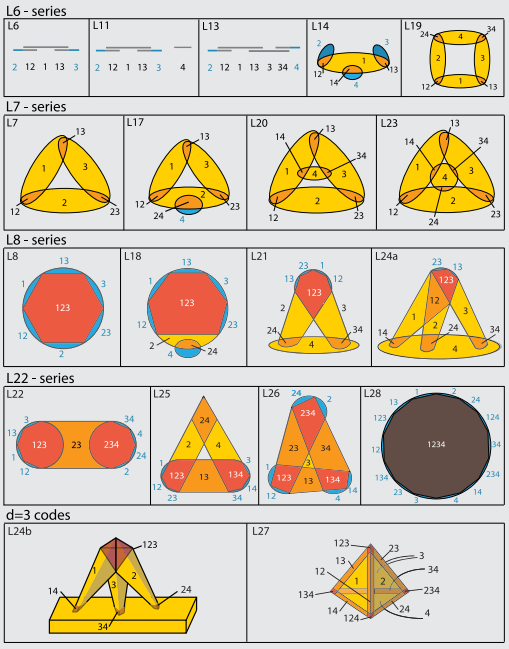
Darryl Yong ’96, editor. Produced in cooperation with the Office of Communications and Marketing. Inquiries, suggestions, comments and updates are welcome and can be emailed to muddmath@math.hmc.edu.

Harvey Mudd College is a co-educational 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.

About the Cover

Harvey Mudd postdoctoral fellow Nora Youngs (more about her on page 4) created the cover image for a paper that she recently co-wrote with Mohamed Omar and others. Convex open sets serve as a model for place fields, the region in space that spatially-tuned neurons detect. The image shows all possible different ways in which four convex open sets can interact and the smallest dimension in which the sets can be drawn. Sets in blue may be present or absent without changing the dimension.

http://arxiv.org/abs/1508.00150



Prefrosh Attend Women in STEM Event

Five incoming Harvey Mudd first years traveled to Jane Street Capital to attend the second annual Women in STEM event, Aug. 3–5, 2014.

Tiffany Fong ’18, Rebekah Justice ’18, Marina Knittel ’18, Teal Stannard ’18 and Jane Wu ’18 were among 77 women from around the country selected to visit Jane Street’s New York City headquarters. Attendees had the opportunity to learn more about how math, computer science and probability are utilized in the financial world, particularly in the work at Jane Street. Students enjoyed the all-women and new-hire panels, which helped them to better understand the transition from being a STEM major to pursuing a career in finance. Jane Street is a proprietary trading firm that utilizes quantitative techniques and computational technology to trade in markets around the world.

Lectures and panels ranged from finance and arbitrage to heuristics and biases. Talks featured many key traders and technologists at Jane Street, including alumnus Andy Niedermaier ’04. Questions were plentiful, leading to thought-provoking discussions between students and presenters. Attendees were further challenged with an Estimathon, in which teams were scored on the accuracy of their estimation ranges for a series of questions.

In a broader context, this experience also expanded many attendees’ perceptions of career opportunities for STEM majors. “Visiting Jane Street gave me a whole new perspective on how math and computer science are applied beyond academia,” said Wu. “It was the perfect way to transition into college, and I was thrilled to meet so many talented women from Mudd and other colleges.”

Ten-year Anniversary for Exemplary Program

The Department of Mathematics proudly celebrates the 10th anniversary of receiving the inaugural Award for Exemplary Program by the American Mathematical Society (AMS) for the strength of its overall program. In 2006, the department was selected to receive this award out of all colleges and universities in North America.

Lectures/Events

Symposium on Biomathematics and Ecology Features Moody Lecturer

Trachette L. Jackson is working to change the face of cancer research, combining mathematical modeling, numerical simulation and in vivo tumor vascularization experimentation to gain a deeper understanding of tumor growth and vascular structure at the molecular, cellular and tissue levels. The University of Michigan professor of mathematics described some of her award-winning research during the 2014 Michael E. Moody Lecture "Mathematical Models of Tumor Angiogenesis," on Friday, Oct. 10. Jackson, an award-winning teacher-scholar whose research in mathematical oncology has received international attention, explored the classical and current mathematical models of tumor angiogenesis and highlighted recent advances. Her talk was part of the International Symposium on Biomathematics and Ecology: Education and Research (BEER), held Oct. 10–12 and hosted by Harvey Mudd and Pomona Colleges. The symposium brought together researchers and educators to share their progress in biomathematics research and to discuss the current state of biomathematics education.

Community Partnerships: Sacred Sistahs

On April 25, the College hosted the fifth annual Sacred Sistahs Math and Science Conference for Middle and High School Girls. The conference introduces African-American female youth to careers in science, technology, engineering and math and exposes them to professional women practicing in these fields.

Math, Mime and March Madness

As part of the spring Michael E. Moody Lecture Series, the husband-and-wife team of Tim and Tanya Chartier presented a mime show March 5. In "Mime-matics," the Chartiers explored mathematical ideas through the art of mime, illustrating and simplifying complex math concepts. Whether creating an illusion of an invisible wall, wearing a mask covered with geometric shapes or pulling on an invisible rope, the couple delved into math concepts such as estimation, tiling and infinity.

Tim, an associate professor of mathematics and computer science at Davidson College who specializes in applied linear algebra in the fields of data analytics and partial differential equations, then presented the ninth lecture in the Moody Lecture Series on March 6. In "Who's Number One? From Ranking to Bracketology," Tim discussed the sports analytics research that helped him create March Madness brackets which beat out 90 percent of over eight million brackets submitted to ESPN's online tournament.

Founded in remembrance of Harvey Mudd Professor of Mathematics Michael E. Moody, this evening lecture series brings speakers to the College who illuminate the joy, wonder and applicability of mathematics. On Sept. 17, Satyan Devadoss of Williams College, a visiting professor at Harvey Mudd for 2015–2016, spoke on the topic "The Shape of Nature: Bee, Tree, Origami."

Tanya Chartier

Postdoctoral Fellows

2015–2016 Academic Year

Ivan Ventura ’07

Ivan Ventura ’07 returned to HMC in fall 2014 as a postdoctoral fellow, having received his PhD in mathematics from UC Berkeley in 2012. His PhD thesis was “Applications of Semiclassical Analysis to Partial Differential Equations,” and he worked under Maciej Zworski. Ventura is a postdoctoral fellow through the NSF Alliance for Building Faculty Diversity in the Mathematical Sciences and is currently doing research with Alfonso Castro, professor of mathematics.

Nora Youngs

Nora Youngs received her B.A. in mathematics from Smith College and PhD from the University of Nebraska-Lincoln. She studies neuroscience from the viewpoint of algebraic geometry and works with Assistant Professor of Mathematics Mohamed Omar on several mathematical projects.

AMS Mathematics Research Community Workshop in Snowbird

The American Mathematical Society's Mathematics Research Community (MRC) workshop introduces young mathematicians to research bridging pure mathematics and various applications amenable to the analysis of discrete models.

Participants were grouped into five teams, each focusing on a particular application. During an intense week in Snowbird, Utah, the teams worked on specific open problems selected by the organizers. Participants were expected to do background reading in advance of the workshop and come ready to collaborate and build strong research ties. The five focus areas were:

- Combinatorial Topology in the Social Sciences
- Representation Theory in Data Analysis
- Combinatorics in Molecular Biology
- Algebraic and Geometric Approaches in Neuroscience
- Algebraic and Geometric Methods in Optimization

"Mathematicians trained in areas such as algebra, topology, geometry and combinatorics are often unaware of the extent to which they are prepared to tackle open problems in fields such as biology, the social sciences, data analysis and optimization," said Professor of Mathematics Francis Su. "There is also significant benefit in attacking applied problems from a discrete perspective with algebraic, topological, geometric and/or combinatorial tools."

This MRC brought together participants with diverse backgrounds and strengths and featured a broad spectrum of applicants, from those familiar with the applications who wished to broaden their mathematical tools to young mathematicians trained in algebra, topology, geometry or combinatorics who were interested in exploring applications.

Professors of Mathematics Su and Michael Orrison co-organized the workshop. Other organizers included Carina Curto (University of Nebraska-Lincoln), Jesus A. De Loera (University of California, Davis) and Christine Heitsch (Georgia Institute of Technology).

Michael Orrison, Amanda Ruiz, Gwen Spencer '05, Tia Sondjaja '08, Mohamed Omar, Nora Youngs and Francis Su

Yong Promoted

Darryl Yong '96 was promoted to full professor, effective July 2015. He began as a visiting professor at Harvey Mudd (2000–2001) while teaching at California Institute of Technology, before being hired full time in 2003. His primary research area is in mathematics education, specifically in the recruitment, training and professional development of highly skilled secondary school mathematics teachers through the Math for America Los Angeles program, for which Yong serves on the steering committee. His other research interests include asymptotic analysis, numerical analysis and applied mathematics. Yong also serves as the College's associate dean for diversity and advises Mudders considering careers in education.

Yong received a bachelor's degree in mathematics from Harvey Mudd in 1996 (along with a second major in music), a master's degree in applied mathematics from Claremont Graduate University in 1996 and a PhD in applied mathematics from University of Washington in 2000, where he was a Huckabay Teaching Fellow.

Darryl Yong '96

Martonosi Recognized

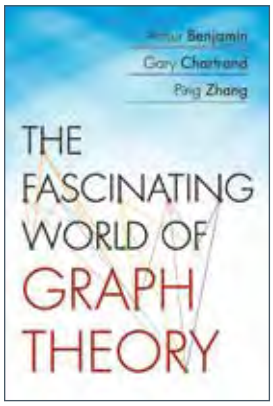
Susan Martonosi holds the Joseph B. Platt Chair in Effective Teaching, a five-year chair awarded to a faculty member who has demonstrated both personal effectiveness in teaching and a passion to promote effective teaching in others. Martonosi researches the application of operations research models and methodology to problems in homeland security. She is also developing mathematical models for malaria intervention policy. Martonosi was the Mathematics Clinic director from 2010 to 2014 and is the College's MCM/ICM team coordinator.

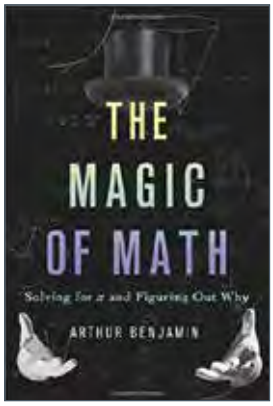
Last July, Martonosi was named president of the Forum for Women in Operations Research and Management Science (WORMS) of the Institute for Operations Research and Management Science (INFORMS). As such, she plays a valuable role in providing networking and professional development opportunities for its members. She was recently elected to the INFORMS board of directors and will serve as vice president of membership and professional recognition.

Benjamin Appointed to Professorship, Publishes Books

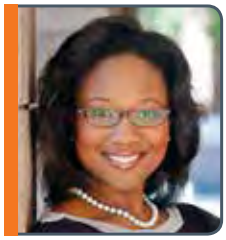
Art Benjamin is the inaugural holder of the Smallwood Family Chair, an endowed professorship established to recognize and support the work of an outstanding faculty member in engineering, mathematics or computer science. An important addition to the $150 million Campaign for Harvey Mudd College, the Smallwood Family Chair was established by Scott R. and Carol Ann Smallwood P17.

Benjamin also has published two books. *The Fascinating World of Graph Theory* explores the mathematics often used to express relationships between objects, such as those in fields like transportation science, data structures and social media. In *The Magic of Math: Solving for x and Figuring Out Why*, Benjamin shows how the math we learned in school—from basic counting and arithmetic to algebra, geometry and beyond—can be easy, intuitive and fun.





Williams Earns Alder Award, ACE Fellowship



This past February, the Mathematical Association of America chose Associate Professor of Mathematics Talithia Williams to receive its 2015 Henry L. Alder Award for Distinguished Teaching by a Beginning Faculty Member. The award honors faculty members whose teaching is effective and extraordinary and extends its influence beyond the classroom. Past recipients include Rachel Levy (2013), Susan Martonosi (2012), Lesley Ward (2006) and Francis Su (2004).

Williams has spoken throughout the country about the value of statistics in quantifying personal health information. Her TED talk, "Own Your Body's Data," has garnered over one million views (bit.ly/TW-data). She has had substantial impact locally and nationally encouraging students from traditionally underrepresented groups to pursue education in STEM. Locally, she runs an annual conference (Sacred SISTAHS) that teaches hundreds of young girls from minority communities about the benefits of studying STEM and how to successfully navigate that path. At the national level, Williams serves as treasurer for SACNAS (Society for Advancement of Chicanos and Native Americans in Science), is founding co-director of EDGE (Enhancing Diversity in Graduate Education) and serves the MAA as governor-at-large for minority interests.

She was recently selected as an American Council on Education (ACE) Fellow for 2015–2016. Etablished in 1965, the ACE Fellows Program is designed to strengthen institutions and leadership in American higher education by identifying and preparing emerging leaders for senior positions in college and university administration. Williams will attend retreats and interactive learning opportunities in addition to undergoing a yearlong mentorship program with prominent educator Freeman Hrabowski at the University of Maryland, Baltimore County.

Pippenger Inducted Into IT Honor Roll

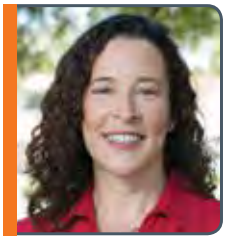
In recognition of his extraordinary contribution to the information technology industry, the IT History Society acknowledged Harvey Mudd College mathematics Professor Nicholas Pippenger, co-inventor of extendible hashing, a database access technique which has a dynamic structure that grows and shrinks gracefully as the database grows and shrinks. Pippenger, who worked on extendible hashing while at IBM Research with colleagues Ronald Fagin, H. Raymond Strong and Jürg Nievergelt (ETH, Zurich, Switzerland), is one of more than 700 honorees on the society's IT Honor Roll. The IT History Society expands the reach of historical and archival activities while communicating the value of preserving their history and heritage for future generations.

Nicholas Pippenger

Gu Named Avery Professor

For the 2014–2015 academic year, Weiqing Gu served as the Avery Professor of Mathematics, a one-year appointment. The Avery Fellows program was created in 1987 by R. Stanton Avery to increase the teaching and scholarly quality and distinction of the faculty throughout The Claremont Colleges. Gu's areas of expertise are differential geometry and topology, Grassmann manifolds and computer-aided geometric design.

Levy Leads Faculty Development, IMMERSION Project



Associate Professor of Mathematics Rachel Levy is serving a three-year term as associate dean for faculty development. She brings substantial mentoring experience to the position, having chaired the Harvey Mudd Teaching and Learning Committee and the Education Committee of the Society for Industrial and Applied Mathematics, among others. Her duties include co-coordinating the 5-C New Faculty Workshop for incoming tenure-track faculty, hosting new faculty orientation and weekly professional development lunches for first- and second-year faculty, and identifying and addressing professional development needs of post-tenure faculty.

As part of a groundbreaking national study to examine how intensive training can affect elementary school teachers' use of mathematical modeling in the classroom, Levy is co-directing the IMMERSION project, funded by a $1.3 million grant from the National Science Foundation. The project is part of ongoing efforts to improve student proficiency and critical thinking in science, technology, engineering and mathematics (STEM). The Common Core State Standards for Mathematical Practice, recently adopted by many states for their K–12 curricula, identify mathematical modeling as one way that students should use mathematics to solve problems encountered in the workplace and life.

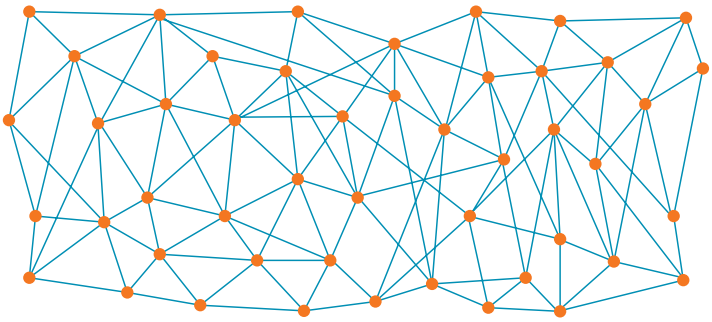
"Mathematical modeling is an important tool for problem-solving and forecasting in many jobs," said Levy. "The activities provide opportunities for students to practice innovation and communication as well as reinforce and apply mathematics concepts in new contexts." Earlier this year, Levy led a working group of researchers and teachers gathered by the National Science Foundation, the Society of Industrial and Applied Mathematics and the American Statistical Association to identify ways that mathematical modeling should appear in the K–6 curricula.

Castro Among AMS Class of Fellows

Professor of Mathematics Alfonso Castro was among 63 mathematical scientists worldwide named to the 2015 Class of Fellows of the American Mathematical Society. Castro was recognized for contributions to nonlinear analysis and elliptic partial differential equations as well as for service to individual departments and the larger community. His research areas include partial differential equations, variational methods, inverse-function theorems and water waves.

Castro's career is marked by numerous distinctions. He has received several National Science Foundation grants as well as a 2012 Simons Foundation Collaboration grant and is a prominent member of the Colombian Academy of Sciences. Castro was awarded the 2013 Colombian National Mathematics prize in recognition of his service to the Colombian mathematical research community.

In its third year, the AMS Fellows program recognizes members who have made outstanding contributions to the creation, exposition, advancement, communication and utilization of mathematics. Castro is the College's fourth AMS Fellow selection. Mathematics professors Arthur Benjamin and Nicholas Pippenger and Harvey Mudd President Maria Klawe were selected for the inaugural 2013 class.



Effectively Communicating Research

The 2015 Society for Industrial and Applied Mathematics (SIAM) Conference on CSE featured a new attraction: "SIAM Communication Doctors," a booth for people wishing to craft effective messages about their research. Graduate students, postdocs and faculty visited the booth, hoping that booth doctors could turn their research summaries into good stories that would appeal to the public. Reporter Flora Lichtman joined Associate Professor of Mathematics Rachel Levy, Nick Higham (University of Manchester), Jeff Humpherys (Brigham Young University) and Matt Parno (MIT) to offer feedback as people pitched their ideas.

Based on the level of interest at the CSE conference, SIAM invited interested readers to submit video clips in which they briefly described their work and explained why they should be given help to produce a YouTube video communicating the work. Submissions were judged on prospective content, enthusiasm and audience. The winner received professional advice and coaching on research communication, along with the services of a professional videographer to film and edit the video.

SIAM

Moody's Mega Math Challenge Marks 10th Year

by Rachel Levy, SIAM vice president for education
Article excerpted from SIAM.org

Can you recall the first time you worked with a team on a significant mathematical modeling problem? For me, it was as a senior at Oberlin College, in a project for NASA in an operations research course taught by Professor Bruce Pollack-Johnson (now at Villanova). I am certain that the experience played a large role in my decision to become an applied mathematician and to join the faculty at Harvey Mudd College, which provides industrial mathematical modeling experiences through its senior capstone Clinic projects. SIAM provides students with mathematical modeling experiences through the Moody's Mega Math (M^3) Challenge, which, like COMAP's Hi-MCM, makes the experience of team-based modeling available to U.S. high school students. M^3 is entirely Internet-based, and carries no entry or participation fees.

This year M^3 celebrated its 10th anniversary. The competition is organized by Michelle Montgomery's marketing and outreach team at SIAM, in collaboration with Frances Laserson, president of The Moody's Foundation. A charitable organization established by Moody's Corporation, the Foundation sponsors M^3 as part of its commitment to supporting education, in particular the study of mathematics, finance and economics. The competition began in the New York City metropolitan area and has expanded each year; the 2016 competition will be open to students anywhere in the U.S.

This year, 1,128 three- to five-member teams of juniors and seniors from 45 states participated in M^3. They had only 14 hours and 20 pages to develop and communicate their solutions to this year's question: "Is college worth it?" In their math models, competitors were asked to determine the cost of earning a degree, account for the impact of President Obama's recent free two-year community college proposal and contrast potential financial outcomes for those pursuing STEM and non-STEM degrees.

The M^3 challenge gives students practice in cooperation and project management. They are allowed to employ any mathematical techniques they choose and to use data and other information from the web to develop their models. Communication plays a key role, both between team members and in the writing of the report. The students work in a situation familiar to many professionals in BIG (business, industry and government) mathematics jobs: Given a new problem and a tight deadline, they must develop an insightful and useful solution.

Judging the competition is fun and rewarding. For the past three years I have served as one of the M^3 triage judges—applied math professionals, mostly SIAM members, who use an online platform to read, score and make brief constructive comments on papers. I enjoy seeing what high school students can do with the big, messy, real-world challenge problems.

As SIAM VP for Education, I also had the honor of serving as a finalist judge and giving a short talk at the award ceremony held in the Moody's building in New York. I was impressed by the high quality of the student presentations, the poise of the team members and the insightful answers to our tough questions. The subtle communication between teammates as they chose who would answer a particular question gave us a glimpse of the camaraderie within the teams. In my talk I discussed the fallacy of the genius stereotype (that great mathematicians work alone, and without benefit of the ideas of others).

This year's six finalists took home a combined $60,000 in scholarships. An additional $65,000 in scholarships was distributed among the six semi-finalists and the 53 honorable mention teams. For the 10th anniversary, the M^3 organizers produced a series of retrospective videos highlighting past competitors' successes during their college careers and on into the workplace. Readers can watch videos, including the finalist team presentations and award ceremony highlights, on SIAM Connect: http://bit.ly/1GVWskM.

Donti Earns NSF Graduate Research Fellowship

Priya Donti '15, a joint major in computer science and mathematics, received several prestigious awards and honors between spring 2014 and 2015. This past spring, Donti was the only current student to be granted an NSF Graduate Research Fellowship, which recognizes outstanding students pursuing advanced degrees in the STEM disciplines. Donti received hers for proposed multidisciplinary work using artificial intelligence in smart-grid technology.

"I feel extremely lucky to have received the award, and am motivated to use it to do good work that positively impacts the world around me," said Donti, who also received a Thomas J. Watson Fellowship to explore the cultural and social ramifications of renewable energy policy. Donti will begin the NSF Fellowship upon return from her Watson year, which will take her to Germany, India, South Korea and Chile. The Watson Fellowship is a one-year grant for purposeful, independent study outside the United States.

Donti also earned a 2014 Udall Foundation Honorable Mention for her commitment to environmental sustainability and community engagement. She has worked for several campus groups in this regard, including Science Bus, Mudders Making a Difference and Engineers for a Sustainable World/Mudders Organizing for Sustainability Solutions (ESW/MOSS).

Zakirova Receives MAA Award

Student researchers Ksenia Zakirova '15 and Michael Cork POM '16 received the Mathematical Association of America's Outstanding Presentation Award at MathFest 2014. "Modeling and exploring chain fountain dynamics" was based on summer research advised by Andrew Bernoff and postdoctoral fellow Rob Thompson. Zakirova and Cork were selected from a group of almost 150 student presenters.

The chain fountain is a counter-intuitive physical phenomenon that occurs when one end of a bead chain is dropped from a large height. Rather than falling straight down, the chain first rises in a fountain above itself, seemingly defying gravity. Gravity continues to pull out the "self-siphoning" chain while forcing it above the side of its container into a curved shape. The effect offers a visually fascinating physics problem.

"We wondered whether we could create a model for the chain siphon in order to determine its properties and analyze why exactly it occurs," said Zakirova, a mathematics major. The team studied the dynamics of the problem using differential geometry, partial differential equations and physical and numerical experiments, including letting the chain fall from a third-floor balcony to see how high the siphon might rise. The students discovered that the angle and drag for the chain as it left the beaker crucially affected the observed shape.

Apker Finalist Researches 2-D Fluids

Physics alumnus Jaron Kent-Dobias '14 was selected as a finalist for the American Physical Society's 2014 LeRoy Apker Award. Under the advisement of Andrew Bernoff, Kent-Dobias conducted senior thesis research in physics and mathematics, focusing on two-dimensional fluids with dipole interactions. Kent-Dobias' thesis demonstrated that the microscopic details of any such system are irrelevant in the macroscopic limit and contribute only to a constant offset in the system's energy.

"I was pleased to see the American Physical Society recognize Jaron for his hard work and dedication to this research project over the past two years," said Bernoff, Diana and Kenneth Jonsson Professor of Mathematics. "His senior thesis is a significant step forward in our understanding of these systems. It was fun and enlightening watching these results unfold from a clever combination of physical modeling, mathematical analysis and numerical simulation."

The Apker Award recognizes outstanding achievements in physics by undergraduate students. Kent-Dobias is the College's eighth Apker finalist since 1998.

Mohamed Omar and Maxfield Comstock '16

Students Collaborate on Exciting Research

Last summer, six students collaborated with Assistant Professor Mohamed Omar on five separate research projects related to the applications of algebraic geometry to discrete mathematics. Maxfield Comstock, a senior majoring in mathematics and computer science, worked with Omar in spring 2014 as an independent study student and then applied for Omar's summer research program. Comstock enjoyed the freedom that Omar gave the students to focus on aspects of the projects they were particularly interested in and to work at their own pace.

"He really wanted us to pursue the problems on our own and to follow our own interests instead of trying to push us to be interested in something just because he is," Comstock says.

Benjamin Lowenstein, another senior majoring in mathematics and computer science, explored algebraic refutations of graph 3-colorability. Based on their research, Omar is preparing submissions to several publications.

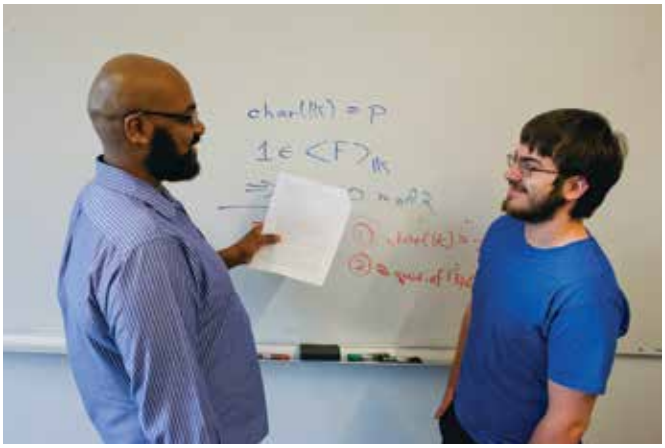
"It was great just to be working on a project with Professor Omar; to have something actually come out of it is even better," Lowenstein says.

Lucy Lu, a recent graduate who majored in mathematics and computer science, starts her PhD this fall. She worked closely with Omar last summer exploring one of his novel ideas on the problem of nonnegative polynomials and sums of squares.

"It was an interesting and exciting experience for me to explore something that no one really knows about. It was even nicer that Prof. Omar shared my excitement throughout the research process," says Lu.

Omar says collaborating with students allows him to engage the students in pedagogy that extends well beyond mathematics. "They learn about writing, expressing themselves through presentations, communicating their ideas effectively through various media, and I think the opportunity to lead them in that light is also something I appreciate and enjoy a lot," Omar says.

This article was adapted from a spring 2015 article published in the Harvey Mudd College Magazine.



Mohamed Omar and Benjamin Lowenstein '16

Mellon Mays Fellows

Cesar Orellana was one of two Harvey Mudd College juniors who are among 10 inaugural fellows selected for the Mellon Mays Undergraduate Fellowship (MMUF) Program, an initiative of The Andrew W. Mellon Foundation that aims to increase faculty diversity at The Claremont Colleges by supporting underrepresented students to pursue careers as professors.

Orellana and Willie Zuniga were each selected to receive the prestigious fellowship based on demonstrated academic ability and stated aspiration to pursue a doctoral degree in their respective fields. The MMUF Program provides academic and co-curricular support through events, faculty mentors, stipends for research and repayment of undergraduate loans up to $10,000. The program continues to support fellows during their graduate and postdoctoral careers through grants, mentoring and training. Since 1988, the MMUF Program has engaged more than 4,000 students, over 500 of whom have earned PhDs.

Orellana, who is majoring in mathematics with an emphasis on operations research and systems engineering, hopes to pursue a course of study in graduate-level mathematics that marries his love of math and engineering. He cites the Engineering Mathematics course (E72) as one of the most stimulating he's taken at Harvey Mudd and would like to eventually teach courses like it that "apply mathematical and computational methods to the solution of real-world problems." Orellana says the support system the fellowship provides makes the prospect of graduate school much less daunting.

Cesar Orellana '17 describes work on a corneal transplant project that involves electro-spinning.

Orellana participated in summer research with Liz Orwin '95, professor of engineering, as a member of the Engman Fellowship Lab, a group working on a corneal transplant project involving electro-spinning—a process by which he created aligned collagen fiber matrices that simulate the environment in which corneal cells live in the body.

Loustalet Is Athlete of the Year

Tasman "Zorg" Loustalet '17

Harvey Mudd College and the Claremont-Mudd-Scripps Athletic Department announced that Tasman "Zorg" Loustalet '17, a member of the men's cross country and track teams, was named Harvey Mudd's Alumni Association Outstanding Athlete of the Year.

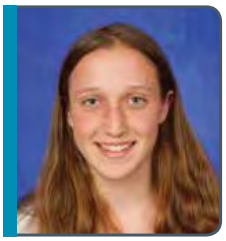
Loustalet, a joint computer science and mathematics major with a concentration in French, was selected as Southern California Intercollegiate Athletic Conference (SCIAC) Runner of the Year for cross country in 2014. He finished first for CMS in every race during 2014 and placed 15th overall at the NCAA Division III Championships.

He is the first-ever CMS male to earn two All-American awards in cross country. He ran the second-fastest time ever for a CMS cross country runner for an 8K. Also, he has been chosen for three straight first-team All-SCIAC selections and first-team All-West Region selections.

Loustalet has run cross country since freshman year of high school. "It's been an important part of my life, and I really enjoy it," he says. "I actually began running as a way to stay in shape for wrestling, but by my junior year, I was just as good at it. I knew that I wanted to run in college and that finding a good program was important. I think I found a pretty darn good program here with CMS. I really like all of the people involved."

In addition to being a runner, Loustalet is a consultant in the Harvey Mudd Writing Center.

Weinstein Earns Goldwater Honorable Mention



Madeleine Weinstein '16 was one of three Harvey Mudd students to receive honorable mentions for this year's prestigious Goldwater Scholarship. Physics major Timothy Middlemas '17 won the award.

Weinstein, a mathematics major, conducted number theory research at Williams College under the supervision of Nathan McNew, Steven J. Miller and Caroline Turnage-Butterbaugh. Weinstein's long-term goal is to earn a PhD in mathematics and teach at the university level. She continued her work in discrete mathematics research this past summer under the supervision of Joe Gallian, professor of mathematics at University of Minnesota, Duluth.

Painting Lesson Leads to Math Prize

To increase awareness of women's ongoing contributions to the mathematical sciences, the Association for Women in Mathematics and Math for America recently co-sponsored an essay contest. Ramita Kondepudi '18 earned first place at the Undergraduate Level for her essay about Maria Klawe, "Painting With the President."

"When I found the AWM contest, I decided on President Klawe immediately," says Kondepudi. "I thought it would be a fun opportunity to get to know her better, as a woman in STEM that I look up to, and write about her accomplishments and life."

Essay submissions were based on an interview with a woman mathematician or statistician in an academic, industrial or government career and were judged by a panel of mathematicians. Winners received a prize and had their essays published online at the AWM website.

In her essay, Kondepudi discusses Klawe's impressive biography as well as some of the many positive interactions she has had with Klawe while at Mudd, including being invited over to her house to learn water color painting, a passion for which Klawe is well known. Kondepudi credits Klawe as a role model who helped her understand that "you don't have to look like the standard model to be successful"—and that women can succeed at the highest levels of science and mathematics.

Kondepudi's passion for writing goes back as far as kindergarten, where she wrote and "published" her first story for the school book fair. In high school, she blogged regularly about sustainability-related activities at ThinkGreenSpeak. She is an Office of Admission tour guide and regular blogger on the College's Admission website.

Kondepudi, who will pursue an engineering degree, says she enjoys the systematic approach that math and science offer to problem solving and wants to use these skills to address sustainable living and environmental advocacy.

Model Performances by Mudd Math Teams

The clock starts at 5 p.m. sharp, and for four consecutive days, several teams of Mudders summon all their creativity to solve problems ranging from disease eradication to sustainable development.

Seven HMC teams competed successfully in the Mathematical (MCM) and Interdisciplinary (ICM) Contests in Modeling this past February. The competitions give each team 96 hours to develop a model to address a real-world problem and to write a formal paper describing their work. Findings are judged on scientific and mathematical accuracy, clarity of exposition and creativity.

One team earned a rare "Finalist" designation—the second-highest scoring percentile. Matthew Dannenberg '16, Justin Lee '16 and Micah Pedrick '17 earned the honors for Problem C in the ICM, which focused on modeling turnover within an organization with the intent of aiding managers to build successful systems for recruiting employees.

Also in the ICM, two teams earned the Meritorious designation (top 17 percent). In the MCM, one team earned Meritorious (top 11 percent), one team Honorable Mention (top 42 percent) and two teams were Successful Participants. Worldwide, 7,636 teams participated in the MCM and 2,137 teams participated in the ICM.

Participating teams:

Finalist
Matthew Dannenberg '16, Justin Lee '16 and Micah Pedrick '17

Meritorious
Dan Schmidt '17, Yossathorn Tawabutr '17 and Bo Zhang '17
Martin Loncaric '15 and Mimee Xu '15
Joana Perdomo '16, Jennifer Rogers '16 and Lin Yang '16

Honorable Mention
Andrew Gibiansky '15, John Phillpot '16 and Sarah Scheffler '15

Successful Participant
Shiyue Li '17, Michael Sheely '17 and Dina Sinclair '17
Sophie Blee-Goldman '16, Nathan Geldner '16 and Jazmin Ortiz'16

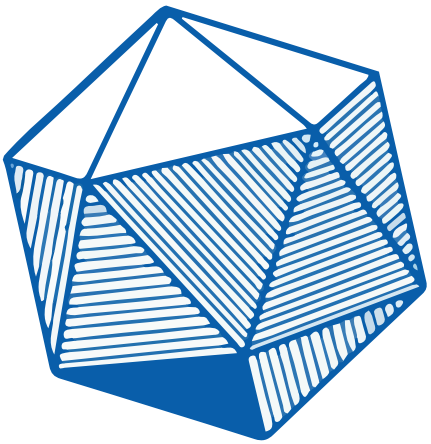
College Continues Tradition of Putnam Excellence

Combining cleverness and problem-solving skills, HMC students continued a longstanding tradition of success at this year's William Lowell Putnam Mathematical Competition, considered one of the world's most prestigious university-level mathematics competitions.

Thirty-six Mudd students took the difficult exam along with more than 4,000 others across the U.S. and Canada. In the individual category, three Harvey Mudd students earned Honorable Mentions (ranking 86th or higher): Abram Sanderson '17 (85.5th), Tongjia Shi '15 (56.5th) and Natchanon Suaysom '18 (71.5th). Each will receive the RIF Prize from the Department of Mathematics for this accomplishment.

An additional nine Mudders made the Putnam Top 500 list: Ben Lowenstein '16, Josh Petrack '16, Sam Miller '17, Colin Okasaki '17, Joshua Kutsko '16, Dina Sinclair '17, Bo Li '16, Alex Ozdemir '17 and Martin Loncaric '15.

In the team competition, Reyna Hulett '16, Sanderson and Shi placed 20th out of 577 institutions. Francis Su and Mohamed Omar coached the teams.



Graduating mathematics students and friends dress to the nines for the annual Magic Castle show in which Mathemagician Art Benjamin performs.

Back row (l to r):
Michael Baeder '15, Maddy Noyes, Greta Gadbois '15, Celeste Melamed '15, Emma Davis '15, Sarah Scheffler '15, Catherine Kim, Tyler Marklyn '15, Shannon Lubetic, Ari Hausman-Cohen '15, Risa Egerter '15, Nathan Hall '15, Samantha Stilson '15, Nicole Wein '15, Jirka Hladis '15, Corey Hayes '15, Eleanor Dwyer

Front Row standing (l to r):
Yukun Lin '15, Katherine Yang '15, Lucy Lu '15, Kyle Shan '15, Tasha Arvanitis '15, Andrew Gibiansky '15, Suzy Beeler '15, Kristina Ming '15, Sherry Zhang '15, Rachel Sherman '15, Maddie Hansen '15, Lauren Rowse, Arthur Chi '15, Elsie Gibson '15, Matt Lam '15, Nancy Shi, Jazmin Ortiz '16, Mimee Xu '15

Seated (l to r):
Professor Nora Youngs, Misha Vysotskly '15, Professor Arthur Benjamin, Martin Loncaric '15, Cleo Stannard '15, Saundra Brown, Will Clausen '15, Bridget Blum

Not shown: Priya Donti '15 and Ryan Seldon '15

2014–2015 Senior Theses

Andrew Brockmann: **Plausibly Deniable Encryption for Personal Data Storage**
Advisor: Talithia Williams

Elizabeth M. Kelley: **When Does a Curve Inscribe a Square?**
Advisor: Francis Su

Matthew Lam: **Elliptic Curves and Generalized Wheel Graphs**
Advisors: Nicholas Pippenger, Michael Orrison

Jazmin S. Ortiz: **Chromatic Polynomials, Orbital Chromatic Polynomials and Their Roots**
Advisor: Mohamed Omar

Eric Stucky: **An Exposition of Kasteleyn's Solution to the Dimer Model**
Advisor: Art Benjamin

Ksenia V. Zakirova: **Inextensible Chain Dynamics**
Advisors: Andrew Bernoff, Rob Thompson

2014–2015 Senior Clinic Projects

Mathematics

Environmental Data Resources: Environmental Cleanup Cost Modeling
Team: Crystal Hsu, Michael Baeder, Kyle Shan, Congjie Shi
Advisor: Talithia Williams

Proofpoint Inc.: Scalable Distributed Encrypted Search
Team: Nathan Hall, Nicole Wein, Teo Asinari, Xiuyuan Lu
Advisor: Andrew Bernoff

Computer Science/Mathematics

American Express: Merchant Recommendation Systems
Team: Arthur Chi, Corey Hayes, Billy Mills, Tongjia Shi, Matthew Wilber
Advisor: Elizabeth Sweedyk (CS)

MITRE Corporation: Quantifying Latent Fingerprint Quality
Team: Martin Loncaric, Sarah Scheffler, Jordan Varney, Christopher Eriksen
Advisor: Yi-Chieh Wu (CS)

Rapid7 Inc.: Understanding and Preventing Threat Through Security Data Analysis
Team: Will Clausen, Abhishek Goenka, Huameng (Michael) Jiang, Arianna Perkins, Xinlei (Mimee) Xu
Advisor: Lisette de Pillis

2015 Departmental Awards and Recognition

Giovanni Borrelli Mathematics Fellowship: Lucy Lu '15

Giovanni Borrelli Mathematics Prize: Tongjia Shi '15

Stavros Busenberg Prize in Applied Mathematics: Yantao Wu '15

Henry A. Krieger Prize in Decision Sciences: Andrew Gibiansky '15, Crystal Hsu '15

Courtney S. Coleman Prize: Reyna Hulett '16, Bo Li '16, Ben Lowenstein '16

Robert James Prize: Magda Hlavacek '17, Abram Sanderson '17

Greever Clinic Award: Crystal Hsu '15, Arianna Perkins '15

Alvin White Prize: Margaux Hujoel '16, Aleina Wachtel '16

RIF Hutchings Prize for Outstanding Performance in the Putnam Competition: Abram Sanderson '17, Tongjia Shi '15, Natchanon Suaysom '18

Class of 2015 Departmental Honors: Michael Baeder, James Bowen, Andrew Ian Brockmann, Priya Lekha Donti, Andrew Gibiansky, Ki Wan Gkoo, Nathan Hall, Matthew Lam, Martin Loncaric, Xiuyuan Lu, Samuel Pramodh, Kyle C. Shan, Tongjia Shi, Eric Stucky, Nicole Wein

Rae Earns Outstanding Alumni Award

The Harvey Mudd College Alumni Association Board of Governors has named Gregory Rae '00 one of three Outstanding Alumni for 2015.

Rae embodies the College's commitment to training great scientists and engineers also well versed in the humanities. After graduating from Harvey Mudd with a degree in computer science and mathematics, Rae joined Google's Log Analysis Group in 2000, helping to develop the Zeitgeist tool, which utilizes proprietary algorithms to garner critical information about top-trending global news.

Since leaving Google, Rae has been at the forefront of social movements critical to protecting the rights of the LGBT community. He was a national leader for the Living Liberally movement and worked on several state and national campaigns dedicated to marriage equality, including as technical lead on California's "No on Proposition 8" and treasurer for "Fight Back New York." He is a member of the National Leadership Council of Lambda Legal in support of LGBT civil rights.

Rae has been a committed supporter of the performing arts. He is a Tony Award-winning producer of major Broadway productions, including *The Normal Heart* (2011 Best Play Revival), *Kinky Boots* (2013 Best Musical) and *Clybourne Park* (2012 Best Play) and is currently involved in several film projects. He is a partner at theatrical production company Martian Entertainment LLC and an associate member of The Broadway League.

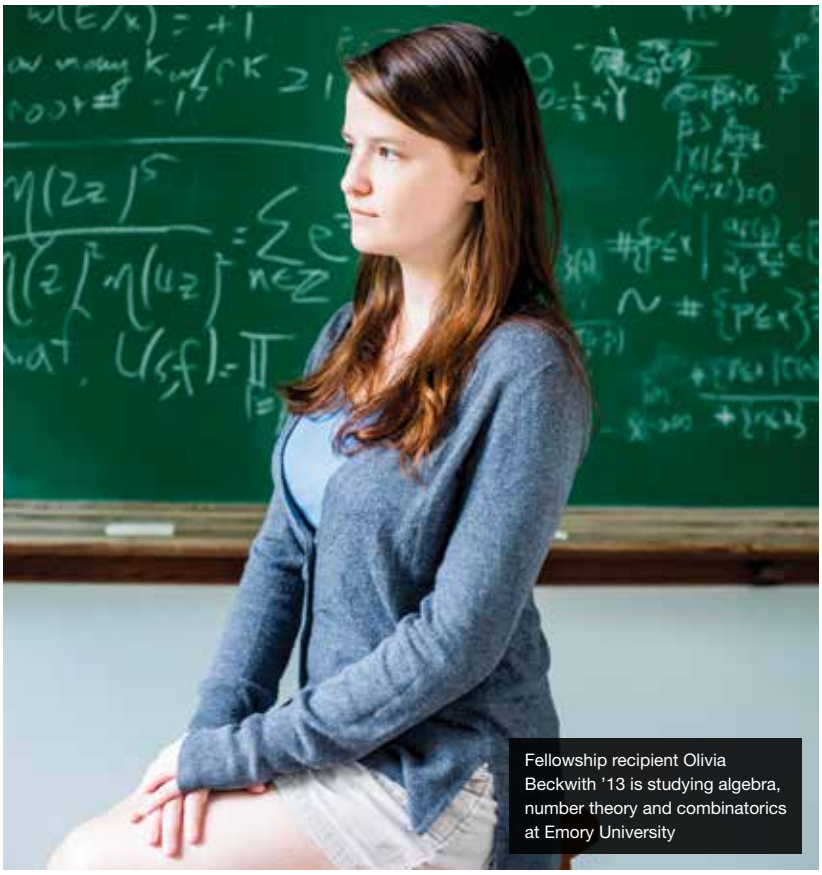
In 2014, Rae collaborated with Brian W. Johnson '98 and William Leonhard Jr. (representing his parents' estate) to endow the Leonhard-Rae-Johnson Chair in support of a distinguished computer science faculty member. Currently, the chair is held by Professor Zachary Dodds.

Gregory Rae '00

Math Alumni Receive NSF Fellowships

Several mathematics alumni received the prestigious National Science Foundation Graduate Research Fellowship for 2014–2015, which supports graduate students pursuing research-based master's and doctoral degrees at accredited institutions. Recipients are awarded three years of research support, including an annual $34,000 stipend, and may also take advantage of research opportunities abroad and access to supercomputing resources. The award also includes a $12,000 cost-of-education allowance for the graduate institution.

Olivia Beckwith '13 (mathematics) was granted the fellowship for her work in algebra, number theory and combinatorics at Emory University; and William Chen '12 (mathematical biology) for ecology research at University of Washington. In addition, Alexandra Schofield '13 (joint computer science and mathematics) received an honorable mention for research in natural language processing being conducted at Cornell University.



Fellowship recipient Olivia Beckwith '13 is studying algebra, number theory and combinatorics at Emory University

BRYAN MELTZ

Gary Smith '67: "I was invited to SciFoo Camp 2015 at the Google-Plex, where I led a discussion of regression to the mean and gave a lightning talk titled 'Big Data, Big Computers, Big Trouble.' The punch line, tweeted on by Tim O'Reilly, was, 'When calculation was hard, you had to think hard before calculating.'"

John Sawka '72: "After 36 years of teaching mathematics, I am retiring at the end of June 2015. I hope to do some traveling around the country and visit old friends."

Beverly Orth '74: "After 30 years of retirement plan consulting with Mercer, I retired on Oct. 1, 2014. It's difficult to summarize the multitude of feelings that I have over ending a long-term relationship of this magnitude. Cleaning out my office makes me realize that I won't have a home away from home any longer. I have spent more of my waking hours in my Mercer office than anywhere else! I will be continuing my education at Portland State University. Since 2012, I have been taking evening classes in literature and writing. Now I will have the flexibility of taking daytime classes, too! I will also have more time for quilting. Instead of watching the fabrics accumulate, I hope to watch finished quilts accumulate."

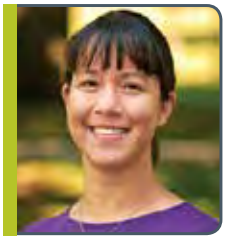
Linda K. St-Cyr '75: "Still cranking out solutions to CFD (Computational Fluid Dynamics) for Ebara International's pumps and turbines."

Eric Olsen '76: "I saw the Harvey Mudd MOOC for Python on edX and decided to sign up. I've been a software development professional since graduating from HMC in 1976, and our company is just getting into Python."

Keri (Ostrofsky) Pearlson '79 lives in Austin, Texas, working for the International Institute of Analytics (iianalytics.com) as the director of the Analytics Leadership Consortium, a think-tank-like community of Fortune 100-sized companies who are very experienced with analytics and want to move the state of the art even further. After leaving HMC, she obtained a master's degree in engineering from Stanford and a doctorate in business from Harvard. She's married to Dr. Yale Pearlson. Their daughter, Hana, just finished her freshman year at Tulane University in New Orleans. Following in her mom's footsteps, she's a techie too—studying computer science and finance.

Shelly Miller '86 worked as an engineer before choosing a career in academia. She was the second person and second female to be hired (in 1998) in air quality and mechanical engineering at the University of Colorado-Boulder, where she is associate professor of mechanical engineering and a faculty member of the interdisciplinary Environmental Engineering Program. She chaired the July 2015 Healthy Buildings America Conference in Boulder, Colorado. Shelly is married to a consulting engineer, with a son, 11, and a daughter, 6. "It's important to me to be a symbol for young women in this field, to inspire them to continue in science and engineering," she says. "You can have a family and do the work you love. You don't have to choose one or the other." Go to http://bit.ly/MillerHMC to see CU-Boulder's story and video about Shelly.

Mark Huber '94 received a three-year grant from the National Science Foundation to study new methods for improving Monte Carlo methods that employ randomness to estimate high dimensional integrals. The goal of the project is to develop better methods for dealing with what are called "heavy tailed distributions," where the number of samples needed for the Central Limit Theorem to kick in is currently too large for practical purposes.



Marie Snipes '99: "I was granted tenure at Kenyon College this year, and in addition to teaching, I am working on an NSF-funded collaborative project to create image processing application modules for upper-division mathematics courses. This image processing project developed out of a workshop I attended at PCMI several years ago that was organized by Andy Bernoff!"

▲ **Nate Eldredge '03** is starting his third year as an assistant professor of mathematics at the University of Northern Colorado. These days his mathematical interests (not counting randomly generated nonsense papers) mostly involve doing probability theory in spaces with weird geometry. Outside academic life, he's enjoying the Colorado lifestyle of hiking up tall mountains and drinking fine beer, usually in that order. In a concession to Colorado winters and back roads, he now has a pickup truck (but no gun rack).

Marguerite Leeds '06 is currently serving with the Peace Corps in the Kyrgyz Republic as a volunteer health educator: "The photo is of me and a bunch of kids I played Frisbee with on weekends at the grade school in the village of Kengesh, where I lived with a family for two months while studying Kyrgyz (the language they speak here). I moved sites, to the south of the country, where I have two more months of training before I begin working at a clinic as a health educator. My new village, where I will live the next two years, is called Jon and is very near the city of Jalalabad."

Tracy Powell '06: "I've been working for Drawloop Technologies since October 2006 shortly after graduating from Mudd where my role has evolved from customer support to product development and management. For the last few years, I've been in charge of the development team overseeing product development, design, features and roadmap. Last week, we announced the acquisition of Drawloop by Nintex, a top Microsoft partner specializing in workflow automation. We are excited about this accomplishment and looking forward to all the things our companies can accomplish together."

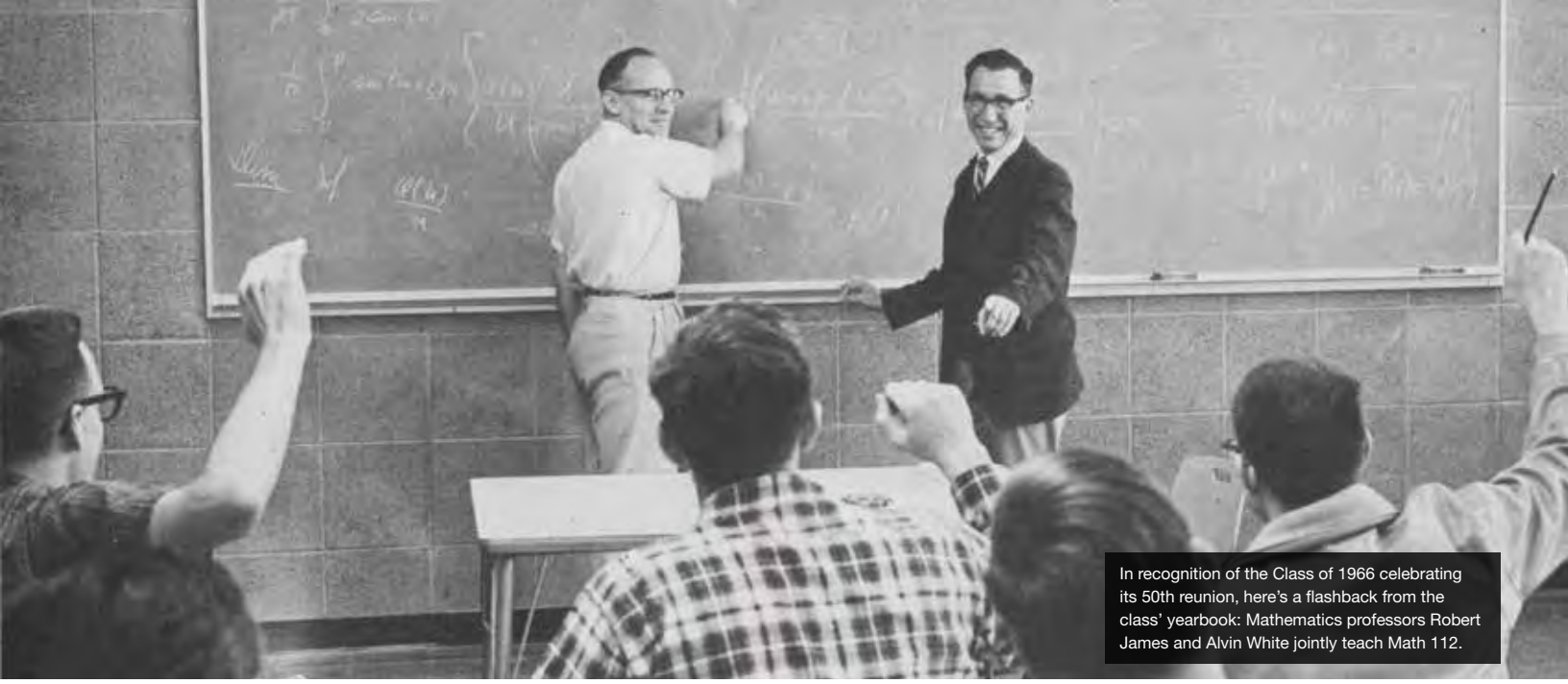
Nick Rauh '06: "I just started this month as the chief of mathematics at the National Museum of Mathematics (MoMath) in New York City. (This is after finishing a PhD in analytic number theory at the University of Texas at Austin in 2013 and teaching at Texas State University for a bit.) In the photo, guests at a museum event were encouraged to help construct the Julia set of the map x^2-1 by backwards iteration from a well-chosen seed point."

Maureen Saint Georges '07: "I have just finished my intern year in pediatrics at the Children's Hospital of Los Angeles! The photo shows us welcoming the new interns (having them run through a dark hallway while we are all blowing bubbles, throwing confetti and generally yelling very loudly). I have two years left of training here at CHLA, after which point, seeing as all Mudders are suckers for punishment, I will be applying for another three years of training in a Pediatric Emergency Medicine Fellowship."

James Moore '07 finished his PhD at the University of Utah in the summer of 2014: "It was a really good program that I would highly recommend (especially to people interested in mathematical biology or algebraic geometry)." He is currently a postdoc at Georgia Tech working on modeling responses to the yellow fever vaccine and on understanding chronic infections/T-cell exhaustion.

Jason Fennell '08 and Lilly Creighton are living in San Francisco where Jason is the director of engineering at Yelp.

David Gross '08 and Aurora Pribram-Jones '09 are having a busy year. David's work at eSolar has continued and supports their first commercial contract, providing solar thermal power for the Sundrop Farms Port Augusta Expansion, a 20-hectare seawater greenhouse in South Australia. Aurora will be defending her PhD in chemistry from UC Irvine at summer's end and starting at Lawrence Livermore National Laboratory in the fall. There she will hold a double appointment as a UC President's Postdoctoral Fellow

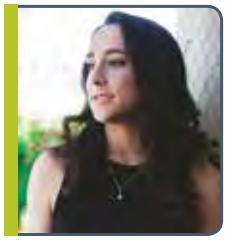


In recognition of the Class of 1966 celebrating its 50th reunion, here's a flashback from the class' yearbook: Mathematics professors Robert James and Alvin White jointly teach Math 112.

in the UC Berkeley Department of Chemistry and a Lawrence Postdoctoral Fellow at the lab. Joining them on their adventure up north (and on many others) will be their new daughter, Avra Gross Goodstein Winkelstein Pribram-Jones Eko, who will enjoy her seventh air-breathing month by the end of 2015. David and Aurora are thrilled and captivated by her every minute of the day.

Parousia Rockstroh '08: "I am beginning the final year of my PhD at Cambridge. I'm still doing math—a PhD in PDE theory. This summer, I returned to Southern California for a graduate summer internship at the RAND Corporation in Santa Monica. I'm working on a project with the Air Force studying transportation efficiency subject to terrorist constraints."

Tia Sondjaja '08: "I received my PhD from Cornell University's School of Operations Research and Information Engineering in August 2014. I just finished my first year as a clinical assistant professor at NYU. This summer, I assisted Professor Su at a summer undergraduate research program at MSRI!"



Natalie Durgin '09: "On May 29, I defended my thesis 'The Geometric Invariant Theory Quotient of the Hilbert Scheme of Six Points on the Projective Plane.' I now reside in Austin, Texas. I just started my first ballet class on Thursday evenings, and I climb with coworkers on Tuesday evenings. I'm an analytics software developer at SpiceWorks (aka, data scientist, aka, optimizing ad revenue). SpiceWorks seems to have a great internship program here and is a really fun company in a really fun city. I think an IPO is in the works and we could use some Mudders!

Edwin Lei '09: "I finished my PhD in statistics at the University of Toronto and am now working as a research scientist doing experimental design and A/B testing at Amazon in Seattle."

Ben Preskill '09: "On August 10, 2013, I married another Mudder, Autumn Petros-Good '09, and we had a wedding with more than 40 Claremont people in attendance, most of them Mudders. I received my PhD in mathematics from UC Berkeley this past month, having written my dissertation on a new method to numerically solve PDEs in the presence of certain kinds of discontinuities. The title is: "The Jump Splice for Elliptic Interface Problems and the Incompressible Navier-Stokes Equations." I've recently moved across the country to NYC to start a job at PDT Partners, a quantitative finance firm specializing in statistical and computational methods."

Josh Swanson '10: "I continue to pursue my PhD in math at UW in Seattle, where I'm in my third year. I finished my Generals exam last quarter (rough topic: Schubert calculus multiplication rules with an emphasis on path counting through Bruhat order) and am working under Sara Billey in algebraic combinatorics. The only administrative requirement left is my thesis. Oh, I picked up my master's along the way, and I've since found it amusing to call myself an official Master of Science. As for mathematical discoveries, I've been working on a conjecture of Ira Gessel's concerning Eulerian polynomials recently and have a promising start, though it's too early to say how it'll work out—I'll see over the next few months!"

Katarina Hoeger '13 completed a master of science degree in computer science at William and Mary, with a specialization in computational operations research, this May.

Nate Pinsky '13: "The big thing in my life is successfully completing my first year as a teacher at Raoul Wallenberg High School in San Francisco. I'm spending the summer preparing for next year, which should in many respects be way easier than this past year (still won't be easy, though). This year I'll be teaching Algebra 1 and Intro to CS." Next year (2015–2016) will be Pinsky's third year as a Knowles Science Teaching Fellow.

SLAVA BLAZER

Travis Athougies '14 and Ileane O'Leary '14 got married on March 14, 2015 (super pi day!).

Bo Lee '14 and his Peace Corps training group in Burkina Faso.

YOUR NEWS MATTERS

Have you changed jobs? Retired? Celebrated a milestone? We want your news!

Please submit updates online at **alumni.hmc.edu/class-notes.**

PUZZLE

BY MOHAMEDOMAR

PROBLEM: A permutation of a set is an ordering of all of the elements in the set for which each element appears exactly once. For example, 312 and 231 are two of the possible permutations of {1,2,3}. A local peak in a permutation is an element that exceeds the value of any of its neighbors.

For example, the permutation 32516784 of {1,2,3,4,5,6,7,8} contains three local peaks, namely 3,5 and 8. Determine, with justification, the average number of local peaks in all 40320 possible permutations of {1,2,3,4,5,6,7,8}.

Visit our website http://www.math.hmc.edu/muddmath to see the answer to this and other MuddMath puzzles.

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