The Colorado College Department of Mathematics and Computer Science

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COUNTABLE BITS

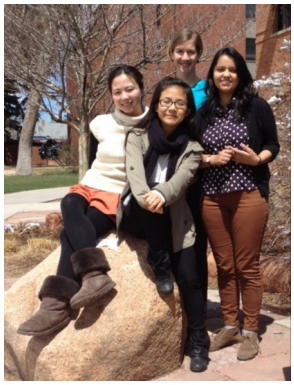
INSIDE THIS ISSUE:

Student Awards

Each year the department gives the **Florian Cajori Award** in Mathematics and Computer Science, honoring a student who has demonstrated unusual talent and achievement and also demonstrated a breadth and depth of interest in math or computer science. This year's honoree is **Cory Scott**, who graduated with distinction in both subjects. We are pleased to have Cory stay on with us next year as a Paraprofessional, before he heads on to graduate school in computer science at the University of Calgary.

In addition, the department honors a graduating student with the **Sophie Germain Award**, which recognizes unusual dedication and passion for mathematics or computer science. This year's award goes to mathematics graduate Kaila Ryan. Kaila will be a corps member of **Teach for America** next year, before pursing graduate work in education.

MODELING CONTEST WINNERS



The annual *Mathematical Contest in Modeling* took place in February, and 5636 teams participated worldwide. Participating students choose one of two open-ended modeling problems, in teams of up to three. Only non-human resources are allowed, and the modeling process and the writing must be completed within four days. Pictured from left to right are **Yukiko Iwasaki** '13, **Namgyal Angmo** '14, and **Aradhya Sood** '14, with team advisor **Andrea Bruder** behind. The team chose the problem that challenged them to "determine an effective, feasible, and cost-efficient water strategy" for 2013 to meet the projected water needs of Saudi Arabia in 2025. They were required to consider desalinization, movement, and conservation of water, and to take into account environmental and economic implications of their strategy. Both Yukiko and Namgyal are Mathematical Economics majors, while Aradhya is a Mathematics and Economics double major. In keeping with their training in mathematics and economics, the team based their model on a Cobb-Douglas production function and found an elegant solution to the problem. Their solution paper, entitled "Water, Water, Everywhere: Meeting the Demands of Saudi Arabia's Water Needs", was chosen as one of just eleven papers to be designated *Outstanding Winner* from the 5636 submitted. Moreover, they received the Frank R. Giordano Award, which goes to "a paper that demonstrates true excellence in the execution of the modeling process." The award is named after Brigadier General Frank R. Giordano, who directed the Mathematical Contest in Modeling for many years. The college last received Outstanding Winner recognition in 1997; since then, contest participation has grown enormously worldwide and the competition is even more intense. The winning papers will be featured in an upcoming edition of the UMAP journal. Congratulations to our outstanding winners!

TEACHING AWARD FOR MARLOW

Marlow received the 2013 Burton W. Jones Award for Distinguished College or University Teaching of Mathematics. This award from the MAA recognizes professors at the post-secondary level in the Rocky Mountain region for teaching effectiveness, for influence beyond the institution, and for the ability to foster students' excitement about mathematics. There are 50 colleges and universities in the Rocky Mountain Region. Marlow states "I am surprised and honored by this recognition from our MAA Section. It would not have been possible without the wonderful colleagues I have in the department here at CC, and most of all, without the great students I have had the privilege of teaching over the last 30 years." He writes "I am soooo happy I'm in the department I'm in!!" As part of the prize, Marlow received a check for approximately one hundred times "e" dollars: $271.82. Steven won the award in 2008, so keep up the effort, team! Thanks to Mike for the nomination, and especially congratulations to you Marlow!

UPCOMING RETIREMENT FOR STEVEN

As we close the 2012-13 academic year, our colleague Steven Janke is finishing his final year as a full-time faculty member in the Department of Mathematics and Computer Science. He will continue teaching half time in the department for the next three academic years, under the college's phased retirement plan. Steven received his B.A. and Ph.D. in mathematics (probability) from the University of California-Santa Barbra and the University of California-Berkeley, respectively. He arrived at Colorado College in 1975 and immediately played an integral role in the rebuilding of Department of Mathematics. He designed courses in real analysis, probability, and statistics at various levels that remain as offerings today. Steven also took the lead in developing the curriculum in the computer science curriculum. He has guided the program from its inception as an emphasis within mathematics to its current status as a successful, rapidly growing major. We will celebrate Steven's magnificent career in 2016 when he fully retires.

Math and Computer Science Faculty (2012-2013)

Marlow Anderson
David Brown
Andrea Bruder
Stefan Erickson
Steven Janke
Beth Malmskog
Jane McDougall
Mike Siddoway
Amelia Taylor
Fred Tinsley
Matthew Whitehead

Departmental Staff

Marita Beckert (Staff Asst.)
Evan Ranken (Paraprof.)
Amy Pacheco (Tech. Dir.)

Evan (above). The Number Theory Horseshoes Tradition continues at the spring picnic (below).

Sabbatical for Amelia

Amelia spent the 2012-13 school year on sabbatical. She received a Dean's Summer Research Grant to start work on a new project with her collaborator at Reed College in August 2012 and a Burroughs Welcome Fund Collaborative Research Travel Grant to spend Spring 2013 working at the Biomathematics Research Centre in Christchurch, New Zealand. While in NZ, she wrote a paper, "Algebraic properties of symmetric n-player cause-and-effect processes", gave four talks and attended two conferences which lead to a trip to the University of Tasmania and a new collaboration with the group there working on applying representation theory to phylogenetics (and an invitation to return on one of their 6 week visitor fellowships). She spent the Fall finishing up two papers, preparing for her time in New Zealand and relaxing. She is looking forward to returning to teaching in the department and has lots of good problems for students to work on.

Our Loss, Dean's Office Gain

After being in the department since 1988, **Mike Siddoway** will move to the Dean's office this summer to become *Associate Dean of the Faculty*. Although not a retirement, it is still a sad moment for the department, knowing that the deanship is a multi-year engagement. Beyond his activities in teaching and scholarship, Mike has long taken a broader interest in the community and its enrichment, whether it be protecting the Piñon Canyon or inviting nature writers such as Trevor Herriot to speak on campus. We know Mike will do a great job serving the campus community in this new capacity. He has an active research program in his work with Pham Ngoc Ánh of the Hungarian Academy of Sciences, and Gene Abrams of UCCS. Mike plans to continue this research work as possible while in his new role as Dean, and even has plans for a book: *Divisibility Properties.* Note that faculty members in the Dean's office have been known to return to the classroom from time to time. Mike says he hopes to teach a block or two, perhaps a few years into his tour of duty. We look forward to still seeing you around Mike!

A Note from our Paraprof

My name is Evan Ranken, and I have a confession to make. My passion for mathematics originated from my interest in a place that many mathematicians find highly objectionable: the real world.[1] Some have asked me why I would even bother studying such a grotesque, inelegant subject. I myself am unsure. Last year, together with my adviser from an REU at Louisiana State, I published a paper in the wildly popular$^{\gcd(72,\,159)}$ field of loop quantum cosmology. Next year I will be attending the University of Rochester in New York to pursue a PhD in theoretical physics. In particular I hope to study the math behind quantum field theory, as well as symmetries in particle physics and whatever else catches my eye. If it pleases the department, we can call my studies "mathematical physics." But when you think of me, remember the more elegant things I worked on. Especially the billboards. Do not let Cory touch the billboards.[1] But, sincerely, I hope I have left a lasting mark on the atmosphere of our department through my enthusiasm for the community and my sporadic obsessions with graphic design.[2] Most of all I am proud to say that I worked alongside one of the kindest, most welcoming and overall most outstanding departments at CC. We have a wonderful group of mathematicians and computer scientists here. Which reminds me: I am a deeply sorry to any computer scientists in trapped in the footnotes.

Computer Science Update

Our Computer Science I course was over-enrolled this year and it appears after pre-enrollment that the same will be true next year. This actually mirrors a nationwide trend indicating more interest in computer science; smart phones and the ubiquitous apps no doubt spur the renewed interest. It is all cyclical, but the increased interest is helping our program grow and this year we hired Don Goodman-Wilson to ease the enrollment pressure by teaching an additional section of Computer Science I.

In keeping with the growth of our major, we have altered the requirements to include a senior project starting next year. The idea is to have students work on their own year-long software engineering project. Many students currently do work on projects ranging from music generation to cryptography to game programming. We simply decided to make the efforts a little more formal and help students build a portfolio of larger programming projects.

Professor Whitehead's focus in computer science is artificial intelligence and during block eight this year he offered a course in machine intelligence. Fourteen students took the course and spent the second week at the Baca campus programming a robot to use camera input in order to navigate the environment. The robotic platform the students used was rugged enough to maneuver outside and was acquired through a grant we applied for last spring to enhance our robotics program. Of course, hardware problems always plague the efforts, but we hope to work out the problems so students can concentrate more and more on the software design.

1: I'm only joking![4] 2: Also my recent obsession with footnotes 3: As popular as requiring a gcd to find a footnote 4: Or am I?[1]

Euclid Scholars!

The Euclid tradition continues. Euclid Scholarships are awarded annually to freshman and sophomores showing outstanding promise in mathematics and computer science. This year's winners are:
Emma Holmes, a sophomore from St. Paul, MN, is an up and coming Math major. Emma states "I have known since I was about 10 years old that math was the place for me". She is "very attracted to the wealth of opportunities that an education in mathematics can provide later in life". Emma is a member of the swim team. She enjoys reading, hiking, baking and yoga.
Katy Martinez, a sophomore from Colorado Springs, states "I am now conscious of the place math holds inherently in my life and now I can start harnessing the power that math possesses in this world … I know that any career I choose will need logical thinking, problem solving, and applications to math to be a core building block". Katy is also an avid swimmer.
Alan Yeung, a first year student from Highlands Ranch, CO, is planning to double major in economics and computer science. He states "As in mathematics, a problem may have multiple solutions. It may be easy to find one solution, but the difficult part is uncovering the most efficient solution … The beauty of computer science entices and exhilarates me, while the creation of that beauty challenges me". Alan enjoys fly fishing, playing piano, reading and running.
Dillon Montag, a first year student from Castle Pines, CO. He says: "I see mathematics as the language of this world" and that " regardless of my career, I know mathematics will always be a tool through which I will attempt to seek out some of the most mystifying but yet exciting secrets this world has hidden". Dillon enjoys reading, writing fiction, the outdoors, and creating short films.

News from Students

Trevor's Big Idea Award: This year CC held a campus-wide entrepreneurial competition called *The Big Idea* where teams of students developed entrepreneurial ideas and then pitched them before a judging panel. The top three teams were awarded a portion of the $50,000 of total prize money. Our own **Trevor Barron**, a sophomore computer science major, was on the top team that won $38,000. Trevor's team's idea was to create a brain monitoring hardware device and smartphone app to help people suffering from epilepsy track and perhaps someday predict seizures. Trevor and his teammate, Jesse Marble, hope to work on the project over the coming summer and we wish them great success!
Putnam Team does Well: Congratulations to **Ravi Donepudi**, **Gautam Webb**, **Shupeng Li**, and **Austin Keller**, who all scored on the Putnam Exam. The CC team score was 30 and the team rank was 111.
Students Going Places: Both **Namgyal Angmo** and **Josh Kim** will be heading off to complete their masters in engineering at Columbia University this fall. Over the summer, **Gautam Webb**, **Hanson Smith**, and **Denali Molitor** will be attending a *Research Experience for Undergraduates*. These are prestigious awards; awardees will have their travel and living expenses covered and receive a stipend to engage in research with a small group of competitively selected students. In recent years, an REU has frequently led to a successful capstone project, and sometimes further research! The *Budapest Semester in Mathematics* is our study abroad program of choice for math majors where students can study a range of rigorous upper division mathematics in Europe. Currently **Denali Molitor** is completing the spring semester, while **Jaclyn Rosenquist** attended in the fall, and **Willa Hopkins** will attend the new summer semester.
Closer to home, **Aradhya Sood** was awarded one of the "new and improved" Faculty-Student Collaborative Grants, for research to be conducted on campus this summer in mathematical economics.

News from Alums

Courtney Gibbons New Tenure Track Faculty: Courtney Gibbons '06 and paraprofessional 2006-07, completes her Ph.D. at the University of Nebraska, Lincoln in August, 2013 and starts a tenure-track faculty position at Hamilton College in New York in the Fall. Courtney works in commutative algebra and has been recognized as both an Outstanding Graduate Teaching Assistant at UNL, an award given by the university to only two graduate teaching assistants each year, and with an Emeritus Faculty Fellowship for top doctoral students. Congratulations Courtney!
Andrea Buchwald '08 will be starting the Ph. D. program in epidemiology at Maryland in the fall. We also enjoyed a visit from **Tra Ho** '08, who was awarded the Tashjian-Crecelius Family Prize for minority women in the sciences at CC in '07. Tra joined a panel of four former award recipients who discussed their career paths after CC to an audience that packed the lecture hall, and included the Tashjian-Crecelius family donors. Tra is enjoying life in Washington DC, and is living proof of the benefits of an actuarial career.

The *Euclid Scholarships* are made possible by donations from generous alumni. If you'd like to help, you may send a check (made payable to "Colorado College" and with "Euclid Scholarship Fund" on the memo line) to: Development Office, The Colorado College, PO Box 1117, Colorado Springs, CO 80901-9897.

Rawles Exam
The annual Rawles exam went off smoothly in Block 6, with six problems of varying difficulty - two were particularly diabolical! Our *upper division winner* was **Gautam Webb**, and our *lower division winner* was **Paul Akpablie**.

Graduating Majors, 2013:

Mathematics:
Mina Chung
Zach Cohen
David Cully
Luke Gallione
Demetria Humphries
Austin Keller
Kalli-Ann Kemling
Kaila Ryan
Briana Sallee
Joanna Tebin
Cory Scott
Linnet Vacha
Eli Williams
Esther Zolotova

Computer Science:
Jessa Karlberg
Eddie Figueroa
Ethan Genz
Jordan Haber
Kate McManus
Andrew Pope
Ari Sapon-White

Mathematical Economics:
Patrick Brody
Annina Fowlkes
Ryan Hedges
Hanna Hoopingarner
Joseph Howe
Yukiko Iwasaki
Shupeng Li
Margaret McDermott
Christin Price
Vyacheslav Sigalov
Hunter Wolfel

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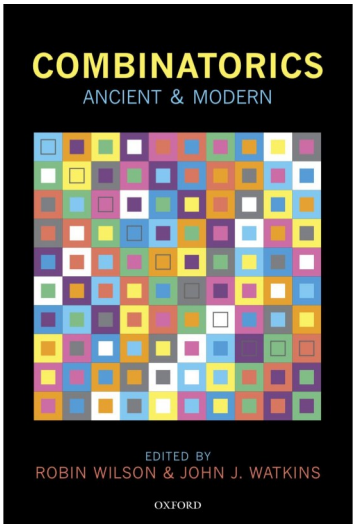

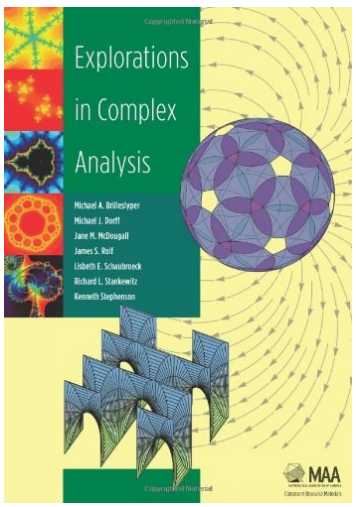

Visitors Next Year

For the first time since 2005 we will have three full time visitors on board. **Michael Penn** comes to us from a visiting position at Bowdoin College. He places an emphasis on experiential learning in the classroom and has developed some innovative calculus labs. He is eager to work with students at all levels (including research) and is looking forward to his classes next year, including Algebra I with 24 students! Michael's research interests lie in algebra and the study of vertex algebras.

Rodney James comes to us most recently from a research position at UC Denver, where he *opted* to teach such courses as abstract algebra, and number theory. Rodney also has a background in Oceanography and is a highly proficient computer programmer. Rodney studies discrete versions of the Riemann-Roch theorem, and more recently tropical graphs.

Beth Malmskog came to us last year from a visiting faculty position at Wesleyan University. We are so pleased that she is returning! Her research interests are in arithmetic geometry, number theory, and cryptography. Beth remains an avid hiker and cross-country skier, and will be starting up her radio show soon on KRCC! Her fun math puzzle blog continues at: http://malmskog.wordpress.com/

Students look out! If you work with any of our talented visitors, you might just find yourself deeply involved in a project on cryptography, vertex algebras, or tropical graphs!

Block Visitors, This Year and Next

The department experienced heavy enrollments this year, as well as facing extreme enrollments for next year (23 in Analysis I, 24 in Algebra I and 25 in Numerical Analysis!). This year's high enrollments required a late-in-the-game addition of several extra courses to meet the demand. We were very fortunate for the additional help from block visitors **Don Goodman-Wilson** and **Ben Katz-Moses**. Don taught a busy introductory computer science class and Ben worked with many students during his five calculus courses. Both Don and Ben brought great teaching talent to the department and our students benefited immensely. Our only confirmed block visitor for next year is **Robin Wilson** who returns from England to teach an FYE course with Marlow. Robin co-authored a soon-to-appear book with John Watkins (see left, and below).

Congratulations, Faculty and Staff

To nobody's surprise, **Andrea Bruder's** third year review was a big success. Congratulations Andrea! **Amy Pacheco** has succeeded in a long term goal, and obtained her Masters Degree in Educational Technology from the University of Idaho Boise. Well done on your masters degree Amy! After a stellar year as Paraprofessional, **Evan Ranken** will be heading off to the University of Rochester pursuing a PhD in physics—the continuation of a stellar career, we are sure! Thanks Evan for spending a year of it with us, for helping so many students, for inspiring us with great problems and talk advertisements, and "encouraging" our seniors to complete their talk write-ups!

Book Publications

At least two books by departmental authors are out this year (book covers at left): **John Watkins** (retired '10) worked with **Robin Wilson** of the Open University on a manuscript they were able to complete during Robin's visit in 2012. The book will appear this summer. The cover design illustrates two orthogonal latin squares of order ten (each pairing of ten colors occurs just once) and represents a counterexample to a conjecture by Euler of 1782 that orthogonal latin squares exist for all orders except for 6, 10, 14, ... (order 6 is his famous 'thirty-six officers problem'). **Jane McDougall** worked with six fellow complex analysts for several years on what might be termed "a second course in complex analysis" that also serves as a source book for enrichment topics and open research problems. The book appeared last fall. Chapters by different authors are unified via an accompanying set of applets. Jane was pleased to be put in charge of the cover design, which shows sample output of the applets from most of the topics in the text.