

COUNTABLE BITS

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The department has for a long time had two administrative positions held by faculty members, the chair and the associate chair. We now have a rotation in place to share these responsibilities. This year Jane McDougall is serving as chair, with Fred Tinsley as associate chair. Next year Jane will continue as chair, with David Brown stepping into the associate chair position. David will move on to become chair in the following year. David has been on sabbatical this year, celebrating his new status as a tenured associate professor.

The 2011 Mathematical Contest in Modeling

Every year in February, undergraduate students from all over the world pick their brains over one of two open-ended, real-world math problems in the Mathematical Contest in Modeling. This year two CC teams of three students each participated. Cassandra Benson (mathematical economics), Atsuya Kumano (mathematics and chemistry and 2011 Euclid Scholar) and Shupeng Li (mathematical economics) worked together on one team, and Ravi Donepudi (mathematics and 2011 Euclid Scholar), Joanna Tebin (mathematical economics) and Mitchell Wiggy (mathematical economics) on another. The students represent five nationalities. Both of our teams chose to work on the second problem, in which students were required to determine the minimum number of repeaters necessary to accommodate 1000 simultaneous users of a VHF radio network in a circular flat area of radius 40 miles. The teams submitted their solutions to the Consortium for Mathematics and Its Applications (COMAP) after only four days.



"It was exciting to try to think up a solution from scratch" says Joanna Tebin from Czestochowa, Poland. Mitchell Wiggy from Colorado Springs adds that "we first had to break down the problem into more manageable parts. We learned that a healthy persistence is necessary in solving a challenging problem. It carries over to other classes, too. I now know what I can do!" When asked what their advice is for future contest participants, Shupeng Li from Nanjing, China says: "The key is to learn how to find the information you need online" and Cassie from Pocatello, ID, says: "It would be helpful to read winning papers from previous years." Atsuya who is from Kobe, Japan, agrees and adds that "it also helped to have the format for the paper ready before the contest starts." Ravi, Joanna and Mitchell are successful participants of the Mathematical Modeling Contest 2011, and Cassandra, Atsuya and Shupeng received a meritorious recognition and will be recognized at the Colorado Mathematics Awards reception in Denver on May 10. Congratulations!!

Current students who are interested in participating in the contest in block 5, 2012, please contact (Amelia.Taylor@coloradocollege.edu) or (Andrea.Bruder@coloradocollege.edu), or check out www.comap.com/undergraduate/contest. Amelia and Andrea teach a half-credit adjunct in the fall semester to prepare students for the contest.

Students spend a semester in Budapest

The *Budapest Semesters in Mathematics* program is an intensive math-focused study abroad program. This program provides North American undergraduates with an opportunity to study a wide variety of areas of math, along with Hungarian language, arts, and culture. Hungary has a rich tradition in mathematics and mathematics education, and the Budapest program allows students to immerse themselves in this tradition. In the past few years, several CC students have participated in the Budapest program. CC math graduate and current paraprofessional Marina Gresham '10 took part in 2009. Sarah Goldstein '11 followed last year. Elise Hellwig '12 is currently in Budapest this spring, and Cory Scott '13 will be headed there next fall.

Marina noted that the Hungarian math system includes a strong emphasis on problem solving for fun. She recalls students sitting around in groups all day and working on problems together. She also found that Hungarians generally have a higher regard for the joy of math. When she told people in Hungary that she was studying math, most people had very positive comments about the subject. She enjoyed being surrounded by people who love math as much as she does.

As a graph theory enthusiast, Cory is excited about the opportunity to study in a country that's produced so many eminent graph theorists. Cory is looking forward to the adventure of being on his own in Europe and getting to study math at the same time.

*Graduating Majors, 2011:***Mathematics:**

Victoria Curnutte
 Sarah Goldstein
 Allison Hasagawa
 Charles Morgenstern
 Jazmine Newsom
 Rob Reed
 Heidi Shannon
 Lauren Shoemaker
 MK Southern
 Sami Zemedkun

Computer Science:

Dylan Craine
 David Cummings
 Jon-Paul Davis
 Lauren Hinkle
 Brittney Onstott
 Lylya Parish
 Matt Polk
 Adam Urban

Mathematical Economics:

Jordan Brooks
 Geoff Clemm
 Emil Dimantchev
 Bradley Dsida
 Katie Ferguson
 Jeffrey Gaudette
 David Glaize
 Anna Glander
 Rachel Levin
 Ryan Lowery
 Samantha Marinello
 Rachel Mushlin

EUCLID SCHOLARS!



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.

OUR PARAPROFESSIONAL: MARINA GRESHAM

Hello there! While it may seem odd that this comes to you at the end of my stay here at the Colorado College Math Department, I cannot pass up the opportunity to briefly introduce myself (and, as luck may have it, promptly wish you well and bid you adieu). My name is Marina Gresham, and for the past year, I have had the great privilege of serving as the 'paraprof' here in the math department.

I came to Colorado College from the small town of Cheney, Washington, eager to escape the legacy of four successful older siblings. By no means did I come into college expecting to be a math major. But the more math classes I took here, the more I loved everything about it... both the math itself, and the department. Math professors were the best that I had. I found that I actually (most of the time) *liked* doing my homework in math classes. And I have to give credit to the paraprofs from my first year, too—Courtney and Benji.

During that first year, I spent *hours* in the math lounge playing SET with those two. We became friends, and I looked up to them a lot. Their influence is the first thing that made me want to become a paraprof—so that I could try to instill my love of math in those that followed me.

Four years later, a math degree under my belt, I sit—remarkably—in the same office that my friends and role models shared a few years ago. Becoming the paraprof is one of the best decisions I have ever made, and I am eternally grateful for the opportunity. This year has convinced me that teaching is what I love to do... and teaching *math* is the best of all possible worlds. I consider my

day a success if someone teases me about my enthusiasm for math. I believe that if you hit someone with enough enthusiasm, it's bound to rub off eventually!

I often notice just how much the enthusiasm of the professors in this department has rubbed off on me. I find myself unwittingly mimicking their teaching styles. During one of our Calculus 1 classes, I was able to fill in for a day and give a lecture on the chain rule. During a long, final example which required many iterations of the rule, I proclaimed to the class, "Now rinse and repeat!" At the time, I didn't think anything of it, but the next day I was sitting in on Amelia's abstract algebra 2 class, and she used the same phrase, crediting it to Marlow. Here I was, using one of Marlow's trademarked phrases, and I didn't even notice! Yikes! I sure am glad that the professors here are the type of people that I *want* to rub off on me!

Now, after five years at home in the CC math department, it is time for me to move on and spread the influence of our great department to others. Next year I will join the PhD program in pure mathematics at the University of Utah in Salt Lake City. Eventually, I plan to return to the front of the classroom full-time and spend my life spreading the joys of mathematics.



The department announced the four winners of the Euclid Scholarships this spring. They are awarded to underclassmen who exhibit unusual talent and interest in the mathematical sciences. In only its third year, the program has already been very successful in helping to recruit outstanding students to major in mathematics and computer science. Here are this year's winners:

Atsuya Kumano is a sophomore from Kobe, Japan. Atsuya especially enjoys studying Linear Algebra, Probability, and Statistics because "in these areas, it is so easy to see instances in which mathematics plays a critical role in our everyday lives." He's found that the more time he spends studying these areas, the more he appreciates math. In addition to math and statistics, Atsuya has a strong interest in chemistry. In his free time, he enjoys traveling, biking, backpacking, and learning languages. His plans for the future include becoming a professor or a traveler and continuing his mathematical pursuits either as a profession or as a hobby.

Ravi Donepudi, a freshman from Vijayawada, India, is intrigued by proofs and axiomatic systems in mathematics. In particular, he's fascinated by "the subtle, yet supremely important nature of the axioms we initially choose", noting that "changing even one axiom leads to extremely different systems. I just find this beautiful!" Ravi is planning a career in mathematical research and teaching. His other academic interests include linguistics, Tolkien studies, and Hellenic studies. To complement his academic work, he enjoys badminton, reading, and running.

Rebecca Mitchell is a sophomore from Fort Collins, Colorado. Rebecca enjoys studying applied math because she "loves to understand real-world phenomena mathematically and problem solve using this understanding." She is considering a career involving mathematical modeling. In addition to her mathematical interests, Rebecca is pursuing a minor in physics and spends time playing ultimate frisbee, climbing, and skiing.

Yiqiao Bao, a freshman from Beijing, China, finds the accuracy of math beautiful. An aspiring physician and biomedical researcher, Yiqiao feels that math will be very useful in her future research. She is drawn to the creativity of math, noting "creativity will be valuable to me no matter what career I'm going to pursue in the future." Her other interests include neuroscience, swimming, photography, reading, and writing.

MORE PARAPROFESSIONAL NEWS

The department is excited to welcome Colorado College math major Victoria Curnutte as its Paraprofessional for the 2011-12 school year. Victoria graduated with Distinction in Mathematics, doing a great senior project on algebraic topology. Victoria has been a tutor for the math department since her sophomore year, and is eager to devote a full year to helping her peers (and studying for the GRE, of course). Victoria looks forward to interacting with students and hopefully encouraging a few to become math majors. She is excited to polish her teaching skills, and looks forward to becoming an integral part of the department.

In other paraprofessional news, our 2009-2010 paraprof Andrew Bean is off to Ohio State University, where he will be doing graduate work in statistics.

AWARDS TO GRADUATING SENIORS

Each year the department presents the *Florian Cajori Prize*, for students who has demonstrated unusual talent and achievement in mathematics or computer science. The award is named after a distinguished historian of mathematics who taught at CC during the late 19th and early 20th centuries. This year's winner was *Lauren Hinkle*. Lauren is graduating with a degree in Computer Science; she completed an impressive independent project on using artificial neural nets to learn how to play backgammon and other games. Lauren will be attending graduate school in CS at the University of Michigan. Incidentally, Lauren was one of our first Euclid Scholars.

Last year the department added a second prize for seniors, called the *Sophie Germain Award*, named after the famous mathematician who did important work in number theory at the turn of the 19th century. The award recognizes a student whose love for the mathematical sciences and drive to succeed exemplify the spirit of Germain. *Sarah Goldstein* was this year's winner. Sarah's senior project was a study of the topological properties possessed by the first uncountable ordinal space. Sarah will be pursuing an MAT at CC next year.

COMPUTER SCIENCE NEWS

The Computer Science side of the department is still thriving despite learning at the end of fall that Jonathan Bredin will not return from his leave of absence. He is now located in Texas (which is much closer to his wife) and has a high tech job in the financial industry. We are certainly sorry to see him go.

Taking Jonathan's place this year is Matthew Whitehead from Indiana University. Matthew's specialty is machine learning and data mining. He has already given seminars this year on search engine design and the Netflix competition (which challenges programmers to beat their success in recommending films to subscribers.) His Artificial Intelligence course this year asked the class as a group to write a program for solving crossword puzzles; despite the complexity of the problem, the program worked, but could not beat our chair (Jane McDougall) in an end-of-block match. Matthew will also be here next year teaching Mobile Computing in the fall, a range of CS courses throughout the year, and the extended format Robotics course (with Janke) in the Spring.

We made some minor adjustments in the curriculum for next year. Operating Systems was folded into the Computer Organization course and a new course in Application Design was added to the books. The idea behind the new course is to develop skills in putting pieces of programs together to form larger applications for computing in both the natural and social sciences. Students will learn a little Python, Perl, shell scripting, MySQL, etc. Along with the standard CS1 and CS2 courses, this should give students some solid experience in programming at the sophomore level.

On a more technical note, you may have noticed that in the fall there was a claim that the famous $P=NP$ problem was solved. The question is whether the class of problems denoted as P (problems solvable in polynomial time) is really the same as the class NP (harder problems for which no polynomial time algorithm is known.) Vinay Deolalikar of HP labs proposed a proof that P does not equal NP, but it now appears that there may be fatal flaws. There is a list of all the attempts to attack this problem on the web at <http://www.win.tue.nl/~gwoegi/P-versus-NP.htm>.

Our CS program continues to grow, with burgeoning student interest in all our courses (and a renewed interest in robotics). This year we'll be graduating almost as many CS majors as Math majors.



Jonathan Bredin

Math and Computer Science Faculty (2010-2011)

Marlow Anderson
David Brown
Andrea Bruder
Sunil Chetty
Stefan Erickson
Steven Janke
Molly Maxwell
Jane McDougall
Mike Siddoway
Amelia Taylor
Fred Tinsley
Matthew Whitehead

Departmental Staff

Marita Beckert (Staff Asst.)
Marina Gresham (Paraprof.)
Amy Pacheco (Tech. Dir.)

Three department alumna received prestigious *National Science Foundation fellowships* for graduate study this spring. *Jess Coyle* ('08) is studying ecology at North Carolina, *Sarah Wolff* ('10) is studying mathematics at Dartmouth, and *Lauren Shoemaker* ('11) begins her work in ecology at the University of Colorado in the fall.

The Colorado College Department of Mathematics and Computer Science

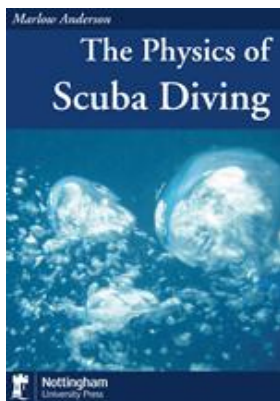
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SCUBA!

For a number of years, Marlow Anderson has taught a course entitled the Mathematics of Scuba Diving, both in the summer session and during the regular school year. He has now published a book based on this course, called "The Physics of Scuba Diving". It is in press with Nottingham University Press. Marlow is a PADI-certified Assistant Instructor, and has been diving all over the world for over 15 years. Some of his favorite dive destinations include the Galapagos Islands, Dumaguete in the Philippines and Palau. The book is written for students and readers without much mathematical or scientific background. It covers the basic physics of pressure, and also includes a description of the mathematics behind dive tables and dive computers, which divers need to avoid the bends.



ON TO THE GREAT WHITE NORTH ... ALMOST

We were all excited when our colleague Sunil Chetty got a tenure-track offer for next year. Sunil comments:

After two fantastic, inspirational, and enlightening years in the mathematics and computer science department here at CC, I will be moving on to a tenure-track position at the College of Saint Benedict and Saint John's University in central Minnesota. Undoubtedly, I will take some of the block plan with me and, for the first few days (or weeks), be thoroughly shocked when class ends after only 70 minutes! There, I will continue in my efforts to enhance the mathematical education of future teachers, in my research in elliptic curves, and in my collaboration with Stefan. And while I will not be physically present to witness the mathematical growth of those students and soon-to-be-majors I have been so fortunate to teach, I hope to still be considered a resource and to hear about their many future mathematical conquests. In turn, I hope to return to CC on some fearless Friday with new and exciting mathematics to discuss.

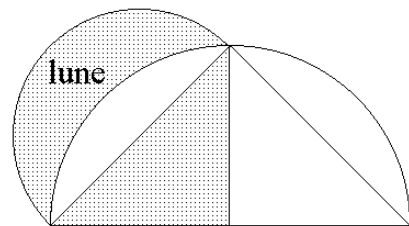
CC & QUEST: BLOCK PLAN IN CANADA

This spring two CC mathematicians had a remarkable opportunity to witness the beginning of a new college, a private undergraduate liberal arts and sciences university in the coastal mountain community of Squamish, British Columbia. The location is spectacular, 40 minutes from Vancouver and also just 40 minutes from Whistler. This new college is a bold adventure — private colleges and the liberal arts are all but unknown in Canada — but Quest University has made it work. On April 30, Quest graduated its very first class.

Much of Quest's success is due to their block program, which, by the way, they borrowed directly from Colorado College. Indeed, Quest president David Helfand and CC president Dick Celeste signed a formal agreement several years ago calling on these two pioneering schools to find ways to work together. For Block 7 this year, retired CC math professor John Watkins packed his bags (and his skis) and headed for Squamish, B.C. to teach a course he called Mathematical Puzzles. All Quest students must take a math course during their first two years and John's course was designed to introduce students to a wide variety of mathematical ideas in number theory, graph theory and logic. John found Quest to be very much like CC in many ways, small classes, dedicated faculty, enthusiastic and fully engaged students; but, because of its small size — it now has about 300 students and will eventually grow to 800 — he also detected a much greater sense of community. He sensed the incredible energy that came from the bond that students and faculty share over the huge responsibility they have for the success or failure of their university. As one student put it: "We're here to help create a university. We didn't come just to attend one."

Mike Siddoway of the math department and his wife Christine in geology have been on sabbatical at the University of Calgary. They both visited Quest while John was there, spoke to the president and other faculty, and gave several lectures. Mike talked about lunes, one of his favorite topics these days. This was also especially appropriate for a talk at a Canadian university since the Canadian dollar has a picture of a loon on the back, and is therefore known as a *loonie*. (Another interesting fact about the Canadian dollar: it looks like a regular 11 sided polygon, but in fact it is an 11 sided curve of constant width — that is, each side is a circular arc with center at the opposite vertex. This allows vending machines to easily measure its diameter.)

Lunes (as opposed to loons) are geometric shapes that have been studied for over two thousand years. A *lune* is a concave region formed by intersecting two circular arcs (and therefore has the shape of a crescent moon). A classic problem, of course, was to "square the circle" and it was thought that a promising approach to this problem might be to square lunes. One person who succeeded in squaring a lune was Hippocrates of Chios (this Hippocrates was a mathematician, not the "father of medicine" guy). The *lune of Hippocrates* is formed by intersecting two semicircles as shown. Can you prove that the area of the lune of Hippocrates is the same as the area of the shaded triangle and, hence, equal to the area of a square (see the picture to the right)?



VISITORS FOR NEXT YEAR

The department is looking forward to two distinguished visitors next year. Our retired colleague

Kathy Merrill will be teaching a course in block four, and our frequent visitor **Robin Wilson** will be teaching another edition of his Mathematics and Music course in block seven.