

COUNTABLE BITS

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Student attendees at Durango:

Sophie Aiken
Jerrell Cockerham
Haley Colgate
Abigail Ezell
Malcolm Gabbard
Caterine Guevara
Damon Hardwick
Cinea Jenkins
Sam Kottler
Marta Nowotka
Edgar Santos Vega
Vladi Vintu
Ying Wang
Michal Wisniewski
Ruyi Yang

STUDENT ORGANIZATIONS

The Math and Computer Science student organizations had a very busy year and we will highlight just a few of each organization's many activities this past year.

Math Club continued to host its blockly Student Speaker Series with a variety of introductory level talks in both math and computer science. The group also hosted a few problem solving sessions in preparation for the Putnam Exam and they created a math t-shirt that we are anxiously waiting to wear. The **Association for Women in Mathematics (AWM)** organized a guest speaker from Lockheed Martin to discuss math in industry. Faculty Advisor of AWM, Beth Malmskog, and two members of the CC AWM



A visit with Denver Representative Diana DeGette (also a CC alum!), from left to right: Sophie Aiken, Beth Malmskog, Diana DeGette, and Elizabeth Foster (Metro State)

chapter, Sophie Aiken and Zoe Frolik also attended the AWM organization's Visit to the Hill where they had the opportunity to discuss important issues for women and other underrepresented groups in STEM with our representatives. The **Society for Industrial and Applied Mathematics (SIAM)** organized a skype session with a CC Math alumna, Melissa Jay, to discuss her path after CC in applied math. They also organized several sessions to help teams prepare for the Math Modeling Contest. The **Coding Club** organized a visit to the Google campus in Boulder which included a tour by CC Computer Science alumnus Nick Crews. They also hosted sessions with several Colorado Springs tech businesses to gain more insight into industry. Most recently, in conjunction with the Career Center, the group hosted CC Computer Science alumnus Soeren Walls for talks with students.

All of the organizations recently switched leadership and we are anxious to see what they accomplish next year!

CC VISITS MAA MEETING IN DURANGO



The Mathematical Association of America holds its Rocky Mountain Section Meeting every spring, and this year CC was well-represented with a bus-ful of 3 faculty members (Agrawal, Anderson, Moran), and 15 students. We had ten CC posters in the Undergraduate History of Math Poster Contest, with four honored ones, including Edgar Santos Vega's top prize winner. CC fielded a student team in Math Jeopardy, and the CC team emerged in first place, beating a team from the Air Force Academy. Lots of math, and lots of fun!

**DAN ELLSWORTH****IKE AGBANUSI****VLADI VINTU****COURTNEY GIBBONS,
with Marlow Anderson
at the Joint Math
Meetings**

TWO TENURE TRACK HIRES

The department was happy to add two new tenure track lines to our department, bringing us to 14 positions altogether.

In computer science this spring we hired **Dan Ellsworth** in our new computer science position. Dan had been a visiting professor in computer science for two years. He completed his Ph. D. at the University of Oregon. His research interests include the energy demands in High Performance Computing, and more recently he has been looking into approaching computer programming as written communication.

In mathematics the department hired Dr. **Ike Agbanusi** in a new tenure-track position in applied mathematics. Ike did his Ph.D. work at Boston University, and has visited Illinois (Urbana-Champaign) and Colgate University. His main research interest is in Partial Differential Equations (PDEs) and general Applied Mathematics. He's also interested in understanding a lot of things through the lens of PDEs e.g. geometry, topology etc. Lately, he's been thinking about stochastic reaction diffusion equations, Schrödinger operators, boundary value problems and microlocal analysis.

RAWLES EXAM

The 48th Annual Rawles Prize Competition was held on January 29th, 2019. Several students took the 3-hour Rawles exam and put forth excellent scores, but the sole winner was Vladi Vintu '20 who earned perfect scores on 4 out of the 6 problems. This is Vladi's 3rd time competing in (and winning!) the Rawles Competition. Congratulations, Vladi!

HONORABLE MENTION ON PUTNAM!

Junior math major Vladimir "Vladi" Vintu scored 58 out of 120 points on the 2018 Putnam Competition, ranking him 87th out of 4623 students who took the exam nationwide. He received an Honorable Mention on this prestigious exam. Vladi will receive an award at the Colorado Mathematics Awards ceremony for earning one of the top Putnam scores in the state. Along with fellow teammates Haley Colgate and Sam Kottler, the Colorado College team ranked 36th out of 568 institutions, the best performance in recent memory.

The Putnam exam is an annual competition for undergraduates in the United States and Canada. The daylong exam consists of twelve very challenging math problems. This year, the median score was 2 (out of 120). Here is a sample question from this year's exam: Find all ordered pairs (a,b) of positive integers for which $1/a + 1/b = 3/2018$.

TENURE FOR COURTNEY GIBBONS

Dr. Courtney Gibbons graduated from Colorado College in 2006 with distinction in mathematics. For her outstanding mathematical accomplishments during her time at CC, Courtney was the recipient of the Florian Cajori award. The department was pleased when Courtney decided to stay a year as the mathematics paraprofessional where she helped run problem sessions and supported the Math and CS community at CC. After Colorado College, Courtney began her Ph.D. at the University of Nebraska-Lincoln. During her time at UNL, Courtney excelled in both academics (winning an award for Outstanding Qualifying Exams) and teaching (winning an award for Outstanding Graduate Teaching Assistant). After Courtney finished her Ph.D. at UNL in 2013, she returned to the liberal arts environment and began working as an Assistant Professor of Mathematics at Hamilton College in Clinton, NY. She continues to excel at teaching, winning the John R. Hatch Class of 1925 Excellence in Teaching Award in 2015 and she also continues to do impressive research in the areas of commutative and homological algebra. This past year, Courtney was awarded tenure at Hamilton College and has been promoted to Associate Professor. Congratulations, Courtney!

ROCKY MTN. CELEBRATION OF WOMEN IN COMPUTING

Last November, Professors Bruder and Burge took a group of nineteen Colorado College Computer Science students to the Rocky Mountain Celebration of Women in Computing, held in Lake-wood Colorado. The celebration is held every other year and we were pleased to be able to take advantage of it being so close to CC. The students had the opportunity to attend career building workshops such as tips for building resumes, and acing technical interviews as well as technically focused workshops including Ruby programming and FreeBSD. Faculty attendees were able to attend a variety of different sessions on how to make computing education more accessible to all. Talks attended by CC faculty included “Leading Conversations about Microaggressions, Bias, and Other Nonsense”, and “Computer Science Is A Social Justice Issue.” There was also an education fair where students could talk to faculty at local Universities about graduate school and a job fair that included local companies such as NCAR as well as larger companies, including Amazon, Google, and Raytheon.

Highlights of the trip included a screening of the documentary “The Computers: the Remarkable Story of the ENIAC Programmers” followed by a conversation over Skype with Kathy Kleinman, the ENIAC Programmers Project Founder; and a Plenary panel on Entrepreneurship, led by four female CEOs, who defined entrepreneurship, shared their stories, and talked with the attendees about why they should consider it as a career path.

The Rocky Mountain Celebration of Women in Computing was able to offer low-cost registration to students thanks to the generosity of many sponsors, including academic sponsors Colorado School of Mines, University of Colorado, Denver University, Colorado State University, and University of Wyoming; professional organizations ACM’s Women in Computing and the National Center for Women in Information Technology; and industry sponsors Sales Force, LGS, and more. Colorado College was able to join the other local colleges and universities as a sponsor of the event thanks to funding provided by Dean Sandi Wong. The Mathematics and Computer Science department is grateful for the Dean’s Office for sponsoring the event as well as funding student and faculty registration and travel. We appreciate the college’s demonstration of their commitment to diversity and inclusion as well as to our students.



Student Attendees:

A.W. Antonoff-Wertheimer
 Bella Christoffersen
 Brianna Fuentes
 Clara Richter
 Darryl Filmore
 Elise Glaser
 Ivy Chen
 Jia Kang
 Khayyon Parker
 Lauren Stierman
 Miguel Guerrero
 Madeline Strasser
 Magdalena Horowitz
 Nicole Woch
 Palesa Mokoena
 Sunny Chiu
 Takuto Namba
 Meredith Fossitt
 Ella Neurohr

*Graduating Majors, 2019***Mathematics:**

Sophie Aiken
 Connor Corbridge
 David Cui
 Yuxuan Feng
 Malcolm Gabbard
 Caterine Guevara
 Sam Kottler
 Zhaopeng Li
 Maggie Mehlman
 Alex Sanchez
 Jessica Schenkman
 Kelli Sullivan
 Michal Wisniewski

Computer Science:

Trystan Alexander
 Abe Binder
 Sasha Carney
 Sunny Chiu
 Mishig Davaadorj
 Pietro Giacomini Sanou
 Quentin Kakuda
 Jia Kang
 Sam Kottler
 Robert Malone
 Palesa Mokoena
 Kochi Nakajima
 Jacob Nehama
 Khayyon Parker
 Clara Richter
 Harrison Selle
 Charles Shorb
 Russell Skorina
 Will Stern
 Ethan Tanen
 Michal Wisniewski
 Stan Zhang

Mathematical Economics:

Chase Brown
 Annie Brandstrader
 Beau Burns
 Lily Chen
 Rae Condon
 Annie Engen
 Andrew Farney
 Grace Ford
 Amanda Franks
 Robbie Gardner
 Adam Jolly
 Spencer Key
 Christian Kitchen
 Caroline Leszinske
 Boxin Li
 Jake Miller
 Eyner Roman
 Risa Seu
 Jordan Stern
 Payton Tich
 Ella Tulchinsky
 Yiting Wang

NCWIT SUMMIT

The department is sending four representatives to the 2019 NCWIT Summit on Women and IT: Sophie Aiken and Sam Kottler (our incoming paraprofessionals), Darryl Filmore (a rising senior who has been active in promoting women in the department), and Ben Ylvisaker. We expect that the sessions and meetings at this conference will help the department continue to attract, retain and empower female students and staff. Last year Janet Burge and Andrea Bruder attended this conference, and brought back helpful ideas and energy. Nationally the representation of women in computing fields is extremely low (as low as 10-15% in some areas). Our department has put significant efforts into attracting women students, and our upcoming senior class is over 40% female!

GIVING TO THE DEPARTMENT

To make a gift to the Mathematics and Computer Science Department, please visit our secure online giving site at www.coloradocollege.edu/giving. Or you can mail your check or money order, payable to Colorado College, to:

Office for Advancement
 Colorado College P.O. Box 1117
 Colorado Springs, CO 80901-9897

Please include the designation "Department of Mathematics and Computer Science" in the memo line of your check, or include a note with your online gift. You may choose an existing fund (e.g., Euclid Fund or Department Fund) as a designation, or contact Andrea Bruder (Chair, 719-227-8216) to discuss new ways to support the Mathematics and Computer Science Department.

The Euclid Fund has been entirely funded by alumni gifts, and supports the Euclid Scholarships (see story on following page), and also funds undergraduate summer research at CC; \$2000 would support one student's project.

JANE'S SABBATICAL

Jane McDougall will be on sabbatical for the 2019-20 academic year. She will start out the summer with some questions about curvature and torsion of space curves that came up in a calculus 3 block of the past spring semester, followed by presenting a paper at the Ninth Congress of Romanian Mathematicians in Galați. She will be completing work with two summer research students of recent past years, and hopes to work on a new project with Spanish and Chilean mathematicians on the maximum magnitude of the Schwarzian derivative for harmonic mappings in the disk.

SAMPLES OF FACULTY SCHOLARSHIP

Molly Moran has had a paper accepted for publication this year:

C. Guilbault, M. Moran, C. Tirel. Boundaries of Baumslag-Solitar Groups. To appear in *Algebraic and Geometric Topology*.

Marlow Anderson had a paper published on-line (with hard copy to follow):

M. Anderson, C. Hollings, R. Wilson. Mathematics Emerging: from Colorado to Oxford. Appearing in *PRIMUS*.

Kirsten Hogensen had a paper appear in print:

K. Hogenson, R. R. Martin and Y. Zhao. Tiling tripartite graphs with 3-colorable graphs: The extreme case, *Graphs Combin.*, 34 (2018), no. 5, 1049-1075.

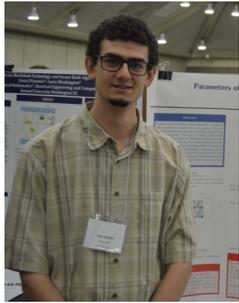
And another paper accepted:

J. Fallon, K. Hogenson, L. Keough, M. Lomelí, M. Schaefer and P. Soberón. A note on the maximum rectilinear crossing number of spiders, *J. Combin. Math. Combin. Comput.*, to appear, 8pp.

She was also invited to participate in two Sonia Kovalevsky Days for middle school and high school girls, at Iowa State and Wisconsin Eau Claire.

SENIOR AWARDS

Each year the department gives the **Florian Cajori Award**, honoring a student who has demonstrated unusual talent, achievement and interest in mathematics. This year's winners are **Sam Kottler** and **Sophie Aiken**. The **Steven Janke Award in Computer Science** goes to the student who best demonstrates unusual talent and achievements in CS; this year's winners are **Miguel Guerrero** and **Michal Wisniewski**. The **Grace Hopper Award** in CS goes to the student who best demonstrates an unusual commitment to the CS community, and the winners this year are **Beau Carlborg**, **Clara Richter** and **Michal Wisniewski**. In addition, **Malcolm Gabbard** and **Sophie Aiken** received the **Sophie Germain Award**, which honors the mathematics student "who demonstrates an unusual commitment to the mathematics community" and "passion for the field." **Maggie Mehlman** won the **Fearless Award**, for the best talk write-ups of the year.



SAM KOTTLER



SOPHIE AIKEN

MATHEMATICAL CONTEST IN MODELING

This year we had two teams participate in the Mathematical Contest in Modeling (MCM). Not only does the Math & CS department have a history of successfully participating, but we also have a history of receiving awards at the highest level (just check wikipedia for further evidence of this!). CC students on the block plan are particularly well practiced at producing quality work over a four day period, and past performance shows that CC is competitive with the best teams from institutions all across the world. Two teams this year registered, participated and produced excellent work modeling the growth and environmental impact of the beloved dragons from Game of Thrones. Both teams attended the SIAM conference in March this year to present their work. Congratulations to the teams who spent several weeks preparing in block 4: Hanqing Li, Jack Gu, Alice Wu were awarded Meritorious Winner (Top 6%), and Ruyi Yang, Adrian Ward and Xavi Dominguez who were awarded Honorable Mention (Top 16%). Over 14,000 teams participated worldwide.

BETH'S SABBATICAL!

Beth Malmskog is thrilled to be taking a pre-tenure semester sabbatical in Fall 2019. To kick it off, in late August/early September she'll be attending the concluding workshop of the MANTA collaboration in southeastern France. This working group in Algebraic Geometry and Coding Theory has organized a series of workshops and collaborations for the last several years, and is celebrating with a final workshop near Toulouse. Also in the Coding Theory vein, she'll be joining three colleagues for a week in September at the American Institute of Mathematics in Los Angeles for a SQuaRE (Structured Quartet Research Ensemble) on codes with hierarchical recovery. Beth and several of her collaborators recently completed a long and laborious software project, implementing functions to be included in a computer algebra package to find all solutions to the so-called S-unit equation. This is an important step in many number theoretic problems, and (to our knowledge) this is the first publically available general S-unit solver. During the rest of the fall, Beth plan to continue working on improvements and applications of the solver. This will likely include visits to the University of British Columbia, the University of Calgary, and Wesleyan University.



Archer Archimedes Malmskog

Beth's final project for sabbatical is to continue summer work on a tool to help with fair legislative redistricting in Colorado. She will also partner with Diana Davis of Swarthmore to develop undergraduate curriculum on mathematics and gerrymandering and redistricting. This will be shared with the mathematical community and incorporated here at CC as part of a course Beth will teach in Spring 2020 on mathematics and social choice.

Of course, a very important aspect of Beth's sabbatical will be hanging out with Archer, her puppy. She also wants to form an accordion ensemble to play Christmas carols this winter—interested parties please email her!

Becca Mitchell was our Homecoming Speaker this year. She graduated from our department in 2012, and received her Ph. D. in applied mathematics from CU Boulder in 2017. She is presently a Postdoctoral Researcher at the National Renewable Energy Laboratory. She spoke about the mathematics of mixing viscous fluids in a pipe or channel.

Euclid Scholarships

This year the department was able to award 10 Euclid scholarships, which are given to first and second year students who show unusual talent and interest in mathematics or computer science. Sophomores: **Ben Brandt**, **Jerrell Cockerham**, **Abigail Ezell**, **John Koerner**, **Ying Wang** and **Delaney Weiss**. First years: **Surbhi Bhutani**, **Jordan Cooper**, **Hayden Low** and **Anna Xu**. Congratulations to all!

**The Colorado College Department of
Mathematics and Computer Science**

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*Math and Computer Science
Faculty (2019-2020)*

Shishir Agrawal
Marlow Anderson
Andrea Bruder
Janet Burge
David Brown
Dan Ellsworth
Stefan Erickson
Kirsten Hogenson
Andrew Kelley
Beth Malmskog
Molly Moran
Jane McDougall
Nguyen Nguyen
Flavia Sancier-Barbosa
Mike Siddoway (on sabbatical)
Richard Wellman
Matthew Whitehead (on sabbat.)
Benjamin Ylvisaker

Departmental Staff

Marita Beckert (Staff Asst.)
Bob Kuo (Paraprof.)
David Bai (Paraprof.)
Amy Pacheco (Tech. Dir.)

Janet's Sabbatical

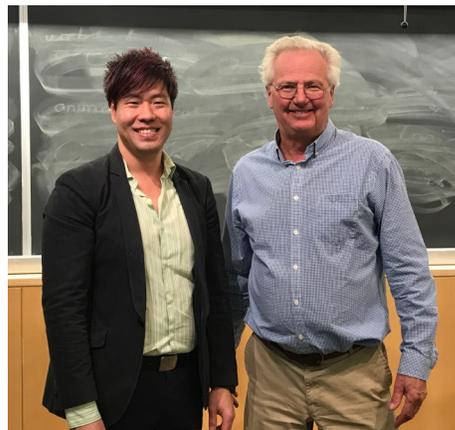
In Spring Semester, 2020, Janet Burge will be spending her sabbatical in sunny southern California visiting the University of California, Irvine. She will be working with Professor André van der Hoeck, the chair of the Department of Informatics and head of the Software Design and Collaboration Laboratory. They will be doing collaborative research on their mutual interests in software design and software engineering education.

LEIBNIZ FEST!

On Thursday, November 28, CC Mathematics and Computer Science Department hosted (the hopefully first annual) Leibniz Fest, an hour-long celebration of the multi-faceted Enlightenment-era mathematician and philosopher Gottfried Wilhelm Leibniz. Leibniz is known to mathematics students mostly for the long and contentious battle between his supporters and those of Isaac Newton about who really invented Calculus. Leibniz's impact is felt in the classroom today through his beautiful notation, which has made the chain rule clear to generations of Calc I students. Mathematicians don't often hear about Leibniz's other work, however; Leibniz was one of the premier thinkers of his generation. Not only was he deeply interested in the underlying questions of existence and meaning, but he created the first 4 function mechanical calculator and refined the binary system. Leibniz was a poster child for the liberal arts in action!

At Leibniz Fest, mathematics professor and "card-carrying Leibnizian" Dr. Marlow Anderson kicked off the event by introducing Leibniz and the calculus controversy to the audience, which included many Calc I students as well as Math and Computer Science majors. Anderson outlined Leibniz's essential mathematical contributions, including the aforementioned elegant notation, referring to Leibniz's original writings and documents for illustration. Then Michael Kim, CC Alum and Riley Scholar in the Department of Philosophy, shared some of Leibniz's many philosophical ideas. As Kim explained, Leibniz's interest in infinity and continuity also influenced his philosophical work. He sought a universal system of logic within philosophy and believed that we live the "best of all possible worlds", a notion later parodied by Voltaire with the character Pangloss in *Candide*. Leibniz's work illustrates the potential for deep interplay between the mathematical and philosophical, later embraced by Bertrand Russell and others.

At the end of the talk, Anderson invited the listeners to join the ranks of card-carrying Leibnizians with personalized membership cards. There were many takers, though some Calculus I students were still on the fence about their Newton/Leibniz affiliation. Their professor (me, Beth Malmskog) encouraged all of them to take Calculus II, at which time the unmistakable superiority of Leibniz notation for the multivariate chain rule would bring them on board.



PARAPROFS OLD AND NEW!

Every year, the department of Mathematics & Computer Science hires two math and computer science paraprofessionals. This past year, the mathematics and computer science paraprofs were **Bob Kuo** and **David Bai** respectively. Bob and David have had an eventful year as paraprofessionals. Among other accomplishments, they both feel like they have made a positive impact on the math & computer science community through organizing various social events and game nights. Notably, they introduced a pie-making contest during the Pi-Day celebration, an event that they hope will become a department tradition.

Bob will be starting graduate school at the University of Colorado - Boulder in the fall of 2019, where he will be pursuing a mathematics PhD. While Bob is not set on a particular area of research yet, he is particularly excited for the opportunity to work with the Number Theory group at Boulder.

David is looking at software engineering roles in his hometown of New York, NY. He plans to move there in the summer/early fall so he can continue choosing to not know how to drive a car. This past year has been a pleasure for him, and he really appreciates the opportunity to work with both students and faculty. He will miss the inquiring minds, perceptive (and at times difficult!) questions, and pedagogical discussions.

That being said, the current paraprofs are glad to pass the mantle onto **Sophie Aiken '19** and **Sam Kottler '19** fully confident that the department is in extremely-qualified, talented hands. Lastly, Bob and David wish the graduating class both failure they can manage and learn from, and success their hard work deserves! Congratulations to our seniors!