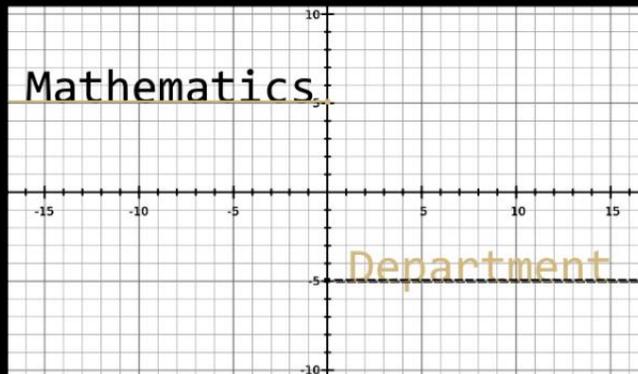


UNIVERSITY OF COLORADO COLORADO SPRINGS



WHERE SHIFT HAPPENS CONSTANTLY

2020

Volume 24 Number 1

*All the v's that's Fit to Print*

FALL 2020

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**LAS Outstanding Student Awards**

During the online ceremony, the following mathematics students were honored for their academic achievements during the Academic Year 2019/2020 by the College of Letters, Arts & Sciences:

Outstanding B.S. Math Student

- Christopher Elszasz
- Colton Hill

Outstanding Graduate Student

- Karl Buvarp

Lorch Family Scholarship

- Evan Senkoff
- Kaylee Wong Dolloff



## 2020 The Year of Limited Events

Unfortunately there were many regularly-scheduled annual activities which needed to be cancelled in 2020, including Pi Day events, Math Kangaroo, Math Club Events, Math Convergence, Poker Night, and the like. We hope that some (if not all!) of these might happen again in 2021.

### **Math Department's Katherine Cliff named as LAS College Outstanding Full Time Instructor for 2020**

From the LAS **Dean Lynn Vidler**: "For 55 years, UCCS has vowed to deliver an exceptional education, and our college has been at the forefront of that mission. Through faculty-led design, we deliver an innovative and uniquely integrated liberal-arts education that inspires thousands of students to excel. Through a communal purpose, we provide students the foundational teachings of critical analysis and thought, effective written and oral communication and the refined and defined scientific methods of inquiry.

Each year, LAS's Outstanding Teaching Awards recognize excellence and innovation in these areas from among our ranks of Lecturers, Instructors, and Tenure-Track faculty. Unfortunately, due to the pandemic, our spring 2020 teaching awards were postponed. It gives me great honor to recognize the winners of our spring 2020 Outstanding Teaching Awards now, and it seems quite appropriate as I reflect on how thankful I am to be part of this LAS community."

In her nominating and supporting letters, **Katherine Cliff** was commended for her outstanding teaching, making real-life connections to the learning, and her care and connection for students. This was clearly evident in her teaching philosophy statement, where she highlighted a passion for teaching "reluctant math learners." This theme of support was highlighted throughout her submission with a specific focus on her rapid adaptation to remote learning in Spring 2020 in which she helped her students AND colleagues. Her stellar FCQ scores were paired with phrases like, "amazing professor," and themes of organization, communication, use of technology, and well prepared lectures.' In Katherine's HyFlex class meeting, her use of technology was outstanding. Students were engaged by working problems in small collaborative groups, discussions, and problem solving. One of our Committee members stated, "I wish Katherine had been my math teacher!"

The math department is proud to congratulate Katherine on this recognition. Well deserved!!

## Robert S. and Barbara R. Lorch Scholarship

The family of former UCCS Professors Bob and Barbara Lorch established the Robert S. and Barbara R. Lorch Department of Mathematics Endowed Scholarship in 2009. The late Drs. Lorch taught political science and sociology, respectively, at UCCS for more than 30 years. Bob and Barbara's son John earned a B.A. degree in Math at UCCS in 1988, went on to earn his Ph.D. in mathematics, and is now a Professor of Mathematics at Ball State University in Indiana. The funding provides for merit-based scholarships for junior or senior math majors. The two students selected for the FY 2020/2021 are **Kaylee Wong Dolloff** and **Evan Senkoff**.



**Kaylee Wong Dolloff**

**Kaylee Wong Dolloff** began at UCCS as a biology major before quickly developing an interest in mathematics and deciding to pursue a double major. She intends to study mathematical biology after graduating, but she finds the theoretical aspect of the field equally fascinating, particularly number theory and topology. She is also a PASS leader for the math center and aims to help students overcome their reservations about math. When she's not busy reading math books, Kaylee enjoys hiking, playing music, and listening to jazz.

*"I'm honored to have received the Lorch scholarship. The math faculty have supported me throughout my academic career, and I can't overstate my gratitude. It's a great privilege to be able to pursue a career doing what I love; I thank the Lorch family and the department for generously supporting me as I do so."*



**Evan Senkoff**

**Evan Senkoff** has had an interest in mathematics since his childhood. He began pursuing an undergraduate degree in pure mathematics from the University of Colorado Colorado Springs in 2018. In addition to learning math, Evan also enjoys tutoring, as evidenced by his involvement in the tutoring centers both in high school and the Mathematics Excel Center at UCCS. Post-graduation, Evan plans on attending graduate school, working to obtain a PhD, and becoming a University professor. When he's not doing math, Evan enjoys drumming, reading, and hiking.

*"I have had a love of math since childhood. The generosity of the Lorch family will be invaluable in allowing me to continue learning and growing in this passion. I am incredibly grateful for this scholarship, and to everyone that has supported me in my journey. I am excited to progress in mathematical understanding and to hopefully earn my PhD and become a professor. The financial assistance provided by the Lorch scholarship is an extraordinary opportunity that will help me achieve this goal, and I appreciate it fully."*

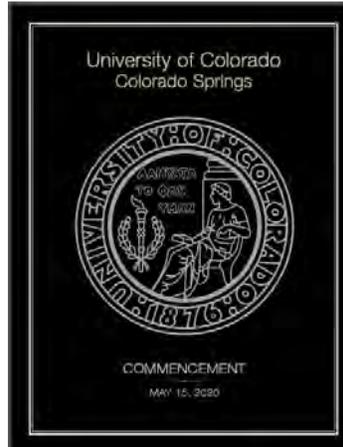
# Congratulations Math Graduates!

Here is the list of the graduates from each of the department's degree programs in 2020.

## B.S. Mathematics Spring 2020

- **Maryam Alabbad**
- **Josiah Ball**
- **Tyler Brendl**
- **AJ Cimino**
- **William Coast**
- **Kyle Cox**
- **Jesse Dodder**
- **Christopher Elszasz\***
- **Colton Hill \***
- **Troy Johnson**
- **Dallas Klumpe**
- **Evan McGovern**
- **Brandon Nachbar**
- **Emily Randono**
- **Benjamin Schwartz**
- **Karsang Sherpa**
- **Caleb Smith**
- **Kimberly Smith**
- **Roy Yeomans, II**
- **Nik Young**

\* *Outstanding Undergraduate*



## B.S. Mathematics Fall 2020

- **Kyle Bell**
- **Danielle Belter**
- **Neil Bergman**
- **Tyler Brendi**
- **Rosie Freymuth**
- **Kristen Gearhart**
- **Adam Jackson**
- **Amy Kelly**
- **Derrick Kluck**
- **Cameron Schlonski**
- **Nicca Small**
- **Edward Thomas, III**



## Graduate Degrees

### MS Applied Mathematics

- **Karl Buarvp\***
- **Lucas Goad**
- **Patrick Taylor McMillan**
- **Elizabeth Peterson**
- **Shane Richmond**
- **Stephen Sivett**

\* *Outstanding Graduate*

### PhD Applied Science- Mathematics

• **Luke Harmon**

• **Thesis Title:**

- Lower Finite Modules over Commutative Rings with Identity

**Thesis Advisor:** Dr. Greg Oman

For more information about UCCS Commencement please visit: <http://www.uccs.edu/~commencement/>

# Profile of a Recent Graduate:

*Kris Gearhart*



In each issue, the Newsletter brings you the profile of one of the department's recent graduates. In this issue we profile a VERY recent graduate. **Kris Gearhart** earned her B.S. Mathematics degree in December 2020!

We discuss with Kris some of her experiences as an undergrad here, as well as her decision to begin the journey of earning a PhD in mathematics at UCCS.

**v'sletter:** Tell us a bit about your pre-UCCS background.

**Kris Gearhart:** I grew up in a military family, so we moved around a lot. But I spent my high school years in Colorado Springs (I went to Pine Creek). Colorado Springs is the place I lived the longest growing up. I liked math and computer science in high school.

**v's:** So you came to UCCS as a math major?

**KG:** Actually, I started as a CS major, but then switched to math after having really good experiences in my Calculus 2 and Number Theory classes. I wound up getting a minor in CS.

**v's:** Tell us about some of the math-oriented activities you were involved with as an undergrad.

**KG:** I did a number of things outside the standard math curriculum. I got involved with the Math Center, both as a tutor and as a PASS session leader. That was a really good way to interact with other people (both the other tutors, and the people who came to the Math Center for help). It also let me know that I had an interest in helping other people learn and enjoy math. I served as president of the Math Club for a year, that was both fun and satisfying. I think we helped to increase the sense of community among the math majors. Unfortunately, with the COVID situation the club hasn't been able to have any actual gatherings. A few Zoom meetings happened, but it just wasn't the same.

**v's:** You've decided to enter the graduate program in math at UCCS.

**KG:** Yes! I took two graduate-level courses as an undergrad; those courses will count towards my Master's degree here. [ed's note: please contact Dr. Oman [goman@uccs.edu](mailto:goman@uccs.edu) if you are interested in the "accelerated master's program"; you can take up to 9 credit hours of math courses which can be used to count towards both your BS and your MS degrees.] I'll start the graduate program this Spring. I'm really excited that I got a Graduate Teaching Fellowship! Longer term, I plan to take the PhD qualifying exam in analysis this summer. If I pass, then I'll apply to the UCCS PhD program. I have already been talking about some research ideas with Dr. Tomforde, I would very much like to pursue those at the PhD level.

**v's: Interests outside the Ivory Tower?**

**KG:** I got into boxing a few years ago. That's been fun, and definitely a great workout! It's been tougher to keep that up during Covid. I also read a lot; I especially like Mario Puzo and Tom Robbins. [ed's note re: TR: ].

**v's: Looking ahead ... career goals?**

**KG:** I had a summer internship working for a missile defense contractor here in Colorado Springs. I'm pretty sure that I got that job because of my having taken UCCS computer science classes. But I'm certain that my strong math background gave me a distinct advantage compared to some of my teammates in regards to having a better understanding of the problems we were trying to solve. I think I did pretty well in that internship, but I'm currently pointing towards a career in academia. I like the teaching part, and the research part seems really exciting.

**v's: Any parting thoughts?**

**KG:** I'm really excited to start my graduate work here in the spring. Dr. Tomforde told me about an umbrella program for graduate student organizations through the American Mathematical Society, I'll definitely look into becoming involved with that. More generally, I've come to appreciate the fact that math is something that everyone can do and enjoy. For me math is a skill (like boxing) that you can improve over time with hard work and perseverance.

[Ed's note: for UCCS math students who are interested in the graduate programs here, contact **Dr. Oman** [goman@uccs.edu](mailto:goman@uccs.edu) for info about the accelerated Master's program, and contact **Dr. Chakravarty** [schakrav@uccs.edu](mailto:schakrav@uccs.edu) for info about the MS and PhD programs, Graduate Teaching Fellowships, and the like.]

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## **Thank You to all the UCCS Math Department Lecturers in 2020!**

- *Brent Bloyd*
  - *Jarrid Carroll-Frey\**
  - *Deric Davenport*
  - *Gaetan Delavignette*
  - *Cynthia Doorack*
  - *Rachel Drawbond*
  - *Andrea Essler*
  - *Joseph Gasteiger*
  - *Lucas Goad\**
  - *Luke Harmon\**
  - *Jewell Anne Hartman*
  - *Dallas Klumpe\**
  - *Veronica Marth\**
  - *Patrick Taylor McMillan\**
  - *Tristan Neighbors*
  - *Cammie Newmyer\**
  - *Elizabeth Peterson\**
  - *Virginia Ramos*
  - *Shane Richmond\**
  - *Stephen Sivetts\**
  - *Rachel Wood*
  - *Michael Zowada\**
- \*Designates Graduate Teaching Fellow

## Three faculty members joined the department in Fall 2020

Meet Dr. Jordan Nikkel, Dr. Justin Cole, and  
Dr. Mark Tomforde

### Instructor: *Jordan Nikkel*



Jordan and Mary Nikkel, checking out the aspens in Mueller State Park in Fall 2020

**Dr. Jordan Nikkel** is the department's newly hired Full Time Instructor. Jordan's entry into the world of mathematics and math teaching began as an undergrad at Vanderbilt University, where he started his studies not knowing whether to pursue physics, computer science, or math. He grew a bit tired of the "pattern matching" approach that the curriculum in his physics classes seemed to be taking; at the same time, his Calc 3 and Linear Algebra classes were feeding his curiosity about WHY things worked. So Jordan wound up getting a double major in CS and math. He continued his PhD studies in math at Vanderbilt (stopping long enough between undergrad and grad school to get married to Mary!), and finished his degree in 2019. His research emphasis was in the area of geometric and combinatorial group theory. While finishing his PhD, Jordan started teaching at Christian Brothers University. He finished his PhD after one year of teaching there and taught at CBU for a second year before coming to UCCS.

Outside of the classroom, Jordan has a wide range of interests. Music! Jordan was the director for two years for Victory A Cappella, an a cappella choir at Vanderbilt. In Memphis he sang with the Memphis Symphony Chorus for three seasons, and when he was much younger, he sang with the Chattanooga Boys Choir. He also plays piano. Outdoors, he enjoys cycling and hiking. Indoors, he's a Dungeons & Dragons player (among other video games), and a sci-fi and fantasy enthusiast. [ed's note: Jordan was wearing a Star Wars shirt during our Teams interview.] Jordan also spends time writing; indeed, he and Mary met many summers ago at a writer's workshop which was held in Colorado Springs. Who says writing has no tangible benefits

In this his first semester at UCCS, Jordan is teaching Calc 1 and Calc 3. He's teaching both of them in Remote Synchronous mode. He's enjoying it, but of course the online format within the general Covid environment has proven to be a challenge.

## Assistant Professor:

*Justin Cole*



Justin Cole, at his home office

**Dr. Justin Cole** is the department's newly hired Assistant Professor. Justin's journey to mathematics was via the "fallen engineer" route. Having grown up in Wichita, Kansas (the self-proclaimed "Air Capital of the World", with Learjet, Airbus, and other aircraft companies located there), Justin entered Wichita State University as a mechanical engineering major. Quickly realizing that he didn't really enjoy the engineering side, but rather did enjoy the math and physics portions, he switched to a double major in those two. He became much more engaged in his studies once he made the switch, but admitted "... that I wasn't the most dedicated student; I was really more interested in sports." Specifically, Justin was on the WSU Track and Field team, for which he ran sprint races (100M, 200M, and 400M). [ed's note: Justin ran 47.24 in the 400M as a senior. That's SMOKIN' FAST!] His training required around 20 hours per week, which, along with competing in meets, proved to be a serious drain on his study time.

With a double math/physics degree in hand, Justin looked around for graduate programs in either field; he landed at Florida State University in the Applied Math program. His graduate studies were pretty intense, but the work ethic he had developed as an athlete served him well in the grad school environment.

After earning his PhD Justin spent four years at CU Boulder (partially supported by an Air Force Office of Scientific Research grant, plus teaching as a part-time instructor). He and his family were quite excited when Justin was hired at UCCS, both for research reasons (Justin and Dr. Chakravarty have very close research interests), and because they really wanted to stay in Colorado. "Everyone has been really helpful, especially in this unusual Covid environment."

Justin is teaching Calc 1 this semester (remote synchronously). He likes the challenge of that class, especially because, for many students, Calc 1 is the first math class they take in university, and usually during their first semester. "Students can get lost in their first year at college, and I try to keep that in mind when interacting with them. I encourage them to stay connected to their classwork as much as possible."

Justin and his wife and two daughters (one age 3 years, the other 7 months) enjoy getting outside to walk or hike (Palmer Park is a favorite spot). Justin still runs in whatever spare time he can find (on a track near his house). He and his family have also done some serious investigating into the local bakery scene.

[ed's note: Justin and the editor agree that Boonzaaijer's Bakery on E. Fillmore tops the list.]

## Associate Professor:

*Mark Tomforde*

Mark Tomforde, hard at work chasing some K-theoretic diagrams arising from graph  $C^*$ -algebras



**Dr. Mark Tomforde** is the department's newly hired Associate Professor. Mark has already had a long, distinguished career as a researcher, teacher, and community enhancer. Mark recalled some of his early experiences that led him to a career in mathematics. "By the time I took geometry in high school, I had a sense that mathematics is what I wanted to do." His undergraduate studies provided him with an understanding of what research mathematics is, what it entails, and what a "research community" looks like. At Gustavus Adolphus College there was a close-knit group of math majors who would study together (and relax together). Mark realized that there was a balance to be had: one needed to "put in the hard work" and persist on one's own in order to more deeply understand the material, but that communication and collaboration were also important pieces of the mathematics endeavor. "There was a strong sense of camaraderie amongst the undergrads, and that was really nourishing for me." Mark worked in the college's math center as a tutor, and is certain that this experience helped him both mathematically as well as in his future teaching endeavors. He remembers two of his professors from Gustavus Adolphus quite well: one of them worked slowly and precisely, while the other was more of a "let's spark some ideas and then see which ones might turn out to be true". Mark's own mathematical style combines those two approaches. [ed's note: at this point in our e-conversation, Mark mentioned Freeman Dyson's famous "Birds and Frogs" essay in this context.]

<https://www.ams.org/notices/200902/rtx090200212p.pdf>

With his fate of becoming a mathematician essentially sealed, Mark then headed off to Dartmouth, where he earned a PhD. The focus of his studies was on structures called  $C^*$ -algebras (read: "C star algebras"). After finishing his PhD, Mark had a 3-year postdoc at the University of Iowa and a 1-year position at the College of William & Mary before taking a tenure-track position at the University of Houston, where he spent 14 years on faculty prior to joining the UCCS this past August.

Mark's contributions in research are internationally recognized as being extremely significant (both in quality and quantity). He has research colleagues throughout the world (e.g. Denmark and Australia); closer to home, Mark and Gene Abrams have coauthored some articles, including one which appeared in the Transactions of the AMS. Mark considers himself to be an "analyst who stumbled into algebra". [ed's note: glad he did!] Mark was invited to give an address at the prestigious Abel Symposium in Norway in 2015. His teaching and service accomplishments are impressive as well. For instance, this year Mark was awarded a Haimo Award for Distinguished Teaching by the Mathematical Association of America; only three faculty per year from throughout the country are so honored. He has mentored a number of PhD and Masters students. He developed and nurtured the CHAMP program at the University of Houston, an outreach effort to help K-12 students from historically underrepresented groups succeed in mathematics. More about CHAMP can be found in this article:

<https://www.ams.org/journals/notices/201805/rnoti-p572.pdf>

Mark hopes to develop and nurture a similar type of community outreach in Colorado Springs in the near future. Mark has visited Colorado Springs many times in the past in order to engage in research projects and discussions with the UCCS Algebra Group (Gene, Zak, Greg O., and Ranga). So although Mark is "newly hired" at UCCS, his is a familiar face around here. He and his wife Measa are living in Minnesota this academic year (Mark is teaching for us remotely); they are very much looking forward to next summer, when they plan to move to Colorado Springs.

**We are so glad to welcome Jordan, Justin, and Mark to the UCCS math faculty! Once the current virus-weirdness is behind us, all three would very much enjoy a visit to their offices from both students and colleagues.**

# Around the Department... (in random order)



The EPFL campus, where Radu spent his sabbatical during AY 2019/20.

## Radu Cascaval

During Spring 2020, **Radu Cascaval** continued his sabbatical visit at Ecole Polytechnique Federale de Lausanne (EPFL) in Switzerland. During the first 2.5 months of the year, he managed to establish collaborations with several faculty from various departments on the EPFL campus and attended numerous events there (a Winter School on Turbulence in PDEs and Fluids, a conference on Machine Learning, a workshop on AI for Space, just to name a few). Then March 16 came: EPFL closed due to the pandemic. He learned (through his kids' experience) that the Swiss educational system was much less prepared to shift to remote/online delivery than US; this made that period of time a very challenging one.

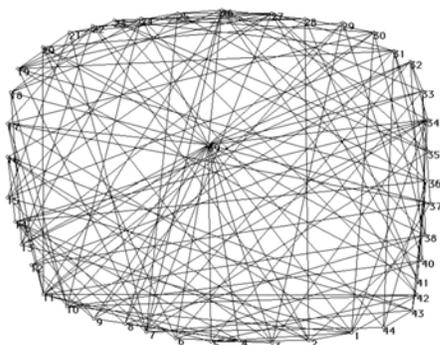
On the flip side, this was an unexpected opportunity to get out in the nature and enjoy the beautiful landscape Switzerland is known for. [Radu had a rental e-bike to conquer the steep hills around Lausanne.] Upon his return to UCCS in Fall 2020, he was sad to come to an empty campus, and not be able to physically see his colleagues and students other than on Microsoft Teams. Nevertheless, he surprised himself finding the remote sync delivery of his courses enjoyable given the circumstances. The biggest takeaway of the past 12 months was that Scientific Machine Learning is here to stay and he hopes to include more and more of it in his research as well as his teaching, for the benefit of our students!



In an article about Switzerland, what else could this be?

## Robert Carlson

Professor Emeritus **Bob Carlson** is doubly challenged: as a retiree he needs entertaining activities, and these are more difficult to find in the plague year. After some mental exercise with New York Times puzzles and his more or less daily walk, there is typically time remaining. What better than to do some math. He just finished a research paper entitled “Metric Graphs With Totally Disconnected Boundary”. Bob recently discovered that his Erdős number is 3 instead of the 4 he knew about. It turns out that his thesis advisor E.A. Coddington wrote a research paper with A. Wintner (Erdős number 1) about 75 years ago. After Coddington died, Bob inherited a book project that Coddington had begun that was eventually published by SIAM. That gives a co-authorship path of length 3 to Erdős. Since Erdős has some posthumous coauthored papers, there is still a theoretical, if improbable, chance of getting to Erdős number 1.



## Jenny Dorrington

This past year, the Math Center started out with its usual buzzing atmosphere of collaboration, with over 17,000 visits between August 2019 and March 2020. Then, of course, things changed drastically. In mid-March, the center moved all of its services online, offering tutoring in math, physics, computer science and statistics as well as Peer-Assisted Study Sessions (PASS) through Teams. The transition went remarkably smoothly, with tutors, PASS leaders and students accepting the change cheerfully. In the fall, there were limited hours offered in person, with a few students making appointments to work with tutors in the center each week. The Math Center staff is continuing to adapt to the new environment and is actively seeking new ways to encourage students to work with our tutors. The physical Math Center has always offered students a sense of community and a place to belong; we hope to provide the same for students in the remote environment.

Math Center Director **Jenny Dorrington** taught four classes, including Number Theory for the first time (a lot of fun!) and Topology (always a joy). Since she hasn't been able to travel this year (a planned trip to Portugal, Spain and Morocco has been put on hold), she has been taking more art classes, using them to “travel” in a different way.

## Yu Zhang

“This year has been tough for everyone in our department” writes **Yu Zhang**. Yu taught math 4850/5850 and Math 3810 in the Spring, and found the move to remote instruction quite difficult for both courses. “Many theorems needed to be proved in the probability model 4850/5850 course, and that was not easy to do remotely.” Yu’s PhD thesis adviser **Harry Kesten** (Cornell University) passed away last year. A memorial tribute to Dr. Kesten appeared in the June/July 2020 edition of the Notices of the American Mathematical Society <https://www.ams.org/journals/notices/202006/rnoti-p822.pdf>

As Grimmett and Lawler write in this memorial tribute: the mathematical achievements of Harry Kesten since the mid-1950s have revolutionized probability theory as a subject in its own right, and in its associations with aspects of algebra, analysis, geometry, and statistical physics. Through his personality and scientific ability, he has framed the modern subject to a degree exceeded by no other. Yu Zhang coauthored eight published articles with Harry Kesten in the area of percolation theory. Yu wrote a memorial article about Professor Kesten this year.

## Katherine Cliff

In this past year, **Katherine Cliff** continued to focus on teaching: her own, as well as serving as a mentor to graduate student teachers through her informal teaching seminars. When everything moved online, Katherine shifted her own classes online, supported other members of the department with the shift, and provided the department's part-time lecturers with materials and support for their move online. Over the summer Katherine prepared new online lecture materials for Math 1050 and for her own classes.

"To deal with...you know, everything, I took up watercoloring this summer. I have no artistic training, but I've been having fun learning. You have to surrender a little to what the watercolors decide to do, which I find relaxing." Katherine graciously provided two of her art pieces for the Newsletter. [ed's note: Thanks much, Katherine!]



## Sarbarish Chakravarty

**Sarbarish Chakravarty** continued his research work on solitons and integrable systems as well as continued serving as the Chair of the Math Department's Graduate Committee. He also continued in his role as advisor to PhD student Michael Zowada. Michael and Sarby are applying ideas from integer partitions to classify a family of rational solutions associated with a nonlinear wave equation.

## Shannon Michaux

**Shannon Michaux** spent much of 2020 working to get her classes moved online. She remarks there have been a few good things about the campus' transition to having many more classes online. First, it's been much easier to park on days when she comes to campus! Second, it's been nice to be able to teach from home on some of our colder days so far. She's also had the opportunity to be impressed in new ways by her students. "In a semester where there is so much going on in the world and when there are extra challenges with learning new online systems, I am blown away by the dedication and perseverance some of my students are showing. I am so glad that they are continuing to pursue their educational goals during this semester and I'm trying to do all I can to help them."

The decision to continue to pursue higher ed during this tumultuous semester is one that hit close to home for Shannon. Her youngest kid graduated from high school in May. "It was a rough Spring to have him lose so many of the fun events that go along with graduation. We spent months wondering if it was still the right choice to go to school this fall and if his school would even be open. I'm happy to say his school has been open for the semester and he's about to complete his first semester of college."

## Greg Morrow

**Greg Morrow** Greg Morrow taught with a tablet and surface pen using OneNote in 2020. OneNote lectures were pre-prepared with typewritten notes and problems, and shared in both “original copy” and “written-upon” formats. He taught Intro to Analysis, Probability & Statistics, Real Analysis I, and Intro to Chaotic Dynamical Systems in this manner. Lectures for all but Real Analysis I were video recorded using Panopto screen capture.

Greg’s “Chaos” class of Fall 2020 was both challenging and rewarding to teach. Luckily the Math Center, and especially Dr. Jenny Dorrington, did some checking around and found an excellent PASS leader for this course in John Stroud. This was definitely a first. Greg taught the course during the regular academic year instead of summer, and for a first time introduced a chapter on Fractals. The course includes an introduction to computing with Mathematica.

For Intro to Analysis in Fall 2020, Greg was lucky to have another great PASS leader in Jacob Lojewski. For both Intro to Analysis and Chaos, there was feedback to the effect that students who began attending the Teams PASS sessions on a consistent basis indeed improved their outlook and success in these respective courses. The graders for 3410 and 4250, whose names I don’t mention due to confidentiality, each did an awesome job, putting in much time and effort with the homework papers via the Canvas document viewer.

Greg participated in the Joint Mathematical Meetings in Denver during January. He revised and published a paper on “Probabilistic aspects of the  $r$ -Stirling numbers” in the Australasian Journal of Combinatorics. Spurred on by one referee for the paper, Greg began another project on the enumeration of the number of ways for partitioning the numbers  $[n]=\{1,2,\dots,n\}$  into  $k$  subsets with certain properties (partition statistics) by way of Stirling numbers. This subject has an elementary flavor that Greg enjoys, and is accessible to a wide readership.

## Peter Braza

**Peter Braza** really enjoyed his first full year with the department. “Great colleagues!” On the research front, his paper submitted last year on the nonlinear pendulum was published in a physics journal, and he submitted a paper entitled, “polar eigenvectors, a better way?” to another journal. On the classroom front, Peter taught Math Modeling for the first time and gave his students very real-life problems. As examples, one project on stopping bubbles in wine bottle labels came from the SIAM Journal of Applied Mathematics and another project idea came from the Journal: Advances in Engineering Tribology (what?). All projects were team-based; he’s pretty sure his students enjoyed the class and learned a lot as well (especially when doing experiments with bouncing balls).

On the home front, Peter and family went to a few national parks in May as soon as the parks opened up. A highlight: hiking the Narrows at Zion National Park. Important note: The Narrows is a river trail – the water was 50 degrees and the water fairly high (“up to our stomachs!”) and flowing well in May – adventurous and freezing!!

## Zak Mesyan

This past year **Zak Mesyan** published an article with colleagues Gene Abrams and Kulumani Rangaswamy, and submitted another two. The preprint with Roozbeh Hazrat (Western Sydney University, Australia) is the longest one for Zak so far, coming in at 44 pages. Zak also gave a talk at the AMS / MAA Joint Meetings in January of 2020 in Denver. But cancelling a trip to Australia planned for the summer, to continue the collaboration with Roozbeh Hazrat, has been the main setback to his research caused by the pandemic.

While the move to remote teaching has been depressing, (“I miss interacting with students in person!”), the situation has been interesting for the technology geek in him. Zak has enjoyed learning to use programs for recording and editing videos, as well as playing with the gadgetry available for that, such as professional microphones. He now has a better appreciation for what good online education can be, but the experience has mostly reinforced the belief that there is no substitute for teaching in person.

Most of Zak’s time has been taken up by his duties as Math Department Chairman, and the last year has been a particularly eventful one for the department, even without considering the massive changes brought about by COVID-19. To name just a few: the department hired three new faculty members, had two faculty resignations, underwent a program review, made structural changes to the graduate degrees, and moved to a new web page. [ed’s note: Whew! and ... Well done and thanks, Zak!]

## Greg Oman



**Greg Oman** has continued to serve the UCCS math department (as chair of the undergraduate committee) as well as the profession (as problems editor for the College Mathematics Journal). In addition, he served as thesis advisor for the department's second Ph.D. student, **Dr. Luke Harmon**, who graduated in May and who is currently a lecturer at the University of California, Merced.

This semester Greg had a paper accepted for publication with former undergraduate math major **John Stroud** (currently an M.S. student at UCCS in physics), and recently submitted another paper for publication with UCCS undergraduate math major **Van Hovenga**. Further, he is currently advising Ph.D. student **Veronica Marth** and undergraduate **Kris Gearhart** on research in algebra.

Finally, Greg had three papers appear in 2020 and an additional paper accepted for publication; he has published four recreational problems appear this year and has had an additional nine problems accepted for publication.

## Kulumani Rangaswamy

Professor Emeritus **Kulumani Rangaswamy** continued his research on various aspects of Leavitt path algebras, publishing a few research articles jointly with his colleagues. Thanks to technological advances such as the Zoom video conferencing platform, he was able to attend virtually many research seminars offered at a few universities throughout the world, such as the Arizona State University, The Western Sydney University (Australia), and also at UCCS.

He was invited to be one of the Editors for a special issue of the research journal *Rendiconti del Seminario Matematico della Università di Padova* published in honor of the 95th birthday of Professor Laszlo Fuchs.

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## Gene Abrams

**Gene Abrams** taught the Discrete Math course (Math 2150) in Spring 2020; he had not taught that course in more than a decade. That course provides the opportunity to give students a solid introduction to proofs and logic, and Gene very much enjoyed doing that. He will teach the course again in Spring 2021 as well. While the switch to online mode in March totally shifted his method of teaching that course, it turned out to be a positive experience for the students. Gene is really thankful for the support of his math department colleagues (e-looking at you Theresa, Katherine and George) in the move to online instruction. His Fall semester courses (Number Theory, Modern Algebra, Rings & Modules) have run smoothly for the most part. He taught the first two remote synchronously; he taught the Rings & Modules course in-person through the end of October, but then switched it to remote synchronous as well.

Gene shared one story which blurs the personal / professional boundary. (Thanks to Greg O. for the heads up on this.) Gene's daughter Ellen finished her PhD in June, in Science and Technology Studies (specifically, history of math). Her focus is on American math in the early 1900s. Seemingly unrelatedly, Gene coauthored an article with department colleagues Zak and Ranga which appeared in 2020. But if one goes to MathSciNet and enters Author = Abrams, Ellen's PhD thesis and Gene's coauthored article appear on the same results page!! (Mickey and Gene are proud parents.)

## Theresa Killebrew

"If someone would have told me that 2020 would stretch me as a teacher as much as it had, I may not have believed them," wrote **Theresa Killebrew** about this past year. The rapid transition to online learning brought about major changes in how she thinks about teaching. Here are some anecdotes from her remote teaching experience:

- her son practicing drums in the room right next door to her as she taught a Calc 2 class
- asking her students during a Teams class session, "Do you have a question, or did you just forget to lower your hand?"
- increasing her wait time for questions while students unmute their mic
- her Teams meetings running slow as molasses because EVERYONE in her house was online simultaneously

Theresa thinks there were many positives during this stressful time. She was able to learn a lot about new technologies and interesting ways to engage students. She had always wanted to try the "flipped classroom" model, but never found the time to pre-record lessons. "I now have a body of lessons recorded that I can leverage in the future. This opens me up to give that method a try."

Personally, Theresa and her husband have been homeschooling their kids this fall, and it's been an interesting challenge to layer on top of teaching from home. Recently, Theresa was teaching ratio and proportion to her 6th grader, fractions with her 4th grader, and then hopped onto her live sessions with Calc 2 students! She cherishes the opportunity to teach math to her own kids. "I am thankful that we've been able to make it work. Hearing my daughter tell me, "Mom, I actually understand math because we've made it fun!" is all the motivation I need to stay positive during this challenging year."

## Reece Adragna

**Reece Adragna** succinctly summed up what many of us are feeling: "This past year has definitely not been what I thought it would be coming into it!" While it was definitely not what he (or any of us) expected, Reece reflected on some of the positive things that came to light both at UCCS and outside of it.

In terms of teaching, Reece was thankful to have had the opportunity to teach Intro to Linear Algebra for the first time in Spring 2020 and then again in Fall 2020. "I really enjoyed reviewing this material and having the chance to work with many students that I taught as Freshmen in Calculus again this year as they are in their Junior or Senior years." Reece spent a lot of time this semester developing some cool animations in Mathematica for Calculus 3 for teaching various 3D concepts, and found some really great online manipulatives for helping students with Cylindrical and Spherical Coordinates. Reece considered himself fortunate that he had gained some experience teaching online prior to the move to remote teaching in March, but having all of his classes in a remote format did present some significant challenges. "The biggest challenge for me in online teaching is reaching and engaging all of the students." [ed's note: likely all of us agree.] "The second most challenging thing for me during the pandemic is that I have not been able to grade exams at a good coffee shop! (I definitely have a caffeine addiction at this point.)" Reece has been very impressed with how well many of his students adapted to remote learning, and their resilience since the start of COVID.

"On a more personal note, during the pandemic I did find a lot of time to ride my bikes and probably put in more elevation gain riding this year than I ever have before. This was a huge gift when there was little else to do during the lockdown. I became more aware than ever of what a blessing it is to live in Colorado!" Reece and his wife thought it would be a good idea to adopt a COVID kitten in April. They adopted "William" a.k.a. "Willie", and he has insisted on coming to visit Reece during class meetings as much as possible.

"As we near the end of this year I am thankful to have been a part of a great campus and department during a difficult time and to watch so many students persevere despite the obvious challenges presented to them. Here is to hoping that we can all be back at UCCS soon!"

## George Rus



George Rus' new 3D printer made some important contributions to fighting covid.

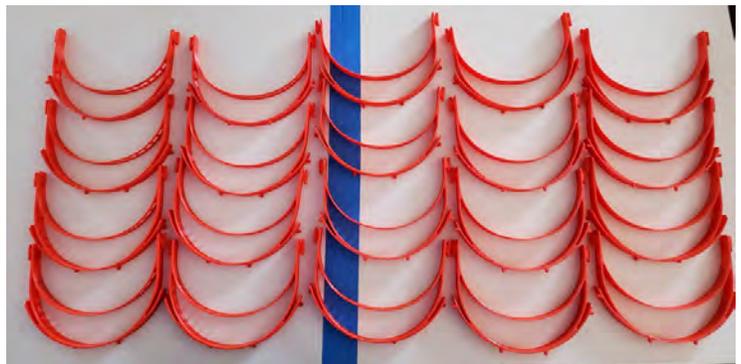
## Jacob Karn

“What else is there to do in the year 2020 but keep developing hobbies ” Continuing some trends from last year, **Jacob Karn** has continued to read books (a few more by Haruki Murakami, a couple by TC Boyle, some William Gibson, etc.). In particular, it has been a busier musical year than anything else. Jacob completed five of his own albums and five more with a friend of his (who plays saxophone). Jacob is also attempting to begin a band (drums, bass, guitar, sax). He is hopeful to start playing with his group around the Springs once COVID restrictions relax some. If anyone wants to know more, stop by his office when we're back or shoot him an email! Jacob will always talk music (and math too)!

**George Rus** planned to use 2020 as an opportunity to revamp some of the courses he teaches. Over the years, one of the most popular teaching strategies for his Calculus students has been in-class problem sessions, or workshops. George decided to create computer typed handouts from his lecture notes in his upper level course in order to free up some class time for workshops. In the Spring semester, he was successful at implementing those new strategies in his Math 3400 course. As such, when the Covid-19 pandemic started, George was able to seamlessly switch his lectures remotely and was still able to hold workshops with all his students by using virtual meetings. For the remainder of the year, George taught remotely, while still interacting virtually with his students on a weekly basis.

In February George was finally able to use the Teaching Enhancement Grant he received the previous year to buy a new 3D printer. As it turned out, the new printer came at the most opportune moment; in April, George joined an initiative started by faculty from Colorado College to use 3D-printing and casting to create face shields for medical professionals and other groups. George used his newly acquired printer and made well over a hundred shields.

On a personal note, in the summer, George and his family hiked the Decalibron, a chain of four 14ers, located in the town of Alma.



## Oman's Offerings

(Here are some of the Problems, written by Greg Oman, which appeared in various national refereed publications during 2020)

Associate Professor **Greg Oman** is a PRODIGIOUS writer of math problems. Each year the Newsletter includes problems that Dr. Oman has written (or co-written, often with UCCS students) which has appeared in a national-level journal during that year (ed's note: we have included some of the .tex symbols; this should not cause any issues in understanding what the question is asking for)

**(1) Problem #1166, College Mathematics Journal 51 (2020), no. 1, p. 66.**

Let  $R$  be a nontrivial left Noetherian ring, not assumed to have an identity. Prove the following: for any  $r, s$  in  $R$ , there exist elements  $x$  and  $y$  in  $R$ , not both zero, such that  $xr=ys$ .

**(2) Problem #1179 College Mathematics Journal 51 (2020), no. 3, p. 246.**

Let  $R$  be a ring, and let  $I$  be an ideal of  $R$ . Say that  $I$  is small provided  $|I| < |R|$  (that is,  $I$  has smaller cardinality than  $R$ ). Suppose now that  $R$  is an infinite commutative ring with identity which is not a field. Suppose further that  $R$  possesses a small maximal ideal  $M_0$ . Prove the following:

- (a) There exists a maximal ideal  $M_1$  of  $R$  different from  $M_0$ , and
- (b)  $M_0$  is the unique small maximal ideal of  $R$ .

**(3) Problem #1185 College Mathematics Journal 51 (2020), no. 4, p. 306.**

Suppose that  $S$  is a commutative ring with identity  $1$ . A subring  $R$  of  $S$  is called unital if  $R$  contains  $1$ . For the purposes of this problem, call  $S$  special if  $S$  has the following properties:

- (a)  $S$  has a proper unital subring,
- (b) there exists a prime ideal of  $S$  which is not maximal, and
- (c) if  $R$  is any proper unital subring of  $S$ , then every prime ideal of  $R$  is maximal.

Prove the existence of a special ring or show that no such ring exists.

## Pawsome Coworkers

After going remote in March 2020, many of the department faculty and staff got to spend time with new pawsome coworkers!

### Purrsey Pawkins

Greg Oman's cat



### Midnight

Sean Dean's Cat



### Willy Adragna

Reece Adragna's Cat



### Pepper

Sean Dean's Cat



### Conti

Zak's wife Maria's brother's cat  
[Zak's cat-in-law?]



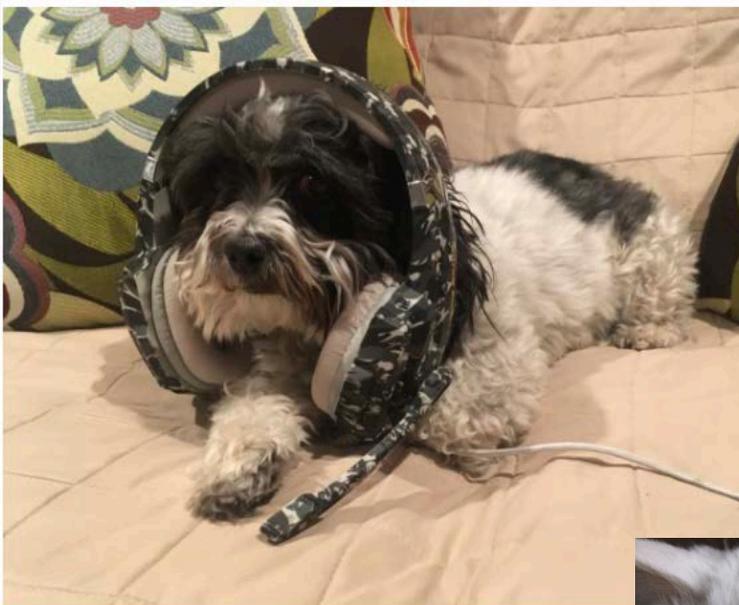
### Squeak Morrow

Greg Morrow's Cat



**Qotsi**  
Dr. Dorrington's Cat

**Elsa Cascaval**  
Dr. Cascaval's Dog



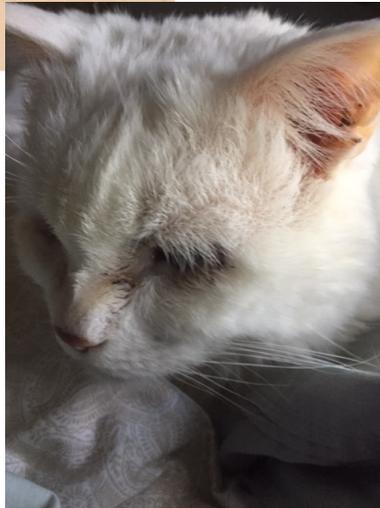
**Sunshine Snuggles**  
Emanuelita's Dog



**Mr. Catswilliam Darcy**  
Emanuelita's Cat



**Maverick & Sage**  
Kevin's Dogs



**Angel Dorrington**  
Dr. Dorrington's Cat