

2021

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**LAS Outstanding Student Awards**

During the "end of year awards ceremony," the following mathematics students were honored for their academic achievements during the Academic Year 2020/2021 by the College of Letters, Arts & Sciences:

**Outstanding Undergraduate Students**

- Eden Ketchum
- Robert McDowell

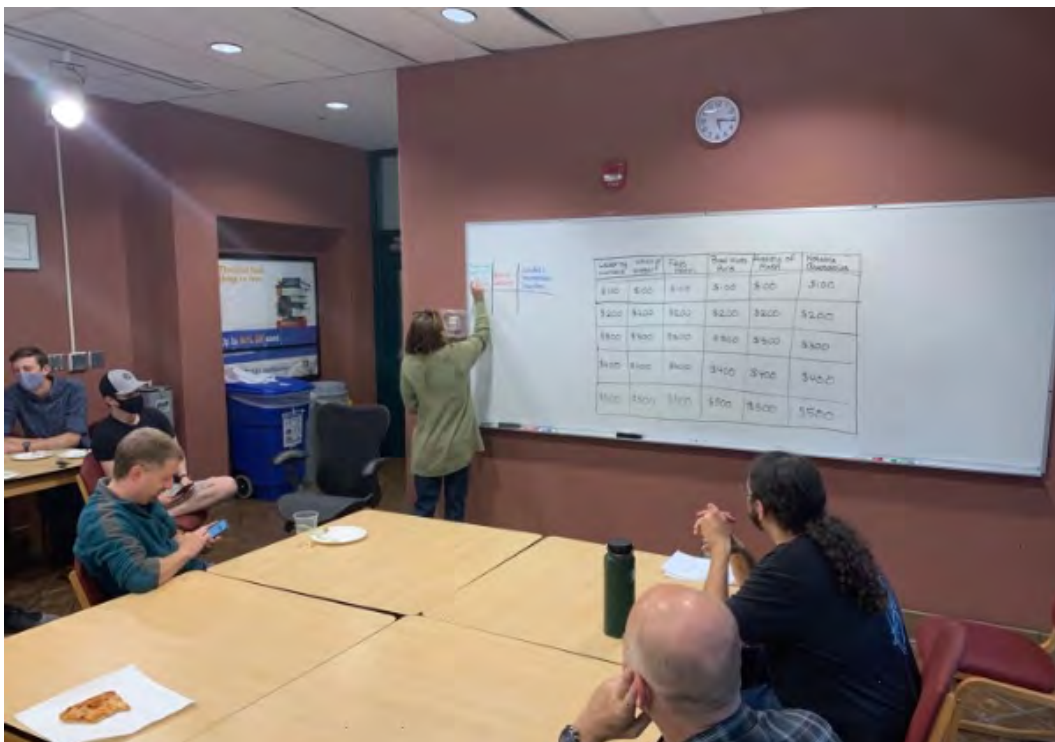
**Outstanding Graduate Student**

- Shane Richmond

**Robert & Barbara Lorch Scholarship**

- Jack Brett
- William Young

## AMS Graduate Student Chapter



Playing *Math Jeopardy!* at the September 20 AMS Grad Student Chapter event

As of Fall 2021, there is a new student organization in the department: an American Mathematical Society Graduate Student Chapter, organized and led by Dr. Tomforde as the faculty advisor, Kris Gearhart as the student president, and Carl Cassidy as the student vice-president. Throughout the semester, the AMS chapter has organized and held several events aimed at learning and professional development. These events inform students of opportunities, promote a sense of community in our department, and increase engagement among our graduate students. On top of that, the events are a lot of fun and provide everyone a chance to interact and socialize.

In Fall 2021, the AMS chapter organized a number of events: a social event at which students played a game of Math Jeopardy; a Research Panel in which professors in the department described their research to students; a Presentation of Math Topics by graduate students in the department; and an Industry Panel with representatives from several businesses in the Colorado Springs area.

Everyone --- whether undergraduate, graduate student, or faculty --- is welcome to attend and get involved with the AMS chapter events. For more info on the AMS chapter, and to see a list of upcoming events, visit the chapter's website: <https://marktomforde.com/ams/>

## **Congratulations Math Graduates!**

Here is the list of math graduates for 2021.

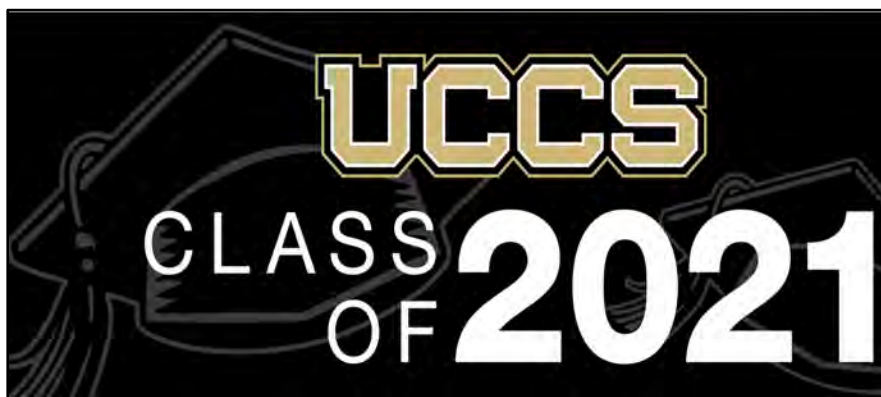
### *Undergraduate Degrees*

#### **B.S. Mathematics- Spring 2021**

- Jennifer Arguello
- Sterling Chermack
- Kaylee Wong Dolloff
- Ohmar Gonzalez
- Van Hovenga
- Jose Ureno, Jr.
- Ruihao Jin
- Eden Ketchum
- Derrick Kluck
- Kyle Kuechle
- Robert McDowell
- Mary Olson
- William Pham
- Mark Pinson
- Dawn Roberts
- Marlee Ruge
- Tj Smith

#### **B.S. Mathematics- Fall 2021**

- Gregory Buchanan
- Christopher Eagan
- Joseph Gilbert
- Jennifer Hatfield
- Adam Jackson
- Rose Kumbera
- Mariah Lewis
- Joshua Mitchell
- Ryan Tayler
- Molly Unruh
- Rachel Yostrum



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## **Honors Track in Mathematics**

Math Majors with a high math GPA are encouraged to consider applying for admission to the Honors Track within the BS degree. This track's main purpose is to help identify and encourage qualified students to take on challenges beyond the standard math curriculum. A Math GPA of 3.5 and a general GPA of 3.0 are part of the requirements by the time of graduation. The highlight of the track is an undergraduate research project under the supervision of a mathematics faculty advisor.

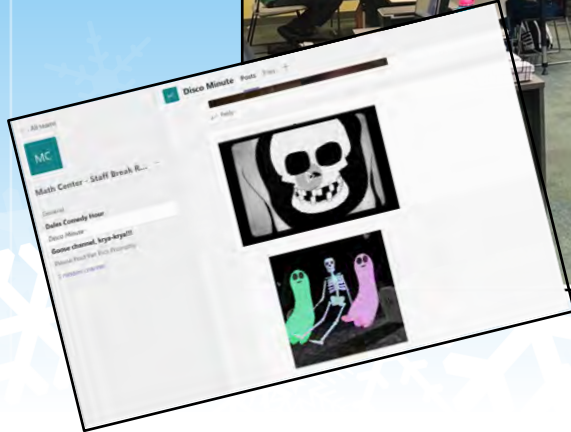
For a detailed description and application form, visit:

<http://www.uccs.edu/math/undergraduate-programs/math-honors-track.html>

## Math Center News

### Reminder

We have a mandatory staff meeting this Saturday (12/5/2020) at 11am.



After moving the Math Center online in less than two days back in March of 2020, **Dr. Jenny Dorrington, Sean Dean** and the student staff worked hard over the year to make the new format work for students. “The tutors and PASS leaders did a fabulous job of learning the nuances of working in Teams and of making every interaction with students as friendly and productive as possible. But there’s really no substitute for the personal connection and energy of working in-person in the center, so we were all happy to return this fall.”

The Center (and the department) have missed out on some of the usual annual events (convergence, Math isn’t scary, Pi day, etc); everyone looks forward to having the Math Center host some of those later this year. The center staff has done what they can to make the center friendly and welcoming. The tutors and PASS leaders also worked to maintain the feeling of close community among themselves, even while working remotely. The two images above are screen shots from their online “Break room.”

Jenny taught both Introduction to Geometry and Differential Geometry online synchronously, and surprisingly really enjoyed the experience. Differential Geometry was also a new class, which made it extra challenging. The students in both classes adapted pretty well, and made good use of the tools in Teams. Jenny is looking forward to teaching Differential Geometry next time in person, though.

“As we all know, this year has been challenging. The shift in course format and virtual learning had a big impact on students. The number of early alerts submitted increased as students faced more challenges this year.” Sean worked hard to connect with those students in the virtual format and build the same sense of support and community as the Center does in-person. Sean worked with those students to connect them with resources and develop study strategies for the class.



## Three New Faculty!

In 2021 the UCCS Math Department hired three new faculty members. They are Dr. Rebecca Afandi, Dr. Denis Silantyev and Dr. Alexandra Epstein.



### Rebecca Afandi

We welcome **Dr. Rebecca Afandi** as a Full Time Instructor to the University of Colorado Colorado Springs. At the same time, we welcome her *back* to Colorado Springs! Rebecca joins Reece Adragna as the only two UCCS math faculty who were raised (starting kindergarten or before) here in the shadow of Pikes Peak.



In her early school years Rebecca attended North Elementary School in Widefield. “That’s where the math switch got turned on for me.” Rebecca participated (along with a dozen other kids) in some after school math enrichment activities in both 5<sup>th</sup> and 6<sup>th</sup> grades. With her interest in math piqued, she continued through middle school and Widefield High School to take plenty of math classes (through Calculus 2). She was also involved in various high school extra curriculars, one of which was participating in the Precollegiate Program, which met on the UCCS campus!

After high school Rebecca headed up to Fort Collins to attend CSU. Talk about diving right in ... she took a course in Modern Analysis during spring semester of her *freshman* year! [ed’s note: yikes!] She very much enjoyed her math courses but admits that it was her love of math PLUS her *stubbornness to succeed* that got her through some of them. Rebecca started off as a Math Education major, but over her first few years at CSU realized that she wanted to focus just on the math side. She participated in a program at CSU called FEScUE (Flexible and Extendable Scientific Undergraduate Experience) for two summers during her undergrad days. This REU-like program involved a confluence of math and biology, a combination she found quite intriguing. (“We taught the bio kids some math, and the bio kids taught us how not to break things in the lab.”) She wrote an honors undergraduate thesis, a project on elliptic curves.

Having realized that she both enjoyed and had a real aptitude in math, Rebecca decided to go to graduate school. Why not stay in Fort Collins? So, she spent the next six years pursuing her Ph.D., which she completed in Spring 2021. The title of her thesis is: “Conjugacy of Integral Matrices over Algebraic Extensions”, written under the direction of Professor Alexander Hulpke. While the initial question arose in a “pure math” environment, Rebecca utilized some significant computing power in her work, including the MAGMA and GAP software packages. While at CSU, Rebecca was supported as a Graduate Teaching Assistant. As such she got to be the primary instructor for some coordinated courses including Calculus I, II and III. She also led recitations for a differential equations class, and had the responsibility of developing the syllabus and writing homework and exams for abstract algebra and linear algebra during the summer.

For a few of the summers during her time at CSU Rebecca was involved with a Math Circles program (see [https://en.wikipedia.org/wiki/Math\\_circle](https://en.wikipedia.org/wiki/Math_circle) ). As part of this program, she helped present ideas about Taylor polynomials to middle school students. [ed's note: wow!]

Outside of school / work, Rebecca has a passion for playing the violin. She has already joined up with the UCCS Symphony Orchestra. "It has a few music majors, but it is mostly comprised of faculty and students in other departments. It has been really fun to play with this group."



Rebecca has been teaching the Business Calculus and Calculus for Life Sciences courses. She has been quite impressed by the energy that students have brought to the classroom, especially with masking and social distancing requirements in place. "I have especially enjoyed having a significant number of older students in my classes. They all work very hard in class, and seem to be really appreciative of the opportunity to attend the university."

Rebecca met her husband Adam in Fort Collins: Adam was also a PhD student in the math program at CSU. A photo of the two of them is above.

Please stop by to say hello to Rebecca Afandi (her office is OSB B413, which she shares with Alex Epstein).

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## 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.

In 2021, the department awarded the Lorch Scholarship to two students, **Jack Brett** and **William Young**.



## Alexandra Epstein



Alex was married last year (photo of Alex and her husband Michael appears above).  
Congrats on that !!

Outside of school / work, Alex is an avid knitter. She started knitting while in high school, and her passion for it has grown each year since, so much so that she was recently commissioned to do a piece for one of the yarn/knitting shops in Fort Collins. Photo of the shawl below!



We also welcome Dr. **Alexandra Epstein** to UCCS as a new Full Time Instructor. Alex grew up in Pennsylvania. She learned a lot of math from her father (who had an undergrad degree in engineering). “I knew early on that I wanted to be a math teacher.” She started as a Secondary Education – Math major at Clarion University (in western PA) before transferring to the Penn State – Harrisburg campus to complete her undergraduate degree in Mathematics. (“Looking back, I realize that Harrisburg had a really good math department, and it prepared me well for grad school.”)

By then she had really caught the math bug and decided to pursue graduate work at Florida Atlantic University. She wound up teaching in the Honors College at FAU, a program which is separate from the main campus. “The students in the Honors College for the most part were definitely willing to put in the work to be able to do the math.” Her first-year graduate algebra course was taught by Dr. Lee Klingler, under whose supervision Alex eventually wound up writing her PhD thesis “Annihilators and  $A+B$  rings”. [ed’s note: Dr. Klingler spent part of one of his sabbaticals here at UCCS in the late 1990s.]

Alex is teaching the newly-developed Trigonometry course along with Calc 1 this semester. (She’ll teach Calc 1 and Discrete Math in the Spring.) She noted that the age-diversity in her classes is really a plus: the older students “... are really focused on their studies”.

[ed’s note: I guess if you don’t grow up around here ...] Alex shared this story. “When first coming out here, I was surprised by how flat the state was (since I was flying in from the east side). I expected most of the state to be mountainous for some reason. But then of course I saw the mountains, but was still surprised at how they seem to just shoot straight up from the plains as opposed to hills getting gradually larger (the Appalachian Mountains in the east are much different, ha ha).”

Please stop by to say hello to Alex Epstein (her office is OSB B413, which she shares with Rebecca Afandi).

## Denis Silantyev

The department welcomes Dr. Denis Silantyev as a new Assistant Professor.

**Dr. Silantyev** grew up in Russia, in a town called Korolev on the outskirts of Moscow. He had a passion for math / physics / computers early on. His father obtained a computer with an Intel 80286 processor (lightning fast for the time!), and kindergarten-aged Denis spent plenty of hours figuring out how to program it. Starting in 5<sup>th</sup> grade, his math and physics interests led him to preparing for and participating in numerous local, then regional, then national, and then even international Olympiad competitions. Together with the courses he took and additional extra-curricular activities while in high school, Denis was quite prepared for his university studies.



Dr. Silantyev attended the Moscow Institute of Physics and Technology (as did his mother, father, and brother!) M.I.P.T. was a 90-minute commute each way each school day from his home (2 trains and a bus). Even with the long commute, and the rigorous curriculum of the university (around a dozen courses per semester, which played out as around half a dozen classes *each day*, six days per week), Denis graduated with a degree in Applied Mathematics and Physics. And not just any degree: he earned a Diploma with Honors (a so-called “red diploma”), signifying that the student earned at most three B grades (and the rest A’s) for their entire college career.

Upon graduation Denis, all things being equal, would have perhaps preferred to continue his studies in math and physics at the graduate level. But in Russia at the time (2007) the job market was extremely tight in the sciences. On the other hand, there were jobs available in I.T., so Denis took such a job (and completed a Master’s degree in I.T. consulting).

A chance discussion with an acquaintance of his then completely changed his trajectory. One of his former classmates at M.I.P.T. had become a graduate student in mathematics at University of New Mexico. After connecting with his former classmate Denis learned about graduate programs in US from him and got excited about scientific opportunities in United States. Denis was surprised to find out that one could do graduate study in math in the U.S., and if one taught as a Teaching Fellow then the study could be done while having one’s tuition and living expenses paid for. What an opportunity! As it turned out, one of the faculty members at U.N.M., Professor Pavel Lushnikov, had also attended M.I.P.T. as an undergraduate. Denis contacted Professor Lushnikov, and one thing led to another, and in 2010 Denis wound up in the Applied Math PhD program at U.N.M.



## Denis Silantyev Continued...

He would spend the next 7.5 years in Albuquerque. “I really enjoyed my time in New Mexico. The lifestyle was so much more relaxed and easy than in Moscow. Everything was so wide open! Unique landscapes and sunny weather all year round! I could live a 10-minute walk from the university.” [ed’s note: sure beats a 90-minute train/train/bus commute!] Moreover, Denis absolutely enjoyed the academic environment at UNM, as a quiet, peaceful, thought-inducing place. There was a large group of researchers at the Math. Dept. at UNM working in different but overlapping areas of applied mathematics with whom Denis had weekly meetings over the years of his PhD program. Most of the scientific ideas were related to nonlinear waves. That weekly exchange helped a lot in Denis' studies and research, sparked many new research ideas and greatly contributed to his successful completion of the degree. One of the topics that later became the main subject of Denis's thesis was transverse stability of plasma waves. “For that I had to write many computer codes and test different scenarios with them (several codes generating various plasma waves), then testing and analyzing their transverse instability via linearized and nonlinear simulations, codes extracting and plotting data from those results.”

While in New Mexico Denis took up mountain biking, motorcycling, and hiking. In 2013 he wound up taking a multiday motorcycle / camping trip through New Mexico, Texas, and Colorado. (See photo.)



Upon earning his PhD in 2017, Denis earned a postdoctoral fellowship at the prestigious New York University Courant Institute of Mathematics. Courant is physically located in (outrageously expensive) lower Manhattan, but fortunately Denis was able to secure Courant-subsidized housing during his four years there, so he could live a short walk away from his office. At Courant Denis worked with Russel Caflisch on particle methods for plasma and rarified gas simulations. He also kept working on high-precision computer simulations of free surface hydrodynamics that followed from his PhD work. That work and the numerical techniques Denis and his colleagues learned through it later extended to many future research projects.

“It was sometimes hard to focus on work while living in New York City, there are so many things to do, and people always seemed to be in a hurry to get somewhere.” At least he found a bit of time to get out of the city, spending some time in upstate New York (see photo of Denis on a hike).

Denis is looking forward to working with both undergraduate and graduate students here at UCCS. This semester he’s teaching two sections of Calculus I, and next semester he’ll teach two sections of Introduction to Linear Algebra. He served in the jury committee of 37th Soifer Math Olympiad, October 1-2, 2021 at UCCS. Denis made a presentation about his research work to the UCCS AMS Graduate Student Chapter in October. He is also organizing and preparing student teams for the February 2022 COMAP competition (at least 10 undergraduate students have already signed up to participate).

Please stop by and say hello to Dr. Denis Silantyev, his office is ENG 279.

## Recent Graduate Profile: Dr. Luke Harmon

In each issue, the Newsletter brings you the profile of one of the department's recent graduates. In this issue we profile **Dr. Luke Harmon**.

Luke earned his Ph.D. in Mathematics at UCCS in Spring 2019. We discuss with Luke some of his experiences as a graduate student here, as well as the paths he has pursued post-Ph.D.



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

**Luke Harmon:** I grew up in Missouri, in a small town named Perryville. I was homeschooled by my mom until my first college class at 17. Neither of my parents were college-educated, so I taught myself math from when I was 10 years old. I was better at math than at most other subjects, and enjoyed it more. After high school, I tried to join the navy as an engineer, but was rejected because of poor eyesight along with some other medical issues. Afterwards I thought "Well, I guess I'll go to college and study math".

I went to Southeast Missouri State University (SEMO) for my Bachelor's and majored in math. I started at 17 and finished right after turning 21. As an undergrad, I felt that math was harder than I expected, but still fun. I started toying with the idea of grad school.

**v's:** *So how did you wind up at UCCS for grad school?*

**LH:** I wasn't sure about going to grad school during my last semester at SEMO, so I only applied to two schools: UC Boulder and University of Utah. I didn't get accepted to either. However, I was lucky enough to have accidentally sent my GRE scores (you can select from a list of schools right after the test) to UCCS. The UCCS Grad Liaison emailed me about applying, and the rest is history!

**v's:** *Tell us about some of your experiences here.*

**LH:** I worked on my Master's from 2013 to 2015, and my Doctorate (studying commutative algebra) from 2015 to 2020. Greg Oman was my advisor for both degrees. I had MANY gaps in my knowledge which needed to be filled and my mathematical maturity was severely lacking, but Greg took on the challenge and pushed me in the right direction. Great advisor!

I also was fortunate to get financial support in the form of a Graduate Teaching Fellowship for most of my years in the graduate program. Along the way I taught College Algebra, Precalc, all three Calculus courses, and Linear Algebra, some of those multiple times. I think that my teaching experience was really helpful when I went to apply for a university position in Spring 2020.

(I'd also add that everyone should try to take Ordinary Differential Equations with Dr. Chakravarty. I'm not particularly interested in the subject, but the class was great anyway!)

## Dr. Luke Harmon Interview

*v's : And you were able to get such a position?*

**LH:** I did. I had a half dozen requests for interviews (via Zoom, of course, given it was Spring 2020), and two job offers. I wound up accepting a position at the University of California, Merced campus. I spent the Academic Year 2020/21 at Merced. It was sort of a weird situation, given that I never met the students nor most of my colleagues face-to-face. It was OK living in Central California, there were some pretty areas around Merced. But for the most part I really wanted to be back in Colorado. So, in Spring 2021 I started applying for positions (both academic and non-academic) back in the Springs.



*v's : .... and ....*

**LH:** Things turned out really well. A company in town named Algemetric is working on cryptography (homomorphic encryption, secure multi-party computation, multi-factor authentication, data compression, etc.). They were looking for someone with training in algebra and discrete systems to help them formalize the math behind a new leveled homomorphic encryption scheme they were developing. So, my background in algebra opened that door for me. Actually, the job I applied for was “Software Architect”, but they were happy with my background and performance on a MATLAB coding assessment, and decided to create a new position (“Research Mathematician”) for me. I took the position in July 2021 and have been working there since then.

*v's : What sort of work is it? (OK, don't divulge any trade secrets ...) Maybe more to the point: can you give some examples of how your math background has been used in this setting?*

**LH:** One goal of the company is to create software that can mitigate ransomware attacks. On my end, this means reading lots of papers about the relevant cryptographic schemes and determining what makes sense for that product. I've spent much of my time just coming up to speed on what the big goal is. But here's one example: I got to haul out the ring of integers localized at a prime ideal to help explain one aspect of the project!



## Luke Harmon Interview Continued...

**v's :** *Most of us in the UCCS math department knew that you were quite involved in marathoning / ultramarathoning during your time in graduate school here. Is that something you are still pursuing?*

**LH:** Right, I was definitely excited about long-distance running during my first few years at UCCS, though I was never much good at it. [v's note: beg to differ ...] The trails on the ridge behind the Engineering building are fun and pretty, it was nice having those so close to campus for training. My favorite race was one in Tennessee called the Barkley Fall Classic. It was around 32 miles with about 10,000 feet of climbing throughout. I finished that one 16th overall in about 10.5 hours, and could barely walk the next day.

But my knees started to get unhappy after long runs, so I've switched athletic endeavors. I now rock climb a lot. Also, I've started getting into Free Diving, and it's easier on my knees!



**v's:** *Thanks for the chat, Dr. Harmon. Also, many congratulations on your recent engagement to Megan! [ed's note: Luke and Megan met at the climbing gym ... quite the active couple ...] We'll check in with you in the future to see how things are going, especially vis-à-vis your work in the high-tech industry.*

[v's note: <https://en.wikipedia.org/wiki/Freediving>]

# Around the Department...

## Reece Adragna

2021 proved to be a fun and busy year for **Reece Adragna**, both professionally and personally. “Between the continual adaptation to the remote teaching environment in the spring and summer semesters, to the re-adaptation to returning to campus to teach in Fall 2021, I felt like I had a full plate!” This past year Reece enjoyed having the opportunity to teach some of his favorite courses once again, including Calculus for Business and Economics, Calculus 1-3, and Introduction to Linear Algebra. It was particularly special for him to teach Intro. to Linear Algebra (Math 3130) in Fall 2021 as the majority of the students in his section had been his students in prior courses. “It was so nice connecting with them again and I felt grateful to have the opportunity.”

Personally, this past year was busy for Reece as well. He spent most of his free time in 2021 cycling and was able to participate in the Courage Classic Copper Triangle in the summer. This particular ride is a 78 mile loop starting and finishing in Copper Mountain with three (painful) mountain passes in the middle. “During my time in the saddle this summer I even had the chance to run into Gene Abrams and his wife Mickey several times on the mountain bike trails!”

Reece shared with the editor that 2021 has been a good year to be part of the Math Department at UCCS, and that he is looking forward to hopefully continuing to get a chance to re-engage with more students in person this coming year.

**“Now to the most important update in my life,** my wife Kaylen and I welcomed our first child, Oliver Charles Adragna, into the world on October 11<sup>th</sup>, 2021. We call him “Ollie” for short. Kaylen and I have both felt so blessed by his life so far and are enjoying learning all that he has to teach us about being parents! (photos below)

Oliver even let us dress him up as “Baby Yoda” for Halloween. He has been doing a great job of letting us sleep as much as possible, but we still feel very fortunate when a little extra rest comes our way.”





## Mark Tomforde



GroupoidFest Participants in November 2021

This fall is **Mark Tomforde**'s first semester on the UCCS campus, and he has been busy meeting people, getting the lay of the land, and figuring out how things work at UCCS. Although Mark was hired in Fall 2020, due to COVID he worked remotely from Minnesota for the 2020--2021 academic year so that he could help his elderly father.

Mark moved to Colorado Springs this past August, and he has been active interacting with our students since he arrived. This fall he is teaching the 4130/5130 Linear Algebra as well as Functional Analysis. He is also supervising a Ph.D. student, and he organized the graduate students to form an AMS Graduate Chapter and hold various events throughout the semester. Mark also continues his research in Functional Analysis and Algebra, and has submitted several papers for publication this year. In addition, this November he organized the annual meeting of a national conference, called GroupoidFest, which was held here at UCCS.

## Kulumani Rangaswamy

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Professor Emeritus **Kulumani Rangaswamy** had a quiet year during 2021. Unlike recent years in which he travelled extensively, Ranga did not attend any in-person conferences in 2021. However, he had the opportunity to attend and also give talks in virtual meetings and seminars from around the world. His joint work with Zak Mesyan and also his work with Ashish Srivastava and his students led to the publications of a couple of papers on the ideal theory of Leavitt path algebras.



## Yu Zhang

**Yu Zhang** continued his research program in percolation theory during 2021. In particular, he focused on showing the existence of the scaling limit in 2D critical percolation. He submitted two articles for publication. He was also invited to speak in an NSF Workshop next July. He is very glad that UCCS has returned to in-person teaching.



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## Sarbarish Chakravarty

**Sarbarish Chakravarty** taught Calculus I in Spring 2021, after not having taught that course for nearly ten years. Sarby thought the course went pretty well, that the students embraced the Hyflex format. He continued his research work on integrable systems and continued serving as the Chair of the Math Department's Graduate Committee. He and his PhD student Michael Zowada found some nice results in their investigation of the rational solutions of the KPI equation. Michael presented his results remotely at a conference in the Isaac Newton Institute, Cambridge in June and then in person at Colorado College in late October. Sarby and Michael published a paper on this topic in November. They are currently writing up another one, and (hopefully) a third paper will also come out of this work in the future. Michael expects to defend his thesis soon.

To read their published work visit: **Chakravarty, Sarbarish, and Michael Zowada**. "Dynamics of KPI lumps." *Journal of Physics A: Mathematical and Theoretical* (2021). <https://doi.org/10.1088/1751-8121/ac37e7>

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## Radu Cascaval

**Radu Cascaval's** 2021 was remarkably uneventful. While he continued working on scientific machine learning theory and applications that were spun off from his sabbatical leave in 2020, he also revived some old collaborations with colleagues in exercise physiology at UCCS. During Spring, he advised a Math undergrad student to complete a project related to modeling and controlling epidemics, based on models used by the Institute of Health Metrics and Evaluation (IHME) at University of Washington. This effort was part of the LAS Student-Faculty Undergraduate Research & Creative Works Awards. He attended the SIAM Annual Meeting held virtually in July 2021, which was originally scheduled to be held in Spokane, WA. He naively had hoped that the event could be held in person in which case he would have combined that trip with a visit to IHME. Incidentally, that northwest corner is one of the few places in the US he did not have a chance to visit yet. Teaching-wise he has taught in the remote sync format during Spring and continued in the Fall, the flexibility offered by this format to students he did find out to be quite welcomed by students. In the Fall semester, he spearheaded the revival of the Math Colloquia Series, even if only virtually. He also co-founded the UCCS Math Clinic, which will only officially start in Spring 2022, an initiative to expose math students to real world problems, customers, and to increase the exposure of students to internships and future career possibilities.

## George Rus

The year 2021 was eventful for **George Rus**, both professionally and personally. Due to the ongoing pandemic, George taught remotely during the Spring and Summer semesters. As such, he took the opportunity to record lessons for some of his courses to be used as supplemental instructional materials in years to come. For the Fall semester, he was very happy to be able to return to campus and teach in person, especially since he decided to teach a new course, which required a lot of student interaction. George taught, over 10 weeks, Math 2650, an introductory course in computational mathematics. Each week he helped his students create and debug MATLAB scripts and use them to solve mathematical problems.

Personally, due to travelling restrictions, George and his family stayed mainly in Colorado. However, that did not stop the family from being very active. The three of them participated in three obstacle races, a running challenge, and (finally) hiked Pikes Peak. Additionally, George trained for and competed in his first marathon. [ed's note: and SMOKED his first marathon, The Colorado Springs Marathon on October 2nd. 4 hours 21 minutes, sub-10-minute-mile pace. Well done, George!]



## Katherine Cliff

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This past year, **Katherine Cliff** continued to focus on teaching, course coordinating, and mentoring. Over the summer, she developed the department's new Trigonometry course (Math 1060), which included refining an Open Educational Resource (OER) textbook and online homework set. This fall, in addition to her teaching duties, Katherine has been running the Graduate Teaching Fellows' inaugural Teaching Seminar. "It's wonderful to connect with and advise the next generation of math teachers." Over the summer, Katherine and family (plus their dog, of course) took a grand tour of the Midwest in their camper. They visited family in Illinois and Ohio, rode a ferry on the Mississippi River, played at lots of parks, went to a private viewing of *Raya and the Last Dragon* in a movie theater, played lots of board games, and got a ton of snuggles from the grandparents. [ed's note: it is sooooo good to start getting back to 'normal'.]

## Jacob Karn



**Jacob Karn** is *very* happy to have things return to some sense of normalcy, both in and outside the classroom. Jacob has been developing another couple of bands over the year (a Jazz band and a Jam band) in addition to his Prog Rock band. He has also been getting hired to do some session work as a bassist with a couple of different groups and artists.

It has been another busy reading year for Jacob. “Some of my favorites from the year are *The Unbearable Lightness of Being* by Milan Kundera, *Invisible Cities* and *Cosmicomics* by Italo Calvino, and *1Q84* by Haruki Murakami.”

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## Greg Morrow

Besides presenting all classes in a remote synchronous fashion during Spring 2021, **Greg Morrow** recorded Panopto videos of his Modern Analysis II (4320/5320) lectures and posted them in Canvas. Panopto videos of lectures were also made available to his Probability and Statistics (3810) students. In Fall, Greg conducted his classes in HyFlex format, with in-person classes meeting one day per week.

The in-person classes were recorded in Teams via Canvas link; on the other class day each week his classes met remote synchronously in Teams meetings that were also recorded for the students. Greg submitted a paper for publication entitled “Associated Stirling number statistics”. He wrote a working paper for a joint project with Sarbarish Chakravarty on generalizations of Viete’s product formula for  $\pi$ .



## Peter Braza

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Peter Braza enjoyed another year as a member of the Department. On the research front, he submitted a paper and was a session chair and gave a talk at the SIAM Conference on Applied Dynamical Systems in May. (“At the ... conference” means in front of my computer in my office, rather than in front of people in a large Portland hotel – oh well 😊”) Speaking of Portland, Peter and family had an awesome vacation this past summer that started in Portland, then to Astoria (Lewis and Clark Pacific Ocean sighting locale), then down the gorgeous Oregon coast, then Crater Lake (while avoiding fires), and then back home.

## Jordan Nikkel

This summer, **Jordan Nikkel** graduated from the Project NExT Brown '19 cohort, where he met many other wonderful aspiring math educators and learned so much about teaching. He also helped organize his first workshop with other NExTers, on using polling as an effective classroom tool to connect with students. Jordan has been so grateful to teach in person this summer and fall, and he has been working hard to learn how to create deep online homework problems in *MyOpenMath* for Math 3130. He also led a reading group in the department this summer, discussing the ideas of *Ungrading* through the book by that name (ed. Susan Bloom).

In the midst of all the craziness going on this fall, Jordan and his wife Mary adopted a new kitten from the local humane society. Totoro is a very rambunctious ball of fur whose tireless antics have been both hilarious and distracting whenever either Jordan or Mary are working at home.



## Justin Cole

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The past year was **Justin Cole**'s first full calendar year at UCCS, so for him it was a year of transition. (He and his family moved to the Springs a few weeks before Fall 2019 classes started.) In addition to teaching Calculus and Linear Algebra remotely, Justin also participated in two virtual conferences. In July Justin spoke at the SIAM Annual Meeting. He also gave one virtual talk for the Nonlinear Waves seminar in the applied mathematics department at CU Boulder. “I am certainly enjoying being back in-person for classes this fall.” This past year he published two papers. The first paper was a student project he started back when he was a postdoc at CU Boulder. The topic was on the effect of nonlinearity on edge modes in so-called topological insulators, a popular topic in physics these days. The second paper was on a very interesting phenomena called rogue waves. Rogue waves, also called “freak waves”, are large amplitude waves that occur in the ocean, seemingly out of nowhere, and then disappear. He studied the stability of rogue waves in a PDE model.

This semester Justin is teaching MATH 4650/5650 Numerical Analysis and really enjoying it. “I find the topic of numerical computation very interesting, and the students have been engaged.” Also, this semester members of the mathematics department organized a small informal seminar called *Nonlinear Waves and Their Application* with faculty members from the physics department. This semester various faculty took turns presenting their research interests. “In the future, we hope to continue gathering for workshops on interesting wave phenomena in physical systems.”

This past year Justin didn't travel too much. He spends most of his time away from work with his family.

## Shannon Michaux

During 2021 **Shannon Michaux** had the opportunity to work to develop a new version of the department's College Algebra course (Math 1040). The course changed from a 3 credit hour course to a 4 credit hour course in the Fall of 2021 in order to allow students to have more time to digest the material. Shannon spent much of the Spring and Summer semesters developing curriculum to support this change. "One of the big challenges of rolling the course out this year was that we were offering the course in three different course modalities- In person, Remote Synchronous and Remote Asynchronous and all three modalities had different curriculum needs." During the fall semester, the Department used the materials Shannon developed in ten different sections of Math 1040. Shannon along with Katherine Cliff was awarded a UCCS Teaching Enhancement award to procure dry erase marker boards for students in College Algebra and Trig to use for group work and other interactive learning experiences.



## Greg Oman

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**Greg Oman** has continued to serve the department as chair of the undergraduate committee and the profession as problem editor for *The College Mathematics Journal*. He and master's student Van Hovenga had a paper accepted to the International Journal of Mathematics Education in Science and Technology, and he is currently working on research with graduate student Troy Johnson and undergraduate student Evan Senkoff. His former student Luke Harmon (Ph.D. 2020) has returned to Colorado Springs as a research scientist for Algemetric, and is doing quite well. [ed's note: see accompanying profile.] Greg gave two talks - one as an invited speaker for a research methods in mathematics course at Cedarville University (virtually), and the other for the conference "Rings and Polynomials" (sadly, also virtually) held in Graz, Austria. Research-wise, he and Luke Harmon have a paper appearing in *The Journal of Algebra and Its Applications* on Luke's thesis work. In addition, Greg has another paper with two Ohio State colleagues submitted, and is currently working on a project in universal algebra (which may make for a nice dissertation topic!).

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## Zak Mesyan

This year **Zak Mesyan** had two papers accepted (one with colleague Kulumani Rangaswamy), and submitted another (51-page) paper. He was surprised to discover that a member of his PhD thesis committee at Berkeley, Guido Imbens, won the Nobel prize in economics in 2021.

Zak taught an asynchronous online course for the first time this year--Introduction to Linear Algebra Math 3130. While he found the experience lonely, "... the format seemed to work well for a good portion of the class, and the technological aspect of it was fun." One of the students in that class, Jennifer Valente, won gold and bronze medals at the 2020 Olympics (held in 2021) in cycling.

As with the previous year, Zak spent most of his time on department chair duties. 2021 has been much less dramatic than 2020, but the department hired three new faculty members, and has been gradually returning to more activities on campus (rather than online).

## Gene Abrams

Consistent with what seems to be the general consensus of the department, **Gene Abrams** was also quite happy to be back to teaching classes in-person this fall. “The students in my classes (especially the Discrete Math 2150 course) are really ready to participate; they ask a lot of questions, and seem quite enthusiastic about engaging with the material.” Although Gene thought that online learning was not the optimal mode, he had to admit that the online environment has some advantages, as Gene “attended” (virtually) some online lectures from mathematicians based literally throughout the world, lectures that he obviously would not have been able to attend in person.

In September he had the honor of serving as the “opponent” on the PhD committee of a student at a university in Karlskrone, Sweden. “Unfortunately, the thesis defense was done remotely.” This past year Gene continued working on some joint research projects on various aspects of Leavitt path algebras, one of which is with UCCS colleague Mark Tomforde.

Here is an article which was published in the Journal of Algebra:

**Abrams, Gene**, Mikhailo Dokuchaev, and T. G. Nam. "Realizing corners of Leavitt path algebras as Steinberg algebras, with corresponding connections to graph  $C^*$ -algebras." *Journal of Algebra* (2021). <https://doi.org/10.1016/j.jalgebra.2021.11.004>

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## Thank You to all the UCCS Math Department Lecturers in 2021

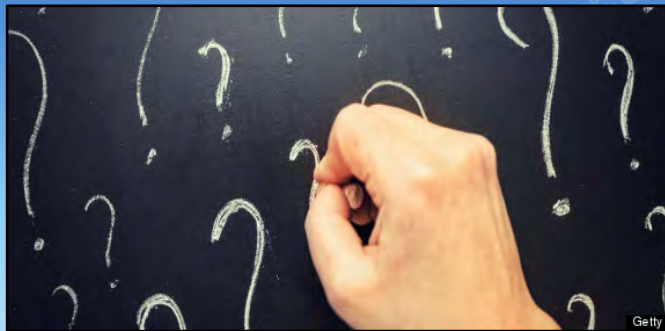
- Selina Akter\*
- Brent Bloyd
- Jarriá Carroll-Frey\*
- Meredith Casey
- Gaetan Delavignette
- Cynthia Doorack
- Andrea Essler
- Joseph Gasteiger
- Kristen Gearhart\*
- Stewart Hathaway
- Troy Johnson\*
- Dallas Klumpe\*
- Elizabeth Peterson
- Virginia Ramos
- Rachel Wood
- Michael Zowada\*



thank you!

\*Graduate Teaching Fellow





## Oman's Offerings

(Here are some of the Problems, written by Greg Oman, which appeared in various national refereed publications during 2021)

(1) [Problem #1192, College Mathematics Journal 52 (2021), no. 1, p. 64.] Let  $R$  be a commutative ring (not assumed to have an identity). Recall that an element  $x \in R$  is a zero divisor if there is some nonzero  $y \in R$  such that  $xy = 0$ ;  $x$  is nilpotent if  $x^n = 0$  for some positive integer  $n$  (note that we do not require a zero divisor to be nonzero).

(a) Prove or disprove: there exists a finite commutative ring  $R$  for which

- (1) every element of  $R$  is a zero divisor, and
- (2) the only nilpotent element of  $R$  is 0.

(b) Does your answer change if “finite” is replaced with “infinite”?

(2) [Problem #1198 (with Alan Loper), College Mathematics Journal 52 (2021), no. 2, p. 142]. Let  $n$  be a non-negative integer, and consider the ring  $R := Q[X_0, \dots, X_n]$  of polynomials (via usual polynomial addition and multiplication) in the (commuting) variables  $X_0, \dots, X_n$  with coefficients in  $Q$ . It is well-known that  $R$  is a Noetherian ring, and so every ideal of  $R$  is finitely generated. Since  $R$  is countable, and there are but countably many finite subsets of a countable set, we deduce that  $R$  has but countably many ideals and thus, in particular, countably many maximal ideals. Next, let  $X_0, X_1, X_2, \dots$  be a countably infinite collection of indeterminates. Observe that (to within isomorphism)  $Q[X_0] \subseteq Q[X_0, X_1] \subseteq Q[X_0, X_1, X_2] \subseteq \dots$ . Let  $Q[X_0, X_1, X_2, \dots]$  be the union of this increasing chain. How many maximal ideals does the ring  $Q[X_0, X_1, X_2, \dots]$  have? (More precisely, what is the cardinality of the set of maximal ideals of  $Q[X_0, X_1, X_2, \dots]$ ?)

(3) [Problem #1210, College Mathematics Journal 52 (2021), no. 4, p. 307]. Let  $R$  be a commutative ring with identity, and let  $I$  and  $J$  be ideals of  $R$ . Recall that the sum of  $I$  and  $J$  is the ideal defined by  $I + J := \{i + j : i \in I, j \in J\}$ . Prove or disprove: there exists a countable commutative integral domain  $D$  with identity and a collection  $S$  of  $2^{\aleph_0}$  ideals of  $D$  such that for all  $I$  distinct from  $J$  in  $S$ , we have  $I + J$  is not in  $S$ .