

THE MCSP TIMES

Two of the many new programs in the MCSP Department are the Actuarial Science major and the Stat Crew student group. These programs help recruiting and prestige, but First and Foremost they are about outstanding students doing great work.

Editor's note: Longer versions of the following articles can be found at our blog site, mcsp.pages.roanoke.edu

The First

Emma Blair will become Roanoke College's first graduate in actuarial science on May 4, 2019. From which it logically follows that Emma is our first triple major in actuarial science, economics, and Spanish. With a math minor. And two years on the lacrosse team. And ballet. With a grade average that rounds to 4.0.



Being first is not new to Emma. She is the oldest of Tommy and Kim Blair's five children. Which means that Roanoke College is not new to Emma, either. Tommy and Kim are both RC grads and have held important administrative positions here.

Actuarial science is a blend of statistics, economics, business, and mathematics that is the "science of risk analysis" used by insurance companies and other industries. This is the second year that a de-

gree in actuarial science has been available at Roanoke College, so it is noteworthy that anyone could complete this demanding major so quickly. How did Emma do it? She found out about the major in a conversation with Registrar Leah Russell as the major was being developed, and got her courses lined up.

Having some inside information did not make the journey easy. Emma had to take ACSI 301, the most difficult course in the major, as an independent study, working with a professor who was learning the material at the same time. Do not try this at home! This illustrates a common pattern in Emma's time at RC: uncovering a new interest, making the choices needed to free up time for the new interest, and then putting in the hard work to succeed.

Her first two years featured lacrosse and a comprehensive search for the right majors. She played important minutes in goal for Coach Schwartz. After two years, Emma traded goalkeeping for coaching. She coached the Salem High School girls lacrosse team, featuring her sister Lilly, to the state finals. She also completed an independent

study analyzing the effects of the newly introduced shot clock in women's lacrosse.

As you might expect, Emma's future is full of outstanding options. She was a finalist for a Fulbright scholarship, but has accepted a Mercatus Fellowship in economics at George Mason University.

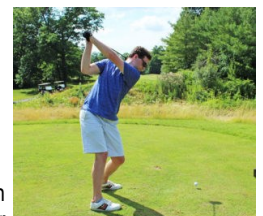


When Emma learned that she had been named Senior Scholar in actuarial science, she laughed and asked how many other seniors were eligible. Regardless, she has set the bar very high for future majors. Emma's advice to entering students is to dive in, try out several majors, get to know your professors well, and take advantage of what Roanoke College has to offer. She has clearly done all of this and more, and that is why she is first!

The Foremost

David Moreau will graduate in May as Stat Crew's GOAT. If you're not familiar with sports lingo, that means Greatest Of All Time. David's four years at RC coincide with Stat Crew's four years of existence, and he has played a major role in the success and development of this experiment in academic-athletic collaboration. At the same time, David has excelled in the classroom, earned great physics graduate school offers, and been a valued RA and student leader in Resident Life.

Golf has played an important role (fore-most, if you'll pardon the pun) in David's academic career. He grew up in East Haddam, Connecticut, playing numerous sports (including fencing) and a jazzy tenor saxophone. Golf became his main sport, which turned his college search southward to find a longer playing season. Then his faculty interviewer in the scholarship competition at Roanoke College showed up with a golf book and an offer to do golf research. David likes to tease me that whatever good impression I made was diminished when the RC bookstore didn't carry my book.



In an unintentional bait-and-switch, I then enlisted David to be a founding member of Stat Crew, at the time a small student group with the vague goal of helping Roanoke athletics. The first year of Stat Crew had a research-like feel as we met frequently to tweak our data collection and report processes. It was a fun collaboration. And David did eventually get to do some golf research. He has used the massive ShotLink data set to explore the markers for success on the PGA Golf Tour. He presented a poster at the Carolina Sports Analytics Meeting at Furman University in 2017, completed an excellent independent study in 2018, and presented new work at Furman in 2019.

Life at Roanoke College has not been all golf for David. He is an outstanding student in physics and math. A summer Research Experience in 2017 at the University of Connecticut focused on virtual reality programming for molecular biology. An internship at Integer Holding Company in 2018 and 2019 has given David practical experience in the laboratory. He has accepted a fellowship offer from the University of Virginia's Center of Applied Biomechanics.



There have been some revelations along the way. David's Dad accompanied him to Atlanta for David's presentation on StatCrew at the national Joint Mathematics Meetings. The surprise for David's Dad was how comfortable David is with his RC math professors. David, in turn, realized that he has absolutely enjoyed the college life.

Eventually, David wants a job developing products that help people. Helping people is part of what he has done with Stat Crew and Residential Life. Come to think of it, that was probably foremost in his mind from the beginning.

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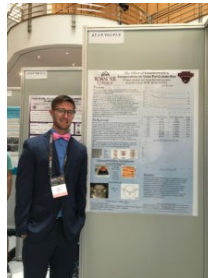
Liam Lambert wins Goldwater Scholarship

William 'Liam' Lambert has won a Goldwater scholarship, one of the most prestigious prizes awarded to students for their academic excellence and commitment to research in the STEM disciplines. He is one of 211 recipients out of 1248 nationwide applicants this year. So, who is Liam Lambert? An aspiring physicist or a mathematician or an engineer? So, as all things in the quantum world go, it is not either /or for Liam, it is all of the above defining him.

A double major in physics and math, Liam is strongly motivated by engineering. He started his work in Dr. Rama Bala's nanoscience lab as a freshmen. As an experimentalist, he has synthesized nanocrystals of maghemite and hematite under various crystal growth conditions. As a physical scientist, he has studied the crystallographic and magnetic properties of the nanocatalysts. As an engineer, he designed and built a magnometer like instrument to map the magnetic hysteresis of his nanocatalysts. He traveled to Thessaloniki, Greece in September 2017 along with Dr. Bala, to present his research findings at Euromat 2017, an international materials research conference. Now, as an applied mathematics student and an aspiring aerospace engineer, he is learning how to create lightweight structures using 3D printing and applying graph theory to improve the efficiency of 3D printing process under the mentorship of Dr. Karin Saoub. Liam plans to map the aerodynamics of 3D printed wing surfaces at Coastal Carolina University this summer.



Each of these roles has stemmed from Liam's innate curiosity for research, creative problem solving abilities and motivation to pursue applications based research. Liam Lambert is a student-scholar, true to every word, and definitely worthy of the Goldwater Award. Congratulations, Liam!



Physics SPS wins

The Society of Physics Students (SPS) at Roanoke College has won the 2018 Blake Lilly Prize for outstanding science public outreach and awareness. This prestigious national recognition is bestowed upon only select few colleges nation-wide, about 10 or so, each year.



(Morgan Heckman ('19), L, leads several STEM outreach events at local elementary schools; Dr. Matt Fleenor, R, is the faculty advisor for SPS outreach events.

Roanoke College-Physics group has been able to lead a variety of outreach efforts over the last several years, thanks to a dedicated group of students and faculty who are passionate in their pursuit of science and its reach to the general public. Dr. Matt Fleenor spearheaded the RC eclipse ambassador outreach program during total solar eclipse of 2018 in North Carolina which was attended by more than 1000 people.

Upon receiving the notification of the award, Fleenor had this to say to students and alumni. *"Thanks for your efforts in making RC Physics a place known for its love of science (and especially, physics). The Physics Group has much to celebrate in being recognized on the national level with other prestigious physics programs. Be confident that you are a member (or alumni) of a nationally-recognized program, a program of excellence and distinction. As I speak for all the faculty, it is a pleasure to call you our students, majors, advisees, and alumni. Please understand that we are always seeking to make the physics group a place of excellence in learning, teaching, and research"*

Using Statistics to Find Trends in Data: One Student's Experience with Kaggle

Michael Johnson is a junior Spanish and Math major at Roanoke College. He found an interesting website that has had a surprisingly large effect on his college career. He says, "Kaggle was kind of an accidental discovery for me. I was in STAT 302 and we were being taught how to use R alongside the normal material. I had never really done any programming before, so I knew the only way I was going to learn it was to sit down with it and figure it out. I stumbled upon Kaggle, searching for datasets to use with R and kind of got to see how everyone else was using it to solve these complex, layered, and sometimes vague/open-ended problems."

Michael learned that Kaggle hosts competitions. One that caught his eye was focused on using housing data from Zillow to predict home sale prices using more advanced regression techniques. Besides the main competition, there was also a more focused competition in which Kaggle would award \$500 to authors of quality kernels (aka scripts). Noting that the current submissions didn't seem all that involved, Michael thought that he could write something as good or better.

Michael simplified the massive dataset by looking at Virginia data from 2010 onwards. He created some nice visualizations in R and used linear regression to demonstrate a linear relationship between the number of days a home spent on Zillow and its median sales price. Michael liked his work but did not think it was very sophisticated: "Since it was simple linear regression, it was nowhere near the level of other posts and I posted it and kind of forgot about it. I was informed a few weeks later that my kernel was chosen as the winner for that week, and I didn't really believe it. But the money went into my bank account so I can confirm it was not a scam."

Asked about his future goals, Michael says, "I never really knew what I wanted to do with my math degree until I found Kaggle and stumbled into the data science field. My plan right now is to build my skills in statistics and programming with the eventual goal of becoming a data scientist. Grad school may be on the horizon, which I had never really thought about before either."

Congratulations, Michael! By trying to learn something new (how to program in R), he used some creativity and perseverance to predict house sale prices and change his life.



Michael Johnson

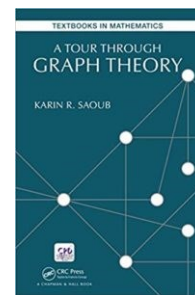
Making an Outstanding Choice



Dr. Karin Saoub

Karin Saoub's textbook *A Tour Through Graph Theory* was selected as an Outstanding Academic Title by *Choice* magazine for 2018. *Choice* is the trade magazine for academic libraries, and Outstanding Academic Titles are "must haves" for academic libraries. Congratulations to Karin!

Karin's editor Bob Ross writes, "This is a particularly impressive award, I believe, because the book did not target an established course market. You envisioned a text at a level where students could learn to appreciate graph theory and mathematics without the prerequisites required for the upper level course. This then confirms your creative approach and insight into what instructors and students might access to develop a greater interest in mathematics early in the curriculum. This is an impressive accomplishment in the textbook market, which tends to be very conservative in mathematics. It is recognition of an outstanding teaching idea and its successful execution."



Breaking News

The students, faculty, and programs in the MCSP Department are constantly growing. Here are some recent developments, starting with two students who are at the top!



Gabe Umland '19 has been named a Fulbright scholar. Of the 11,000 yearly applicants, fewer than 1,000 students and professionals nationwide earn this prestigious teaching/research award each year. With this award, Gabe will be teaching English in Indonesia for a year. Gabe is multitalented, with a Business Administration major with Marketing concentration and a minor in Mathematics. He works for the IT and resource development departments on campus, and is also a photographer for the PR department. He did a semester abroad in New Zealand and spent his 2018 summer in Istanbul, Turkey teaching English. We know that Gabe will do great work and enjoy the journey.

Anika Holzer '19 has been accepted into the Peace Corps. After graduating this May, Anika will start training for a two-year adventure in Tanzania teaching math. Anika's diverse talents are reflected by her major in Art History and minor in Mathematics and singing with Oriana, as well as a semester abroad in Ireland and a Washington semester as an intern for Search for Common Ground. We wish Anika the best and thank her for her commitment to making the world a better place.



Linnea Kremer '17 has been accepted into the University of Chicago Ph.D. program in Medical Physics. After graduating from Roanoke, Linnea went to the University of Nottingham for a Masters in Medical Physics (and to play some football). Linnea was a Physics major at Roanoke.

Taylor Ferebee '17 has been accepted into the Cornell Graduate Field of Computational Biology Ph.D. program. Taylor has been in the Masters program in Mathematical Sciences at Clemson University while working in a computational biology lab. Taylor was a Physics and Mathematics double major at Roanoke.

Morgan Elston '15 has received her Masters degree in Mathematical Sciences from Clemson University. Morgan was a Mathematics major at Roanoke.

Mathematics professor **Chris Lee** has been named one of three Teaching Scholars for Roanoke College. This is a new award for faculty researching evidence-based best teaching practices, as Chris has been doing with mastery-based teaching. Congratulations to Chris!

Actuarial Science at Roanoke College is on the map! The program, in only its second year, has been certified by the Society of Actuaries and is one of only two schools (joining George Mason's Masters program) in Virginia on the Universities and Colleges with Actuarial Programs (UCAP) list. Being on the UCAP list also puts us on the map of actuarial science programs at the Society of Actuaries website and is an important certification.

RC Exhibits in Baltimore

Roanoke College had a strong presence at the Joint Mathematics Meetings in Baltimore January 16-19. Professors Adam Childers, Dave Taylor, Hannah Robbins, and Roland Minton all gave talks. Maggie Rahmoeller completed a short course in the use of R in statistics. Hannah talked with various editors interested in her newly written linear algebra book. We all had quality time with friends and colleagues from around the country, and attended talks that gave us inspiration and new ideas.

This year the Exhibit Hall also included a booth manned by Dave and Adam, where they talked to interested people about their phone app, Classroom Stats. This app, attractively priced at \$0, takes clickers to the next statistical level, enabling quick and impromptu class surveys and data collection with immediate statistical analysis. Their talk on Classroom Stats was a big hit. Dave and Adam left the meeting with several great ideas to improve their product – some of which they had already implemented!

The Joint Meetings illustrate why it is important for faculty to get off campus. New ideas for Classroom Stats, Stat Crew, class assignments, teaching innovations such as mastery-based testing, and more all came from talking with colleagues. The Meetings enrich us and help spread the word about the energy and talents of Roanoke College faculty.



Dr. David Taylor and
Dr. Adam Childers

On Beyond RC

What happens when you graduate from Roanoke College? You might be surprised what there is to be found once you go beyond RC and start poking around. Five recent MCSP grads shared their graduate school journeys on Friday, November 9.



Taylor Ferebee, David Matheny, Thomas Lux, Damian Ream, and Anderson Lidz have a wide range of backgrounds and experiences, giving the audience good advice from several perspectives. Underlying themes were: (1) MCSP prepares you well for graduate school, (2) do your homework: find out about the professors and the work they do, and (3) be clear about what type of graduate program you want to enter: direct to Ph.D., Master's with option for Ph.D., or specialized Master's.

Each type of program was represented: Anderson did a 10-month Data Science degree that led directly to a job, Taylor is in a Master's program that will lead to a Ph.D. program, and Thomas went straight into a Ph.D. program. David is following yet another path, having gone into a job that will pay for his graduate education.

In some ways the application process is much like applying to undergraduate schools. There's a test to take (the GRE) and forms to fill out and essays to write. However, the stakes are higher and there are important differences. Opening conversations with recent graduates and professors is a great way to get ideas about the places that you would like to go.

Teachers of the Year

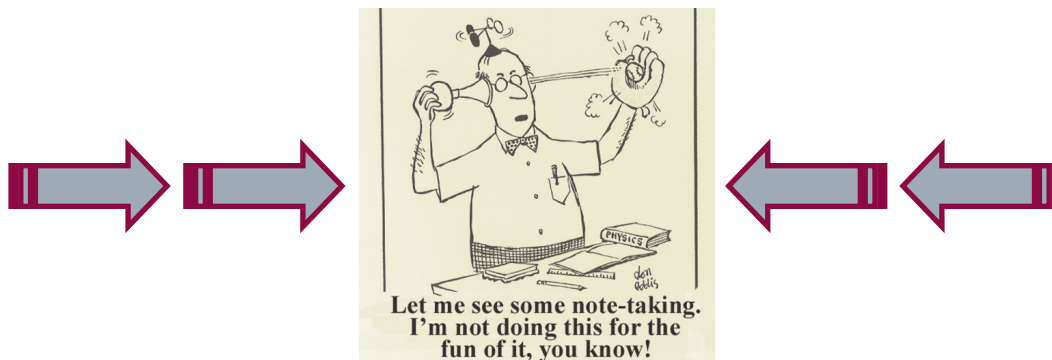


Blaire Conner (RC Math '08) has earned the first Fauquier County Public School's Superintendent's Innovator of the Year award. County School Superintendent David Jeck cited Blaire as "a teacher who demonstrates innovation, a true growth mindset, and a 21st century approach to instruction." Blaire teaches at Liberty High School and is known for fun activities in her courses. In Blaire's words, "Our students build catapults using popsicle sticks, clothespins, spoons, rubber bands, and tape. We then use those catapults to fling bright orange ping-pong balls. With a coordinate plane projected onto the wall, we use the slow motion video on our phones to record the ball in motion. Students then watch the video playback to record points the ball passed through on the coordinate plane. We then use these points to determine the equation of the quadratic curve of best fit that the ball traveled." Blaire was one of our favorites at Roanoke College due to her sense of humor and passion for excellence. She completed her mathematics major while raising her son Braden and coaching cheerleading at Salem High School. Focusing all that energy into the classroom produces an award-winning teacher, who will continue to improve. She says, "The world, and therefore our students, are constantly changing. We owe it to them to change with them and to do whatever we can to help them to reach their goals and to be successful." Congratulations, Blaire, and thanks for representing Roanoke College!

Susan Sine (RC Math '88) has earned the 2017 Roanoke County Educator of the Year award from the Salem-Roanoke County Chamber of Commerce. Theresa Hartley, the school division's mathematics coordinator, praised Sine's dedication to her students, along with her love of math and fun lessons. "Susan is an outstanding math teacher," Superintendent Greg Killough said in a news release. "She has helped countless numbers of students both in her classroom and beyond learn and excel in math." Susan (then Mayorshi before marrying fellow math major Ken Sine) was in some of the first classes I taught at Roanoke College. She is another of my favorite students as an upbeat presence who made everybody around her better. She has clearly retained those wonderful traits.



The faculty in MCSP are here because we love teaching, and it is a special pleasure to see our graduates share the passion for learning that makes great teachers. We especially pride ourselves and innovation and constant growth, and we are proud to see those qualities so perfectly exemplified by Blaire and Susan.



Fun with Physics and Life

I was saddened to learn that Dick Minnix died on November 28. Dick was a hero to me, and I suspect many others, and truly had a large positive effect on physics education.

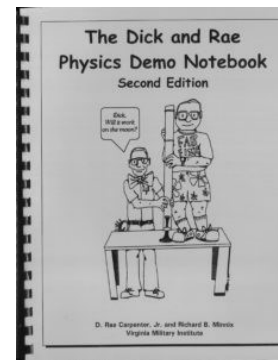


I first met Dick in California at a large conference for community college math professors. Dick was there as a keynote speaker and I was there to give a much smaller talk. Which is to say that we were not of equal status. Nonetheless, Dick spotted my nametag, introduced himself and we had a great time chatting. I was very glad that my talk was well before his, because the man put on a show! You can see one of his bits – spinning a glass of water without spilling a drop – online from a Facebook

post of Main Street Lexington titled “The ever-amazing Dick Minnix wowing the crowd at the Science Festival.” This shows Dick at 80 years young!

In California, one of his routines was based on mirrors and had him flying – you can see a very brief piece of this in the Roanoke College Medalist video for Rae Carpenter, at the 2:52 mark. It is wonderful! Minnix and Carpenter were both Roanoke College graduates who became physics professors at VMI, and their “Dick and Rae” shows entertained and inspired countless students and non-students. Their book *Dick and Rae Physics Demo Workbook* is a thick treasure trove of clever illustrations of physics principles. I bought the book after seeing Dick’s presentation of one of the projects that uses coffee filters to investigate the effects of air resistance. This idea was central to a very successful calculus lab we used at Roanoke. Who knows how many other great classroom experiences owe their existence to the innovative minds of Rae and Dick?

As a young mathematics teacher, I looked on one side and saw painful struggles with theoretical mathematics and then looked to another side and



saw Dick Minnix flying and doing loops with water. It was clear which side was having more fun, and which side students preferred. More importantly, it was clear that students were learning physics concepts while having fun. I have tried, not always very successfully, to bring as much Minnix magic into my mathematics classroom as I could.

I’m sure I speak for many others when I say thanks to Dick Minnix for making it fun!

Fuzzy Memories

Jeff Spielman died on Sunday, March 10. He was a longtime colleague and friend. We worked together at Roanoke College for 28 years. My sadness over his passing is a longstanding sadness, as the intelligent and funny man I worked with for so long had been lost in dementia for several years.

In happier times, Jeff arrived at Roanoke the same year I did. He was hired as the senior mathematician, I as the junior. He thought that was quite funny for a few years, then we got old enough that neither of us wanted any kind of “senior” label. Together we got math majors doing independent studies, we got grants to do technology workshops for local high school teachers, and we reshaped the mathematics curriculum. We spent way too much time talking about sports.

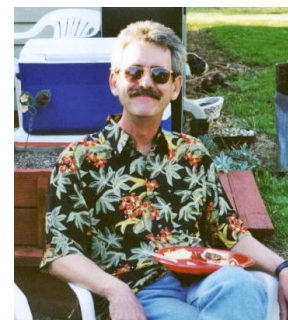


Jeff brought exploratory data analysis into our traditional statistics courses and helped design a successful statistics concentration. But I remember him best for his “Dr. Fuzzy” persona. His hair could get curly when he needed a haircut, but the reason for the nickname (to be honest, this was not widely used) was his work with fuzzy logic.

Back in the day, fuzzy logic was a hot new field used by various industries to solve difficult problems. Smart washing machines that responded to the amount of dirt in the water, control systems for ultrafast trains, and other complex systems were going to be transformed by fuzzy logic.

In fuzzy logic, a statement is not necessarily true or false. Each statement has a truth value. A statement like “Jeff loved the Pittsburgh Steelers” would have a truth value of 0.95 (almost completely true), while a statement like “The Steelers are lovable” might come in with a truth value of 0.1. The truth values are similar to probabilities, and make up the components of loosely phrased-common sense rules like “If you are approaching a turn at high speed then slow down.” The mathematics of combining statements with logical operators AND, OR, and NOT is consistent and produces good results. Jeff taught courses, supervised independent studies, and gave talks on fuzzy logic.

Unfortunately, the statement “Jeff had good health” would not have a large truth value. He battled epilepsy as a child, and blamed years of epilepsy medicine for his later cognitive difficulties. Early in his Roanoke career he went into the hospital with kidney problems. Plans to remove the infected kidney were abandoned when it was found that he had been born with just one. Jeff always found the humor in these difficult situations. It was sometimes disconcerting to hear him joke about such things, but in the end the truth value of “enjoy life while you can” has to be high. Keep smiling, Jeff.



Those Were the Days

I have found few advantages to being over 60 years old. I can play golf from the senior tees. I get the senior discount at McDonald's. I saw Jimi Hendrix in concert. That's about all.

Roanoke College math lecturer Claire Staniunas was hired by Ron Walpole. In RC history, Walpole has the star power of, say, Warren Buffet. Ron was the long-time chair of the department and was the author of the best-selling introductory statistics book in the U.S. He hired Claire to teach an evening statistics class in 1984. That gives Claire the longest RC employment record in the department.



Mrs. Claire Staniunas

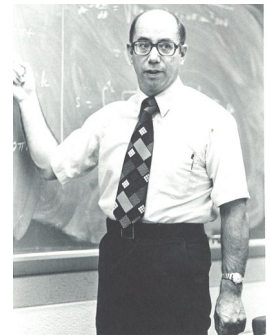
The teaching job has acquired a large layer of structural duties. Claire's syllabus from 1984 barely fills half a page. I wrote my "syllabus" on the board the first day of class. Current syllabi run 3-5 pages. When Claire taught her first class at RC, Walpole greeted her with his statistics book (on *loan*, and faithfully returned at the end of the semester) and a drawer in a desk for her "office" space.

At Roanoke College, introductory statistics courses were *hard*. Stat 101 used to account for more than 20% of the F's on campus. Math 103 (Elementary Functions) created another 10% of the F's. Students were expected to memorize the statistics or calculus formulas they needed. INQ 240 is a *very* different statistics course, with projects and technology giving much-needed aid to the students.

The department was much smaller in 1984. Interestingly, both Ron Walpole and Bill Ergle had PhD's in statistics. Ken Garren and Jane Ingram completed the big four faculty in math/stat, but by 1984 Ken had moved into the Dean's office (eventually becoming President of Lynchburg College). Sue Glass and Susan Smith were full-time teachers; both, by the way, were outstanding tennis players. Physicists Lee Anthony and Jerry Adams had moved on, leaving Bob Hudson to fend for himself. Ron Walpole died suddenly in 1985, leaving the mathematics program shorthanded. When I was hired in 1986, the department also hired mathematician Jeff Spielman, physicist Frank Munley, and computer scientist Patti Ollar. Almost half the department was new! Fortunately, MCSP is much more stable now.

Trexler was not new in 1984, but with fewer faculty there was more room. It wasn't *usable* room, though, as much of it was devoted to storage of machine parts and physics equipment. One of Claire's "office" assignments was at the end of a lab table, accessible only through careful navigation of stacked equipment. The room was kept very cold to keep condensation from raining onto the equipment. A later office was in a computer storage room, usable after shoveling off a space on a table. The rest of campus was not much better. Trout Hall was missing air conditioning and plumbing. A three-hour final exam could be a challenge on many levels.

Claire has weathered the cold offices, storage rooms, and various calamities with her usual good humor. Facilities have improved, paperwork has expanded, and students have changed, but Claire continues to provide the same great service to Roanoke College.



Dr. Ron Walpole

RC Math on the National Stage

Mathematicians in Denver, Colorado, recently experienced several examples of the enthusiasm and imagination that make mathematics at Roanoke College special. MathFest is a national meeting of the Mathematical Association of America, held this year in Denver from August 1-4. Five Roanoke College professors presented pedagogical innovations at the meeting.



Chris Lee is at the forefront of mastery-based testing. His talk "A Case Study in Implementation across a Mathematics Curriculum" was noteworthy for the careful data collection he has done as he has introduced mastery-based testing in all of his classes. Karin Saoub discussed results from her INQ 241 course in her talk "Critical Thinking and Writing Development through Project and Paper Scaffolding in a Liberal Arts Math Course." Dave Taylor and Adam Childers have been developing a data collection and analysis phone app, and presented its features in a poster session titled "Classroom Stats: Spice up Your Classroom with Fun, Live, Data Collection and Analysis." Maggie Rahmoeller discussed the development with Jan Minton of an innovative mathematics course for biology majors in her talk "Quantitative Biology: An Alternative to Calculus for Biology Majors."

Not to be left out of the summer fun, Hannah Robbins is writing a linear algebra textbook and Roland Minton is writing an article on his use of chaos theory in a freshman seminar class, and gave a talk at the Great Lakes Analytics in Sports Conference in June.

Roanoke College is blessed to have both the quantity and quality of classroom innovation represented by these presentations. The numerous Trexler hallway discussions that the math faculty conduct, reinforcing and improving each other's ideas, pay dividends for Roanoke faculty and our students.



An MCSP Canon



Hannah plays upright bass, Rich plays lead guitar, Melody, rhythm beat, melody, rhythm beat, MCSP stars.

MCSP faculty are active in a variety of ways, and music especially plays a large role in our interests. Hannah Robbins plays upright bass and sings in a band named Leftover Biscuits that plays “old-grass” music, a mix of bluegrass and old-time styles. Rich Grant was in a group named Buc9D9, consisting of a trio of Roanoke College professors. The band played rock and pop songs.

Shende’s tabla rolls, Maggie’s oboe soars, Melody, rhythm beat, melody, rhythm beat, MCSP scores



Anil Shende plays the tabla, an Indian rhythm instrument a little like a bongo. Anil can vary the pitch of his beat using hand pressure. Maggie Rahmoeller is an accomplished oboist who plays with the Valley Chamber Orchestra, accompanies the Roanoke College Choir and sits with various other groups.

Claire Staniunas is a mainstay of Our Lady of Nazareth’s choir, often singing solos and the verses in responsorial psalms. Jan Minton is in the Salem Presbyterian Church Handbell Choir, which plays regularly in church and performs occasionally in public.

Rama Bala sings Indian traditional music, often in a format known as a kriti. Carnatic music has a long history in the region where she grew up. Dan Robb has put Physics lyrics to rap music that he composed on his computer. This puts Physics in a fun context for his students.

Perhaps this impressive collection of musical talents is why our department is so harmonious. You may be tempted to think that music provides a relaxing change of pace from our technical disciplines, but that would ignore the strong connections between music and STEM fields. Both feature a focus on intricate patterns and an appreciation for small but important improvisations within a set of common rules. We don’t believe in the “Music of the Spheres” anymore, but music is definitely a part of the MCSP canon.

Bethlehem

In Agnes Handal’s hometown, Christmas season is a happy time with numerous parades and festivities. Musical groups called scouts come from miles around to march and play their drums and bagpipes, celebrating with local townfolk and tourists of various religious backgrounds.

Agnes, who is a junior actuarial science major at Roanoke College, showed pictures and videos of her home to a group at Salem Presbyterian Church. Her story becomes especially interesting when you realize that her family has been living in the same area for more than 500 years. They live in Bethlehem in Palestine.



Much of the political unrest that plagues this region seems to be set aside at Christmas, as Muslims join in the centuries-old traditions surrounding December 25 in Bethlehem. In this historic place, for a brief time each year, people converge to celebrate the past and create hope for the future.

Oh, The Words We Say!

Physics Faculty and their favorite phrases painted on mementos presented by senior class 2018; from left to right: Dr. Matt Fleenor “Tangent Unavoided”, Dr. Dan Robb “That deserves a Starburst”, Dr. Jarrett Lancaster “Sup”, and Dr. Rama Bala “It’s just algebra”



As faculty often do, we not only reflect on the impact we make on students’ learnings but also often wonder about what other things catch students’ attention. It turns out the ‘quirky’ phrases some of us use make a lasting impression more than we think.

“Tangent Unavoided” by Dr. Matt Fleenor

These shorts rants often entail some important application or some important piece of background information that currently adds to the topic at hand. While the short, impassioned diatribe may be viewed by students as unimportant, it most certainly is essential. This is especially true when I notice that one (or more) students have a rather confused (or bored) look on their faces. Nothing to rescue boredom or confusion like a “tangent unavoidable”.

“That deserves a Starburst” by Dr. Dan Robb

The story behind it is that several years ago (I think while teaching Electrodynamics in Fall ‘15) I decided to start rewarding especially good questions or especially insightful answers to questions I asked the class with a Starburst. The class definitely took to the idea, with some students aiming to earn Starbursts and other students actually deciding to turn them down because of a desire to pursue learning for its own sake and not a candy reward. They also came to decide as a group whether a certain question or answer was worthy of a Starburst or not — sometimes there was 30 seconds or so of debate about this!

“It’s just Algebra” – Dr. Rama Bala

This phrase came about in one of the upper level physics courses, specifically in quantum mechanics course. We were solving several complex wave function problems in that course. With so many mathematical expressions involved, I used the phrase “it is just Algebra” in order to alleviate the exasperation from solving those hard problems. While in the context of quantum mechanics this phrase has a mathematical connotation, it has deeper meaning for me.



Message from the Chair:

Welcome to this year's edition of the *MCSP Times*! We've got a vibrant and high-functioning group of faculty and students here, and we've been perhaps busier than ever. Four new faculty members settled into our department this fall. In computer science, Wale Sekoni became the newest tenure-track member of our department. Mathematics welcomed lecturer Roger Reakes with his many years of teaching experience in upstate New York, and physics had Evan Aguirre and Hiba Assi join us. Hiba brings experience in teaching from Washington & Lee University and Virginia Tech to our department, and Evan, straight out of graduate school, brought us an excitement for plasma physics. While Evan is leaving us after the year ends to take a post-doc position, we're happy that the other three will continue in 2019-2020 (and the chair was most excited to have a year free from hiring).

In terms of students, we're almost bursting at our seams in early-level classes; this past fall, we saw over 100 students in some version of Calculus 1 (in the recent past, numbers have been in the high 70s), we saw 75 students in the introductory computer science course (a new record as far as we can tell), and the introductory physics and engineering colloquium course hit 30 students again; we continue needing two lab sections for our major-level introductory physics!

This year, Dan Robb was on a full-year sabbatical as he researched material for, developed, and began writing a undergraduate-friendly thermal physics textbook, and Durell Bouchard took the spring semester off of teaching to create a subset of the Python programming language that could be used for introductory computer science classes to help bridge the difficulty gap in changing languages. Karin Saoub had a reduced teaching load due to a Faculty Research Year award, and that time was spent writing her second textbook on graph theory, targeted towards undergraduate mathematics majors. For next year, Rama Balasubramanian will be on a full-year sabbatical, Anil Shende will take a spring sabbatical, and Adam Childers has a Faculty Research Year award.

Overall, things continue to go very well for the Department of Mathematics, Computer Science, and Physics, and we are looking very forward to the future. As always, I wish the best for you, your families, and your friends for the coming year!



Dr. David Taylor

Stairwell to Heaven

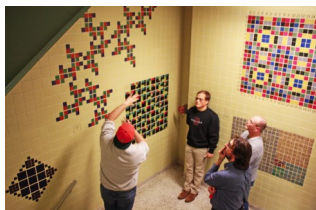
There is a big surprise waiting for new users of the east Trexler stairwell between the second and third floors: it looks great! Jan Minton's HNRS 241 Mathematics and Art class took on the project as part of their community engagement activity. The "grand opening" featured tea, cookies forming an M.C. Escher tiling (note the 3D-printed cookie cutter in the foreground), and guided tours of the installations.



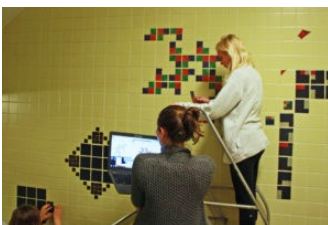
Five displays augment the "mod 9" table done by a previous iteration of the course. Shannon Baker and Olivia Long explain the multiplication of colors, having previously shown off their *Fibonacci Squares to Golden Rectangles* spiral seen below.



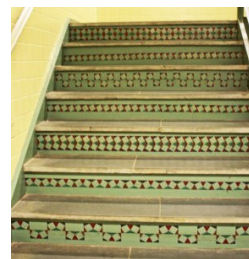
Nathan Price and Sam McKnight created a colorful Cayley Table illustrating symmetries of the square and combinations of those symmetries. A staple of abstract algebra, the Cayley Table is given an attractive presentation here.



The finished product takes advantage of the square tiling of the stairwell walls and printed labels that stick nicely to the tiles. Sadie Klam and Elizabeth Knudsen carefully consulted their computer model before attaching the pieces of their *Iterations: Block Stacking*. You can see the Cayley Table under construction as well as one of the iterations of Liam Courtney and Sam Richardson's *Koch Snowflake Squared*.



Gwyn Herndon and Drew Luther made sure that the stairs themselves were decorated. Pythagorean triangles are arranged to illustrate each of the seven border patterns to help you contemplate symmetry as you take yourself to the next level.



Thanks to HNRS 241, the drab transition from floor to floor in Trexler has become much more interesting and attractive.

