Volume 7, Issue 1 April 2017

THE MCSP TIMES

ROANOKE COLLEGE
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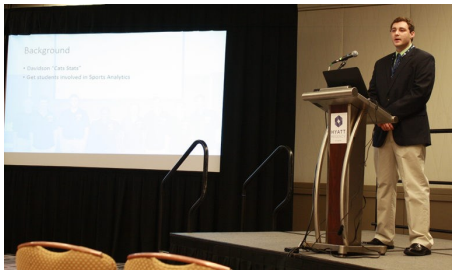
Stat Crew Breaks Through

The fans in Roanoke College's spectacular new Cregger Center are getting loud as the Maroons hit three-pointers and make defensive stops. Up high in the stands, a couple of students are busily clicking on their laptops. They are with Stat Crew, a group of students who collect and analyze data for many of the Roanoke College sports teams. The Crew started in fall 2015 with seven members, and has added members and an impressive list of accomplishments. The students have a variety of majors and ages, but share a love of sports and a commitment to excellence. Here are some of the Crew members with strong MCSP ties.



David Moreau is a sophomore physics major, a member of RC's golf team, and a founding member of Stat Crew. He has presented research on golf statistics at the 2016 Carolina Sports Analytics Meeting (CSAM) in South Carolina. At the Joint Mathematics Meetings in Atlanta in January 2017, he introduced a national group of math and sports researchers to the Stat Crew. He says, "Roanoke has some immense opportunities for people willing to put in the work for them. As a sophomore undergraduate student, I presented at the biggest math meeting in the world."

Zach Rodgers is a junior computer science major who is analyzing basketball shot chart data to test the hypothesis that righthanders shoot more accurately from the left side of the court and lefthanders shoot better from the right. He is gaining valuable research experience while exploring an interesting question. He is a member of the "research division" of Stat Crew.

Rooney and Maria (seated)

Maria Kuchenbuch is a senior mathematics major. She joined the Crew for the 2016-17 basketball seasons and did much of the data collection for the halftime stats that were displayed on the Cregger Center's big scoreboard. She enjoys applying her statistics concentration to campus athletics, and says that the analytics gives her "another way of looking at the sports."

Taylor Ferebee is a senior mathematics and physics double major and Connor Sampson is a senior physics major. Both are founding Crew members. Taylor presented research at CSAM on analyzing soccer passing graphs. A casual conversation with one of the other presenters turned into summer internships for Taylor and Connor with the Atlanta Blaze team in Major League Lacrosse. Although she was unable to attend, Taylor's research was accepted at Cascadia Symposium on Statistics in Sport in Vancouver, Canada.

Joey Miller is a junior physics major and a member of RC's men's basketball team. Another founding Stat Crew member, Joey has been active in his athletic "off season" collecting data for men's and women's soccer and lacrosse games. He has attended CSAM twice.

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Sky Weber is an honorary Stat Crew member. Sky is a senior mathematics major who had a summer internship with the Cape Cod Baseball League. She is adapting major league baseball statistical analytics to ODAC baseball. Doing analytics has made baseball more enjoyable for her, giving her some "mind exercise" while watching games. Both Sky and Maria are interested in a career in sports analytics.

Sky, Abby Hobby, Connor, Taylor

In less than two years, Stat Crew students have successfully presented research at regional and national meetings, and secured internships with professional sports teams. As David says, "I think all of us in the Stat Crew really wanted to invest our time to make sure we were doing something meaningful for the college." The coaches on the receiving end of Stat Crew work are very appreciative of their hard work and their contributions to Roanoke College athletics .

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Faculty Profile: Dr. Maggie Rahmoeller

Maggie Is Here!

The importance of just *being there* is often underestimated. Maggie Rahmoeller* says that her life trajectory is not the result of a rigidly followed long-term plan but the by-product of being in the right place for new opportunities. This is not to say that Maggie is like the character Chance in Jerzy Kosinski's *Being There*. Maggie has seized her opportunities and made them great.

An early example came when deciding which instrument to play in sixth grade band. Her mom overruled trumpet and drums as being too noisy, so Maggie ended up on the oboe. (Mom surely regretted this choice a few weeks into the tortured goose honking phase of oboe novices!) Maggie slowly progressed from miming in band practice to actually playing notes to being an accomplished oboist who has accompanied the Roanoke College Choir and numerous other music groups.

Her career in math similarly started with a small spark of liking math, to telling people she wanted to do "math for a business" (she still has no idea what she meant by this) to a major at McKendree University near her home town of Webster Groves, Missouri. A summer REU at Miami University seemed to point to graduate school, but a summer internship pointed to industry. While in San Francisco presenting a poster of her REU work at the Joint Mathematics Meetings, she passed some time talking with a friendly professor from North Carolina State. This resulted in an opportunity to go there for graduate school, where she got a Ph.D. in mathematics. But that path also had some twists and turns, as her initial choice of mathematical focus had to be quickly changed. She then found a great topic and potential research advisor, who promptly retired. The third time was the charm, as she found a topic (Lie representation theory) that plays off of her love of linear algebra. Maggie summarizes this journey as "something happens, then you take the opportunity and find something that you really like."

Her journey to Roanoke College was less random. The first round of interviews in this process is a brief 20-minute conversation at the Joint Mathematics Meetings. Maggie talked with Dave Taylor and Adam Childers at the end of a long day. Dave and Adam were tired and their façade of mature professionalism had worn off, leaving a bickering-brothers style banter that charmed Maggie. She wanted to work with people who are excellent at their jobs and clearly enjoy each other's company. She "happened" to be at Adam's pedagogical talk the next day (she does not object to the word "stalking" here), which by being there gave her important ideas for her future INQ 240 class. The job offer was for a one-year position, which her NC State advisor suggested would be too risky, but Maggie felt that the worst case was that she would learn a lot from some "cool guys" and gain valuable experience.

The one-year position turned into a two-year position, and then this year became the tenure track position that Maggie is in. But that description ignores the national search that MCSP conducted, which turned up some very strong candidates. And it ignores the reasons why Maggie was chosen: the excellent teaching she did with a very heavy teaching load, including the creation of three new courses (INQ 240 and INQ 300 sections, plus a new and ambitious Quantitative Biology course co-designed and co-taught with Jan Minton); her energetic leadership of the Math Club; her mentoring of students at all levels, leading to three independent studies this spring and a graduating senior in 2016 whose parting advice for the department was "hire Maggie!"

Maggie has seized this opportunity at Roanoke College. She characterizes her colleagues as fun, smart, and hard-working which are some of the ways we would describe her. We are glad that Maggie is here!

* Pronunciation guide: RAH (a cheer for Maggie) plus a muttered "muller."

Material Outreach

Excellence in the classroom and outreach to the community are two important characteristics of the Roanoke College mission. It would be hard to find two students who embody these traits more than senior Physics majors Josh Carr and Hanna Lyle.

Josh and Hanna came to RC with different mindsets. Hanna grew up in Martinsville, and chose the friendly community at Roanoke over the more competitive environment at Davidson. Josh is Salem born and bred, and for financial reasons only applied to Roanoke. He anticipated transferring elsewhere to pursue an engineering degree; after committing to staying, he applied himself to classes and classmates and loved it. Hanna's big decision was dropping the Honors program. She loved the Honors community but had scheduling issues fitting Honors classes around a double major in Physics and Chemistry.

The Physics major has given them far more than just technical knowledge. Hanna fell in love with the problem solving focus of the discipline and the Roanoke faculty. Josh appreciates learning about the why as well as the how of life's processes. Both comment on the importance of being able to communicate concepts and relationships to different disciplines. This recognition gives them a different perspective on general education classes from some students. They appreciate the time and creativity that the faculty bring to INQ and Honors courses. Hanna cites an Ethics and Marriage class as a freshman and Math and Art as special opportunities for learning. Josh's classes on Science/Myths/Magic and Gun Control felt like they were made for him. Josh is a talented amateur card magician.

Communication is fundamental to the outreach work that each has done. Hanna is outreach coordinator for the chemistry and physics clubs. She organizes after school classes in elementary schools on topics like engine combustion and polymers. A very popular activity utilized a trebuchet that Josh had helped build. They have also done STEM nights in elementary schools, churches, and Girl Scouts troops. Josh was active in Young Life in middle and high school. That was brought full circle at Roanoke when he became the Young Life leader at Andrew Lewis Middle School.

To round out their undergraduate education, Hanna and Josh have been busy in the summer. Hanna has had summer internships with Eastman Chemical Company, and Josh had a physics REU at Georgetown University. They took the same May term class in Germany, a fortunate choice since they had started dating shortly before. That choice reflects a wide range of common interests they have found, the most important being an approach to life that focuses on learning and helping others.

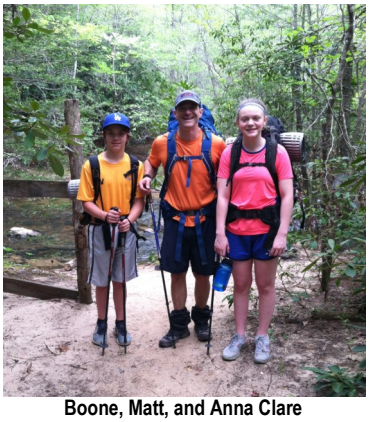
Their next challenge is graduate school in materials science. This new field gives them a chance to utilize their interdisciplinary skills in physics, chemistry, and engineering. As of this writing, they are likely to head west to Montana State or Colorado. Hanna anticipates ending up in industry, where you can clearly see results. Josh is interested in teaching or becoming a "scientific lobbyist" informing scientific policy. In both ways, they could help further the environmental sustainability causes that interest them. And so Josh and Hanna's outreach takes them into the larger world in which liberal arts graduates make their marks.

Why science teachers should not be given playground duty.

AT The Top

A journey of 2190 miles through 14 states, over a time span of 22 years. For Matt Fleenor, hiking the Appalachian Trail evolved from a chilly spring break trek to an important life goal involving family, students, and friends.

Matt first started on the AT in 1994 with a friend from the University of Tennessee. They did 55 miles in Shenandoah, and were not prepared for the cold weather at 4,000 feet in the mountains. Wearing socks for gloves and shirts for headgear only helped so much. Other casual hikes followed as Matt worked through graduate school and started a family. After coming to Roanoke College in 2006, regular hikes with Young Life fueled a new appreciation of hiking. The combination of the meditative aspects of walking, the sense of accomplishment in reaching a destination, and the proximity of the Appalachian Trail hooked Matt.



Boone, Matt, and Anna Clare

By 2010, the idea of completing the AT had taken hold. It would not be easy. Family and work commitments limited him to about 200 carefully planned miles a year, spread out from Maine to Georgia. Weather is uncertain, and life intrudes in the form of various positive distractions and negative disappointments (the death of Kevin Hartley still weighs heavily). While it would have been easier to say "that's enough" and stop, Matt began to see the AT as a personal challenge that he needed to meet for himself and his children. There is value in finishing what you start, and this value is being eroded by the fast and disruptive pace of modern life.

Matt's growing love of hiking led him to create classes for HHP and May term. This, in turn, created a support group for his quest. He estimates that 30 percent of his walking was with friends, including students. His May term class was cheering him on as he reached the Georgia terminus of the AT. Two of the three Fleenor children, Anna Clare and Boone, joined him for sections of the AT in Tennessee and North Carolina, and Matt's parents contributed rides to and from the trail along with two significant miles of hiking. The entire family joined Matt for the completion of the AT at Katahdin, Maine in August of 2016 to highlight an eventful summer vacation in New England.

Matt with RC grads Andrew Feeney and Eric Kessler. Feeney was a founding Stat Crew member and hiked the AT in 2016.

Even as a section hiker, "Humble Pi" (his trail name) felt the camaraderie of AT hikers. You might see someone briefly on day 4 of a hike and not again until day 37, but that person would remember you and return the spoon that you had left at the day 4 shelter. An important part of the AT culture is summarized by the phrase "hike your own hike" which acknowledges the different motivations, walking paces, and personalities of people on the trail. This is one of many AT lessons that Matt tries to pass on to his children and students.

The scariest animal encounters on his journey were the wild boar that he startled rounding a corner and the Virginia rattlesnakes that noisily threatened an imminent strike. However, the scariest event was a slip in New Hampshire that his heavy backpack spun into a violent fall and head crack on a rock. After several anxious minutes, it was apparent that he had neither broken bones nor a concussion.

What's next for Matt? He has been eyeing maps of the Pacific Crest Trail, wanting to get to know the terrain and history of the West Coast in the same way he has experienced the East Coast. Whether that happens or not, he will be talking with his children and students about the lessons of persistence and focus on process that hiking provides.

Blogging Down

We're on the web!
mcsp.pages.roanoke.edu

The MCSP blog at mcsp.pages.roanoke.edu has timely updates on activities of department faculty and students. This year we have squealed about Maggie Rahmoeller getting pigged, sung about connections to the Roanoke College choir, and given the 411 on sports numbers. Here are four other stories from our blog.

Buon Viaggio

May 2016 graduates Maya Shende, Randall Pittman, and Thomas Lux presented their senior research at the Workshop on Big Data Analytics, a part of the ACM International Conference on Computing Frontiers … held in Como, Italy! They used machine learning techniques to explore Admissions data, focusing on which variables are most correlated with enrollment at Roanoke. In a challenging recruiting environment, this gives Roanoke College Admissions a competitive advantage, and got three students a molto bene trip!

Childers Victorious

Adam Childers received the Dexter C. Whittinghill III Award for the most outstanding contributed paper in statistics education, as voted by the Statistics Education special interest group of the Mathematical Association of America. Adam's award-winning talk "Facebook Consulting: a Semester-Long Project for Introductory Statistics" was based on the course project in his Honors 240 class. Students analyze a company's Facebook page activity, looking for patterns in shares, likes and so on based on time of day or day of week. A paper on this work will appear soon in the mathematics journal *PRIMUS*.

Poe Physics Majors

Physics majors Luke Poore and April Raab continued a tradition of MCSP theater participation. Both have done multiple productions, as has computer science major Kimi Halverson. Luke was a lead actor and April the stage manager for "Nightfall with Edgar Allen Poe" which dramatizes Poe's most famous works. Luke also plays in the band Flaky Biscuits with his dad Mark and math professor Hannah Robbins. Physics majors have well developed creative abilities! Luke has been recovering from a broken leg – perhaps he took the old theater expression literally? Both had summer internships , Luke in engineering locally at Dressler-Rand, and April in an REU at Rensselaer Polytechnic Institute in New York.

All Square

Square used to mean "boring" but Jan Minton's Honors class Math and Art found out otherwise while researching their class projects. Certainly "beautiful" and "delicious" are better descriptions of the cookies decorated by the class. Inspired by the artwork of M.C. Escher, the cookies form a tiling that is based on a simple square tiling (focus on the arrangement of cookies at the center of the picture). Student projects included a Pythagorean tree and graceful curved shapes that are squares in hyperbolic geometry; they are on display in the Honors classroom in New Hall. Creativity and beauty arise from the humble square!

Alumnus Profile: James Pennix

Social Mathematics

James "JP" Pennix, Dean of Admissions at Radford University, pauses each spring to mentally match the graduates with his image of them when they first enrolled. The personal growth he sees, showing the impact he and his school have had on their lives, "means the world to me."

You might not think that JP's undergraduate degree in Mathematics and Master's degree in Social Work would combine as perfect preparation for a career, but he uses skills from both degrees every day. The Admissions challenge is to accurately predict how many teenagers will eventually choose to go to Radford; mathematical and statistical techniques are essential here. Discussions with high school administrators and the creation of policies that benefit underserved communities are social work. JP's background serves him well.

JP grew up in Madison Heights, Virginia, the youngest of eight children. He was always strong in mathematics, but he needed special counseling from his high school calculus teacher, Mrs. Shreve, to not drop the class after a rough start. He not only persevered, he earned an A. As a math major at Roanoke College, he was similarly uncertain of his talents: "I was always asking questions in class and then following the professors back to their offices to ask more questions." This was his route to success, and one that he tries to help Radford students find.

Pennix was a star basketball player, leading the Maroons to three ODAC championships, with the team ranked as highly as #5 after a win at Division 1 VMI. He was active in student government as the President of the Black Student Alliance. But it was in his job delivering the campus mail that he got to know President and Mrs. Fintel. Like most people who come in contact with JP, they became good friends.

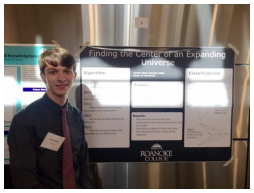
After graduation, JP spent ten years in sales in the DC area. He came back to Roanoke to get his Master's at Radford while being an assistant basketball coach at Roanoke. Mike Maxey, then Dean of Admissions at RC, talked him into giving Admissions work a shot. JP brought his mathematical analytical skills to bear, with spreadsheets of yield rates from high schools and new tools such as a predicted grade average formula. A three-year tryout turned into twelve years at Roanoke and then the Dean of Admissions post at Radford in 2010. JP lives in Salem with his wife Lisa and boys Jamie and Jordan (son Damian is in college).

Admissions work is challenging, as the student marketplace has become quite volatile. But JP has found his calling. He is passionate about his opportunities to help young people find their way. As the first in his family to graduate from college, he has a special affinity for the underserved populations of college-bound students. His approach to his work can be summed up in one of his favorite MLK quotes, "Intelligence plus Character - that is the goal of true education." And so the mathematics major with the social work degree continues to analyze the data, make strong connections with people, and find ways to improve the world through higher education.

In the News: Find out more about the following MCSP stories at www.roanoke.edu

Dave Taylor and policy research in *Roanoke Magazine 2016*

Morgan Heckman and Rae Galatas in *MCSP Blog*



Christian Moore's summer research in *RC Research Blog*

Linnea Kremer's family RC ties in *Meet the Maroons*

MCSP News

The MCSP faculty teaches a variety of courses from our major courses to INQ and Honors courses. Then there are other courses you might not expect, such as Matt Fleenor's hiking course (see page 4) or the following.

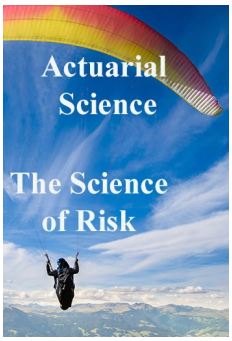
Goodshende and Badminton

If your image of badminton is from a family picnic with cousins lazily batting the "birdie" around, attend one of Anil Shende's badminton classes at Roanoke College. But watch out for students smashing overheads and diving for short shots. The fastest sport on earth (shuttle speeds have been measured at over 250 miles per hour!) is highly competitive and strategic. The variety of shots that you can play make it a cerebral sport, but also one that can be strenuous workout. The picture shows computer science major Connor Ricks smashing one (see the blur in the highlighted circle) directly at his opponent for a winner. This pleases Professor Shende, if not opponent Shende. You have to bring it in this sport!

Durell and other Personnel

Congratulations to Computer Science Associate Professor Durell Bouchard, Physics Associate Professor Dan Robb, and Mathematics Associate Professor Hannah Robbins on being awarded tenure! And an extended welcome to not-so-newcomers Maggie Rahmoeller and Jarrett Lancaster. Maggie has been hired as an Assistant Professor of Mathematics after two years as a visiting professor. Jarrett has agreed to return for a second year as a Visiting Assistant Professor of Physics. We look forward to the excellent work that all of these young faculty members will provide!

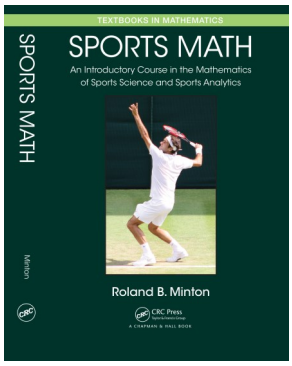
Love Actuary



Roanoke College has become the first college in Virginia to offer an actuarial science major. Actuarial science is the science of risk, blending aspects of mathematics, statistics, business, and economics. Actuaries have traditionally worked for insurance companies calculating expected payouts and helping to set premiums. Health providers and financial institutions increasingly hire actuaries to help them predict the future costs and benefits that determine financial viability. The actuary profession is often rated as the best profession in terms of salary, stability, work conditions, and opportunities for advancement. The addition of an actuarial science major gives Roanoke College students an entry into this exciting profession.

Sports Math Myths

Roland Minton's new textbook *Sports Math* is an introduction to both sports science (the physics of sports) and sports analytics (the analysis of sports statistics). One chapter in the book does some myth-busting on sports. Did you know that it is physically impossible to keep your eye on the ball? That soccer referees and baseball umpires must overcome cognitive illusions in the human brain to make correct calls? That Roanoke College softball pitcher Kelly Higbie would have easily struck out baseball great Barry Bonds at the peak of his career? Get the book and find out why!



Message from the Chair:

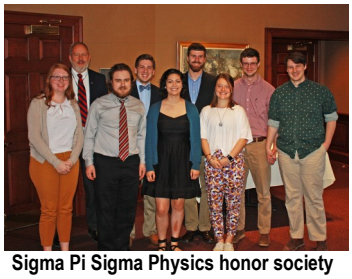
Welcome to this year's edition of the *MCSP Times*! There are a lot of exciting things going on in our department. Our visiting mathematics faculty member, Dr. Margaret Rahmoeller, was hired into our tenure-track opening this year, so she will be with us for a long, long time! Last spring we hired Dr. Jarrett Lancaster into our visiting physics position, and he has fit in extremely well; so well, in fact, he's sticking around for the 2017-2018. Both faculty members have brought enthusiasm for their disciplines to the college and to the classroom, and both have already taken on independent study research projects with students. Most importantly, they have each contributed to a positive feeling in the MCSP community. While our new Actuarial Science major began this past fall, full rollout begins next year, so the number of students in our department will be increasing (and it has already been increasing over the last 4 years). In some very new and exciting things, three computer science students (Thomas Lux, Randall Pittman, and Maya Shende) presented their machine learning research at an international computer science conference in Italy last summer, mathematics faculty Jan Minton and Maggie Rahmoeller very successfully team taught both sections of Quantitative Biology this year, and next year our Fundamental Physics course and Physics for Life Science course will have a shared lab for the first time, bringing students with varied non-physics interests together to learn and share some of those interests as they relate to physics. 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!

The Year in Pictures

A New Idea Takes Flight

Pi Day "winners" Scotty Smith and Adam Childers receive their just desserts from President Maxey. They raised $251 for charity.

A wave of congratulations to Susan Sine (RC '87), Roanoke County Educator of the Year



Sigma Pi Sigma Physics honor society

Upsilon Pi Epsilon Computer Science honor society

Pi Mu Epsilon Mathematical honor society