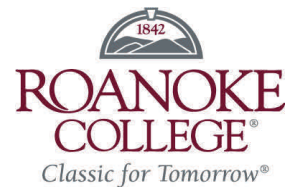


THE MCSP TIMES



Maroon Academics: Clutch



Kat, Ed, Jared and brownies

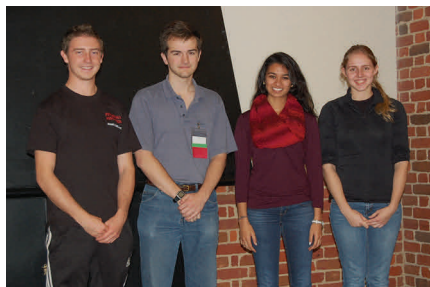
MCSP students are competitive. While it is unlikely that they will be on ESPN anytime soon, several notable successes have elevated the profiles of our students and programs.

The Mathematical Contest in Modeling is an international competition of three-person teams working for three days on open-ended problems. The 2013 team of Ed Hrinia, Jared Meadows and Kat Jansen designed the “optimal brownie pan.” They took into account uniformity of baking (no hard edges or soft middles!) and ability to fit multiple pans into an oven. Not content with a half-baked theoretical solution, the team tested ovens and pans for temperature distributions; lab work can be fun! What did they conclude is the ideal shape? This was far less important to the judges than their process; it is a modeling contest. (FYI, the team’s 28-page report praised the hexagonal pan.) The team’s process was impressive enough to earn a Meritorious rating, placing them in the top 1% of the 5636 teams. This is the third straight year that a Roanoke College team placed in the top 1% in this competition, a feat which no other school in Virginia can claim!



Jon, Heather, Reem, Morgan and Jared

The Southeastern Region of the Consortium for Computing Sciences in Colleges conducts a student programming contest at its annual meeting. The team of Thomas Lux, Randall Pittman, Maya Shende and Natalie Wilkinson placed third out of thirty teams. In this competition, teams are given eight problems to solve in three hours. Solutions require strong and quick analysis of the problem as well as solid programming skills. The Roanoke College team, consisting of all sophomores, solved five problems and had a near miss on a sixth. A different form of competition at this meeting was the student research competition. From the research paper entries, the top ten advanced to a poster competition, from which the top five advanced to oral presentations, from which the winners emerged. In first place was the Roanoke College duo of Randall Pittman and Thomas Lux, with Maya Shende second and John Guidry fourth. Maroon dominance! All of these projects were funded by the department for summer 2013 research.



Thomas, Randall, Maya and Natalie

The Maryland-DC-Virginia section of the Mathematical Association of America stages student competitions at its spring meeting. Roanoke College claimed two prizes at the 2013 meeting. Heather Cook, Jon Marino, Reem Zeidan, Jared Meadows and Morgan Elston won both the Radical Dash and Math Jeopardy competitions.

We are very proud of these student accomplishments. However, just as in athletics the true benefit of competition is in the prepa-



Jeopardy and Radical Dash Trophies

ration and the act of competing, regardless of final ranking. Among the other students to put themselves on the line and reap these benefits are Taylor Ferebee, Brandon Peterson and Jared Thomas, who competed in the 2013 University Physics Competition. Heather Cook, Jon Marino, Sam Parsons and Natalie Wilkinson competed in the 2013 Putnam Mathematics Competition. Thomas Lux, Randall Pittman and Natalie Wilkinson competed in the 2014 Mercer University Programming Contest. Congratulations to all of our outstanding, competitive students!

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Message from the Chair: Dr. David Taylor



This is my first “message” as chairperson of the Mathematics, Computer Science, and Physics Department. Since taking over after Dr. Roland Minton’s term as chair ended in December, I’ve discovered and realized how much work it can be; managing the day-to-day operations while keeping a long-term direction for the department in mind is a huge task, but I’m determined to take an already excellent department that I have loved for over six years and help it grow to something even greater. We’ve already started visiting each other’s classes to find new ideas to improve the already high-level of teaching in our disciplines, and I’m happy that our students have been performing at higher and higher levels inside and outside of the classroom. I’m excited to lead our department, and I always welcome suggestions from our students, colleagues, and alumni about things we can do to make the MCSP Department even better. Stop by and visit or shoot me an email with your thoughts, and I wish you, your families, and your friends the best for the coming year!

Faculty Profile: Dr. Dan Robb

Sometimes a new faculty member’s transition into the job is like a novice driver’s first time with a stick shift. The timing with the clutch pedal is not right, there is a lot of gear-grinding, the engine gets killed a few times, and the progress from point A to point B bumps along in fits and starts. With new Roanoke College Physics professor Dan Robb, the transition has been like a smooth shift into fifth gear on the auto-bahn.

Of course, Dan is not really a new faculty member. He had four successful years at Berry College before coming to Roanoke. The transition was further smoothed by the fact that he had developed a teaching style emphasizing active learning that is very much in phase with the other members of the Physics Group at Roanoke.

Dan grew up in Delaware. His grandfather was a Ph.D. chemist who worked for Dupont, and was an early inspiration for Dan. He went to Williams College, perhaps the premier liberal arts college in the country. He earned his own Ph.D. from the University of Texas at Austin in Physics, and then went on to two postdocs, during which he focused on research. He knew he wanted to end up at a school that had significant teaching expectations while supporting student research. He found good matches at first Berry and now Roanoke.



An important product of his postdoc at Florida State is his wife Natalia. After meeting her at a party, he nervously invited her, at the last minute, to join him and other students going to a restaurant. He took it as an encouraging sign when she showed up. The relationship flourished, and after stops in upstate New York and Atlanta they have a home in southwest Virginia. Natalia is a computational neuroscientist at Washington & Lee. By the way, Dan later found out that Natalia was already going to the restaurant before his invitation.

Dan is a computational physicist, bringing modeling skills that nicely complement the rest of the department at Roanoke. In the summer after his first year, he supervised a

research project by Maya Shende on “Computational Modeling of the pre-Böttinger Complex.” This foray into computational neuroscience indicates Dan’s commitment to student research and his wide-ranging interdisciplinary approach to research.

Dan has a thoughtful approach to teaching. While acknowledging that Physics is a challenging discipline, he believes that a combination of active learning techniques and community building can minimize the attrition that plagues technical disciplines nationwide. He has definite ideas on the best ways to help students learn, but cautions that students need to hear the rationale for these methods. A strong sense of community is also needed so that students feel supported and not isolated. This is not just theory: the Physics program has shown impressive growth in the last few years.

Dan Robb has made a smooth and successful transition into the Physics Group at Roanoke College. The road ahead looks to be clear for an outstanding career.

Student Profiles: Heather Cook and Jon Marino

This story combines many of the elements that make Roanoke College and MCSP special. It is a story about academic excellence. It is a story about opportunities seized. It is a story of friendship, between Heather Cook and Jon Marino.

The mathematics faculty sometimes think of them as HeatherJon, or perhaps it's Jon-Heather. After all, they have been in the same class at least once in each of their eight semesters at Roanoke. They have been officers of the Math Club and Pi Mu Epsilon honor society. They have gone to mathematics meetings, both regional and national, together. They anchored the first place Math Jeopardy team at the 2013 Mathematics Association of America regional meeting. They both gave talks at MathFest 2013 in Hartford, Connecticut. They have competed together in various mathematical contests. They gave a joint MCSP Conversation Series talk on their research in 2014.

Yet, Heather and Jon are often opposite sides of the same coin, complementary rather than identical. Heather is from out-of-state (Marshall, Illinois; she came to Roanoke partly because "they wouldn't leave me alone") and Jon is from the Roanoke Valley. Heather is interested in applied mathematics while Jon is interested in pure mathematics. This means that their favorite math classes are different (applied differential equations for Heather, geometry for Jon) and their future mathematical directions are different. Heather will enter the Ph.D. program in statistics at the University of Virginia. Jon is still deciding among the pure mathematics graduate programs at Virginia Tech, Arizona State and Florida State.



While Heather and Jon have excelled in the classroom, the most impressive credentials on their resumes are research and professional presentations. Heather has done research on Blackjack Switch probabilities (with Dr. Taylor), Zombie Dice probabilities (Dr. Taylor again), and a statistical analysis of data from the Lafayette River (with Dr. Childers). Jon has looked at graph theoretical properties of Twitter networks (with Dr. Saoub) and proved some results about properties of compositions arising from a Blackjack problem (with Dr. Taylor).

They will be going to Portland, Oregon, this summer to MathFest to talk about their research. This will be Heather's third national talk and Jon's second. They both admit to being intimidated their first time on the national stage, but have overcome the nerves enough to enjoy being the experts on a topic. While they realize that their research is on a par with most other student presenters, they have encountered some skepticism related to the relationship of the research to games. They both find that the real world connection makes the research more enjoyable for listeners and easier to talk about. They are quite firm about the work not being easy, but find it easier to fight through the many details because the problems are interesting.

Academic excellence, providing opportunities to travel, leading to strong graduate school programs; and all with a friend who is going through the same experience: it has been a good four years for Heather and Jon.



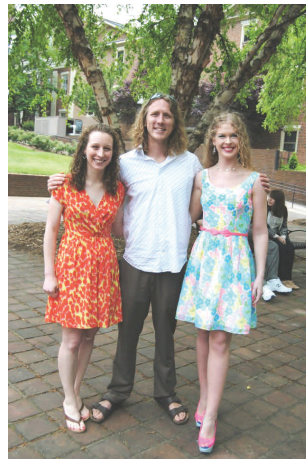


Our Media Stars

They say that everybody gets 15 minutes of fame. In MCSP, it seems that our 15 minutes has been occurring for very small values of 15. Nevertheless, a couple of short TV spots put us in the news in 2013. WLSL (NBC) had a running Pi Day theme on their morning talk show. Dave Taylor was interviewed about the Math Club's tradition of pie-ing professors for charity, and π trivia was sprinkled throughout the show. WDBJ (CBS) did a preview of the Roanoke Valley Reef opening in February. Jan Minton spoke about the reef during this spot. On the radio, Roland Minton was interviewed for a WVTF (NPR) story about his book *Golf By the Numbers*. Chris Lee appeared in print in several places with his wife Christina and dog Nitro in pieces about their webservice Deaf Dogs Rock.

MCSP Salutes the Class of 2013

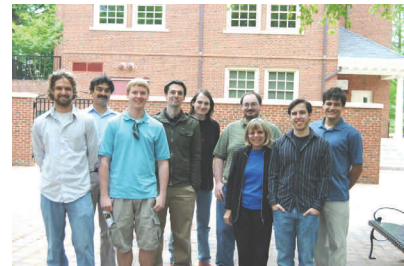
We faculty view graduation with a mixture of pride and regret (mostly) that we will not see the graduates as often. The class of 2013 was an especially large and good one in MCSP. The college had an interesting GPA situation that resulted in co-valedictorians and three salutatorians. One of the co-valedictorians, Jeremy Johnson, was a Math minor, and all three salutatorians are MCSP people! From the left in the picture, Katie Thornton had a Statistics concentration and Math minor, Ed Hrinya was a Physics major, and April Saul was a Math major. Katie and Ed were double majors, and the three of them were Senior Scholars in their five respective majors! We are always pleased when students explore and excel in multiple disciplines. We wish all of the Class of 2013 the best as they pursue graduate schools and industries and begin to make their marks on the world!



So proud of our three Salutatorians!



2013 Physics Grads



2013 Computer Science Grads



2013 Math Grads



An Experimental Poster Session

The students in Experimental Analysis (PHYS 315) presented the results of several experiments in a semester-ending poster session. Topics included the charge to mass ratio of an electron, the speed of light, the Ideal Gas Law, the Stefan-Boltzmann law, electron diffraction and the Michelson Interferometer. Through these experiments, which reproduce breakthroughs in physics, the students developed a greater appreciation for the challenges of controlling environment, systematic errors and statistical errors.

The Fruits of Durell's Labor

Before interviewing Durell Bouchard about his wine business, I had visions of Napa Valley and Paso Robles being surpassed in the near future by Bouchard's Yard. Durell quickly burst that bubble; *his* vision is of a steady production of six gallons of wine per year, all enjoyed with his family. This is very much a hobby, a release from the rigors of academic life and a way to be outdoors and enjoy his 20-acre home in Roanoke County.

Durell's interest in spirit production started with a beer-making club in college and progressed to wine-making in graduate school in Philadelphia. He has continued making wine in Virginia, buying grapes from suppliers while beginning to grow his own. His production has recently outstripped his consumption, as his two young boys Clay and Jude have given his life a different kind of buzz.

The growing of grapes is a complicated but fascinating process. Durell works with six varieties, three reds (Cabernet Sauvignon, Cabernet Franc, and Pinot Noir) and three whites (Chardonnay, Sauvignon Blanc, and Gewurztraminer). There are numerous barriers to making world-class wine in the backyard: the Virginia climate and soil are not ideal for any of these varieties, the lack of small wine barrels means his fermentation is done in plastic buckets and glass, and Durell is determined for this to be a natural process. Virginia's damp climate makes grapes susceptible to fungi, but no fungicides will be used. "No chemicals," says Durell, before ruefully adding "but no grapes either."

Actually, his vines have produced grapes that the local deer have appreciated. The trellis that held the grapes three feet off the ground provided a comfortable wine-tasting height for the deer. Durell is now shooting for an eight-foot-high arbor arrangement. The process requires patience as the vines grow the extra five feet. Durell expects that a full harvest is still years away.

Meanwhile, there is wine to be made and enjoyed. The first month of the wine-making process requires daily attention, but after that first month little intervention is needed. Attempts at control such as testing and modifying sugar levels are optional. Durell is content to "take whatever nature gives."

In Virginia, the phrase "scholar-farmer" is likely to bring to mind Thomas Jefferson, whose approach seemed to be a nearly manic attempt to try everything. Durell, Roanoke College's scholar-farmer, is considerably more laid back, enjoying his family and his developing grapevines. He can take a walk in the woods by taking a few steps out his back door. As he tinkers with his grapevines, we can see that Durell Bouchard is, with or without grapes, enjoying the fruits of his labors.



News in Physics: AFM

The Physics Group has purchased a high resolution atomic force microscope (AFM). This instrument can produce high resolution images of structures that are 1000 times smaller than a human hair. Physics students and faculty use the AFM for mapping micro and nanostructures, studying surface properties of thin films, and manipulating matter at the nanoscale.



Blog-A-Rhythms

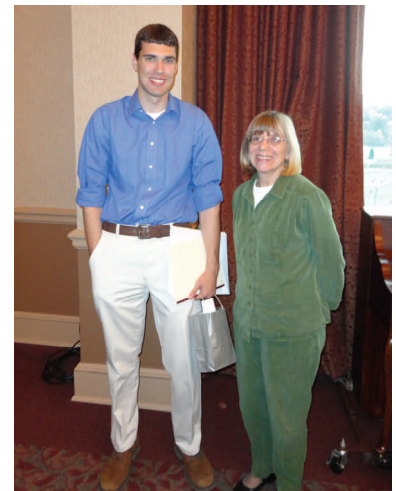
The MCSP department is blogging! You can find entries at mbsp.pages.roanoke.edu. Many of them are newsy items highlighting some of the many great things going on in the department. Others are more “bloggy” in the sense of being something interesting that is on our mind for some reason. March entries included: *Programming Team Places 8th at Regional Competition, With Pi-zazz, Physics Students Visit Local Elementary School, Sports Stats Heaven, MCSP Summer research students report on neural network simulation and robotic mapping, and Pun and Taylor, Math and Magic.* Keep up with the department and share your news with us!

Remembering Dr. Jane Ingram

We were heartbroken this summer by the news that Jane Ingram had suddenly passed away. Jane was a mainstay of the department for over 30 years, and will remain an inspiration to those of us lucky enough to know her. The department had established a Jane Ingram Computer Science Award upon her retirement in 2012. Jane is shown with Paul Vines, the first winner of this award. Jane set a high standard for all of us. An impressive characteristic of Roanoke College, which Jane embodied, is the impulse to keep striving to achieve more. We can honor Jane, and ourselves, by continuing to strengthen that part of our campus culture.

Here are some of Roland Minton’s remarks at an on-campus memorial for Jane in September.

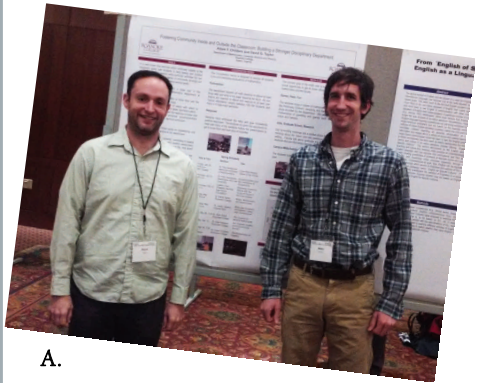
Jane’s life was good and significant. I, like many others, am a much better person for having known her. I have much to thank Jane for: her integrity and attention to detail, her relentless pursuit of getting better, her kind acts, her humor and tolerance for my humor, her devotion to students, and her guidance.



New Computer Lab

While we prepare for the new Science Complex (send in your contributions now!) we are still doing our best with the old Trexler. One large change for this year is the move of the main computer lab from the second floor to the third floor. The new space connects to the computer science faculty offices and is an attractive and popular hangout for students. For those of you who had classes in the climate-challenged Trexler 363 or 364, you will appreciate the moderate temperatures in the lab and the new classroom in Trexler 263.

MCSP at Work and Play



A.



B.



C.



D.



E.



F.



G.



H.



I.

- A. Dave Taylor and Adam Childers presenting posters at conference.
- B. Bowling night for the MAA.
- C. Tyler Cockey on attack for the Maroons.
- D. Thomas Lux giving a talk at CCSC.
- E. Which MCSP faculty member has the soccer moves?
- F. Rich Grant and a spring break group in Nicaragua.
- G. Sean Mathieson delivers the heat at the MCSP picnic.
- H. The Inquisition crayons.
- I. Dave Taylor wishes Adam Childers a Happy Pi Day!

Selected Faculty Research

Adam Childers: Presentation at JMM: "Sensitivity in Experimental Design"

Anil Shende: Presentation at JMM: "QUBES Hub"

Presentation at International Conference on Combinatorics, Graph Theory and Computing: "Maximal Induced Paths and Minimal Percolating Sets in Hypercubes"

Chris Lee: Presentation at ICTCM: "Moodling Mathematics: a learning management system"

Dan Robb: Poster Presentation: "Evolutionary algorithm search for network connectivities conducive to periodic behavior at sub-spiking frequencies" (with Natalia Toporikova), Paris, France

Paper published: D. T. Robb and A. Ostrander, "Extended order parameter and conjugate field in the dynamic phase transition in the mean-field Ginzburg-Landau model", *Physical Review E* 89: 022114 (2014).

Dave Taylor: *An Introduction to Probability: The Mathematics of Games*, to appear, CRC Press

Served as program chair, Maryland-DC-Virginia Section of the Mathematical Association of America

Durell Bouchard: Paper submitted "Segmenting Motion Capture Data Using a Quantitative Analysis"

Hannah Robbins: Presentation at AMS meeting: "Ring extensions preserving the finiteness of associated primes"

Paper "Associated primes of local cohomology after adjoining indeterminates" to appear, *Journal of Pure and Applied Algebra*

Jan Minton: FEMMES keynote: "How a Math Professor Became Involved in an Extraordinary Art Exhibit"

Karin Saoub: Presentation at JMM: "A Tour Through Graph Theory: Projects for a Liberal Arts Math Course"

Matt Fleenor: Visiting Faculty Program, Research Fellowship, Oak Ridge National Lab (TN)

Rama Balasubramanian: Paper "Characterization Studies of Iron Oxide Catalysts" submitted, *Journal of Materials Science*

Paper *Investigation of Nanocatalysts for the Synthesis of Y-shaped Nanotubes*, submitted, *Hyperfine Interactions*

Roland Minton: Presentation at JMM: "Effective Driving on the PGA Tour"

Presentation at Carolina Sports Analytics Meeting: "A Not-So-Hard Way to Improve Putting"

Selected Student Research

Alex Cowan: "Synthesis of Nanomaterials" URAP project

Allen Kirby: "Instrument Identification in Rock and Metal Using Partial"

Andrew Bowers: "Proposal for Multiple Image Steganography with an Image Deficit"

Bennu Guntoro: "Scheduling Household Appliances Based on User's Behavior Patterns"

Chris Teeple : "Calibration and Image analysis using AFM"

David Crush: "Javascript Security"

Eric Friedman: "Study of Content Management Systems for Creating an Educational Portal"

Greg Wise: "Mapping studies of Actin Filaments using Confocal and AFM imaging techniques"

Heather Cook: "Surviving an Outbreak of Zombie Dice" presented at MAA and MathFest

"Assessment of Water Quality in the Chesapeake Bay by Parameter Estimation"

James Deyerle: "Study of Odd Length Maximal Snakes in Hypercubes"

Jen Baker: "Medical Physics: Radiation Therapy"

John Guidry: "Beat and Emotion Tracking Mobile Radio" presented at CCSC

John Khandon-Barani: "Methods for improving chemical-mechanical planarization uniformity"

Jon Marino: "#GraphTheory: 140 Characters or Less" presented at MathFest

"Integer Compositions Applied to the Probability Analysis of Blackjack and the Infinite Deck Assumption"

Maya Shende: "Computational Modeling of the pre-Botzinger Complex" presented at CCSC, second place

Melissa Rickman: "An Android App for Detecting Engine Misfires"

Natalie Wilkinson was selected for an REU at the University of Maryland doing computational graph theory

Randall Pittman: "Analysis of Sensors for Robotic Localization and Mapping" presented at CCSC, first place

Samantha Parsons: "Protecting Confidentiality and Scientific Integrity Through Synthetic Data"

Sarah Dvorak: "Predictive Analytics in Soccer: Shots, not Goals"

Sean Reed: "The Ant Zoo: Distributing Tasks Using Stigmergy and Ant Behavior"

Taylor Ferebee was accepted to the 2014 Wolfram Science Summer School program

MCSP Conversation Series: Faculty, Performing Artists, Alumni, Students, and Visitors

