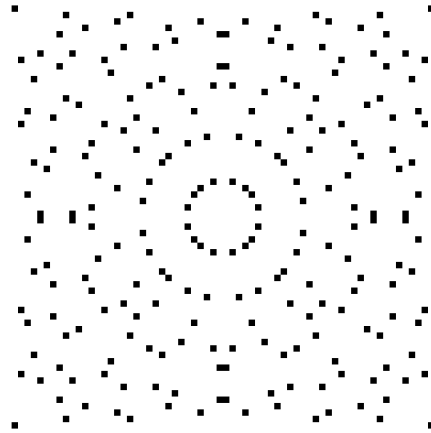


What's ν ?

News from the Department of Mathematics and Computer Science



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The lurking suspicion that something could be simplified is the world's richest source of rewarding challenges. – Edsger W. Dijkstra

God created the natural numbers, and all the rest is the work of man. – Leopold Kronecker

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About the cover: For her senior honors project, Jackie Kearney investigated images like the one shown on the cover of this newsletter. The image shows the points (x, y) for which

$$x^2 + y^2 \equiv 0 \pmod{n}$$

for $n = 65$. The structure of the points varies considerably for different values of n . Jackie worked with Dr. Heinold on this project.

About This Issue

By Fred Portier

Some of you may be wondering why I am putting out this newsletter in August and listing it as May. The truth is I started it in May but then I put it off for a week, which became a month, which became ... August. The information is valid (as of May).

This is the sixth edition of this newsletter and it is time for a change. I will be looking for someone to take over the role as editor. I suspect we could see a change in format, maybe even a change to something other than a flat document; I have been writing this using L^AT_EX.

Please let me know if you have ideas for how we can update and improve this newsletter.



The Fall department picnic was fun but a bit cool and damp.

Student Activities

By Brian Heinold

Another year has flown by. Here's what our students were up to this year.

At the inaugural SPARC festival on campus, Jackie Kearney and Chris Lewis presented their honors projects. Jackie's project was *Analyzing the Behaviors of Mathematical Functions Through the Use of Contour Maps* and Chris's was *Fun with Graph Labeling: How Low Can you Go?* Math/History double major Megan Czajkowski presented her honors project, *Apostle or Prostitute? Re-examining the Portrayals of Mary Magdalene through the Ages*.

Also at the SPARC festival, freshmen Joey Gannon, John Martin, and Mike Mugno won a prize for a lightning talk on their project, *CUBI Critic*. Kaitlyn Perry and Kristen Portalea presented a poster entitled *Four is Cosmic*, and Jon Denby, Eric Detzel, and Joaquin Rodriguez presented their work on calculating one million digits of π .

We had three teams compete in this year's COMAP math modeling competition. Our competitors were Jon Denby, Eric Detzel, Joaquin Rodriguez, Haley Blevins, Megan Czajkowski, Arthur Hughes, Jackie Kearney, Sarah Leder, and Kaitlyn Perry. At the 2009 CCSC-Eastern conference, Haley, Chris, Joaquin, Seth Wheeler, Kevin Hamilton, and Howard Hagan participated in the programming competition.

Finally, congratulations to junior Amanda Kitzmiller who will be participating in an REU at Summer Institute for Training in Biostatistics at USF.

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SmallTalk*By Brian Heinold*

This year was the second year of our department colloquium, Smalltalk. Smalltalk is an informal gathering of students and professors where someone gives a short talk on something interesting. Professors Butler, Portier, Weiss, Petrelli, and I gave talks this year, and all the rest of the talks were given by our students.

In the fall, Kaitlyn Perry and Kristen Portalea (KP²) showed us some fun things about math. Chris Lewis and Jackie Kearney presented the early results of their honors projects. Sean Gannon spoke about math and music, and his brother, Joey, showed us some really cool programs he wrote for his TI calculator. Haley Blevins started and ended the semester giving us a before and after on her senior project, a cookbook for the Zune.

In the spring, Alejandro Orellana gave a nice talk on the applications of fractals and chaos to economics. The COMAP participants talked about their solutions. Joey Gannon, John Martin, Mike Mugno gave a great presentation on CUBI Critic, a program they wrote that allowed audience members at the school's plays to text their comments and have them appear on screen for everyone to see. Sean and Joey Gannon rocked the Science Building with the huge portable boombox they built from a car stereo. Haley talked about a program she wrote for a client at the Aberdeen Proving Grounds. And to close out the year, Amanda Kizmiller and Jacky Powers showed us how RSA encryption works.

Every Smalltalk speaker gets a duck – not a real duck, but a cute little rubber ducky. Haley Blevins is the all-time ducks leader, having amassed at least half a dozen ducks over the last two years. I have three ducks that hang out on my desk all day. You can see their happy faces at the top of the next column.



Brian's ducks

- ☼ -

Upsilon Pi Epsilon*by Scott Weiss*

The department of Mathematics and Computer Science has been awarded a chapter of Upsilon Pi Epsilon, the national honors society for the computing and information sciences. The chapter inducted its first members in a ceremony in October. The inducted members were:

- Dr. Fred Portier
- Prof. Scott Weiss
- Haley Blevins
- Christopher Lewis
- Eric Detzel
- Kevin Hamilton
- Jacqueline Powers
- Seth Wheeler
- Joaquin Rodriguez

The students were inducted based on their GPAs both within the computer science and information systems disciplines and overall.

Prof. Bill O'Toole welcomed participants and guests to the ceremony, giving a short introduction to the

history of computing at the Mount. Prof. Weiss, Dr. Portier, and Ms. Blevins conducted the ceremony, taking the roles of Upsilon, Pi, and Epsilon and explaining the importance of the society and the various symbols involved. Dr. Daniela Raicu of DePaul University in Chicago, IL was UPE's national representative. She presented the school with the charter for the chapter.

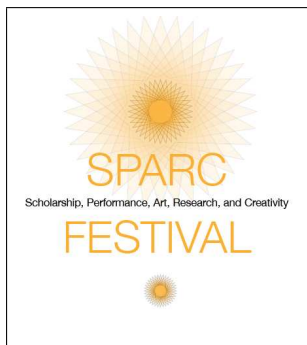
Haley Blevins was the president of UPE for this academic year. UPE members had a special reception for Sara More, a speaker from McDaniel College this spring. Seth Wheeler will be taking over as president in the fall.

- ☼ -

Mount Holds SPARC Festival

By Fred Portier

The first **SPARC Festival** was held in April. SPARC stands for Scholarship, Performance, Art, Research, and Creativity. It takes the place of the *Student Research Festival* which was held in conjunction with Accepted Students Day. The SPARC festival featured poster sessions, 10 minute lightning talks, and 30 minute presentations by members of the university's honors program. The festival had an opening ceremony, a community picnic, a closing ceremony, an art exhibition, and musical and theatrical performances. All of the events were well-attended. The 2011 SPARC festival is scheduled for April 12, 13, and 14.



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A Puzzle

There are two doors. The sign on one door reads: *In this room there is a new car, and in the other room there is a tiger.* The other reads: *In one of these rooms there is a new car, and in one of these rooms there is a tiger.* One of the signs is true and the other is false. Which door should you pick? (The tiger is pretty hungry.)



Dean Bushman at the fall picnic.

Faculty-Student Puzzle Competition

By Scott Weiss

For the past several years, the department has hosted a trivia competition each October, culminating in a faculty-student game. This year, we tried something a little different. I created a suite of eight different puzzles. Student teams raced against a faculty team to be the first to solve all the puzzles. This format generated much more student interest than the trivia contest; we ended up with eight student teams (plus the faculty team).

The teams had ninety minutes to solve the puzzles. They were also given hint coupons they could use to get help from me at a cost of a five-minute penalty on their finishing time. The puzzles were all based

off of various majors at the Mount (computer science, business, elementary education, etc.). Each one led to a single-word answer. Solvers were intended to combine those answers into a final solution. The first team to do all this (including penalties) would be the winner. If no one solved everything, the team who solved the most puzzles would win.

The competition was quite close. One student team (senior Chris Lewis and juniors Jon Denby, Howard Hagan, and Joaquin Rodriguez) opened up an early lead, but got stuck on a couple of later puzzles. The faculty team (Melanie Butler, Brian Heinold, Chris Jarvis and Luca Petrelli), with judicious use of hint coupons, solved the last two puzzles in the final moments. As the only team to solve all eight puzzles, they were declared the champions. The student team of Lewis, Denby, Hagan, and Rodriguez were this year's student winners.

Care to see how you would fare? Some puzzles are included in this newsletter. Remember you're looking for a one-word answer from each puzzle; the number in parentheses following the puzzle title tells you how many letters are in that word. Most of the puzzles come without instructions, so you'll have to figure out what to do. For answers, write to me at sweiss@msmary.edu.

- ☼ -

time with her dog, Jax, and playing piano, basketball, tennis, and golf.



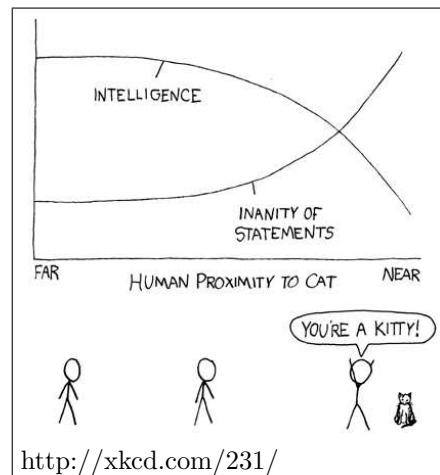
Dr. Jonelle Hook

Introducing Dr. Hook

By Fred Portier

- ☼ -

We welcome our new Assistant Professor of Mathematics, Dr. Jonelle Hook. Originally from northeast Pennsylvania, she completed her undergraduate study at Misericordia University, receiving a BS in both Mathematics and Computer Science. She completed her graduate study at Lehigh University, receiving an MS and PhD in Mathematics. Before coming to teach at the Mount, Dr. Hook was an Instructor at Lehigh and an adjunct faculty member of Misericordia. Her research interests are in Graph Theory and Combinatorics. She has a love for music, dance, and the arts as well as mathematics. Some of her favorite pastimes include spending



What I do*by Christina Weaver ('98)*

I have just finished my first year as a tenure-track Assistant Professor of Mathematics at Franklin & Marshall College in Lancaster, Pennsylvania. It's been a fun but totally hectic year filled with teaching and my applied math research at a small, selective liberal arts college. I had no idea what I would do as a math major when I came to the Mount, but after a long winding path, I now feel that I am doing what I'm meant to do.

Like all Mount math majors, I took courses in many different areas of mathematics, but the convergence of many trajectories (pun fully intended) led me to applied mathematics. For one, in Prof. O'Toole's "Mathematical Modeling" course, we learned how arms races, voting systems and predator/prey populations can all be described mathematically. Also, on the Mount's "Mathematical Contest in Modeling" teams, my classmates and I worked feverishly to solve an applied math problem we knew little about, write a paper about our approach, and submit it just before the deadline. (That routine became all too common in graduate school!) Finally, as a student assistant for Drs. August & Portier's MSM² program for high school teachers, I saw how mathematics could be used to understand the wildlife

populations at Chincoteague National Wildlife Refuge. These experiences sparked my interest in mathematical biology, and helped me to decide to pursue a PhD in Applied Mathematics at the State University of New York at Stony Brook after graduating from the Mount in 1998.

After two years of applied math courses at Stony Brook, I spent another three years doing research on projects to design image analysis algorithms to quantify different kinds of brain tissue found in microscope images, graduating in 2003. While there I also taught three undergrad math courses, which I thoroughly enjoyed. This helped me realize that I wanted teaching to be part of my future career. First though, I wanted some more research experience before jumping onto the academic "tenure track".

Through the contacts I made during my thesis work, I took a postdoctoral research position in Biomathematics and Neuroscience at Mount Sinai School of Medicine in New York City. At Mount Sinai I learned about mathematical models that describe how electricity flows through a neuron. Ever since, I have applied these models to real data collected in the laboratory from my biologist colleagues. These models allow us to study neurons in new ways, and are an important complement to traditional biological experiments. Because my simulations can be quite detailed, I often use parallel computing to do the work efficiently.

Neurons change their shape during development, learning, aging and disease. Sometimes a neuron's function changes too, as it does in aging. I use mathematical models to understand how the shape of a neuron interacts with other biological properties, like the levels of calcium or sodium, to give rise to its function. We have developed a way to predict how a neuron might be able to compensate for age-related changes in shape, to counteract associated changes in function. We hope to use these techniques in the future to help design clinical therapies. In my research I continue to develop these methods, and to apply them to different diseases like Alzheimer's.

After six years at Mount Sinai, I sought a tenure-track position where I would return to the classroom, but also continue my computational neuroscience research. I applied to colleges across the country, and ended up at Franklin & Marshall. F&M's

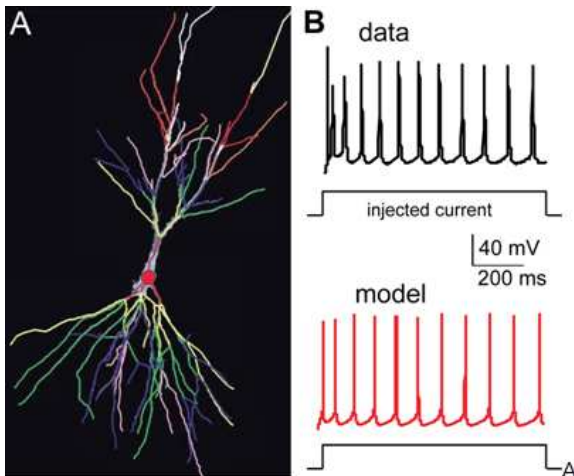


Figure 1: A) Microscope image of a neuron from the hippocampus, traced automatically with the image analysis package NeuronStudio. B) In vitro voltage response to current injection of a neuron from the cortex (above) and best-fit mathematical model (below).

liberal arts mission is similar to the Mount's, though it is slightly larger with about 2200 undergraduates. F&M students take "First Year Seminars", "Foundations" courses and other general requirements, reminiscent of the Mount's carefully designed Core Curriculum.

F&M faculty members teach five courses per year. For me this year it was Calculus I and II, and Probability & Statistics: courses I have never taught before. I loved the teaching overall, but all the preparation taught me that professors pull all nighters sometimes too! It has given me a new respect for my colleagues at colleges teaching four or five courses per semester, and for high school teachers teaching year-round.

I spend the remainder of my time pursuing research: performing simulations and analyses, working with long-distance collaborators, and writing journal articles and federal grants to fund my research. For the first time this year, I am involving undergraduates in my research. One has been helping with the neuron modeling. The other will start a new project to develop image analysis software for the Clinic for Special Children, a non-profit clinic that works with the Amish and Mennonite communities around Lancaster. I hope to give my students the

kind of research experiences that inspired me in new and exciting ways.

When we moved to Lancaster last summer, my husband Tony (also MSM'98, in Computer Science) and I bought an 1890's townhouse just a short walk from campus. We live there with our 2-year old Catherine, with Baby #2 due at the end of August. My family couldn't be happier—we now live about 35 miles from where I grew up in northern Maryland. Lancaster is a historic town with plenty to do; much more than just the outlet shopping and Amish farmland I knew about as a kid. If you're ever in the area for a visit, please look us up!

Fermat Appreciation Day

By Brian Heinold

This year part of our theme for Math Seminar was the history of math. If there's one thing I learned teaching it, it's that whoever is generally credited with discovering something was probably not the one who actually discovered it. Calculus is no exception. Up until this year I had always told students that Newton and Leibniz co-discovered calculus (and there was a big fight about who discovered it first, but that's another story). It turns out that much of calculus was discovered a few decades earlier by Pierre de Fermat.

Fermat discovered a general procedure for finding tangent lines to all sorts of curves, and he found formulas for the areas under polynomial curves – that is, he solved the two major problems of calculus. His procedures were remarkably similar to what we do nowadays in Calculus I. Where Fermat fell short, apparently, was in not recognizing the connection between the two problems. That was done by Gregory and Barrow and later by Newton and Leibniz and it is what we know as the Fundamental Theorem of Calculus.

So why isn't Fermat given more credit? Well, he was a little too secretive about his work. He published almost nothing, and what we do know, we know from his letters to other mathematicians and manuscripts discovered after he died. Fermat did a lot of other things including jump-starting number theory and probability. He discovered what is now

called *Fermat's Little Theorem*, which is the foundation for secure internet transactions. Emily Grugan suggested in class that we should have a Fermat Appreciation Day. Fermat's birthday is (probably) August 17. It's a shame that there are no big holidays in August. How about Fermat Day on August 17?



The annual end of year dinner at Ott's.

New Core Curriculum

By Fred Portier

This past year I was on a committee which put together a framework for a new core curriculum. The new core would be substantially smaller (48 credits) with some major changes from the core we have all come to know. Although the finer details have not been worked out I think we are going to see something really new. It has been over 20 years since this kind of reform has taken place.

The core math requirement is going to go through a radical change. The current proposal has basic statistics being taught in conjunction with and in the context of a social science. Instead of teaching statistics, the mathematics core course will speak to the nature of mathematics. This fall we are piloting a potential new core math course called "Mathematical Thought and Problem Solving." Students will be challenged to see mathematics as a way of approaching problems and answering questions that is different from any other discipline. Our new assistant professor, Dr. Jonelle Hook, will be teaching this course.

Mount Graduates for 2010

By Chris Jarvis

We are very happy to present to you the 2010 Math and Computer Science graduates. We asked the graduates to tell us what they had planned for after graduation. This is what they say.



Math and Computer Science Graduates of 2010 on the steps of Coad Science building

Amy Allison: After graduation I plan on attending Mount St. Mary's graduate school. I plan on getting my Masters of Teaching to become a secondary math teacher. This summer I will be taking time off to travel to Maine and Wyoming. The years spent at the Mount have been great.



Amy Allison

Chelsea Allison: I will be moving back home to Ellicott City. I plan to be employed by a county in Maryland teaching middle school math.



Chelsea Allison

Haley Blevins: After graduation I plan on taking a week and vacationing to Charlotte, NC to visit my sister and her family. On May 24th, I plan on starting work full-time as a Department of Defense Civilian at US Army base Edgewood APG working for the Center for Health Promotion and Preventative Medicine as a Computer Scientist.



Haley Blevins

Megan Czajkowski: After graduation I will be returning to work full time for Serco, North America. I hope to enroll in a graduate program at Georgetown or UMBC next spring.



Megan Czajkowski

Callie Jo Gillen: I will be moving back home (nothing exciting) to Eldersburg, Maryland. I have an open-contract with Carroll County Public Schools and will be finding out shortly where I will be and whether it will be middle or high school. I actually went to Carroll County Public Schools, so it is going to be cool to return. I plan on spending a lot of time this summer going to Ocean City, Maryland before hitting the real-world.



Callie Jo Gillen

Emily Grugan: I can't believe it has been 4 years already. It's scary how fast time goes! After graduation, this fall I will be a fulltime student at Widener University School of Law. I will be living at home in Wilmington, Delaware while attending school. So this summer, I plan on relaxing, working some, go-

ing to the shore, and just enjoying the time off before the rigorous schedule begins late August.



Emily Grugan

Artie Hughes: After graduation, I am going to Tours, France to immerse myself in the French culture for a month and complete the requirements for a B.A. in French. The remainder of the summer will be spent as an intern at the National Science Resources Center (affiliate of the Smithsonian Institution and the National Academies). In the fall, I will be attending Georgetown University to pursue a Masters of Science in Biostatistics. During my studies at the university, I will be conducting research at the Georgetown University Medical Center.



Artie Hughes

Jackie Kearney: I do not know what exactly I'll be doing next year. I have applied for a few different things and am still waiting to hear back and figure everything out. However, right after graduation I will be going on a service trip to Belize with other Mount students for about 2 weeks.



Jackie Kearney

Chris Lewis: After I graduate, I hope to attend graduate school, though at which school and in which subject are two things I don't yet know: Hood College has already accepted me, and I'm waiting to hear from Loyola University and University of Maryland College Park. The programs at Hood and Loyola are Master's Degree in Computer Science, while the UMD College Park program is a Ph.D. program in Applied Mathematics & Scientific Computation. As for what I'd like to eventually do, I hope to use the time I spend in graduate school to decide that.



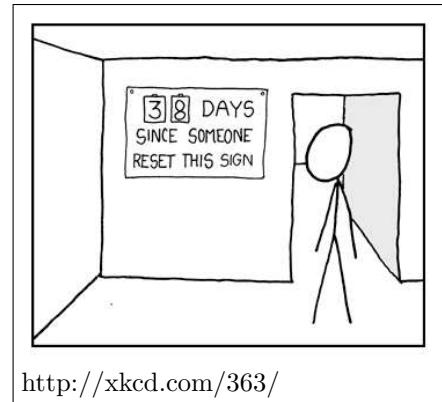
Chris Lewis

Jimmy Morgan: After Graduation I plan to live at home, in Baltimore for the summer. In August, I will fly out to St. Paul, Minnesota to work with NET ministries. Net is a nonprofit organization in

the Catholic church that sends out young adult missionaries to put on retreats for teens all around the Nation. I am excited to spend the next year in service and still undecided about longer term plans.



Jimmy Morgan



Nicole Shilling: After graduating the Mount, I will be entering in to the work force. I am currently applying to six different counties throughout the state of Maryland for a High School or Middle School Teaching job in Mathematics. The day after graduation, I will be attending a week-long conference in Florida with R.U.F. (Reformed University Fellowship). Once the week is up, I will be returning to Frederick County and continuing to be a Long Term Sub at Tuscarora High School teaching Algebra 2 which I started on April 28th (even though I was still a full time student at the Mount).



Nicole Shilling

Puzzles From The Faculty-Student Puzzle Competition

By Scott Weiss

Business (4)

To succeed in business, you must always think about what comes next



Hints (in random order):

- Bakery goods
- Books
- Electronics
- Gas
- Hardware
- Italian food
- Java
- Kid stuff
- Office supplies
- Pretty much everything
- Sandwiches

Computer Science (4)

All you have to do is follow the directions.

1. Start with the phrase COMPUTERSCIENCE.
2. Eliminate the consonant that appears most often.
3. Switch the vowels that appear consecutively.
4. Replace the short five-letter English word hidden in your string with an anagram of it meaning "direct".
5. Insert one letter anywhere in the string so that you can find a four-letter word in it that may appear on a door.
6. Move a girl's name within the string to the point immediately after the second letter.
7. Move the fourth letter to a position so that you can find a word that can follow "family" in a familiar phrase somewhere within the string.
8. Swap two adjacent letters to form a word in the string that means "sign". (If you can't, that would be a bad one.)
9. You can find a six-letter word reading backwards (as if it were on its back!). Remove it.
10. Exchange two adjacent letters to form a number in your string.
11. Drop the n th letter of the string where n is the number formed in step 10.
12. Remove a musical note from the string.
13. Move the third letter to form the name of a key. This key is your answer!

Criminal Justice (7)

Some of these guys have met their match

GDCOO NCQW	W	D	CE ICWXYN
NEUXO YNPP	I	R	CKQUI LXEMAUYYLNQ
PJNQEXIT JXEZNP	J	E	ENF EKOJXQ
PKWNQZCY	L	F	MQ. XIOXWKP
PWUMNQ-ZCY	C	P	OJN SXTNQ
RCOZCY	O	O	UTN IECYOXY
SCZNP RXYM	Q	N	WQXANPPXQ ZXQUCQOD
	V	Q	
	X	B	

Each rectangle holds a famous name encrypted in a simple substitution cipher. The cipher is consistent for all fourteen names (so if A represents B in one name, it represents B in all of them). After deciphering them, match the names on the left to those on the right, drawing a line between the dark circles on the rectangles. Your lines should cross seven circles. After one last step, the letters in those circles, read from top to bottom, will spell your answer.

Secondary Education (7)

Maybe not your #1 choice...

Song on side 1 of *Dark Side of the Moon*

State to join the union

President

Winner of the most prestigious Oscar, with "The"

Man to walk on the moon

Pulitzer Prize for General Non-fiction, with "The"

Preakness Stakes winner

Wealthiest American, according to *Forbes* in Sept. 2009

Most populous U.S. city

Y D O L M Y A D A O R B A
T G U N O F A U G U T S I
O G A D I N F I V E E M N
J I N L B U T E S L W R V
O I T A E R E X G P T R L
H A O Z N A E N P E I E Y
A C E Z O F A A P P A P S
D E R U A S N D E P H A N
A N D B O I T T O E M E N
M E F F U B N E R R A W P