NC STATE UNIVERSITY Undergraduate Math

Issue 1, Fall 2015

College of Sciences Welcomes Dean William Ditto

On September 1st, 2015, Dr. William Ditto, former Dean of the College of Natural Sciences at the University of Hawaii at Manoa, was named the new Dean of the College of Sciences. Dr. Ditto's main field of research as a physicist is in nonlinear dynamics and chaotic systems, where he has authored or coauthored nearly 200 publications.

With a bachelor's degree in physics from UCLA, a doctorate in physics at Clemson, and a career including time with the U.S. Department of the Navy, Arizona State University, the University of Florida, and Georgia Tech, Dr. Ditto's innovation and leadership are exactly what a brand new College of Sciences will need to continue to thrive and grow into a world-renowned program.



Dean William Ditto pictured in SAS Hall. Photo by Marc Hall.

"Math Doesn't Bug Me" at BugFest 2015

This year's BugFest was held on September 19th at the Museum of Natural Sciences in downtown Raleigh. Mathematics undergrad and graduate students and the Center in Scientific Computation participated in "Math Doesn't Bug Me," an interactive display including math games and research posters. A special thanks to the organizers, Lorena Bociu, Steven Derochers, and Shira Polster, and to all the volunteers!

http://www.math.ncsu.edu/undergrad

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BugFest 2015 Volunteers

Student Internship Experience

- 1. Where did you do your internship?
- 2. How did you find out about the opportunity?
- 3. What did you do on a daily basis?
- 4. What skills did you utilize that you've gained from NC State?

Ben Pierson, senior in Applied Math:

1. MaxPoint Interactive, an advanced digital advertising technology company.

2. Email from Math Dept., on campus info session.

3. I worked with SQL, a querying language, to pull large data sets for my team and I to analyze. Our

main objective was optimization, which helped us serve ads online to a targeted audience while measuring certain metrics surrounding the interaction.

4. My experience in writing Matlab code transitioned to SQL. I have also taken some data science classes where I handled large data sets, so I was able to handle the size of MaxPoint's data. I always worked in teams, so group projects and research experience helped me to communicate with my coworkers.

Alice Dai, senior in Applied Math and Statistics:

- 1. Bank of America
- 2. Through ePack

3. Evaluated transaction information to identify

customer behavior after credit product

prepayment. Cleansed and classified transactional data by query in SQL. Conducted online research to classify business names as same payee.

4. Software like SAS, SQL, and also analytical skills.

Andrew Gannon, senior in Applied Math:

- 1. Virtual Exchanges Inc. -- Entry Level Programmer
- 2. Found and applied on ePack

3. Developed data upload sheets in excel using Visual Basic. Used an online retail program called Channeladvisor and developed Business Rules (code that interprets input data and distributes it to many different online retailers).

4. Most of the coding was easily completed by using 'tree guides' which are paths from different nodes using if/then statements that process and validate input information. Used lots of logical skill that were learned in MA 225.



Meet Mary Rosage

Hello math majors! I am the newly appointed career counselor for the College of Sciences. After moving to North Carolina for graduate school at NC State, I have fallen in love with this state and am excited to work where I went to school.

A lot of students interested in math do not know of possible career options that are available for a degree in math. But the possibilities are infinite! Employers love math majors because math is so fundamental and can be applied to meet a variety of different needs.

You all learn amazing skills throughout your undergraduate years, but you have to be able to convey these skills to an employer. This could be through your resume, in an interview, when talking to your coworkers or boss, etc. If you ever want to learn about careers in math, do a mock interview, or talk about your unique situation, you can schedule an appointment with me through ePACK. I look forward to meeting and getting to know all of you!





SUM Club Featured Student

"Being in SUM club has provided many opportunities to hear about other math related job experiences and help give information and connect with employers who are in math careers. This has been extremely helpful in figuring out my next steps in mv own career. It's also fun to hang out with other math minded people and to be able to enjoy spending time together, whether that's playing Catch-Phrase or laughing at a math joke in a meeting. To sum up. SUM club is a math club where both social and academic life combine.

-Kelly Doss, senior in Math



Study Abroad Experiences

I applied for and participated in the Budapest Semesters in Mathematics Program. I chose BSM because of the number theory courses, but I also enjoyed taking other courses like combinatorics and set theory. I also



managed to get away from the math at times and explore Europe. I got to visit many different places like Croatia, Munich, Strasbourg, Paris, and a few other places, and a couple of my favorite memories were the traditional dances at the Busójárás festival in Mohács and a 15 mile bike ride from Budapest to

Szentendre. I met a fantastic group of friends from all over the world during my semester, and I definitely recommend looking into Budapest. -Alex Hazeltine, studied in Budapest, Hungary

I found a summer chemistry study in Hangzhou, China led by an NC state professor, which was nice because it fit my language needs and satisfied a GED requirement. I received the Gilman International Scholarship, which covered all of my travel expenses and the full program cost. It granted an incredible opportunity to explore China and the culture without the added financial stress. It's absolutely worth it to whoever wants to apply! -**Colt Bradley, studied in Hangzhou, China**



Scholarship Opportunities

There are many scholarships out there, students just have to find them! Students are also encouraged to apply for prestigious national scholarships such as the Rhodes, Gates, and Goldwater. More information can be found at http://www.math.ncsu.edu/undergrad/scholarships.html.

Benjamin A. Gilman International Scholarship

Who can apply: Undergraduate freshmen through juniors receiving Federal Pell Grant with limited financial means to pursue studies abroad world wide
Award: Approx. \$1,200, but up to \$5,000 based on need, and additional \$3,000 Critical Need Language Supplement for programs in countries where language study is vital to national security
Deadline: March 3, 2016
More info: http://www.iie.org/Programs/Gilman-Scholarship-Program

AMS Math in Moscow Scholarship Program	NSF S-STEM Research Scholars Program in
Who can apply: Students interested in a mathematically intensive program of study focusing on problem solving Award: \$9,800 Deadline: April 15, 2016 for Fall 2016 and Sept. 15, 2016 for Spring 2017 More info: http://www.ams.org/programs/travel- grants/mimoscow	Mathematics Who can apply: Talented students with financial need, especially for traditionally underrepresented groups Award: \$5,000 for undergrads Deadline: May 16, 2016 More info: https://www.math.ncsu.edu/summer/STEM/ index.php

Advanced Math Electives for Spring 2016

Course	Pre-Requisites	Instructor	Time
MA 401: Applications of Differential Equations II	MA 341	Castle	MWF 8:30-9:20
Differential Equations in		Norris	TTH 1:30-2:45
MA 402: Mathematics of Scientific Computing	MA 341 or MA 405	Gremaud	MW 3:00-4:15
MA 403: Intro to Modern Algebra	MA 225	Turner	TTH 1:30-2:45
MA 408: Foundations of Euclidean Geometry	MA 225	Lin	TTH 3:00-4:15
MA 416: Intro to Combinatorics	MA 225 or CSC 226	Hersh	MWF 10:40-11:30
MA 421: Intro to Probability	MA 242	Sullivant	MWF 1:55-2:45
MA 426: Real Analysis II	MA 425 and MA 405	Martin	MWF 12:50-1:40
MA 437: Applications of Algebra	(MA 403 or MA 407) and MA 405	Singer	TTH 10:15-11:30
MA 451: Methods of Applied Mathematics II	MA 341	Haider	TTH 1:30-2:45

Interesting Math Courses

MA 544: Computer Experiments in Mathematical Probability

Instructor: Dr. Jack Silverstein

The intent of the course is to reveal to the student the virtues of using the computer to gain insight into mathematical behavior. Examples will be chosen from topic in probability theory that are either not typically covered in courses, or not having a complete mathematical treatment at the present time. For further details go to

www.math.ncsu.edu/~jack/ma544.html and/or contact the instructor. Satisfies the writing and modeling requirements.

MA 591: Conic Optimization

Instructor: Dr. David Papp

Convex optimization (a generalization of linear and semidefinite programming) is a rich and thriving mathematical discipline that has become an essential part of the toolkit of computational mathematics and engineering, with applications ranging from graph theory and algebraic geometry to statistics, operations research, and optimal control. Course will review the mathematical and algorithmic fundamentals of the area, focusing on optimization over convex cones, along with applications and open research problems fitting to the audience's interest.



Math Honors Program

The Math department welcomes the new Mathematics Honors Program director, Dr. Min Kang, and we thank Dr. Sandra Paur for directing the program for 35 years.

In May 2015, Math honors students Thomas Gray, Darren Lipman, Matthew Loeffler, Samuel Magura, Nicholas Quayle and Sara Troutman graduated. New students joining the program are Robert Gentry, Gareth Johnson and Sam Weber.

Every year about 20% of math graduates complete the Math Honors Program and about 80% of those students go on to graduate school, such as Berkeley, Princeton, Stanford, MIT, Cornell, NYU and UCLA. Math honors students have also received 19 NSF, 3 DoD, and 3 Gates Fellowships for graduate school as well as 7 Goldwater Scholarships.

Besides taking a number of advanced Math courses, students also do research either at NC State or in a summer REU Program (Research Experience for Undergraduates) nationwide. More than 30 students have completed a study abroad program focusing on Math.

Dr. Kang is happy to talk to any student interested in participating – stop by her office in SAS 4114 or email her at

kang@math.ncsu.edu. For more info visit http://www.math.ncsu.edu/ honors.

B.S Applied Math: Financial Math Concentration

Interested in Financial Math, Actuarial Science, or Portfolio Management?

The Financial Mathematics Concentration for the Applied Mathematics Degree is designed to prepare prospective students for careers in these fields.

Students will automatically earn a minor in Statistics and have the option to pursue a minor in Economics.

We invite you to apply for admission to this program. Students with a GPA of 3.5 or better will be considered.

Run a "What If Degree Audit" to see the requirements for the program.

Visit http://registrar.ncsu.edu/coda to apply.



Undergrads Under Grads

Undergrads Under Grads (UUG) is a new program designed to connect female and minority students in the math major with mentors in the graduate program.

Graduate mentors can talk with you about the career path you want to be on – either leading into a grad program or a job out of college. We can also help you go over application materials for REU's, internships, jobs, and grad school.

Mentor matches have already been made for the fall semester, but interested undergrads are welcome to attend our upcoming informational sessions. Our next event is a panel on applying to graduate school, co-organized with the NCSU chapter of the AWM. Sign-ups for one-on-one mentoring will open up at the start of the spring semester, so visit us at <u>go.ncsu.edu/mathuug</u> for more information.

Association for Women in Mathematics

The purpose of the Association for Women in Mathematics is to encourage women and girls to study and to have active careers in the mathematical sciences, and to promote equal opportunity and the equal treatment of women and girls in the mathematical sciences. The student chapter at NCSU is open to all members of the mathematical community, regardless of gender or position.

We have a weekly brown bag lunch in the 4th floor commons Thursdays from 12:30 to 1:30. People bring their lunch and we bring an extra treat. Feel free to drop in to chat and decompress. We will also have a visit by Emily Gordon of SAS to talk about her career trajectory and educational background

(10/19, 3:00). In the spring we will host Sonia Kovalevsky Day, which entails inviting middle-school aged girls to SAS for a day of math games and workshops.

Look us up on Get Involved or email Suzanne Crifo at secrifo@ncsu.edu to join our mailing list.

Math Circles in the Triangle

Math Circles is an outreach program for middle school students who are curious and enthusiastic about concepts in mathematics. The goal of the program is to expose young minds to interesting topics that a middle schooler would not typically see in their curriculum.

Math Circles of the Triangle meets monthly on Saturday mornings in SAS Hall with the organization, instruction, and support of department faculty and students.

If you would like more information or you would like to participate, visit https://www.math.ncsu.edu/MathCircles/index.html or contact Dr. Fenn at mafenn2@ncsu.edu.



U U G Undergrads

under **Grads**

Sonia Kovalevsky Day, Spring 2015

Logic Puzzles

Crossing a Bridge

Alice, Bob, Charlie, and Danielle want to cross a bridge. The bridge is of a width such that a maximum of 2 people may cross at a time.

Alice takes 10 minutes to cross, Bob takes 5 minutes to cross, Charlie takes 2 minutes to cross, and Danielle takes 1 minute to cross.

Also, it is night. Each trip requires a flashlight. There is only one flashlight. They are not allowed to toss the flashlight over the river.

If two people cross the bridge together, they must walk at the pace of the slower person. So if Alice and Bob cross together, they will take 10 minutes.

How fast can you get all 4 people over the bridge? (hint: you can get everyone across in faster than 19 minutes).

KenKen

5	6×	3-	1-	
			3-	
2÷		12+		1-
1-	1-		1	
		3+		5



How to play

1. You must fill in the numbers from 1 to 5 (for a 5x5 grid) in each row and column. Do not repeat a number in any row or column.

2. The areas of the grid with dark outlines around them are called cages. At the top left of each cage is a target number and operation. If the cage says "4+". That means the two numbers that go in that cage must add (+) up to 4.

3. Look for any cages that are around just one box. The target number will have no math operation symbol. Simply write the target number in that cage.

4. Look for other cages, rows, and columns where there is only one possible solution.

5. Keep going until you've completed the whole puzzle!

Society for Undergraduate Mathematics

SUM Club is NC State's premier student organization for those with a passion for math. We help bridge the gap between undergraduates and the rest of the university and provide students with opportunities for growth in academics, service, and leadership. This is accomplished through mathematical presentations at meetings, career events, social get-togethers, and other college- and university-wide involvement.

Open to any student, math major or otherwise, we meet on the first Thursday of every month to get to know one another, do a math puzzle or two, discuss opportunities within the college, and plan events for the club and the community. The club plans to host a variety of events, including collaborations with the Career Development Center and the Statistics Club. We wish to impact the community as well by volunteering and tutoring at local schools and STEM programs.

From bowling to movie and game nights, we hope to continue to create a strong undergraduate connection within our field and bring together students within the university. We would love to see more people involved! Email us at sumclub@math.ncsu.edu with any suggestions, comments, questions, or to be added to our email list.



	SUM Club Executive Board		
	President	Ben Pierson	
	Vice President	Prem Shah	
Nuclear State	Treasurer	Shane Finkel	
1 200	Secretary	Karl Schneider	
	Public Relations Guru	Sorena Dadgar	
	College of Sciences	Kathryn Ray	
	Council Representatives	Amanda Williams	

Bridge Crossing Solution

Answer: 17 minutes

Explanation:

Charlie & Danielle go across, 2 min.

Charlie goes back, 2 min.

Alice & Bob go across, 10 min.

Danielle goes back, 1 min.

Charlie & Danielle go across, 2 min.

The key is to only have Alice and Bob cross once each, specifically together, and make Charlie and Danielle shuttle the flashlight across.

KenKen Solution

⁵ 5	6× 1	^{3−} 2	1- 3	4
2	3	5	³− 4	1
²÷ 1	2	12+ 4	5	^{1−} 3
1- 4	^{1−} 5	3	¹	2
3	4	3+ 1	2	⁵ 5

Newsletter feedback: sumclub@math.ncsu.edu