



Director: Dr. Alina Duca

Editor: Trisha Clinckscales

Meet Dr. Cooper

Dr. Andrew Cooper joined the Department of Mathematics in Fall 2013. A native of San Antonio, Texas, he holds a BS (2005) and a PhD (2011) from Michigan State University. Before coming to NC State, he held a postdoctoral post as Hans Rademacher Instructor of Mathematics at the University of Pennsylvania.

Dr. Cooper's research is in parabolic geometric flows, a method of finding the 'best' (shortest, tightest, lowest-energy) geometric representation of a topological object. One example of such a flow is the way that soap bubbles shrink—they minimize their surface area—until they pop. A soap bubble that starts out convex will get rounder and rounder and shrink almost to a point; one that starts out like the surface of a donut will shrink almost to a ring. Once we've determined all the different possible ways that the bubble can pop, we have a classification of all bubbles into 'popping types'. Cooper currently studies when and how flows of geometric objects called Lagrangian submanifolds (which arise in classical physics, general relativity, and string theory) can become singular (i.e. 'pop'). Besides physics, geometric flows have applications in computer graphics, and the technique was crucial to the solution of the century-old Poincaré Conjecture in 2003. Dr. Cooper is a proponent of the idea that learning mathematical ways of thinking is essential not only to science and engineering, but for all students. Mathematics might be defined as the art of describing one's thinking in such a way as to allow another person to think the same sequence of ideas in the same way. Thus the study of mathematics holds many lessons about how to think critically and



how to communicate clearly. The same attention to detail that is required to work through a calculus problem turns out to be just as useful in understanding legal contracts or political rhetoric; for example to distinguish between reducing the debt (a statement about a first derivative) versus reducing the deficit (a statement about a second derivative).

Dr. Cooper has a particular interest in writing in the mathematics classroom. Writing can serve as an exercise to organize one's thoughts and help reflect on new and old topics, and also as a shareable final product for students at all levels. Cooper is among the first collegiate mathematics instructors to have his students blog, and is interested in expanding to other social media such as wikis. It may surprise some to learn that several prominent mathematicians keep regular blogs about their mathematics, and that social-media projects such as PolyMath, MathOverflow, and the Tricki have led to real insights in research mathematics.

Outside of mathematics, Dr. Cooper's academic interests include linguistics (he worked in the Computational Linguistics Lab as an undergraduate) and philosophy of the mind. He also enjoys photography and playing saxophone.

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An interpolation between the coffee cup and the donut, smoothed by mean curvature flow

Advanced Mathematics Courses - Fall 2014

MA/LOG. 335. Symbolic Logic	1:30 – 2:45 TH	Hafner
MA 351. Introduction to Discrete Mathematical Modules	10:15 – 11:30 TH	Kaltofen
MA 401. Applied Differential Equations II*	11:45 – 1:00 TH	Chertock
	11:45 – 1:00 TH	Selgrade
	12:25 – 1:15 MWF	Norris
	1:30 – 2:20 MWF	Martin
MA 402. Computational Mathematics: Models...	10:15 – 11:30 TH	Graham
MA 408. Foundations of Euclidean Geometry	3:00 – 4:15 TH	Jing
MA/ST 412. Long-Term Actuarial Models	3:00 – 4:15 TH	Scroggs
MA 421. Introduction to Probability*	11:20 – 12:10 MWF	Silverstein
MA 426. Mathematical Analysis II	9:10 – 10:00 MWF	Martin
MA/CSC 427. Introduction to Numerical Analysis I	11:20 – 12:10 MWF	Chu
MA 430. Mathematical Models in the Physical Sciences	11:45 – 1:00 TH	Fulp
MA 437. Applications of Algebra	8:30 – 9:45 TH	Jing
MA 440. Game Theory	11:20 – 12:10 MWF	Schechter
MA 493/450. Methods of Applied Mathematics I	1:30 – 2:45 TH	Haider
MA 493. Measure Theory and Lebesgue Integration	12:25 – 1:15 MWF	Bociu

The following **graduate courses** are offered in the fall and may also be used as advanced math electives: MA 501*, MA/OR 504, MA/OR 505, MA 513*, MA 515, MA 518, MA 520, MA 521, MA 522, MA 523, MA 524, MA 526, MA/OR 531, MA 532, MA 534, MA/ST 546, MA 551, MA/BMA 573, MA/CSC 580, MA 584.

* These classes are also offered during one of the Summer Sessions.



Need Access to the Math Undergraduate Lounge? If you are a new or continuing Math Major who has not already requested access to the Undergraduate Lounge, you need to see Di Bucklad in SAS Hall 2108.

MA 493: Measure Theory and Lebesgue Integration

Instructor: Dr. Lorena Bociu

The scope of this class is to go beyond the Riemann integral and introduce the beautiful theory of measures and Lebesgue integration. Topics covered will include: sigma-algebras, measurable functions, the Lebesgue integral, convergence theorems, Lebesgue measure on \mathbb{R} , L^p spaces, and Hilbert Spaces. This course can count towards satisfying Math Honors Program requirements, in place of one of the graduate level math classes.

MA 450/493 Methods of Applied Mathematics I

Instructor: Dr. Mansoor Haider

This course is one of two courses in applied mathematical methods that were offered for the first time in 2013-14. This course will provide you with a foundation in mathematical tools and techniques needed to study scientific and engineering problems. Primary topics include Dimensional Analysis and Scaling, in which mathematical models are analyzed at a fundamental level prior to their analytical or numerical solution; Perturbation and Asymptotic Methods, which reveal analytical structure of solutions via systematic approximation; Balance Laws, which serve as the basis for modeling with equations; and Discrete Processes, which are increasingly important in several applications. Prerequisites for this class include MA 242 and MA 341, or equivalent.

COURSE HIGHLIGHTS

SUM Series

The SUM Series features informal talks on mathematical topics. The talks are held Wednesdays from 4:00 to 4:50, in 2102 SAS Hall. You will have a few minutes to help yourself to pizza before the talk.

For upcoming topics or to join the list, check out the SUM Series website: <http://go.ncsu.edu/sumseries>

SUM Club --- Society for Undergraduate Mathematics

The SUM Club of NCSU is dedicated to bringing together undergraduate students who have a common interest: mathematics.

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 is led by President *Ben Pierson* and Vice President *Jessica Miller*, with the assistance of its faculty advisor *Dr. Molly Fenn*.

The club plans to host a variety of events, including a Career Development Center Information Session on Careers in Math. More information can be found in the career corner section of this newsletter. We wish to grow in the community as well and volunteer as tutors for 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.



News from the Math Honors Program

Director: Dr. Sandra Paur

Website: <http://www.math.ncsu.edu/honors>

Congratulations to our December 2014 graduates: **Laura Poag**, **Karen Stabile** and **Samantha Zuber**! Laura is working at Nuventra Pharma Sciences, Karen is working for Microsoft, and Samantha is completing graduate work in mathematics at NC State.

Nick Dunn and **Allison Saito** attended the Budapest Semesters in Mathematics last semester. Get in touch with them if you want to find out more about the program.

Welcome to our new students in the Math Honors Program: **Robert Baraldi**, **Jason Barlow**, **Mia de los Reyes**, **Darren Lipman**, **Tyler Maltba** and **Sara Troutman**.

Currently there are thirty-three students participating in the Math Honors Program and invitations to join the program will be extended sometime during pre-registration. Every year approximately 20-25% of math graduates complete the Math Honors Program and about 80% of those students go on to graduate school. Schools they have attended include Berkeley, Princeton, Stanford, MIT, Cornell, NYU and UCLA. Math honors students have received 13 NSF Fellowships and four DoD Fellowships for graduate school as well as six Goldwater Scholarships and two Gates Fellowships. Besides taking more challenging courses to complete their math degrees, Math Honors Program students also do research either at NC State or in a summer REU Program (Research Experience for Undergraduates). More than 30 students have completed a study abroad program focusing on mathematics, either at the Budapest Semesters in Mathematics or the Math in Moscow Program.

Participation in REUs, BSM and similar programs has played a major role in the success of our students in getting accepted into excellent graduate schools. Dr. Paur is happy to talk to any student interested in participating in the Math Honors Program – stop by her office in SAS 3144 or email her at sopaur@math.ncsu.edu for an appointment.



Student awards



- Math Senior Award for Outstanding Scholarship: **Alex Chin** (May '14)
- Math Senior Award for Outstanding Research: **Laura Poag** (Dec. '13)
- Math Senior Award for Outstanding Community Engagement: **Joe Murray** (May '14)

We wish them good luck for the College Senior Awards Competition!

- Congratulations to **Mia De Los Reyes**, a double major in Applied Math and Physics, who was chosen to represent NCSU for the very prestigious Astronaut Scholarship Competition in 2014. Good luck Mia!

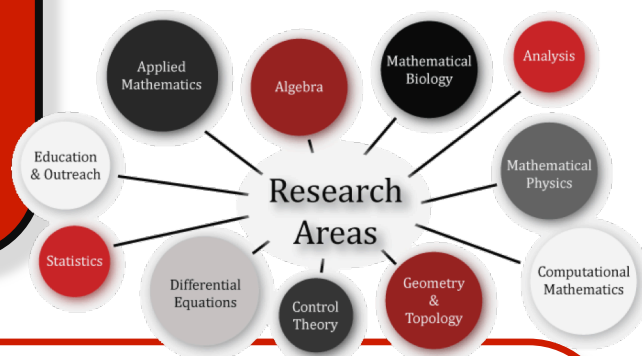
NCSU Office of Undergraduate Research invites proposals for

UNDERGRADUATE RESEARCH GRANTS

BEGINNING APRIL 1, 2014

GRANTS WILL COVER: Cost of supplies, Reference books, Software, Travel to Conferences, Etc...

Note: If you plan on doing research next fall, talk with your research advisor about applying for one of these grants. For more info visit the Office of Undergraduate Research website: <http://undergradresearch.dasa.ncsu.edu/>



Research Opportunities in the Research Training Group (RTG) in Mathematical Biology

Our RTG program, funded by the NSF, offers undergraduates (as well as graduate students) the chance to carry out cutting-edge research at the interface between mathematics and biology. Each year, up to four students will receive **support for a minimum of two semesters** to work with faculty and graduate students. Projects will involve the development of mathematical models for biological systems and the application of these models to experimental data and/or the development of new techniques for the analysis of biological data. These research experiences will provide interdisciplinary training at the interface of mathematics, statistics and biology, providing a great way to start working in the exciting and rapidly expanding area of mathematical biology. Participating faculty: Tom Banks, Kevin Gross, Mansoor Haider, Alun Lloyd, Sharon Lubkin, Mette Olufsen, Ralph Smith and Hien Tran.

More information is available at the RTG website <http://rtg.math.ncsu.edu> (still under construction). Interested undergraduates should contact Mette Olufsen (msolufse@ncsu.edu).

SAMSI's Undergraduate Modeling Workshop

Date: May 18-23, 2014

Location: North Carolina State University, Raleigh, NC

This week long workshop will provide an introduction to mathematical and statistical research in data modeled using networks. Talks will be presented by statisticians and mathematicians who work with networks, but especially with social networks. Visit <http://www.samsi.info/UGM14> to apply. Application deadline is April 7, 2014 at 5:00pm EDT.

Please send questions to: ugworkshop@samsi.info

NCSU Office of Undergraduate Research

Event: Annual Spring Undergraduate Research Symposium

Date: Monday, April 14, 2014

Purpose: Great opportunity to present a poster of your work to the NCSU community

Registration and Abstract Submission Begin: Monday, March 3, 2014

Website: <http://undergradresearch.dasa.ncsu.edu/>



Career Corner for Math Majors

By *Jenna Hartwell*, M.Ed. (jrhartwe@ncsu.edu)

It's the month of March, which means spring is finally upon us. With it comes longer days, baseball season and, for many seniors, the beginning of their first professional job search. Congratulations to the class of 2014 – welcome to the next chapter of your life!

As the new designated Career Counselor for the College of Sciences here at NC State, I'm getting a lot of questions about best practices for beginning a job search and suggestions for where to look for opportunities. Here's the good news - through studying mathematics you have acquired many of the top qualities we know recruiters are looking for! According to the National Association of Colleges and Employers, companies want applicants with the following skills:

Communication

Teamwork

Decision Making

Planning/Organizing/Prioritizing

Information Processing

Think of your time here at NC State: group projects/problems, undergraduate research and classroom assignments are all ways you have developed and refined the above noted skills.

Nevertheless, even with an awareness of the marketability of their strengths, I'm finding many graduating seniors have developed a major case of what I call the "*laters*" I regularly hear phrases such as "Oh, I'll edit my LinkedIn page later," "I have a test this week so I'll apply later," and "My goal is to write my resume once I have finished [insert unnecessary task here]."

The reality is your job search should start now. Today. This can be as simple as telling your F³ (friends, family, faculty) you're looking for full time employment or as complex as drafting a comprehensive job search strategy; especially as most job searches for graduating seniors take between three and four months.

Whatever you decide, at a bare minimum you should be using the free tools available to you from the **Career Development Center** (careers.ncsu.edu). Most noteworthy is **ePACK** (www.ncsu.edu/epack) – your one stop, career shop.

Within ePACK you will find job postings exclusively for NCSU students and the Employer Directory where you can find contacts. There is also **GoinGlobal** (job search tools for more than 30 countries and 50 U.S. metropolitan areas), **CareerShift** (returns job search results from every career site and job board) and so much more. You can even make your resume public so employers can search ePACK and find you!

Good Luck with your job search and I greatly look forward to meeting and talking with all of you soon. Happy hunting, and remember - ***Career Starts Now!***

CAREER
CENTER

This semester, the **SUM Club of NCSU** will be hosting a Math Department Information Session led by the Career Development Center. Mrs. Jenna Hartwell, the new Professional Advisor for the College of Sciences, will be leading a talk focused on what undergraduates in Mathematics should be doing during their time in college to plan ahead, and what they can do with their degree when they graduate. Students will learn how to talk about their major when asked about their plans and how to properly organize themselves to utilize the opportunities around them.

If you have ever wondered about whether participating in internships, doing research, or going to Career Fairs will be beneficial to you as an undergraduate, this Information Session will clear up some questions you may have. All interested students are welcome to attend. The event will be held on **Wednesday, March 26th from 5:30 – 6:30 pm in SAS 1102**. Please email sumclub@math.ncsu.edu if you have any questions!

Wondering
where your
math Major
will take you?

Career information session for math majors

Wednesday, March 26

SAS 1102

5:30 - 6:30 pm

Hosted by SUM Club

What math majors say...

Helpful Resources to use in Pursuit of the Best Degree

Joe Murray (Class of 2014)

I think one of the best ways to learn (and understand) the material in the upper-level math courses is to read the proofs of theorems (especially the important ones). Often times you will notice that these important theorems are proved in nontrivial ways, which reveals subtle tricks you can utilize in your own proofs. Some of the easier problems you find on homework or tests will require proofs which are fairly straightforward, but the more difficult ones will require the use of more subtle techniques, which are often embedded in proofs of theorems in the corresponding chapter. Keep this in mind while studying, as it can help you figure out those difficult proofs much more easily.

Another thing I would recommend is that you try to pursue your passions outside of school. Whether you like video games, speaking Italian, or snowboarding, there's probably a campus club perfect for you. Being involved in student organizations helps you make new friends and possibly gain the opportunity to take a leadership role, which can help you when applying to graduate school or while looking for employment.

Finally, I would like to seriously recommend using all resources at your disposal. This includes the University Tutoring Center, your academic advisor(s), and the career center. These resources exist solely to help you, and that is exactly what they do. Don't be afraid to ask for help. You're only going to be here for four years, so you should make it count!

What Can I do with a Math Degree?

Laura Barnobi (Class of 2013)

Business Technology Analyst at Deloitte Consulting, LLP

In my first 2 years at NC State, I had three majors: Civil Engineering, Mathematics Education, and Math. The first two paths would have prepared me for a career, but I did not find my major courses interesting. Once I was focused on Mathematics, the curriculum allowed me to follow my interests - pursuing one topic, while still getting a foundation in Calculus, Linear Algebra, Real Analysis, Statistics, and Discrete Mathematics. After reaching out to my professors, they continued to support and challenge me. In the end, my mathematics degree prepared me to pursue graduate studies or begin a career in industry.

I had no idea what I wanted to do when I grew up. I enjoyed studying mathematics, so I assumed I would get a graduate degree or teach math. As I looked for prospective graduate programs, I attended the Engineering Career Fair and spoke to representatives about the Business Technology Analyst (BTA) program at Deloitte Consulting. I researched many options, and realized going into consulting would allow me to solve unique problems while working with interesting people. The math courses that are helping me now in my career include MA 225, 425 and 426. (Thanks Dr. Paur, Dr. Franke, and Dr. Martin!) These courses taught me to *think* – and this gave me an edge over other students interviewing for the same job. My advice for Math Majors is below:

- **Take classes that interest you.** If you're a math major, then there was a time in your life that you loved math. You can continue to find those classes that peak your interest!
- **Get to know your professors.** Other than helping you finish that 10 page homework assignment, they can help lead you in the right direction. They can help you find the right REU, graduate program, or tell you about a career you didn't even think you'd enjoy.
- **Look and see what's out there.** This includes taking *useful* general education courses such as a logic or computer science course. Trying new things is what college is all about – so have as many different experiences as you can!

UNDERGRADUATE PROGRAMS IN MATHEMATICS

Mathematics Department
Campus Box 8205
Raleigh, NC 27695



Did you know?

Basketball Statistics - NCAA Tournament in Raleigh

Mathematics Teaching Associate Professor John Griggs and his crew will be doing statistics for the Men's NCAA Basketball Tournament in Raleigh on March 21 and 23 at the PNC Arena. The crew consists of NC State graduates - Doug Brann, Carla Kelly, Tangie Gray, Alan Hoffler (mathematics), Timmy Tucker (mathematics education), Randy Griggs, Alex Eichman (Mathematics), and Corky Trutza - who are currently employed as programmers, cytogeneticists, communication consultants, deans of students, personal trainers, and medical salesmen.

SAVE THE DATE

Mathematics Awareness Month 2014 * April 2014

Mathematics, Magic, and Mystery

<http://www.mathaware.org/mam/2014/>