MATHEMATICS NEWSLETTER

SAY "HI" TO
RADMILA SAZDANOVIC

Radmila Sazdanovic joined Department of Mathematics at NCSU in Fall 2013. Her mathematical journey started in Serbia, and continued with a Ph.D. from the George Washington University in 2010, followed by postdoctoral positions at Mathematical Sciences Research Institute and University of Pennsylvania. She has also been a visitor at Columbia University, the Kavli Institute for Theoretical Physics in Santa Barbara, California, and the Simons Center for Geometry and Physics at Stony Brook University.
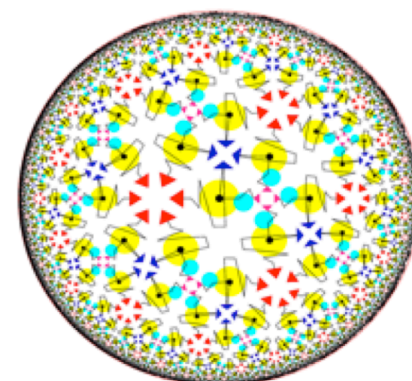
Radmila's research involves topology, algebra, combinatorics, and their interactions and applications – the mathematics of shapes and (algebraic) structures. Specifically, Radmila is an expert in categorification, a process which takes some mathematical object (say, a positive integer n) and realizes it as a mathematical "shadow" of some other mathematical object (say, a vector space of dimension n). Exercise for the reader: if vector spaces V and W lift n and m, what should be assigned to $m + n$?

Her work in categorification stems from her interest in knot theory she developed as an undergraduate. A two-month research project led to a long term collaboration and publishing a book *LinKnot* accompanied by a software package. Knot theory has connections to several fields of pure mathematics and applications to molecular biology (protein folding) and physics (you can tie light in knots using holographically-controlled knotted laser beams!). More recent developments include applying topology in large data analysis and engineering.

The rich geometric structures of knots, tessellations of the hyperbolic plane, and diagrammatic representations of algebraic structures that appear in categorifications, are at the core of the Radmila's digital art Radmila is passionate about popularizing and teaching mathematics. She gave a number of public lectures about a two-way relation between mathematics and art: carefully chosen visualization can be used to convey a mathematical idea that would take pages and pages of formulas and symbols. She places a strong emphasis on visual aspects of learning mathematics and is one of the editors of

"Experience- centered approach and Visuality in the Education of Mathematics and Physics" published in 2012. She was involved in Philadelphia Area Math Teachers' Circle, *Girls in Engineering, Mathematics and Science* program at University of Pennsylvania and the *Girl's Angle* Math Club for girls http://www.girlsangle.org/. You can catch her next speaking in the Math Circle in the Triangle on December 7 (more information: http://www.math.ncsu.edu/MathCircles/).

Director of Undergraduate Programs

For his years of dedicated service in the Undergraduate Program, we extend a sincere "Thank You" to Dr. Scroggs. We would also like to congratulate Dr. Alina Duca on her new role as the Director of Undergraduate Programs.

Advanced Mathematics Courses

The following classes may be used as advanced math electives in the Spring 2014

MA 401 (1) Applied Differential Equations II	8:05 – 8:55 MWF	TBA
MA 401 (2) Applied Differential Equations II	11:20 – 12:10 MWF	Martin
MA 401 (3)- pplied Differential Equations II	1:30 – 2:45 TH	Lubkin
MA 408 (1)- oundations of Euclidean Geometry	3:00 – 4:15 TH	Lin
MA 408 (2) - Foundations of Euclidean Geometry	3:00 – 4:15 TH	TBA
MA 410 – Theory of Numbers	11:45 – 1:00 TH	Kaltofen
MA/ST 412 – Long-Term Actuarial Models	3:00 – 4:15 TH	TBA
MA/CSC 416 – Introduction to Combinatorics	10:15 – 11:05 MWF	Reading
MA 421 – Introduction to Probability	1:30 – 2:20 MWF	Paur
MA 426 – Mathematical Analysis II	12:25 – 1:15 MWF	Paur
MA/CSC 428 – Introduction to Numerical Analysis II	1:30 – 2:45 TH	Chu
MA 432 - Mathematical Models in Life and Social Sciences	11:45 – 1:00 TH	Lloyd
MA 437 – Applications of Algebra	11:45 – 1:00 TH	TBA
MA 493/451 – Foundations of Applied Mathemtics	10:15 – 11:30 TH	Shearer
MA 493 – Mathematics of Scientific Computing	1:30 – 2:45 TH	Gremaud
MA 493/BIO – Modeling Techniques for Biological Systems	1:00 – 2:15 TH	Tran
MA 501 – Advanced Mathematics for Engineers and Scientists I	11:45 – 1:00 TH	Lubkin
MA 502 – Avanced Mathematics for Engineers and Scientists II	10:15 – 11:05 MWF	Fulp
MA 512 – Advanced Calculus II	10:15 – 11:05 MWF	Zenkov
MA 520 – Linear Algebra	11:45 – 1:00 TH	Putcha

Upcoming Events for Undergraduates

October 14 - Academic advising for Spring semester begins
October 18 - Last day to withdraw or drop a Fall course without a grade
October 22 - Registration for Spring semester starts

Check your enrollment date on MyPack Portal!

MA 493: Modeling Techniques for Biological Systems

Instructor: Hien Tran

This course is designed to provide students with a fundamental understanding of how mathematics and statistics are applied to problems in life sciences. The approach uses several biologically motivated case studies (e.g., population dynamics, chemostat, infectious diseases, physiologically based pharmacokinetic models). For each case study, students will be led through discussions about why a model is needed and what goals are to be sought. Students will examine the mathematical models both analytically and computationally (SimBiology toolbox) in order to compare their behavior with those exhibited by the modeled phenomena. A long-term goal of the course is to spark student interest for deeper study of some of the biological, mathematical and statistical topics involved. The course includes a significant writing component, teamwork, laboratory exercises and research projects that involved computer lab component.

MA 493: Mathematics of Scientific Computing

Instructor: Pierre Gremaud

Prerequisite: Two semesters of calculus, some familiarity with basic linear algebra concepts

Catalog description: Web search engines are built on linear algebra; from cell phones to JPEGS, Fourier analysis permeates our digital world. In this new one-semester course, you will learn about the mathematics of some of the fundamental tools of scientific computing that made these (and other) technological advances possible. Topics to be covered include: classification, dimension reduction, Monte Carlo, regression and Fourier analysis.

Each technique will be paired with a project stemming from an actual application. "Big data" is here: learn how to solve quantitative problems and analyze data.

MA 493/451 Foundations of Applied Mathematics

Instructor: Michael Shearer

This class will include a variety of topics related to mechanics, including an introduction to continuum mechanics, both solid mechanics (elasticity) and fluid mechanics, the basics of calculus of variations, and some techniques such as Fourier analysis. If there is time, some discrete processes will be covered as well.

The class is suitable for juniors and seniors who have a background in calculus (MA 242) and differential equations (MA 341 ODE and preferably MA 401 or MA 534 PDE)

COURSE HIGHLIGHTS

MA 494 Major Paper in Math

Catalog description: MA 494 introduces students to one or more forms of writing used in scientific and research environments. Students are required to take a companion math course at the 400-level or above, and adapt writing assignment(s) to the topics in the companion course.Instruction covers all phases of the writing process (planning, drafting, revising, and critiquing other people's work). Emphasis is placed on organizing for needs of a variety of readers; concise, clear expression.

Enrollment process
A student who wishes to take this class must:

- Find an instructor who agrees to work with him/her.   The easiest option is to identify a math course with a writing component (e.g. MA408, MA412). This course could also count as a math elective.

- Talk to the instructor and have him/her consent via email or in-person

- Email Dr. Duca (anduca@ncsu.edu) with a request to be added to this class. The instructor who agreed to work with the student must be copied on this email; ask the instructor to reply to Dr. Duca with a confirmation email.

MA 499 Independent Research in Mathematics

Catalog description: Study and research in mathematics. Topics for theoretical, modeling, or computational investigation.

At most 6 hours total of MA 499 and 491H credit can be applied towards an undergraduate degree.

Enrollment process
A student who wishes to take this class must:

- Find a math professor who agrees to work with him/her. Agree on the workload for the course and the appropriate amount of credit hours (1-6)

- Email Dr. Duca (anduca@ncsu.edu) with a request to be added to this class, the name of the professor, and the number of credit hours. The professor who agreed to work with the student must be copied on this email and reply to Dr. Duca with a confirmation email.

News from the Math Honors Program *by Dr. Sandra Paur*
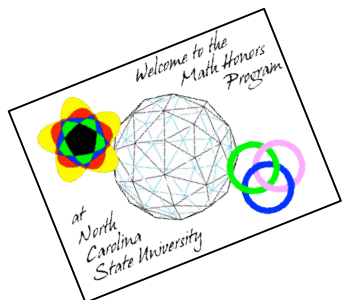
Every year approximately 20-25% of math graduates complete the Math Honors Program and about 80% of those students go on to graduate school. Schools they have attended include Berkeley, Princeton, Stanford, MIT, Cornell, NYU and UCLA. Math honors students have received 13 NSF Fellowships and four DoD 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.

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.

Congratulations to May 2013 graduates: Joey Arthur, Jason Cockrell, Khalida Hendricks, Ethan Lockhart, John Nardini, William Oakley, Robert Pearce, Phillip Phipps, Sean Plummer, Sean Ressler, James Rowland, Ryan Walker, David Woodley and Peiqian Zhong.

Joey, Ethan, John Nardini and Sean Plummer are doing PhD studies in mathematics at Stanford, Rensselaer Polytech, University of Colorado at Boulder and Texas A&M respectively. Khalida, Sean Ressler and James are doing PhD study in physics. Khalida and James are at Ohio State, Sean is at the University of California at Berkeley and Phillip is doing a masters in physics at NC State. David is working on a master's in nuclear engineering at NC State and William and Peiqian are doing master's programs at NC State in applied math and operations research respectively. Jason Cockrell is employed at Analog Devices in Greensboro, NC.

Welcome to the new students: Ermin Bibic, Christian Chapman, Ashton Dyer, Marschall Furman, Thomas Gray, Alex Hazeltine, Matthew Loeffler, Jake Robbins, Alexandria Vail, Brett Yarchin, and Pengfei Zhao. Thirty-three students are currently participating in the Math Honors Program. Invitations to join the program will be sent during advising time.

Please contact Dr. Paur (SAS 3144, sopaur@ncsu.edu) to find more about the Math Honors Program. More information about the program can be found on the Math Honors website at http://www.math.ncsu.edu/honors.

~ 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 . There is a low-volume (weekly) email list dedicated to announcements of upcoming SUM Series talks.

~ 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 speakers throughout the year, including a representative from Fidelity Investments. We wish to grow in the community as well and volunteer as tutors for local schools and STEM programs. From bowling, to movie nights with Statistics Club, to video games with the Society of Physics Students, 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.

Opportunities in the Math Department at NCSU

NSF Scholarship in Science, Technology, Engineering, and Mathematics (S-STEM): Research Scholars Program in Mathematics

Description: Funded by the National Science Foundation (NSF), the S-STEM Research Scholars Program in Mathematics at North Carolina State University aims to attract, retain, and graduate academically talented, financially needy math students who may not make it to graduation and into the technological workforce without additional financial resources and other support structures.

Where: NC State University, Department of Mathematics

Scholarship: $5,000 for undergraduate students to support tuition, fees, and textbook charges per academic year.

Scholarship Eligibility Criteria:

• be a U.S. citizen, U.S. Permanent Resident, or Admitted Refugee
• full-time enrollment in mathematics; undergraduate students are eligible for S-STEM scholarships in their *junior* and *senior* years
• demonstrate financial need (by submitting a Free Application for Federal Student Aid (FAFSA), available at www.fafsa.ed.gov)
• demonstrate academic ability or potential

Scholarship Application Requirements:

Complete an online application form available on the Mathematics Department website;

Applications will be accepted in November for Spring 2014 have results of completed Free Application for Federal Student Aid (FAFSA) on file at the Office of Scholarships and Financial Aid (OSFA)

UNDERGRADUATE BIOMATHEMATICS

The **U**ndergraduate **B**io**M**athematics (UBM) initiative at NC State offers students the chance to carry out cutting-edge research at the interface of mathematics and biology. Eight students a year, four from the mathematical sciences and four from the biological sciences, will receive summer support ($4000 stipend) as part of a year long research experience. Research projects will be carried out by our teams of four students, under the supervision of two faculty members. MA 493 (Fall semester) and its sister course MA 493/BIO 495 (Spring semester) are designed to prepare biology students for the research component of the UBM program.

Student participants in UBM research will be recruited in the Spring semester. Student projects will take place over the Summer, with work continuing into the Fall semester. Some projects might begin in Spring semester.

For further information, contact Hien Tran (tran@ncsu.edu)

MORE OPPORTUNITIES!!!!!!!!!!!!!!!!!

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

Our new RTG program, funded by the National Science Foundation, offers undergraduates (as well as graduate students and postdocs) 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 (academic year and/or summer) to work together with faculty members 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   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. Projects involve a number of different biological applications, such as immunology and cell proliferation, transmission of infectious diseases, tissue development and regeneration, cardiovascular dynamics and virus dynamics. They will be led by participating faculty who include Tom Banks, Kevin Gross (statistics), 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).

"Considering my generation's share of the national debt, maybe we should use some bigger numbers."

Posters on the Hill 2014 in Washington DC
Call for Abstracts
Submission Period: Sept 2 – Nov 4, 2013
Event: TBD (Spring 2014)

The Council on Undergraduate Research invites you to submit an abstract for the 18th Annual Posters on the Hill. Your research should represent one of CUR's Divisions -Arts and Humanities, Biology, Chemistry, Geosciences, Health Sciences, Mathematics/Computer Science, Physics, Astronomy, Psychology, and Social Sciences.

Any questions regarding submissions contact:

Mary Pat Twomey-mptwomey@cur.org

Any questions regarding the event contact:

MeLisa Zackery – mzackery@cur.org

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SAMSI

E&O: Undergraduate Workshop - Feb 20-21, 2014

As part of its Education and Outreach Program for 2013-2014, the Statistical and Applied Mathematical Sciences Institute (SAMSI) will offer a two-day undergraduate workshop on topics of current interest in statistics and applied mathematics.
Deadline for applications January 17, 2014
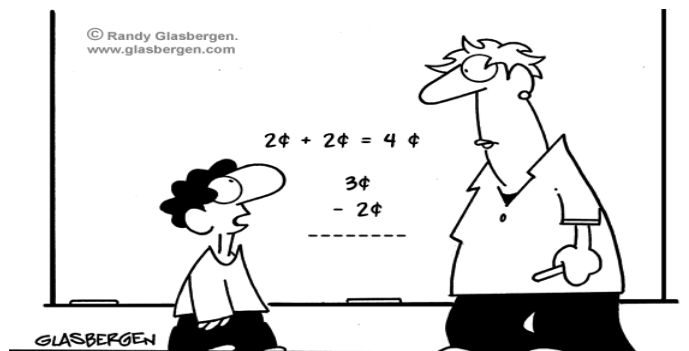
Send questions to ugworkshop@samsi.info
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Sigma Xi Student Research Conference

Registration for the 2013 Sigma Xi Student Research! For Conference details and to register, please visit
http://www.sigmaxi.org/meetings/src/2013src.shtml

Event Dates: **November 8 & 9, 2013** Event Location: Research Triangle Park, North Carolina USA

Dates and Deadlines
October 15, 2013 – Registration and Abstract Submission Deadline (to appear in conference program)

Scholarships, Grants, Research Opportunities, and Conferences

There are many ways to enhance your mathematics education through research, attending conferences, or applying for scholarships or grants. Here are a few opportunities you might want to consider:

- ✓ Research grants for undergraduates:
  http://www.ncsu.edu/undergrad-research/

- ✓ State of NC Undergraduate Research and Creativity Symposium: http://www.sncurcs.org/

- ✓ Regional Math and Statistics Conference for Undergraduates at UNCG:
  http://www.uncg.edu/mat/rmsc/

- ✓ Nebraska Conference for Undergraduate Women in Math: http://www.math.unl.edu/~ncuwm/16thAnnual/

- ✓ Grants for NC State students for the spring and/or summer semesters.
  http://undergradresearch.dasa.ncsu.edu/funding/nc-state-undergraduate-research-grants

- ✓ Noyce Mathematics Education Teaching Scholarships:
  http://poe.ced.ncsu.edu/noyce/

Southeastern Conference for Undergraduate Women in Mathematics

Date: Saturday October 26 & Sunday October 27 at Clemson University in South Carolina.

Goal: Is to increase retention of women in mathematics by giving female undergraduates and first year graduate students in mathematics a forum to present research they conducted while undergraduates.

Deadline for registration: Wednesday October 16

Further information on the conference can be found at the conference website:

http://www.ces.clemson.edu/~jimlb/SCCUWM/2013/SCCUWM.html.

¡ TIS THE SEASON FOR SOME PUMPKIN π

UNDERGRADUATE PROGRAM

Mathematics Department
North Carolina State University
Campus Box 8205
Raleigh, NC 27695