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# The N.C. STATE UNIVERSITY UNDERGRADUATE MATHEMATICS NEWSLETTER

# Meet Lorena Bociu and Bill Kranec

Lorena Bociu received her Ph.D. from the University of Virginia in 2008, and subsequently held postdoctoral positions at University of Nebraska-Lincoln and the Centre National de la Recherche Scientifique (CNRS)- Institut Non Linéaire de Nice (INLN), in Sophia Antipolis, France as a NSF International Research Fellow.

Lorena's research interests lie in Nonlinear Partial Differential Equations (PDEs), one of the key areas of interaction between mathematics and other sciences. Her work is focused on analysis and control of nonlinear PDEs, for example, wellposedness, regularity, and long-time behavior for evolutionary PDEs, and sensitivity analysis and control in free boundary problems, with focus on fluid-elasticity interactions.

In addition to her research, Lorena also enjoys teaching very much. She promotes "active learning" in Mathematics and truly believes in the importance of the teacher and their influence over a student's desire to learn and achieve their goals. She has been involved in several programs meant to advocate women's pursuit of mathematics and mathematical careers, and gave presentations on "Why should I study math? What can I do with a math degree?" at several schools. She is an active member of AWM (Association of Women in Mathematics), and this year she also serves as a faculty mentor for NCSU-WISE (Women in Science and Engineering).

Bill Kranec received his Masters in Mathematics from the University of Virginia in 2004, afterwards accepting a position in the Strategic Planning division of CarMax, a Fortune 500 used car retailer. There, he successfully applied mathematics and data analysis to study used car pricing

dynamics as well as the pricing

"flow" of automotive parts in the company's vehicle reconditioning process, before leaving in 2009 to relocate to France with his family Since then, he has held several teaching positions before arriving at NC State. In class, Bill enjoys interacting with students and stressing the value of mathematics for solving problems in everyday life. Last spring, he received an award from the Office of Faculty Development to study ways to improve student learning through data analysis.

Together, Bill and Lorena organized a special mathematics exhibit during "BugFest" at the North Carolina Museum of Natural Sciences in September 2012, entitled "Math Doesn't Bug Me". With the assistance of several graduate student volunteers, participants played various games (involving bugs, of course) illustrating important mathematical principles in geometry, graph theory, and game theory. Both children and their parents got to have fun and got a glimpse of how mathematics can be applied in everyday life.

In January, their group also participated in Lacy Elementary "Math and Science Night". When they are not on campus, Bill and Lorena can be found at home with their daughters Lisa, who is six years old, and Alexandra, who recently turned one. As a family, they enjoy spending time outside, swimming or playing tennis when the weather is nice. They also enjoy practicing piano, playing board games (Settlers of Catan, anyone?), and, of course, watching movies. If they're not holding one of their girls, Bill and Lorena both enjoy cooking, with Lorena serving delicious and authentic Romanian cuisine, and Bill handling most of the grilling, smoking, and baking (unfortunately, Bill's childhood home of New Jersey is not known for its culinary tradition).



## **Advanced Mathematics Courses**

The following classes may be used as advanced math electives in the Fall 2013

MA/LOG 335	Symbolic Logic	Auerbach
MA 351	Introduction to Discrete Mathematical Models	Kaltofen
MA 401	Applied Differential Equations II	Selgrade
MA 402	Computational Mathematics: Models, Methods and Analysis	TBA
MA 408	Foundations of Euclidean Geometry	Jing
MA 421	Introduction to Probability	Paur
MA 426	Math Analysis II	Martin
MA 427	Introduction to Numerical Analysis I	Chu
MA 430	Mathematical Models in the Physical Sciences	Fulp
MA 437	Applications of Algebra	Singer
MA 440	Game Theory	Schecter
MA 444	Problem Solving Strategies for Competitions	Lin
*MA 493-003	Differential Equations for the Life Sciences	Tran/Banks
*MA 450/493	Methods of Applied Math I	Shearer
*MA 520	Linear Algebra	Bakalov/Putcha
	*Course listed has been highlighted on the following page.	



Did you know that Dr. John Griggs has collected the statistics for the NC State University men and women's basketball games for 22 years?

## MA 520 "Linear Algebra"

Instructor: B. Bakalov

## Prerequisite: MA 405

The course will start with basic concepts in vector spaces and will quickly move to an in-depth study of linear transformations and their associated matrices. In particular, the rational and Jordan canonical forms will be studied. By the end of the course, students will have mastered the important concepts of Linear Algebra necessary to take the introductory course in Lie Algebras (MA 720). Some knowledge from MA 405 will be assumed. If this is your first Linear Algebra course, you should take MA 405 instead.

## MA 493: Differential Equations for the Life Sciences

## Instructor: H. Tran

**Prerequisites:** Two semesters of calculus, e.g. MA 231 or MA 241. NO previous computing experience is required. This course may replace MA 341 for the BS in MA/AMA; however, MA/AMA students must obtain permission of the instructor to take this course.

Biologists are increasingly using mathematical models to help understand the world around us. In this new course you will learn about the most widely used type of model: differential equation models. Using real-world examples drawn from many areas of biology (such as ecology, evolution, epidemiology and virology) you will learn the mathematical techniques that are used to explore and understand this type of model. Our exploration of models will involve hands-on computer activities, starting with web-based apps and moving on to learning how to write your own code. In our journey through this course you will see how models are put together and analyzed, as well as learning some new biology along the way.

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## MA 450/493 Methods of Applied Mathematics I

## Instructor: Michael Shearer

This new course is the first of a sequence of two methods courses to be offered for the first time in academic year 2013/14. The purpose of the course is to give you the mathematical tools to study scientific and engineering problems. In this first class, the primary topics are: Dimensional Analysis and Scaling, in which mathematical models are analyzed at a fundamental level before attempting explicit or numerical solutions; Perturbation and Asymptotic Methods, which reveal the structure of solutions without needing formulas for the solutions themselves; Balance Laws, the basis for modeling with equations; Discrete Processes (as opposed to continuous processes modeled by differential equations), which are increasingly important in applications. Each technique will be embedded in applications and examples. Prerequisites for the class are Calculus, MA242 and ODEs, MA341, or equivalent.

http://www.math.ncsu.edu/~shearer/ma450.html



Spring 2013



News from the Math Honors Program By Dr. Sandra Paur

Samuel Christie graduated in December 2012 and has applied to teach English in Japan. New students in the Math Honors Program include Casey Burcher, Rong Lin, Dustin Leininger, Michael Lindsey, Sam Loomis, Sam Magura, Theresa Mazzoleni, Monica Poletti and Allison Saito. Thirty-nine students are currently 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. More information about the program can be found on the Math Honors website at http://www.math.ncsu.edu/honors.

## SUM Series – Math and Pizza

The SUM Series features informal talks on mathematical topics. The talks are held on Wednesdays from 4:00 to 4:50, in 2012 SAS Hall. You will have a few minutes to help yourself to pizza before the talk. For upcoming topics, check out the SUM Series website: go.ncsu.edu/sumseries. You can also do a search on "ncsu sum series"

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

Instructions for joining the list are on the website.



Mathematics Newsletter



The father of geometry, he is most famous for his work "The Elements".

Euclid.

Euclid's most famous work is his treatise on mathematics "The Elements". The book was a compilation of knowledge that became the center of mathematical teaching for 2,000 years.



Mathematics students who are interested in participating in undergraduate research have several options. By seeking out a faculty mentor, students can begin working on research during the academic year. If you are interested in doing this, talk with your professors, attend talks in the department that sound interesting, check out the research interests of faculty using the department website, and talk to your peers. These are great ways to find faculty members who might have a project that interests you.

Another exciting opportunity to participate in undergraduate research is through a summer Research Experience for Undergraduates (REU) program. These programs occur at universities around the country. They usually involve working on a project with a small group of other undergraduates under the direction of faculty mentors. These programs pay students a stipend for the summer and often include housing costs and some help with travel and meal expenses. Deadlines to apply for REU programs are usually in February or March, but you may be able to find some with later deadlines. Search for "Math REU sites" to get some good lists of programs.

If you are interested in attending a math conference with many talks and events for undergraduate students (including a grad school and career fair), or if you want to present research you've done, consider attending the Southeastern Sectional meeting of the Mathematical Association of America on March 15th and 16th at Winthrop University in Rock Hill, SC (about 3 hours away, just south of Charlotte). You can register on site or in advance. For more information, see the website below. http://sections.maa.org/southeastern/maase/conference2013/index.php

\*\*\*Also, Up to \$1,000 can be awarded to undergraduate students to participate in research.\*\*\*

Students are encouraged to apply online at <u>www.ncsu.edu/undergrad-</u> research/Studentsa/undergrad-research-awards.php.



## UBM-Group Integrated Undergraduate Training in Mathematics and Life Sciences at North Carolina State University

MA 493, offered by Dr. Tran, is part of a new program, UBM-Group: Integrated Undergraduate Training in Mathematics and Life Sciences at North Carolina State University. The UBM program, funded by the National Science Foundation, offers undergraduates 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 as part of a year-long research experience. The special topic course was designed to prepare biology/mathematics students for the research component of the UBM program.

Want to know more? Contact Hien Tran (919-515-8782, tran@math.ncsu.edu)

# **CONFERIO**



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