UNCG

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Department of Mathematics & Statistics Annual Report 2011-2012

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1. Summary

Ratnasingham Shivaji,
H. Barton Excellence Professor & Department Head

It has been a pleasure to lead a vibrant department consisting of three full professors, nine associate professors, eight assistant professors, four lecturers, three staff members, 12 doctoral students, 11 master's degree students, 99 undergraduate math majors, and 26 undergraduates with math as a second major. Over the year, we graduated 14 undergraduates and five master's students. Because the program is only three years old, no doctoral students were eligible for graduation yet.

We made some changes in administration of the departmental office. We established an Associate Head position and hired a new administrative assistant. We also successfully reclassified our main Administrative Assistant position to Business Coordinator Manager.

Our faculty made significant contributions in research. This includes 45 peer-reviewed journal articles (published or in press) and one refereed conference proceeding paper, creating a rate of 2.25 articles per tenured/tenure-track faculty member. Our faculty also published two books and three book chapters. We submitted 15 external grant proposals of various sizes, out of which nine were funded. We had continuations on six of our existing externally-funded projects. We had three successful internal grant proposals for seed money. We were also part of two externally-funded collaborative projects with other departments.

The department had a banner year in terms of research colloquia: 30 given by 28 external speakers, and 12 by internal speakers. We hosted 17 external research visitors whose stays ranged from two to 14 days. We started two new Lecture Series, the Computational Mathematics Lecture series and the Helen Barton Lecture Series in Mathematical Sciences. These lecture series have already featured world-renowned experts from areas of specialty represented in the department. We hosted a large number of colloquia and seminars, and many research collaborators from all over the world visited us this academic year. For the last seven years, the department has hosted an NSF/MAA-supported student research conference. This year's conference was the largest, featuring 162 delegates representing 27 schools. The students made 48 presentations. This year, we also hosted a successful UNCG Summer School in Computational Number theory for 15 participants.

In terms of courses, we offered a total of 140 sections including 37 online sections. With the objective of enhancing the effectiveness of our course offerings, beginning in Spring 2012, we have limited our class sizes to 50 students in lower level lecture classes and to 35 in classes from Calculus 1 and above. We have established a recruitment and retention plan for a BA in Mathematics with Teaching Licensure, which will reach full implementation in Fall 2012. We also started an undergraduate research scholarship program (via Barton Excellence Funds) to help our brightest undergraduate students obtain research experience.

We made several enhancements to our Computational Mathematics PhD program including opening new specialty tracks. Several new tuition waivers for graduate students were obtained. We recruited nine excellent new graduate students (5 PhD/4 MS). Next year, we will have a total of 16 PhD students and 10 MS students in our program. We have initiated a "graduate student tea" program where faculty and graduate students relax together and converse on mathematics or any other topic related to their program. We also obtained seven additional office spaces for graduate assistants in the Brown building.

We have considerably enhanced our Math Help Center offerings. In particular, help for higher level classes was added. Math Help Center offerings continued to serve as the lifeline for underprepared students in lower level math/stats courses. The Center recorded a staggering number of individual student visits (2032) and ran 32 group review sessions. A new home for the Math Help Center, including an office space for the director, was established in the Curry building. The Statistics Consulting Center also continued its excellent service to the UNCG community recording more than 100 consulting sessions.

For the first time, the department joined IMA (Institute of Mathematics and its Applications). IMA Director, Dr. Fadil Santosa, visited the department and made a presentation on IMA activities. The department has already benefitted from this alliance, with the IMA co-sponsoring our upcoming international statistics conference in October 2012. This has also increased opportunities for our graduate students to attend important workshops. One attended the Annual Industrial Mathematics Workshop this summer in Calgary, fully funded by the IMA.

A very successful Math Club was established. The club aims to create a community for undergraduate and graduate math enthusiasts. The club met every other Wednesday beginning the second week of each semester. Turnout was excellent, and the club quickly attracted a core group of members. Most meetings centered on talks given by our very talented faculty and graduate students.

This year, the Vicky Langley Math Scholarship ($50,000 for endowment and $10,000 for current restricted funds while endowment is being funded) was established. Also, Jerry Vaughan has added a $50,000 deferred charitable gift to the Jerry E. Vaughan Math Scholarship he established earlier. Donations were also provided by Ms. Shierina Brown, Mrs. Dorothy Howell, Miss. Nancy Taylor, Mrs. Christine Posey, Mrs. Kim Carswell Smith, Mrs. Linda Philips, Mrs. Vicky Langley, Mr. Ray Truitt, Mrs. Teresa Sink, and Mrs. Frankie Hubbard. Our sincere gratitude goes to all our donors.

In closing, let me say that a department is only as good as its faculty and students, and we had several leaders in this area who have brought extra recognition to the department. One of our undergraduate students, Anna Tuck, received the Student Excellence Award in the spring during the Student Honors Convocation by the Lloyd International Honors College's Council. Dr. Paul Duvall, an outstanding educator in the department, received the College Teaching Excellence Award, speaking to his phenomenal teaching abilities and care for students. Sat Gupta was elected President of the North Carolina Chapter of the American Statistical Association. Sat Gupta and Jan Rychtar were recognized for Outstanding Accomplishments by the College of Arts and Sciences at the annual Celebrations of Scholarship. The department also became home to one more prestigious international journal, *The Journal of Statistical Theory and Practice*, a Taylor and Francis Publication. Sat Gupta serves as the

Editor-in-Chief for this journal. This is in addition to our existing international journal, *Topology and its Applications*, an Elsevier Publication for which Jerry Vaughan serves as Co-Editor-in-Chief.

2. Faculty and Staff

2.1 Faculty

Doyel Barman, Lecturer

Dr. Barman earned her Ph.D. in 2011 from the University of North Carolina at Charlotte and joined the UNCG faculty in 2011. She taught Contemporary Topics in Mathematics, College Algebra, and Precalculus II.

Greg Bell, Associate Professor
Director of Graduate Studies

Dr. Bell earned his Ph.D. in 2005 from the University of Florida and joined the UNCG faculty in 2005. He currently serves as the Director of Graduate Studies. His research focus is on geometric group theory, geometric topology, and asymptotic invariants of groups.

Raushan Bouziakova, Associate Professor

Dr. Bouziakova earned a Ph.D. in 1995 from Moscow State University and joined the UNCG faculty in 2009. Her research focus is on topology.

Dagny Grillis Butler, Lecturer

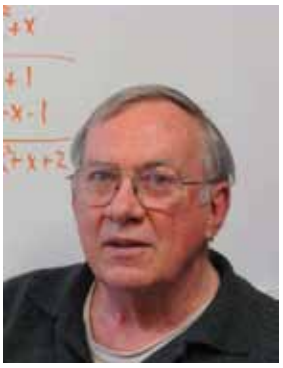
Ms. Butler earned her M.S. in 2009 from Mississippi State University and joined the UNCG faculty in 2011. She is currently working towards her Ph.D. in Mathematical Sciences from Mississippi State University. She taught College Algebra.

Maya Chhetri, Associate Professor

Dr. Chhetri earned a Ph.D. in 1999 from Mississippi State University and joined the UNCG faculty in 1999. Her research focus is on nonlinear elliptic boundary value problems.

Roland Deutsch, Assistant Professor

Dr. Deutsch earned a Ph.D. in 2007 from the University of South Carolina and joined UNCG faculty in 2007. His main research focus is on environmetrics non-parametric dose-response models.



Paul Duvall, Professor

Dr. Duvall earned a Ph.D. in 1967 from the University of Georgia and joined the UNCG faculty in 1986. His research focus is on number theory, cryptography and combinatorics.

Igor Erovenko, Associate Professor and Director of Undergraduate Studies

Dr. Erovenko earned a Ph.D. in 2002 from the University of Virginia and joined the UNCG faculty in 2002. He currently serves as the Director of Undergraduate Studies. His research focus is on combinatorial properties of linear groups and bounded generation of S-arithmetic groups.

Richard Fabiano, Associate Professor

Dr. Fabiano earned a Ph.D. in 1996 from Virginia Tech and joined the UNCG faculty in 1996. His research focus is on applied mathematics, differential equations, and control theory.

Talia Fernós, Assistant Professor

Dr. Fernós earned a Ph.D. in 2006 from the University of Illinois at Chicago and joined the UNCG faculty in 2010. Her research focus is on infinite groups from both geometric and analytical perspectives.

Sat Gupta, Professor and Associate Head

Dr. Gupta earned a Ph.D. in Mathematics from the University of Delhi (1977) and a Ph.D. in Statistics from Colorado State University (1987). He joined the UNCG faculty in 2004. His research focus is on sampling designs, time series forecasting, and biostatistics. He is involved in on-campus/off-campus statistical consulting.

Carlos Nicolas, Assistant Professor

Dr. Nicolas earned a Ph.D. in 2008 from the University of Kentucky and joined the UNCG faculty in 2008. His research focus is on combinatorics.

Sebastian Pauli, Assistant Professor

Dr. Pauli received his Ph.D. from Concordia University in Montreal in 2001. Since then he was the lead developer of the computer algebra system KASH/KANT and joined UNCG in 2006. His research focus is on computational number theory, computational class field theory and the distribution of the zeros of the derivatives of the Riemann Zeta function.

Scott Richter, Associate Professor

Dr. Richter earned a Ph.D. in 1997 from Oklahoma State University and joined the UNCG faculty in 2001. He serves as the Director of the Statistical Consulting Center. His research focus is on nonparametric methods and multiple comparisons.

Dohyoung Ryang, Assistant Professor

Dr. Ryang earned a Ph.D. in 2005 and an Ed.D. in 2010 from the University of Alabama, Tuscaloosa. He joined the UNCG faculty in 2010. His research focus is on mathematics education and geometric group theory.

Jan Rychtář, Associate Professor

Dr. Rychtář earned a Ph.D. in 2004 from the University of Alberta and joined the UNCG faculty in 2004. His research focus is on mathematical biology, game theory and functional analysis.

Filip Saidak, Assistant Professor

Dr. Saidak received a Ph.D. in 2001 from Queen's University in Ontario, Canada and joined the UNCG faculty in 2005. His research focus is on classical questions concerning prime numbers and their distribution, and the location of zeros of the Riemann zeta function and its derivatives.

Carol Seaman, Associate Professor

Dr. Seaman earned a Ph.D. in 2000 from Central Michigan University and joined the faculty at UNCG in 2008. She serves as the Program Coordinator for Secondary Licensure in Mathematics. Her research focus is on undergraduate mathematics education.

Insuk Shim, Lecturer

Ms. Shim earned a M.A. in 2006 from the University of Alabama, Tuscaloosa and joined the UNCG faculty in 2011. She taught Contemporary Topics in Mathematics, Precalculus I, Introduction to Probability and Statistical Inference.

Ratnasingham Shivaji,

H. Barton Excellence Professor and Department Head
W.L. Giles Distinguished Professor Emeritus of Mathematics
(Mississippi State University)

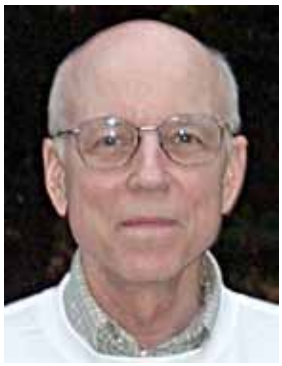
Dr. Shivaji earned a Ph.D. in 1981 from Heriot-Watt University in Edinburgh, Scotland and joined UNCG in 2011. His research focus is on partial differential equations, in particular, nonlinear elliptic boundary value problems.

Clifford Smyth, Assistant Professor

Dr. Smyth earned a Ph.D. in 2001 from Rutgers University and joined the UNCG faculty in 2008. His research focus is on combinatorial probability, computational complexity, and discrete geometry.

Brett Tangedal, Associate Professor

Dr. Tangedal earned a Ph.D. from the University of California at San Diego in 1994 and joined the faculty at UNCG in 2007. His research focus is on algebraic number theory with a particular emphasis on explicit class field theory.

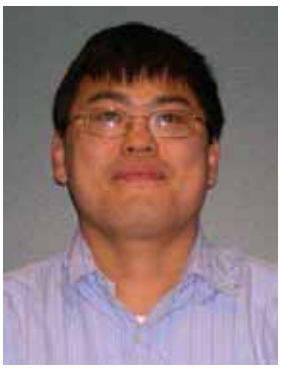


Jerry Vaughan, Professor

Dr. Vaughan earned a Ph.D. in 1965 from Duke University and joined the UNCG faculty in 1973. His research focus is on general topology, set theory and logic, functional analysis, and set-theoretic topology.

Walker Weigel, Lecturer

Ms. Weigel earned a M.A. in 1967 from UNC-Chapel Hill and joined the UNCG faculty in 1985. She taught Elementary Introduction to Probability and Statistics, Fundamental Concepts of Statistics, and Calculus for Business and Social Sciences.



Dan Yasaki, Assistant Professor

Dr. Yasaki earned a Ph.D. in 2005 from Duke University and joined the UNCG faculty in 2008. His research focus is on modular forms, particularly the connection between explicit reduction theory of quadratic forms and the computation of Hecke data for automorphic forms.

2.2 Staff

Richard Cheek, Systems Administrator

Mr. Cheek graduated from UNCG with his M.S. degree in Computer Science in 1998 and has been the Systems Administrator for the Department since 1999.

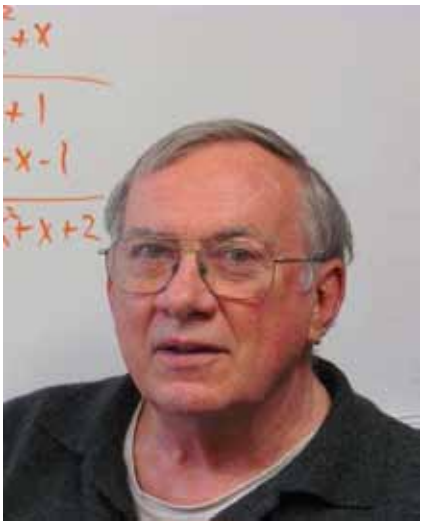
Haley Childers, Business Services Coordinator (Office Manager)

Ms. Childers received her B.A. in Art History from UNCG in 2009 and joined the Department in 2005. She is currently working on her M.S. degree in Library and Information Studies at UNCG.

Nina Williamson, Administrative Support Associate

Ms. Williamson received her B.A. in English and Languages from East Tennessee State University in 2006 and joined the Department in 2011.

3. Honors and Awards



Paul Duvall received the prestigious 2011 College Teaching Excellence Award

Anna Tuck was awarded the Student Excellence Award by the Lloyd International College's Council. The Council bestows the award on those seniors who, through their academic careers at UNCG, have given superior demonstration of skills and motivation.

Sat Gupta was elected the President of the North Carolina Chapter of the American Statistical Association.

Sat Gupta and Jan Rychtar were recognized at the College 2011 Celebration of Scholarship event for outstanding accomplishment.

Carol Seaman was chosen to be one of the 30 participants in UNCG's inaugural 2012 Leadership Institute.

4. Teaching Profile
4.1 Undergraduate Programs
Changes for 2011-2012

The Department of Mathematics and Statistics continued a major undergraduate programs overhaul that began in the spring 2010 semester. As a result of the university wide Academic Program Review conducted in 2011, the department decided to combine or eliminate undergraduate programs with low enrollments in order to increase the program efficiency. We eliminated all teaching licensure concentrations except for the BA in mathematics program. Pure mathematics, applied mathematics, and interdisciplinary concentrations in the BS in mathematics program were merged into a single mathematics concentration in the BS in mathematics. Effective fall 2012 we are offering the following undergraduate programs:

Igor Erovenko, Director of Undergraduate Studies

-BA in Mathematics
-BA in Mathematics with teaching licensure
-BS in Mathematics with concentration in mathematics
-BS in Mathematics with concentration in statistics

In the spring 2012 semester the Undergraduate Studies Committee put forth a proposal to create a new experimental course MAT 190 Pre-calculus. The aim of this proposal is to see whether we can replace a two semester pre-calculus sequence consisting of MAT 150 and MAT 151 with a single semester pre-calculus course that would meet for three hours of lectures and one hour of discussion per week. We are offering the first section of MAT 190 in the fall 2012 semester and we plan to track performance of the students who advance to MAT 191 Calculus I class from MAT 190 in the spring 2013 semester. If MAT 190 graduates are successful in MAT 191, we will be looking forward to gradually phasing out the two semester pre-calculus sequence and to replace it with a one semester pre-calculus course. This change would allow math majors, as well as many other science majors, such as physics, chemistry, and computer science majors, to stay on track to graduate in four years.

As part of our commitment for high quality instruction in the classroom, we strive to provide the best possible learning environment for the students. In the spring 2012 semester we reduced the sizes of all lecture sections in all mathematics and statistics classes down to 50, while most of the classes at the level above remedial have a limit of 35 seats and all classes at 300 level or above are limited to 25 students per section.

In the fall 2011 and spring 2012 semesters the department tried several different approaches to assess achievement of student learning outcomes in all GMT marked courses. The department is now ready to conduct a formal assessment of all GMT courses in the fall 2012 semester.

2012 B.A. & B.S. graduates, those pictured from left to right are Matthew Clark, Anthony Sparks, Arthur Huey, Adam Eury, Zane Styron, Kirby Morgan
Those not pictured: Angela Auer, Jennifer Koszulinksi, Keith Potter, Max Graves, Matthew Jester, John Patterson, Alexandria Bennett, Katie Cater, Suzanne Jordan

4.2 Graduate Programs

Changes for 2011-2012

Dr. Greg Bell became the new DGS in Fall 2011

There were several significant changes to the Graduate programs in the Department of Mathematics and Statistics during the 2011-2012 academic year. After many years in this role, Dr. Paul Duvall stepped down as Director of Graduate Study. Dr. Greg Bell began transitioning to the role of DGS in the Spring of 2011 and assumed the role fully in Fall of 2011.

The University-wide Academic Program Review conducted in 2011 sought to increase efficiency by eliminating or combining programs with low enrollment. The Department decided in the Spring of 2011 to combine the two Master Degree concentrations offered in Mathematics at UNCG. The former concentrations in Applied and Pure Mathematics have now been combined into one Mathematics Concentration. The Applied Statistics Concentration was not changed.

Combining these programs will not affect current graduate students since it is possible to satisfy the requirements for the new Mathematics Concentration by satisfying either set of the old Pure or Applied Mathematics Concentration requirements. Graduate students can work with their academic advisor or the Director of Graduate Study to find an appropriate selection of coursework to specialize in pure or applied mathematics.

These changes become official in the 2012-2013 academic year.

Along with the changes to our MA program, the PhD program underwent significant changes designed to expand opportunities within the degree and enhance students' experiences in the program. Three changes were proposed: increasing the number of dissertation hours; increasing the number of topics

for qualifying exams and altering the timeline for completion of these exams; and changing the programming project and its relationship to the dissertation.

Originally, the department required PhD students to take 12 hours of dissertation. Students are now required to take between 18 and 21 hours of dissertation. This applies to current and future PhD students and will allow students ample time to focus on dissertation research once they've passed the qualifying exams and topic defense.

Qualifying exams were originally offered in just five areas: Algebra, Analysis, Combinatorics, Numerical Analysis, and Topology. The department decided to add three new exams: Differential Equations, Linear Algebra, and Mathematical Statistics. The timelines and number of attempts were also modified. Students now have to pass all three exams by the beginning of their fifth semester in the program and have a total of five attempts to pass these three exams. Additionally, at least one exam must be chosen from among Algebra, Analysis, or Linear Algebra, which are traditionally considered to be fundamental topics in mathematics.

The new exam in Linear Algebra will be offered for the first time in August 2012, while the Differential Equations and Mathematical Statistics exams will be offered for the first time in August 2013.

The final change to the PhD program concerns the Programming Project. In the past, the project was an additional requirement that demonstrated students' ability to solve a computational problem or use a mathematical software package. The change to the project sees it being more integrated into the dissertation itself.

After passing three qualifying exams, each student chooses a dissertation advisor and forms a dissertation committee. With the help of the advisor, the student chooses a dissertation topic and proposes this topic in a public oral exam. A part of this exam is computational in nature. This portion of the project should clearly demonstrate that the student is capable of handling computational aspects of the intended dissertation topic. After the presentation of the dissertation topic, the dissertation committee administers an oral exam. After passing this exam, the student may apply for admission to candidacy and begin work on the dissertation.

Finally, all graduate Students will be happy to know that Dr. Dan Yasaki has worked with the graduate school to create a LaTeX template for theses and dissertations that conforms to their rigorous formatting standards. This template was included in the many updates made to the department's homepage at http://www.uncg.edu/mat/.

Current Graduate Students

The department's PhD and MA students are an integral part of the teaching and research mission of the university. Graduate students led 18 sections of 100-level mathematics and statistics courses, helped with 4 sections of mathematics labs and devoted countless hours helping undergraduate students in the Math Help Center. This year the Math Help Center expanded the courses for which assistance was given to include Calculus 2. Over the course of the next few semesters, graduate students will begin helping

undergraduates in all courses of the Calculus sequence as well as differential equations, linear algebra, and abstract algebra.

Next year as part of SACS accreditation, the Graduate School will distinguish between Graduate Teaching Assistants and Senior Graduate Teaching Assistants. One of the requirements for Senior GTAs is that they participate in programs designed to help them improve their teaching throughout the year. Although this won't be required until 2012-2013, the Mathematics and Statistics Department has been offering MAT 601 (Teaching Mathematics Seminar) for several years. Since it was first offered, Dr. Jerry Vaughan has led this course with great success. This year, Dr. Bell began leading it. This seminar gives students a forum for discussing successes and difficulties they encounter throughout the semester, gives students an opportunity to practice new lecture techniques in front of an audience of their peers, and provides pedagogical training and discussion. The course also deals with university requirements and practical matters. Although this seminar was suggested to all students in the past, the department will require all Senior GTAs to take this course (pursuant to SACS guidelines) and recommend that all GTAs take the course as well. Although GTAs are not responsible for running their own sections of classes, many of the topics that are discussed in MAT 601 apply equally well to tutoring or leading lab sections.

In addition to the Teaching Seminar, the Director of Graduate Study and the Department Head are in constant communication regarding our graduate teaching assistants in an effort to ensure that these students are doing their job to the best of their ability. For many undergraduates, our GTAs are the only mathematics and statistics instructors they will have at UNCG and we are confident that our GTAs do their job well and reflect positively on the department.

Our students gave several presentations throughout the year. Dani Moran demonstrated her Sage package that computes Cech and Voronoi complexes in a seminar and in the Math Club. Abraham Abebe gave an introduction to Degree Theory. Brian Sinclair demonstrated his project on polynomial factorization over local fields. Rick Shepherd gave a talk on Binary Quadratic Forms, Quadratic Fields and Genus Theory. George Merrill gave a Formal Introduction to Rewriting Systems in the Math Club. Finally, Ricky Farr spoke about Euler Maclaurin Series Summation at the UNCG Summer School in Computational Number Theory devoted to a Computational Approach to L-functions.

Additionally, several students will be participating in conferences during the summer. In addition to Ricky Farr, who gave a talk at the Summer School, Lauren Farr, Jonathan Milstead, Catherine Payne, Rick Shepherd and Brian Sinclair attended lectures at the Summer School in Computational Number Theory. Dani Moran has been accepted to attend a conference in topology at Georgia Tech during the summer and Abraham Abebe will attend the IMA workshop in Mathematical Modeling in Industry XV where he will work with a team of graduate students on Interactive Treatment Planning in Cancer Radiotherapy. During the summer, the graduate school also awarded research assistantships to Abraham and Brian to allow them to continue working on their research during this time.

Finally, in an effort to bring faculty and graduate students together, we have started what we hope will be a regular Graduate Student Tea in the department. This tea was a great success and allowed students and faculty the opportunity to relax and socialize without the pressure and structure of a classroom setting.

Spring Graduate Tea

This year, William Ely, Shierina Fareed, Michael Higgins, Guanghui Lei and Jeong Sep Sihm graduated with masters degrees. Jeong Sep Sihm will remain at the department, joining the PhD program as the first PhD student focusing on statistics. Pralad Shah graduated with a Post-Baccalaureate Certificate in statistics and will remain at the department to pursue an MA degree.

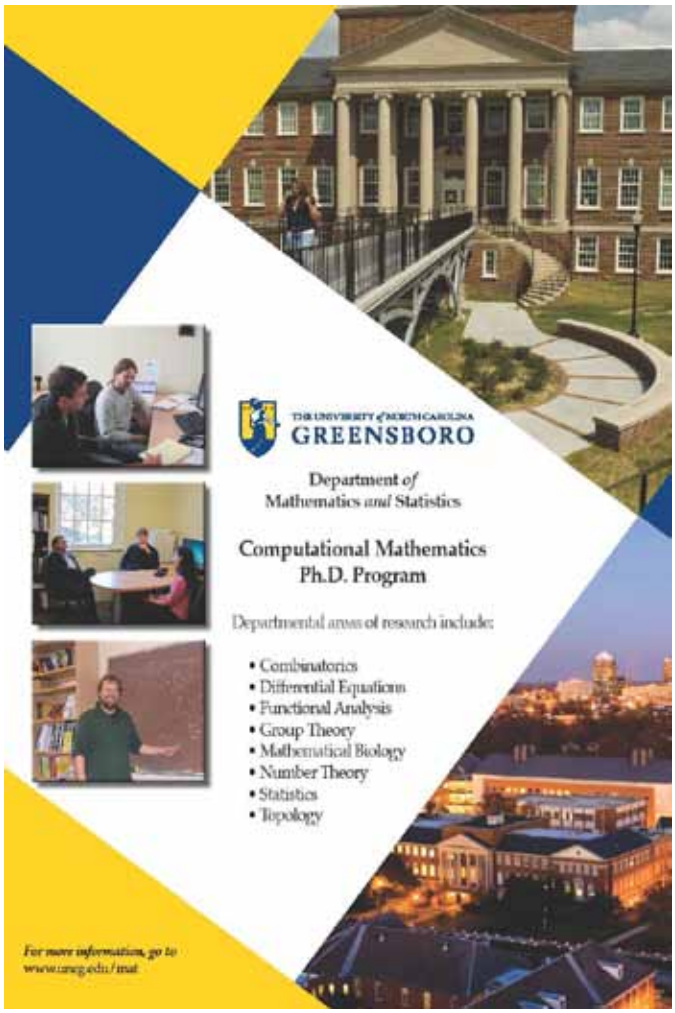
2012 Master's Graduates, from left to right Shierina Fareed, Michael Higgins, William Ely and Guanghui Lei. Those not pictured: Pralad Shah

Future Plans

This year the department undertook additional efforts to recruit students to our PhD program. Dr. Bell delivered a colloquium-style lecture at Guilford College and answered questions about our MA and PhD program while Dr. Shivaji went to Wake Forest to talk about our PhD program. In the coming years the department hopes to continue to reach out to students in these two local schools and expand to other schools in the area. The department will also make use of opportunities available through the AMS and MAA in order to bring attention to the PhD program and recruit the best students possible.

The department received many strong applications this year and we were able to recruit 5 new PhD students and 4 MA students to our program.

Next year the department anticipates creating a new program that seeks to combine the MA and PhD degrees. This degree would allow talented students who wish to pursue a PhD degree the opportunity to begin work towards that degree immediately following the bachelor degree instead of first obtaining a MA degree. The department expects to evaluate the level of the courses tied to the qualifying exams in the Fall of 2012. The department expects an exciting 2012-13 year; several students should be admitted to candidacy and begin work on their dissertations.



5. Funding Opportunities for Math Majors
5.1 Undergraduate Programs

Our department offers numerous scholarships, each of which has different requirements and restrictions. These include

- Helen Barton Scholarship;
- Ione Holt Grogan Scholarship;
- Vicky Langley Math Scholarship;
- Judith J. Mendenhall Scholarship;
- Mary D. Murray Scholarship in Mathematics;
- Eldon E. and Christine J. Posey Mathematics Scholarship;
- Cornelia Strong Scholarship;
- Dr. Theresa Phillips Vaughan Math Scholarship;
- Bertha Barnwell Vielhauer Endowed Scholarship.

There are also numerous other opportunities to financially support mathematics education at UNCG:

1. STAMPS (Science, Technology and Math Preparation Scholarships) awards up to $6750 per year in scholarship support to students who major in Biology, Chemistry & Biochemistry, Computer Science, Geographic Information Science & Earth Science, Mathematics & Statistics, or Physics & Astronomy.

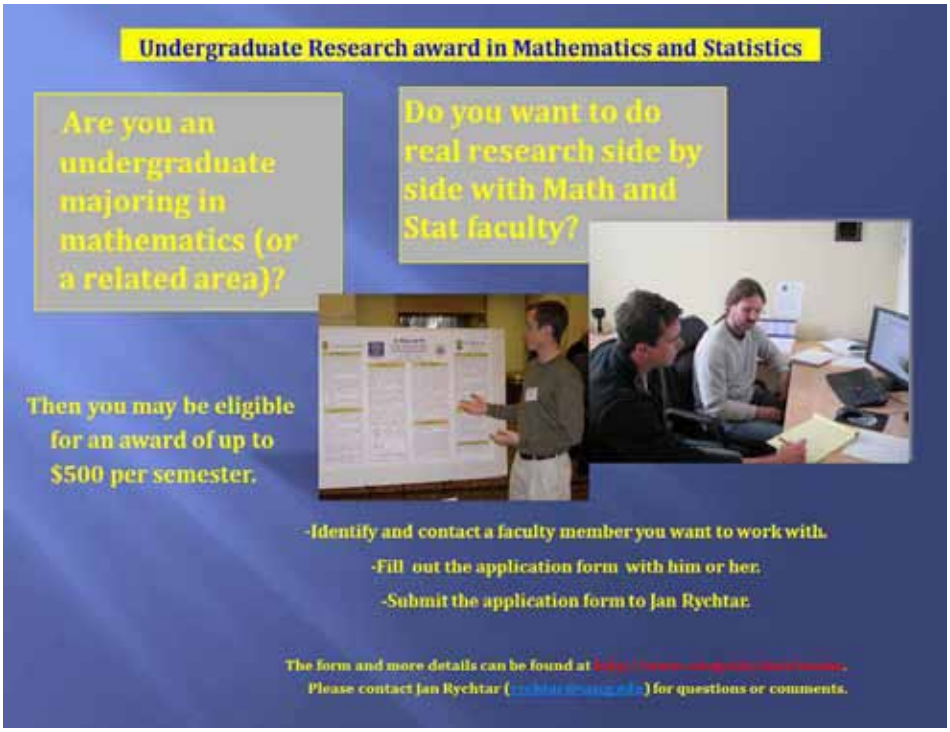
2. The NSF Math-Bio Undergraduate Fellowship awards a stipend of up to $4500 per year and offers exciting research opportunities with various math-biology research projects.

3. Project ENRICH is a program in the UNCG School of Education that partners local teachers with students interested in becoming science or math teachers in K-12 education through a teacher residency program.

4. The College of Arts & Sciences UNCG Scholarships has several different scholarships for general arts and sciences. Many of these scholarships are available to undergraduate full-time students majoring in mathematics.

5. The Department of Mathematics and Statistics offers grader positions to senior qualified undergraduate students.

6. Helen Barton Undergraduate Research Awards in Mathematics and Statistics are given to promote research in Mathematics and Statistics done by undergraduate students.



David Sykes, a Math major, received a Helen Barton Undergraduate Research Award in Mathematics and Statistics in Spring 2012 for his work on the project called "State Influenced Modeling of kleptoparasitism" under the supervision of Jan Rychtar.

5.2 Graduate Programs

Our Graduate students are usually funded via graduate assistantships. Their duties include one or a combination of the following: teaching lower level Mathematics or Statistics courses, tutoring in the Math Help Center, or monitoring the Math Emporium Lab.

Graduate Assistantship levels:

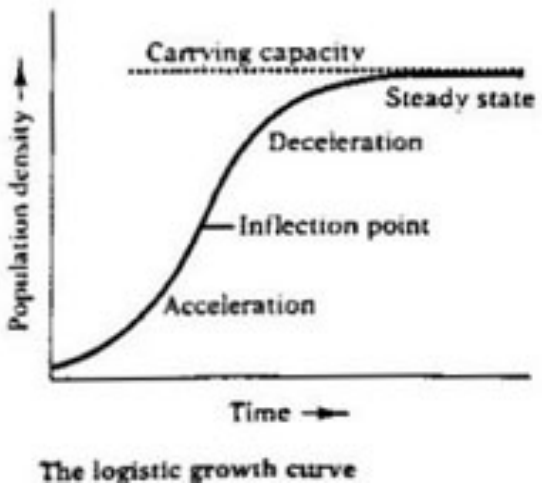
- **$10,800+tuition waivers** for the M.A. in Mathematics (Mathematics/Applied Statistics Concentration)
- **$18,000+tuition waivers** for the Ph.D. Program in Computational Mathematics

For the 2011-12 academic year, we had eleven Ph.D. Students and five Masters students that were funded through Graduate Assistantships.

6. Research Profile

6.1 Research Groups

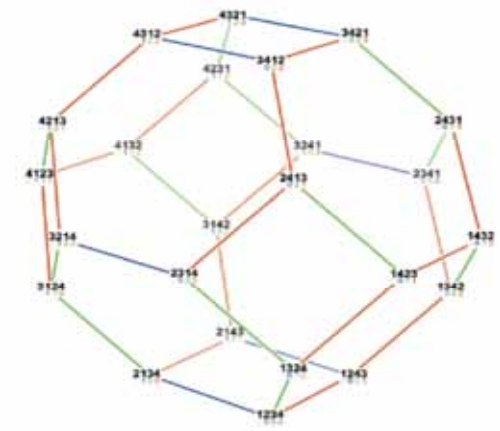
Applied Mathematics



The logistic growth curve

Applied mathematics is a discipline that develops mathematical techniques and concepts which can be used in understanding the natural and social sciences. Researchers at UNCG carry out research in differential equations, control theory, game theory, stochastic processes, graph theory and combinatorial probability. Areas of application include modeling of reaction-diffusion processes, flexible structure, stealing behaviors, vector/ host affinity's effect on disease spread, and the behavior of random networks. Faculty are actively involved in organizing conferences in specified research areas as well as annual conferences targeted only for students. Most faculty in this group have also worked with undergraduate students which resulted in journal publications as well as numerous conference presentations. Faculty involved in this research group is Maya Chhetri, Richard Fabiano, Jan Rychtar, Ratnasingham Shivaji and Clifford Smyth.

Combinatorics, Group Theory and Topology

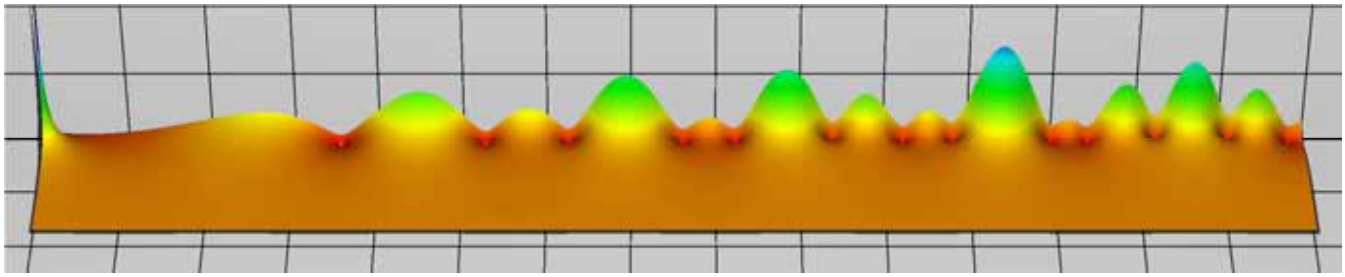


Combinatorics, Group Theory and Topology are three active areas of research in pure mathematics at UNCG. The Combinatorics Group works with combinatorial probability, computational complexity, and discrete geometry. Group Theory research areas include geometric group theory, representation theory, and arithmetic groups. UNCG's topologists work with general and set-theoretic topology, geometric topology, topological algebra, and asymptotic topology. Faculty involved in this research group is Greg Bell, Raushan Bouziakova, Paul Duvall, Igor Erovenko, Talia Fernos, Clifford Smyth and Jerry Vaughan.

Mathematical Biology

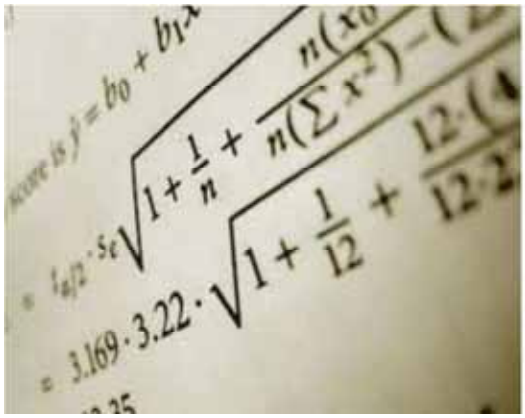
Modeling disease transmission in mosquitos, understanding behavior of dung beetles, tracking of mice and bats, understanding the mating of honey bees or knowing how much fish to harvest have all one thing in common—mathematics. The Department of Mathematics and Statistics is proud to be part of the truly interdisciplinary research. The faculty offer expertise to assist UNCG faculty and graduate students with their research in biology and beyond. Faculty involved in this research group is Maya Chhetri, Roland Deutsch, Sat Gupta, Sebastian Pauli, Jan Rychtar, Ratnasingham Shivaji and Clifford Smyth.

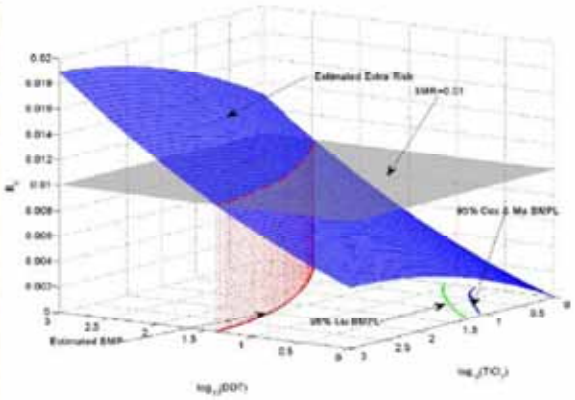
Number Theory



Number theory is one of the oldest research areas in pure mathematics. It is concerned with the study of integers (in particular prime numbers) and generalizations thereof. In the last 30 years number theory has found many applications, especially in cryptography. The members of the number theory group at UNCG work in several areas of number theory, including algebraic, analytic, and computational number theory and modular forms. Faculty involved in this research group is Sebastian Pauli, Filip Saidak, Brett Tangedal and Dan Yasaki.

Applied Statistics





The statistics faculty is actively involved in discipline-based research in several areas of statistics, including non-parametric methods, multiple comparisons, multivariate analysis, risk analysis, dose response methodology and sample surveys. Statistical methods have long been an indispensable part of scientific discoveries. As a result, the Statistics faculty is actively involved in interdisciplinary research with researchers from many disciplines, as co-investigators or key personnel on externally funded projects, as well as undergraduate research through the NSF funded Math/Bio and REU projects. The Statistics faculty also provides support through the Statistical Consulting Center to researchers across many disciplines at all stages of research, including assistance with articulating research questions and designing data collection, often for grant proposals, and subsequent data analysis and interpretation, and manuscript preparation. These collaborations lead to peer-reviewed journal articles on a regular basis. Faculty involved in this research group is Roland Deutsch, Sat Gupta and Scott Richter.

6.2 Publications

Journal Articles in 2011

Greg Bell
In Press

1. Universal spaces for asymptotic dimension, *TOPOLOGY AND ITS APPLICATIONS*
   Greg Bell, Andrzej Nagorko

Raushan Bouziakova
Published

1. Fixed-point free maps of Euclidean Spaces, *FUNDAMENTA MATHEMATICAE*
   Raushan Bouziakova, Alexander Chigogidze

In Press

2. Stationary Sets in Topological and Paratopological Groups, *HOUSTON JOURNAL OF MATHEMATICS*
   Raushan Bouziakova, Cetin Vural

3. On multivaled fixed-point free maps on R^n, *PROCEEDINGS OF THE AMERICAN MATHEMATICAL SOCIETY*
   Raushan Bouziakova

4. More on injections into Function Spaces over ordinals, *TOPOLOGY AND ITS APPLICATIONS*
   Raushan Bouziakova

Maya Chhetri
Published

1. A Game Theoretical Analysis of the mating Sign Behavior in the Honey Bee, *BULLETIN OF MATHEMATICAL BIOLOGY*
   M. Wilhelm, **Maya Chhetri**, J. Rychtar, O. Rueppell

2. On the existence of multiple positive solutions to some superlinear systems, *PROCEEDINGS OF THE ROYAL SOCIETY OF EDINBURGH, (SECTION A).*
   Maya Chhetri, Sarah Raynor, Stephen Robinson

Alexander Chigogidze
Published

1. Fixed-point free maps of Euclidean spaces, *FUNDAMENTA MATHEMATICAE*
   Raushan Bouziakova, **Alexander Chigogidze**

In Press

2. Fixed-point free maps of Euclidean spaces, *FUNDAMENTA MATHEMATICAE*
   Raushan Bouziakova, **Alexander Chigogidze**

Talia Fernos
In Press

1. Reduced 1-cohomology and relative property (T), *MATHEMATISCHE ZEITSCHRIFT*
   Talia Fernos, Alain Valette

Sat Gupta

Published

1. On Estimating Finite Population Mean in Simple and Stratified Random Sampling, *COMMUNICATIONS IN STATISTICS-THEORY AND METHODS*
   Javid Shabbir, **Sat Gupta**

2. Inequality, Social Support and Post-Disaster Mental Health in Urban Mexico, *HUMAN ORGANIZATION*
   Eric Jones, **Sat Gupta**, Art Murphy, Fran Norris

In Press

3. Estimating Variance of Stratified Random Sample Mean in Two Phase Sampling Using Two Auxiliary Variables, *AMERICAN JOURNAL OF MATHEMATICAL AND MANAGEMENT SCIENCES*
   Sat Gupta, Javid Shabbir

4. The Effects of Nurse Presenteeism on Self Reported Quality of Care and Patient Safety, *AMERICAN JOURNAL OF NURSING*
   Susan Letvak, Chris Ruhm, **Sat Gupta**

5. A New Sampling Design for Systematic Sampling, *COMMUNICATIONS IN STATISTICS-THEORY AND METHODS*
   Z. KHNA, J. SHABBIR, **Sat Gupta**

6. Generalized Scrambling in Quantitative Optional Randomized Response Models, *COMMUNICATIONS IN STATISTICS-THEORY AND METHODS*
   Sat Gupta, Samridhi Mehta, Javid Shabbir, B. K. Dass

7. Regression Estimation of the Mean of a Sensitive Variable in the Presence of Auxiliary Information, *COMMUNICATIONS IN STATISTICS-THEORY AND METHODS*
   Sat Gupta, Javid Shabbir, Rita Sousa, Pedro Corte-Real

Sebastian Pauli

In Press

1. New Zero free regions of derivatives of the Riemann Zeta function, *ACTA ARITHMETICA*
   Thomas Binder, **Sebastian Pauli**, Filip Saidak

Scott Richter

In Press

1. Synergy directed fractionation of herbal dietary supplements: Identification of synergists from goldenseal (Hydrastis canadensis) as a case study, *JOURNAL OF NATURAL PRODUCTS*
   N. Czech, **Scott Richter**

Dohyoung Ryang

Published

1. Analysis of Korean mathematics teacher educators' response to the Mathematics Teaching Efficacy Beliefs Instrument, *RESEARCH IN MATHEMATICAL EDUCATION*

Dohyoung Ryang, Tony Thompson, Craig Shwery

Jan Rychtar

Published

1. A Game Theoretical Analysis of the Mating Sign Behavior in the Honey bee, *BULLETIN OF MATHEMATICAL BIOLOGY*
   M. Wilhelm, M. Chhetri, **Jan Rychtar**, O. Rueppell

2. Kleptoparasitic melees - modelling food stealing featuring contests with multiple individuals, *BULLETIN OF MATHEMATICAL BIOLOGY*
   Mark Broom**, Jan Rychtar**

3. Evolutionary games on star graphs under various updating rules, *DYNAMIC GAMES*
   Mark Broom, Chris Hadjichrysanthou, **Jan Rychtar**

4. Evolutionary dynamics on graphs - the effect of graph structure and initial placement on mutant spread, *JOURNAL OF STATISTICAL THEORY AND PRACTICE*
   Mark Broom, **Jan Rychtar**, Brian Stadler

In Press

5. A game theoretic model of parasitism with strategic arrivals and departures of beetles at dung pats, *JOURNAL OF THEORETICAL BIOLOGY*
   Heather Barker, Mark Bloom, **Jan Rychtar**

6. Effects of causal networks on the structure and stability of resource allocation trait correlations, *JOURNAL OF THEORETICAL BIOLOGY*
   Robert Gove, William Chen, Nicolas Zweber, Rebecca Erwin, **Jan Rychtar**, David Remington

Filip Saidak

In Press

1. New Zero free regions of derivatives of the Riemann Zeta function, *ACTA ARITHMETICA*
   Thomas Binder, Sebastian Pauli, **Filip Saidak**

Ratnashingham Shivaji

Published

1. Classes of infinite semipositone n x n systems, *DIFFERENTIAL INTEGRAL EQUATIONS*,
   Eun Kyoung Lee, **Ratnasingham Shivaji** and Jinglong Ye

2. Positive solutions for n x n elliptic systems with combined nonlinear effects, *DIFFERENTIAL INTEGRAL EQUATIONS*
   Jaffar Ali, K. J. Brown and **Ratnasingham Shivaji**

3. Nonexistence results for classes of 3 x 3 elliptic systems, *J. NONLINEAR ANALYSIS*
Ratnasingham Shivaji, Jinglong Ye

4. Diffusive logistic equation with nonlinear boundary conditions, *JOURNAL OF MATHEMATICAL ANALYSIS AND APPLICATIONS*
Jerome Goddard II, Eun kyoung Lee and **Ratnasingham Shivaji**

5. On *S*-shaped and reversed *S*-shaped bifurcation curves for singular problems, *ELECTRONIC JOURNAL OF QUALITATIVE THEORY OF DIFFERENTIAL EQUATIONS*,
Eunkyung Ko, Eun Kyoung Lee and **Ratnasingham Shivaji**

6. S-shaped bifurcation curves in ecosystems, *JOURNAL OF MATHEMATICAL ANALYSIS AND APPLICATIONS*
Eun Kyoung Lee, Sarath Sasi and **Ratnasingham Shivaji**

7. Positive solutions for infinite semipositone problems on exterior domains, *DIFFERENTIAL INTEGRAL EQUATIONS*
Eun kyoung Lee, Lakshmi Sankar and **Ratnasingham Shivaji**

8. Multiplicity results for classes of infinite positone problems, *Z ANAL. ANWEND*
Eunkyung Ko, Eun Kyoung Lee and **Ratnasingham Shivaji**

In Press

9. Population models with diffusion, strong allee effect, and nonlinear boundary condition, *J. NONLINEAR ANALYSIS,*
Jerome Goddard II, Eun Kyoung Lee and **Ratnasingham Shivaji**

Clifford Smyth

Published

1. The dual BKR inequality and Rudich's conjecture, *COMBINATORICS, PROBABILITY, AND COMPUTING*
Jeffry Kahn, Michael Saks, **Clifford Smyth**

2. Enumeration of Non-crossing pairings on bitstrings, *JOURNAL OF COMBINATORIAL THEORY. SERIES A*
Todd Kemp, Karl Mahlburg, Amarpreet Rattan, **Clifford Smyth**

3. Approximate query complexity, *TRANSACTIONS ON COMPUTATION THEORY*
Clifford Smyth

In Press

4. Revolutionaries and spies, *DISCRETE MATH*
   Clifford Smyth, David Howard

5. Equilateral sets in l_p^d in Thirty Essays in Geometric Graph Theory, Janos Pach ed. Algorithms and Combinatorics Series, Springer
   Clifford Smyth

Brett Tangedal
Published

1. On p-adic Multiple Zeta and Log Gamma Functions, *JOURNAL OF NUMBER THEORY*
   Brett Tangedal, Paul Young

Jerry Vaughan
In Press

1. Ordinal Remainders of ψ-spaces, *TOPOLOGY AND ITS APPLICATIONS*
   Alan Dow, **Jerry Vaughan**

Dan Yasaki
Published

1. Modular forms and elliptic curves over the field of fifth roots of unity, *EXPERIMENTAL MATHEMATICS*
   Paul Gunnells, Farshid Hajir, **Dan Yasaki**

2. The arithmetic of planar binary trees, *INVOLVE*
   Adriano Bruno, **Dan Yasaki**

Refereed Conference Papers

Richard Fabiano (2011). Semidiscrete approximation schemes for LQR control of equations in thermoelasticity, *50th IEEE Conference on Decision and Control*

6.3. Book Chapters, Books and Monographs

Book Chapters

Szydlik, J. E., Beam, J., Kuennen, E., & **Carol Seaman**. (2011), "Course Materials for Prospective Middle Grades Teachers", In Press, *MAA Notes*. Mathematical Association of America

Szydlik, J. E., Beam, J., Kuennen, E., & **Carol Seaman** (2011), "The Middle School Program at the University of Wisconsin Oshkosh", In Press, *MAA Notes*. Mathematical Association of America

Clifford Smyth (2011). "Equilateral sets in l_p^d (accepted October 2011)", *Algorithms and Combinatorics vol 39: Thirty Essays on Geometric Graph Theory*. Springer-Verlag

List of Books/Monographs Published in 2011

Rao, C. R. & **Sat Gupta** (2011), Advances *in Quantitative Methods*, Grace Scientific Publishing, USA

Carol Seaman, Szydlik, J. E., & Kuennen, E. (2011). *Big Ideas in Euclidean and Non-Euclidean Geometries,* McGraw Hill

6.4. Research Presentations

Greg Bell

1. *Coarse Property C.:* Workshop on Geometric Topology, Warsaw, Poland.

2. *Coarse Property C.:* Joint Meeting of the Polish and Israeli Math Societies, Lodz, Poland.

3. *Yu's Property A:* Geometric Group Theory, Bristol, United Kingdom.

Raushan Bouziakova

1. Fixed and Periodic points of single/multi- valued maps of Euclidean spaces AMS special session, Winston-Salem, September 24-25

2. "Algebraic Version of Tamano Theorem," Summer Topology Conference, NYC June 26-29

Maya Chhetri

1. *Existence of Positive Solutions for a Class of Semipositone Systems with Exponential Growth in R^2,* Colombian Mathematical Congress, Bucaramanga, Colombia

2. *Existence of Positive Solutions for a Class of Semipositone Systems with Exponential Growth in R^2,* Sixth International Conference on Dynamic Systems and Applications, Atlanta, Georgia

Roland Deutsch

1. *Looking Back at South Africa: Analyzing and Reviewing the 2010 FIFA World Cup*. UNCG Math Club Meeting, Greensboro, North Carolina

2. *Benchmark Analysis for Joint-Action Quantal Data in Risk Assessment*. UNCG Computational Mathematics Seminar, Greensboro, North Carolina

Richard Fabiano

1. *Semidiscrete approximation of LQR control of equations in thermoelasticity,* 50th IEEE Conference on Decision and Control, Orlando, Florida

Talia Fernos

1. *Images of real representations of $SL_n(Z_p)$.* UNCG Mathematics and Statistics Seminar, Greensboro, North Carolina

2. *Reduced 1-cohomology and relative property (T),* Rice University Geometry-Analysis Seminar, Houston, Texas

3. *Images of Real Representations of $SL_n(Z_p)$.* Seminaire du MAPMO, Orleans, France

Sat Gupta

1. *Data Analysis and Inferential Limitation,* Invited talk at the Indian Agriculture Research Institute, Junagarh, India, Junagarh, India.

2. *Optimality Issues in Two-Stage Optional RRT Models,* Invited talk at Delhi University, Delhi, India.

3. *Optimality Issues in Two-Stage Optional RRT Models,* International Conference on Applied Mathematics & Statistics, Ahmedabad, India

4. *Optimality Issues in Two-Stage Optional RRT Model,* Colloquium Talk at UNCG, Greensboro, North Carolina.

5. *Optimality Issues in Two-Stage Optional RRT Models,* Invited talk at University of Memphis, Memphis, Tennessee.

6. *Optional RRT Models,* Invited talk at University of Houston, Clear Lake, Houston, Texas.

7. *Additive, Multiplicative and Generalized Scrambling in Two-Stage Optional RRT Models,* Invited talk at Lehigh University, Bethleham, Pennsylvania.

8. *Parameter Estimation in Two-Stage Optional Randomized Response Models,* Invited talk at University of South Alabama, Mobile, AL, Mobile, Alabama.

Scott Richter

1. *Simultaneous Confidence Intervals for Location Using Medians and Permutation Test,* Joint Statistical Meetings, Miami, Florida

Dohyoung Ryang

1. *Exploratory analysis of Korean Elementary Preservice Teachers' Personal Efficacy and Outcome Expectancy in Mathematics Teaching,* 38th Annual Conference of Research Council of Mathematics Learning, Cincinnati, Ohio.

2. *A revision of the Mathematics Teaching Efficacy Beliefs Instrument for Korean Preservice Teacher,* 38th Annual Conference of Research Council of Mathematics Learning, Cincinnati, Ohio.

3. *The Mathematics Teaching Efficacy Beliefs Instrument for secondary preservice teachers*. MAA Southeastern Section Conference, Tuscaloosa, Alabama.

4. *The Mathematics Teaching Efficacy Beliefs Instrument for a Non-Western Culture,* MAA Southeastern Section Conference, Tuscaloosa, Alabama.

5. *Mathemtics problem-solving ability of middle grade prospective teachers,* NCCTM Conference, Greensboro, North Carolina.

Carol Seaman

1. *Foregrounding and Backgrounding: An Approach for Secondary Mathematics Teacher Preparation*. Science & Mathematics Teacher Initiative (SMTI) 2011 National Conference, Portland, Oregon

Ratnasingham Shivaji

1. Positive solutions to nxn elliptic systems with combined nonlinear effects, AMS Annual Meeting in New Orleans, Louisiana (Invited special session paper), January 2011

2. S-Shaped Bifurcation Curves in Ecosystems, AMS Sectional Meeting in Las Vegas, NV (Invited special session paper), April 2011

3. S-Shaped Bifurcation Curves in Ecosystems, 6th International Conference on Dynamic Systems and Applications held in Morehouse College, GA (Invited special session paper), May 2011

4. An existence result for an infinite semipositone problem with asymptotically linear growth at infinity, AMS Section Meeting, Winston-Salem, NC (Invited special session paper), September 2011

Clifford Smyth

1. *Revolutionaries and Spies (September 2011).* AMS Sectional on New Developments in Graph Theory, Wake Forest University, Winston Salem, North Carolina

2. *The BKR inequality on finite distributive lattices,* Combinatorics Seminar, Louisiana State University, Baton Rouge, Louisiana

3. *The BKR inequality on finite distributive lattices,* The logic and combinatorics seminar, University of Notre Dame, South Bend, Indiana.

Brett Tangdal

1. "Computational Aspects of the Conjectures of Stark, Brumer-Stark, and Gross," invited talk presented at the Tokyo Institute of Technology Mini-Conference on Multiple Sine Functions on February 14, 2011

2. "Zeta Functions and Their Arithmetics," colloquium talk given at UNC Greensboro on March 23, 2011

Jerry Vaughan

1. *More ordinal remainders of ψ-spaces*. Prague Topology Symposium 2011, Prague, Czech Republic

Dan Yasaki

1. *The University of Tokyo Graduate School of Mathematics, "Spines for Q-rank 1 groups", January 2011*

2. *Computations with explicit reduction theories (SQuaRE–Structured Quartet Research Ensemble), American Institute of Mathematics, Palo Alto, California, "Perfect forms over number fields", February 2011.*

3. *Quebec Vermont Number Theory Seminar (Burlington, VT), "Modular forms and elliptic curves over Q(\zeta_5)", March 2011.*

4. *Explicit methods in number theory, Oberwolfach, Germany, "Computing modular forms using Voronoi polyhedra", July 2011*

5. *Reduction theory and applications, Hakuba village in Nagano prefecture, Japan, "On perfect forms over real quadratic fields", November 2011*

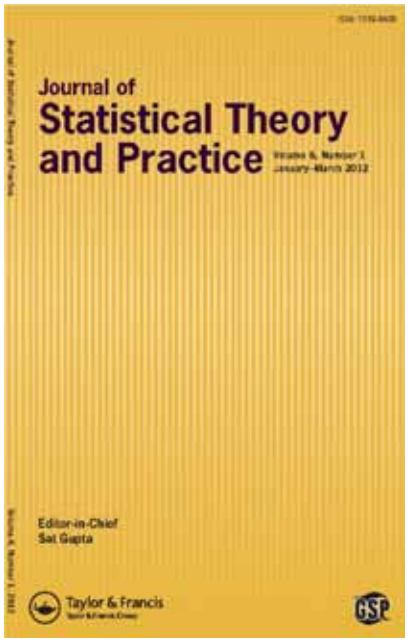
6. *Palmetto Number Theory Series XVII, Clemson University, "Modular forms and elliptic curves over the cubic field of discriminant −23", December 2011*

7. *On modular forms and elliptic curves over Q(zeta_5).* RIMS: Automorphic forms, trace formulas, and zeta functions, Kyoto, Japan.

8. *Computation of modular forms using Voronoï polyhedra.* Computations with Modular Forms 2011, Mathematics Center Heidelberg, Heidelberg, Germany

6.5. Department Journals

Journal of Statistical Theory and Practice

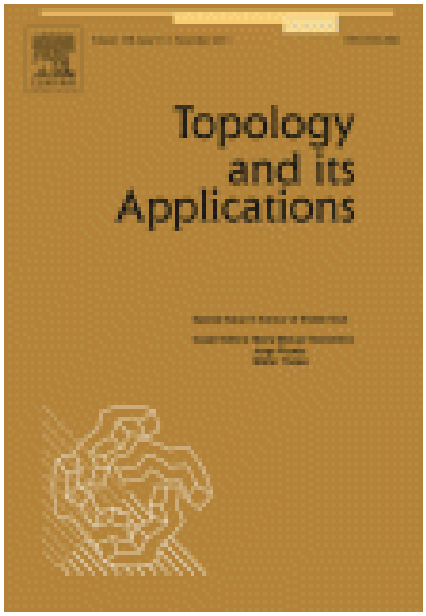


Sat Gupta

The Journal was conceived and started in 2007 by Professor Sat Gupta at UNCG. Some of the most eminent academics in the field of statistics such as C. R. Rao (Penn State), Joe Gani (Australian National University) and Pranab Sen (UNC Chapel Hill) are members of the editorial board. Sat Gupta serves as the Editor-in-chief.

Topology and Its Applications

This journal is primarily concerned with publishing original research papers of moderate length. It is felt that it is inadvisable to attempt a definitive description of topology as understood for this journal. Certainly the subject includes the algebraic, general, geometric, and set-theoretic facets of topology as well as areas of interactions between topology and other mathematical disciplines. Jerry Vaughan serves as an Editor-in-Chief.



Jerry Vaughan

7. Undergraduate Research Program

Background and history

The major push for undergraduate research in the Department started in 2005 with the establishment of a math/biology research group by Drs. Rychtar, Chhetri and Gupta from the Department of Mathematics and Statistics, together with Drs. Rueppell and Remington from the Department of Biology and Dr. Crowe from the Office of Undergraduate Research. The group has been funded by two major the NSF grants 0634182 (2006-2010) and 0926288 (2009-2012) and over the years has involved 16 faculty and over 40 undergraduate students. The students and faculty received 19 awards and recognitions, gave over 220 presentations and published over 25 research articles in major international journals.

Research projects in 2011-2012

Each year, students and faculty work in interdisciplinary teams of 4-6 people, consisting typically of 2-3 undergraduate students (at least one from math and one from biology) and 2-3 faculty (at least one from math and one from biology). The following were research projects in 2011-2012.

Stealing behavior in dung beetles (*O. Taurus*)

Dung can be a real treasure for creatures like *O. Taurus*. Some beetles even steal balls made by others. Since dung beetles are abundant and relatively easy to work with, they constitute an almost ideal model and experimental organism for understanding of stealing behavior. The group led by Rychtar and Crowe has investigated various aspects of their behavior such as when it is a best to arrive to a dung pat.

Mating, division of labor, aging and cooperation in honey bees

Honey bees are perfect organism to model complex social behavior. They exhibit elaborate mating rituals, they divide tasks within each colony, they cooperate with each other without receiving an apparent benefit for such a behavior and their behavior also change with their age. In a series of related projects, the group led by Rueppell, Rychtar and Chhetri investigated the above fascinating behavior of honey bees.

Ecology of Infectious Diseases

A mosquito bite is bad on its own but things can get really ugly when the mosquito carries a disease. The group led by Wasserberg and Smyth modeled complex systems of vector born diseases such as the La-Crosse encephalitis which is relatively common in Western-Carolina.

Automated video processing

Ever wonder how do people know so many things about nocturnal animals such as mice and bats? It is simple. Use thermal cameras, record videos for many nights and then PERSONALLY watch the videos. Very soon, things will get even simpler as the group led by Kalcounis-Rueppell and Pauli works on computer programs for automated processing of such recordings.

Detecting and Modeling Natural Selection

Thanks to Darwin, many have no doubts about the existence of evolution and natural selection. However, very few really saw it in action. The group led by Schug, Remington and Deutsch builds computer models and studies the wild population of *Drosophila Ananassae* in order to see evolution of eye genes of certain this species

Thermoregulation in plants

The group led by Lacey and Richter is addressing questions about the evolution of thermal acclimation in plants and its potential impact on species survival in different thermal environments and in the face of global warming. The experimental organism *Plantago lanceolata*, is a temperate perennial weed introduced into North America from its native Eurasia. It can partially thermoregulate its reproduction by altering floral color and reflectance in the visible and near-infrared regions in response to external temperature at the time of flowering.

Resource allocation

Plants such as Arabidopsis lyrata provide an excellent model organism for resource allocation. The group led by Remington and Rychtar studied this plant in order to better understand the mechanisms behind optimal division of limited (and unpredictable) resources and their allocation for reproduction or survival.

Randomized response techniques

Do you want to know how many students take illegal drugs or engage in illegal or dangerous behavior? Direct and personal questioning usually works best, but in this case, chances of getting truthful answer are slim. A group led by Gupta and Crowe uses statistics to develop a survey method that allows anonymous individual responses yet provide very good estimates on the aggregate level.

Research Articles

- M. Crowe, E. Raspet, J. Rychtar and S. Gupta: Effect of Density and Extra Dung on Brood Parasitism in the Dung Beetle, Onthophagus Taurus, submitted to J. of Insect Behavior.
- 1.Patterson, J. W. and Richter, S. J. Estimating P-values for Randomization Tests. Submitted to the Journal of Data Science
- M. Broom, J. Rychtar: A general framework for modelling territorial interactions, to appear in J. Theor. Biol.
- H. Barker, M. Broom and J. Rychtar: A game theoretic model of kleptoparasitism with strategic arrivals and departures of beetles at dung pats. J. of Theor. Biol, 300 (2012)
- R. Gove, W. Chen, N. Zweber, R. Erwin, J. Rychtář, D. Remington, Effects of causal networks on the structure and stability of resource allocation trait correlations, Journal of Theoretical Biology, 293 (2011)
- M. Broom and J. Rychtar: Kleptoparasitic melees - modelling food stealing featuring contests with multiple individuals, Bulletin of Mathematical Biology, 73 (2011)
- M. Wilhelm, M. Chhetri, J. Rychtar, O. Rueppell: A Game Theoretical Analysis of the Mating Sign Behavior in the Honey bee, Bulletin of Mathematical Biology, 73 (2011)
- Graham, A.M, Munday, M.D., Kaftanoglu, O., Page R.E. JR., Amdam G.V., Rueppell, O. (2011) Support for the reproductive ground plan hypothesis of social evolution and major QTL for ovary traits of Africanized worker honey bees (Apis mellifera L.). BMC Evolutionary Biology
- 9.Rueppell O., Metheny J.D., Linksvayer T.A., Fondrk M.K., Page R.E. Jr., Amdam G.V. (2011) Genetic architecture of ovary size and asymmetry in European honey bee workers. Heredity, 106

Major conference presentations

- Tuck, A., Gupta, S., Crowe, M., and Figueroa, J. An Optional Unrelated-Question Randomized Response Model, International Conference on Applied Mathematics and Statistics, Ahmedabad, India (2011)
- Wasserberg G, The ecology of cutaneous leishmaniasis: implications of understanding the degree of vector-host coupling on epidemiological patterns and disease control. Tel Aviv University, Israel (2011)
- Rueppell, O. Genomic recombination in Apis. Cold Spring Harbor Laboratories Meeting on Honey Bee Genomics and Biology, Cold Spring Harbor, NY (2011)
- M. Jester, Z. Huntington-Meath, R. Deutsch, M. Schug, D. Remington: Detecting and Modeling the Genes Influenced by Natural Selection in Drosophila ananassae, State of North Carolina Undergraduate Research and Creativity Symposium, East Carolina University, Greenville, NC
- H. Moore and J. Patterson, S. Richter, E. Lacey: The Effect of Induction Temperature on Internal Spike Temperature and Male Reproductive Success in a Natural Environment, Math Biology Symposium, Duke University, NC
- E. Dely and D. Kwon, C. Smyth, G. Wasserberg: The Effect of Vector-Host Coupling on the Dynamics of Vector-borne diseases: Consequences of Demographic Effect, Math Biology Symposium, Duke University, NC

Some faculty members in the Department are also involved in a REU program. Jan Rychtar is a Co-PI on the NSF grant 0850465 REU Site: Interdisciplinary Quantitative Science REU at UNCG. The grant provides support for interdisciplinary teams of UNCG faculty to conduct research with UNCG as well as non-UNCG students. From the Department of Mathematics and Statistics, Jan Rychtar, Scott Richter and Sebastian Pauli have been involved in the grant.

8. Mathematics Education Program

The program is coordinated by the math education committee consisting of Dr. Carol E. Seaman, Associate Professor of Mathematics and Program Coordinator for Secondary Licensure in Mathematics, and Dr. Dohyoung Ryang, Assistant Professor of Mathematics. They are responsible for teaching all courses that are specifically designated for undergraduate students seeking teaching licensure in mathematics, namely, MAT 303 (Topics in Mathematics), MAT 304 (Introduction to the Foundations of Geometry), MAT 330 (Axiomatic Foundations of Geometry), MAT 405 (Foundations of Mathematics for Teaching I), and MAT 406 (Foundations of Mathematics for Teaching II). In addition, we teach the following 500-level courses for master's students in Mathematics Education: MAT 503 (Problem-Solving in Mathematics), MAT 504 (Foundations of Geometry for Teachers), and MAT 513 (Historical Development of Mathematics).

Carol Seaman, Chair of Mathematics Education Committee

In addition to teaching mathematics courses for preservice and inservice teachers, we advise all undergraduate students in the BA-HS in mathematics major (Those seeking licensure in secondary mathematics), participate in the Council of Program Coordinators (a School of Education initiative that administers all the professional requirements of the teacher preparation programs at UNCG), write and administer grants related to mathematics education, lead department efforts to recruit and retain mathematics majors, present professional development opportunities for teachers in local school districts, and engage in scholarly research in undergraduate mathematics education.

Students in the BA-HS major in mathematics must complete all requirements for a BA in mathematics, including all general education and College of Arts and Sciences requirements, as well as completing MAT 330, MAT 405, MAT 406, 15 hours of professional education coursework, 100 hours of internship in local high schools, and a final semester of student teaching. Students must maintain a 2.5 GPA in mathematics to qualify for student teaching. At the end of their program of study, students also complete an electronic portfolio of licensure evidences (as specified by the state of North Carolina) as part of their application to the state for a teaching license.

In addition to these activities within the department Dr. Seaman and Dr. Ryang participate in the RISE (Research and Instruction in STEM Education) Network on campus, Dr. Seaman as faculty facilitator of the network. In this capacity Dr. Seaman attended the Johnson C. Smith University STEM Conference in October 2011 and the Conference on Research in Undergraduate Mathematics Education in Portland, OR in February 2012. Along with four other RISE members she will also attend the AAC&U 2012 Institute on Integrative Learning and the Departments.

Dr. Seaman and Dr. Ryang both facilitated and participated in the development of a proposal for a STEM living and learning community entitled Achieving Together in Mathematics and Science (AToMS), which was funded by the Chancellor in February. The goal of AToMS is to attract students into STEM fields (including STEM teaching) and retain them. Students in AToMS have the choice to live together while

enrolling in common integrated courses or may live off campus or anywhere on campus while still enrolling in these same common integrated courses and participating in co-curricular experiences. These experiences in AToMS will strengthen students' scientific and/or mathematical knowledge through the use of student-oriented teaching methods and improve the students' communication skills to enable them to convey concepts in science and mathematics to each other and to those in the outside community.

In the 2011-2012 year, Dr. Seaman partnered with Dr. Holt Wilson and Dr. Kerri Richardson of the department of Teacher Education and Higher Education to deliver a 120-hour professional development experience for 30 elementary (K-5) teachers in two local schools in which teachers were introduced to the new Common Core State Standards in Mathematics. The project was funded through an NC Quest state grant entitled *Core-Math: Supporting the Implementation of the Common Core State Standards for Mathematics Using Learning Trajectories*. A preliminary report on this project was presented at the Association of Mathematics Teacher Educators in Ft. Worth, TX in February 2012.

9. New Proposals and Awards

Grant Proposals 2011-12						
Grant Proposals & Awards						
Submitted Date	**PI Name**	**Co-PIs**	**Project Name**	**Sponsor**	**Funded/Not Funded**	**Amount Funded**
5/2/2011	Colleen Fairbanks (Teacher Ed/Higher Ed)	Jewell Cooper, Ye He, Carol Seaman (Mathematics and Statistics)	English as Second Language X Excellent STEM Learning	Department of Education (DOED)	Not Funded	
5/9/2011	Jan Rychtar	Sat Gupta, Maya Chhetri, Roland Deutsch	UNCG Regional Mathematics and Statistics Conference	Mathematical Associate of America (MAA)	Funded	**$1,500** 9/1/11-12/31/11
8/22/2011	Jan Rychtar	Ratnasingham Shivaji	REU Site: Applied and Computational mathematics at the University of North Carolina at Greensboro	National Science Foundation (NSF)	Not funded	
9/7/2011	Sat Gupta	NONE	P-3 funds for AISC Conference	College of Arts and Sciences	Funded	**$3,000** 10/1/2012-5/5/2013
9/7/2011	Ratnasingham Shivaji	NONE	P-3 Funds for research	College of Arts and Sciences	Funded	**$3,000** 8/1/2011-5/15/2012
9/30/2011	Clifford Smyth	NONE	Correlation Inequalities	NSF	Not Funded	
10/18/2011	Sat Gupta	NONE	International Conference on Advances In Interdisciplinary Statistics and Combinatorics	North Carolina Chapter of American Statistical Association (NCASA)	Funded	**$3,500** 10/5/12-6/30/13
11/8/2011	Sat Gupta	Jan Rychtar, Scott Richter	International Conference on Advances in Interdisciplinary Statistics and Combinatorics	NSF	Funded	**$20,000** 09/01/12-6/30/13
11/19/2011	Sat Gupta	Ratnasingham Shivaji, Jan Rychtar	International Conference on Advances in Interdisciplinary Statistics and Combinatorics	Institute of Mathematics and its Applications (IMA)	Funded	**$2,000** 9/1/12-6/30/13
1/9/2012	Jan Rychtar	NONE	Mathematical Models of territorial interactions	NSF	Not Funded	
1/11/2012	Ratnasingham Shivaji	Jerome Goddard, Auburn Univ., Montgomery	Population dynamics with diffusion, harvesting, grazing, and negative density dependent emigration on the boundary	NSF	Not Funded	

1/17/2012	Jan Rychtar	Maya Chhetri, Sat Gupta, Ratnasingham Shivaji	The 8th Annual UNCG Regional Mathematics and Statistics Conference	NSF	Funded	**$10,000** 9/1/2012-8/31/13
1/19/2012	Raushan Bouziakova	NONE	Collaboration in Topology and Topological Algebra	Simons Foundation	Not Funded	
1/22/2012	Jan Rychtar	NONE	Game-theoretical models in biology	Simons Foundation	Funded	**$30,000** 9/1/2012-8/31/2017
1/30/2012	Clifford Smyth	NONE	Collaboration in Combinatorics	Simons Foundation	Funded *	**$30,000** 9/1/12-8/31/2017
2/6/2012	Clifford Smyth	NONE	Correlation Inequalities	National Security Agency (NSA)	Funded	**$64,800** 1/1/13-1/1/15
3/20/2012	Dan Yasaki	Sebastian Pauli, Brett Tangedal, FIlip Saidak	P-3 funds for UNCG Summer School in Compuatational Number Theory	College of Arts and Sciences, UNCG	Funded	**$3,000** 3/20/12-8/15/12
5/7/2012	Jan Rychtar	Ratnasingham Shivaji, Sat Gupta, Maya Chhetri	The Eighth Annual UNCG Regional Mathematics & Statistics Conference	MAA	Funded	**$3,000** 9/1/12-12/31/12
Active Funded Projects						
	Tracey Howell	A. Edward Uprichard (Teacher Ed/Higher Ed	UNC System/Guilford County Schools Mathematics Project	Weaver Foundation Inc.		**$250,000** 9/1/06-7/31/12
	Tracey Howell	A. Edward Uprichard (Teacher Ed/Higher Ed)	UNC System/Guilford County Schools Mathematics Project	Cemala Foundation, Inc.		**$600,000** 9/1/06-7/31/12
	Tracey Howell	A. Edward Uprichard (Teacher Ed/Higher Ed	UNC System/Guilford County Schools Mathematics Project	Joseph M. Bryan Foundation		**$1,200,000** 9/1/06-7/31/12
	Dan Yasaki	Sebastian Pauli	SERMON 2009	UNCG Group Undergraduate Training in Mathematics		**$3,876** 5/1/09-5/31/12
	Jan Rychtar	Maya Chhetri, Mary Crowe, David Remington, Olav Rueppell	UNCG Group Undergraduate Training in Mathematics	NSF		**$233,820** 9/1/09-7/31/12
	Jan Rychtar	Maya Chhetri,	The Seventh Annual	NSF		**$5,000**

*Did not accept since he was also awarded an NSA grant.

		Roland Deutsch, Sat Gupta, Jan Rychtar	UNCG Regional Mathematics Conference			7/1/11-6/30/12
Active Funded Projects With Other Departments						
	Peter Wilson	Carol Seaman	Core-Math: Supporting the Implementation of the Common Core State Standards Using Learning Trajectories (Ends 6/30/2012)	North Carolina Quest		**$227,988** 7/1/11-6/30/12
	Debra Wallace	Sat Gupta	Comparing Risks of Myocardial Infarction Reoccurrence in Whites and Blacks	National Institute of Health (NIH)		**$477,750** 9/07-5/12

10. Lecture Series, Colloquia, Seminars and Research Visitors

10.1 Lecture Series in Computational Mathematics

UNCG

UNCG LECTURE SERIES IN COMPUTATIONAL MATHEMATICS

Spring 2012

http://www.uncg.edu/mat/talks

Speakers

Zhilin Li (North Carolina State University)
How to Model and Simulate Moving Fronts?
Wednesday March 14th at 4pm in Petty 303, Refreshment at 3:30 in Petty 116

Jason Manning (University at Buffalo)
Recognizing n-manifold groups
Friday, March 16th at 4pm in Petty 303, Refreshments at 3:30 in Petty 116

Jon Hosking (IBM Research Division)
L-Moments: Inference for Distributions and Data using Linear Combinations of Order Statistics
Wednesday, March 21st at 4pm in Petty 303, Refreshments at 3:30 in Petty 116

Corina Tarnita (Harvard University)
Cooperation and Construction
Wednesday, April 4th at 4pm in Petty 303, Refreshments at 3:30 in Petty 116

Fadil Santosa (Director of the Inst. of Mathematics and its Applications, Minnesota)
The Mathematics Behind Bar Codes
Wednesday, April 11th at 3:30pm in Petty 150, Refreshments at 3:00 in Petty 116

Michael Pohst (TU Berlin)
On computing integral points of Mordell curves over global fields
Wednesday, April 18th at 4pm in Petty 303, Refreshments at 3:30 in Petty 116

Pankaj Agarwal (Duke University)
Geometric Arrangements and Their Applications
Wednesday, April 25th at 4pm in Petty 303, Refreshments at 3:30 in Petty 116

Organizing Committee: Greg Bell, Francine Blanchet-Sadri (Computer Science), Roland Deutsch, Sebastian Pauli (chair), Jan Rychtar

Sponsored by the Department of Mathematics and Statistics and the College of Arts and Sciences at UNCG.

10.2 Helen Barton Lecture Series in Mathematical Sciences

THE UNIVERSITY of NORTH CAROLINA
GREENSBORO
Department of Mathematics & Statistics

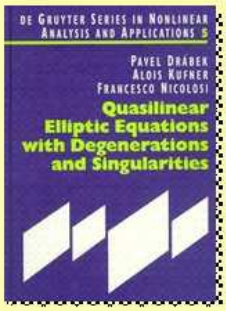
Helen Barton Lecture Series in Mathematical Sciences

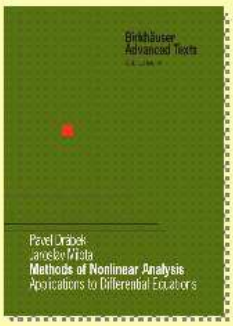
Dr. Pavel Drábek

Professor and Head of Mathematics
University of West Bohemia, Czech Republic

Professor Pavel Drábek is a Professor and Head of the Department of Mathemtics in University of West Bohemia, Czech Republic. He graduated from Charles University, Prague, in 1977 and received his PhD from Czechoslovak Academy of Sciences, Prague, in 1981.

His research is in the field of Nonlinear Boundary Value Problems for Ordinary and Partial Differential Equations focusing on the questions of existence, uniqueness and bifurcations of solutions as well as stability of evolution equations. He is well regarded as an expert in this field. He has published more than 150 journal articles, seven research monographs and textbooks in Analysis and Differential Equations. He is a fellow of the Learned Society of the Czech Republic since 2003, he served as a chair of Czech National Committee for Mathematics (2004-2006) and currently is a member of the editorial board of several prestigious journals in the field.





For more information, please see: http://www.uncg.edu/math/talks/index.html
or contact Dr. Maya Chhetri at maya@uncg.edu

Series of Lectures on Quasilinear PDEs

Introduction

Monday, March 19th, 2012
Reception: Lounge, Petty 120, 3:30-4:00 PM
Lecture: Petty 150, 4:00 PM

We present some a priori estimates for the p-Laplacian-like equations and illustrate the difference between the semilinear (p=2) and quasilinear (1<p<2, p>2) case. We also relate the bifurcation result from the principal eigenvalue of the p-Laplacian and the Fredholm alternative-type result for nonlinear homogeneous operators. We illustrate the striking difference between the linear and nonlinear case.

Tools and Techniques

Tuesday, March 20th, 2012
Reception: Lounge, Petty 120, 3:30-4:00 PM
Lecture: Petty 150, 4:00 PM

We present the basic idea of the Nash-Moser iteration technique in order to prove the L^{\infty}-boundedness of the weak solution of a quasilinear boundary value problem. We prove the bifurcation from the first eigenvalue of the p-Laplacian, relate it to the bifurcation from infinity and the linearization of the p-Laplacian about the principal eigenfunction.

Some Geometric Results and Open Problems

Friday, March 23rd, 2012
Reception: Lounge, Petty 120, 3:30-4:00 PM
Lecture: Petty 150, 4:00 PM

We discuss the existence and multiplicity results connected with the Fredholm alternative for the p-Laplacian at the first eigenvalue. We relate the bifurcation result to the variational structure of the problem. We also combine the variational approach with the method of lower and upper solutions to show how the lack of Palais-Smale condition can be overcome and prove the existence of a critical point.

10.3 Colloquia

Marcello Lucia	The City University of New York	11/4/2011	Survey on variational methods, and applications to PDE's
Kumer Pial Das	Lamar University	11/11/2011	Further Results for The Joint Distribution of The Surplus Immediately Before and After Ruin Under Force of Interest
Pavel Drabek	University of West Bohemia, Czech Republic	11/11/2011	The second eigenfunction of the p-Laplacian is not radial
Kelly Delp	Buffalo State College	3/15/2012	Playing with Surfaces: Spheres, Monkey Pants, and Zippergons
Imogene Grimes	Sr. Director, Biostatistics, Otsuka Pharmaceuticals Co.	4/14/2012	The Statistician's Role in Drug Development and Approval
Martin Schmoll	Clemson University	4/14/2012	Dynamics on doubly periodic covers of some L-shaped surfaces
Peter Gordon	New Jersey Institute of Technology	10/5/2011	Local kinetics and self-similar dynamics of mophogen gradients
Alfonso Castro	Harvey Mudd	9/23/2011	Solvability of Boundary Value Problems for Semilinear Differential Equations
Paul Young	College of Charleston	10/15/2011	The Combinatorics and Arithmetic of Bernoulli Numbers
Fadil Santosa	Director of the Institute of Mathematics and It's Applications (IMA)	4/11/2012	About IMA and its opportunities

10.4 External Seminar Speakers

Chad Awtrey	Elon University	2/29/2012	Computing Galois-theoretic invariants of p-adic fields
David Ford	Concordia University	4/17/2012	Connections Between the Montes Algorithm and MacLane's Construction
Alfonso Castro	Harvey Mudd	9/22/2011	Recent results on the wave equation with non-monotone nonlinearities
Jerome Goddard II	Auburn University Montgomery	10/21/2011	To harvest or not to harvest? How much is the question.
Dhanya Rajendran	TATA Institute For Fundamental Research	6/1/2012	Existence result for a certain class of Singular elliptic Problem
T.V. Anoop	IISc Bangalore	6/12/2012	On Generalized Hardy-Sobolev Inequalities

10.5 UNCG Seminar Speakers

Richard Fabiano	UNCG	8/24/2011	Infinite dimensional linear systems
Jan Rychtar	UNCG	8/31/2011	On the three-player single out game
Sat Gupta	UNCG	9/14/2011	Optimality Issues in Two-Stage Optional Randomized Response Models
Danielle Moran	UNCG	9/28/2011	Programming Project Presentation: Computing Cech Complexes with Sage
Abraham Abebe	UNCG	11/2/2011	An Introduction to Degree Theory
Talia Fernos	UNCG	11/16/2011	Images of Real Representations of SL_n (Z_p)
Brian Sinclair	UNCG	11/30/2011	Programming Project Presentation
Clifford Smyth	UNCG	1/18/2012	Correlation Inequalities and the BKR inequality
Jerry Vaughan	UNCG	1/25/2012	Maximal almost disjoint families of natural numbers
Ricky Shepherd	UNCG	2/15/2012	Binary Quadratic Forms, Quadratic Fields and Genus Theory
Filip Saidak	UNCG	4/4/2012	Prime Gaps
Clifford Smyth	UNCG	5/2/2012	Some Open Problems in Combinatorics

10.6 Research Visitors

Research Visitor	**Institution**	**Dates visited**	**Host**
Karl Mahlburg	Louisiana State University	5/3-5/7/12	Clifford Smyth
Nursel Koyuncu	Hacettepe University, Turkey	3/13-3/27/2012	Sat Gupta
Pavel Drabek	University of West Bohemia, Czech Republic	11/11-11/13/12; 3/18-3/25/12	Maya Chhetri, Shivaji
Mark Broom	City University, London	4/14-4/28/12	Jan Rychtar
Javid Shabbir	Quaid-I-Azam University, Pakistan	5/23-5/30/12	Sat Gupta
David Ford	Concordia University	11/13-11/27/11; 4/13-4/25/12	Sebastian Pauli
Michael Pohst	TU Berlin	4/16-4/22/12	Sebastian Pauli
Paul Young	College of Charleston	10/15-10/18/2011	Brett Tangedal
Jerome Goddard II	Auburn University Montgomery	8/23-8/26/2011; 10/21-10/24/2011; 3/12-3/14/2012	Shivaji
Brittany Stephenson	Mississppi State University	4/3-4/7/2012	Shivaji
Sarath Sasi	Mississppi State University	9/21-9/26/2011; 11/3-11/6/2011; 3/14-3/21/2012; 5/2-5/8/2012	Shivaji

Lakshmi Kalappattil	Mississppi State University	9/21-9/26/2011; 10/27-10/31/2011; 2/10-2/13/2012; 3/14-3/21/2012; 5/2-5/8/2012	Shivaji
Eunkyung Ko	Mississppi State University	9/21-9/26/2011; 11/9-11/13/2011; 2/10-2/13/2012; 3/14-3/21/2012	Shivaji
Alfonso Castro	Harvey Mudd	9/21-9/25/2011	Shivaji, Maya Chhetri
Peter Gordon	New Jersey Institute of Technology	10/3-10/6/2011	Shivaji
Marcello Lucia	The City University of New York	11/3-11/6/2011	Shivaji
Xavier Roblot	Tokyo Institute of Technology	11/16-11/22/2011	Brett Tangedal
Dhanya Rajendran	TATA Institute For Fundamental Research	5/30-6/5/2012	Shivaji
T.V. Anoop	IISc Bangalore	6/11-6/13/2012	Shivaji

11. Service Profile

The departmental faculty was very actively involved on various Department, College and University committees. Four major service programs provided by the department are: The Math Help Center, The Math Emporium, The Statistical Consulting Center, and the State Math Contest.

11.1 Math Help Center

Director, Maya Chhetri

Services:

- Free tutoring is available to all UNCG students enrolled in 100-level MAT and STA courses as well as STA 271/290. This is a walk-in service in Petty 147 and is open Monday-Thursday 10am-6pm and Friday 10am-1pm.
- In addition to this tutoring service, MHC also arranges **Review Sessions** for courses covered in MHC upon the request of instructors. Usually, Review sessions are requested a week prior to mid-term exams. These Review Sessions are conducted by Graduate Teaching Assistants (GTAs) who tutor in MHC.
- The Director of MHC also hires undergraduate students with math GPA higher than 3.0 to help instructors in grading, managing on-line materials and proctoring exams for lower level courses.

Fall 2011 Activities

1. 9 Graduate Teaching Assistants tutored in Math Help Center and some of them conducted review sessions before mid-term exams.
2. 709 student visits were recorded in MHC.

3. 22 Review sessions were conducted.
4. 9 undergraduate students helped 12 instructors in their classes.

Spring 2012 Activities

In spring 2012, we added MAT 292 and MAT 293 to be tutored in MHC.

1. 10 GTAs tutored in Math Help Center and some of them conducted review sessions before mid-term exams.
2. 1323 student visits were recorded in MHC.
3. 10 Review sessions were conducted.
4. 8 undergraduate students helped 11 instructors in their classes.

Plan for Academic year 2012-2013

- We have asked Student Success Center that they do not need to provide tutoring service for mathematics and statistics courses. However, we feel that our graduate students are mathematically competent, mature and that they will be constantly supervised and periodically monitored by the Director of MHC. We anticipate that this will increase the number of students visiting and getting help from MHC.

- We will further expand MHC service to include more upper level courses such as – MAT 394 (Calculus IV), MAT 310 (Linear Algebra) and MAT 390 (Differential Equations). Selected Graduate Teaching Assistants will be asked to attend one of these courses and will be responsible for tutoring the respective courses in MHC.

In the past, ad-hoc method was used in evaluating the performance of GTAs in MHC. The Director had used suggestion box for students to comment on their experience at MHC or appear un-announced to do the review. A formal procedure will be adopted to evaluate tutoring services – contact students from specific courses to get their feedback, ask students who regularly visit MHC for their feedback and observe GTAs while tutoring and give constructive criticism if necessary.

11.2 Math Emporium

Description of Math Emporium (WLL marker) courses:

WLL courses are enhanced versions of online courses (WTX and WEB). Students enrolled in WLL courses will be required to attend a 1 hour class meeting every week and to spend a minimum of 3 hours per week in a computer lab working on online learning assignments. The goal of the weekly class meeting is to focus students' attention on the week's upcoming learning assignments. As with any class the weekly lectures cannot cover all the materials student needs to know and can only serve as a guide to what and how the student needs to learn. The mandatory lab attendance ensures that students spend sufficient time on online learning assignments. A key feature is that highly trained staff will be present throughout the lab sessions to help students with whatever difficulties they encounter in learning the material. Mid-term exams will take place during the evening hours and final exam during the common final exam times. In each of the Fall 2011 and Spring 2012 semesters, we offered one section of MAT 115 and MAT 150 as WLL classes.

Math Emporium Coordinator, Maya Chhetri

11.3 Statistical Consulting Center

The Statistical Consulting Center (SCC) offers consultation and advice to University researchers engaged in:

- the design of studies and experiments (including proposal preparation)
- the statistical and graphical analysis of data
- the appropriate choice, application and presentation of statistical methods.

Faculty that currently serve as consultants are Scott Richter, Sat Gupta, and Roland Deutsch.

Using the Center

Faculty and staff: General consultation is provided to faculty and staff free of charge. However, researchers routinely list consultants as co-authors on journal publications or paper presentations, and as co-PIs on research grants, as recognition for their service. Researchers are encouraged to interact with a consultant as early as possible in a study, preferably at the planning stage. To obtain assistance, send a brief description of the scope and type of assistance anticipated to scc@uncg.edu.

Graduate students: Graduate students who wish to use the SCC must register for STA 667 during the semester in which they plan to use the Center. The student will then be entitled to one hour of consulting per week for that semester. STA 667 is designed to be a learning experience for both the

consultants and their clients. The SCC points out problems, tries to correct errors, suggests possible solutions, and assists in the analysis of the results. Every attempt is made to increase the understanding of problems and possible solutions.

Enrollment in STA 667 is by sections, corresponding to different faculty members involved in consulting during that semester. Students must obtain permission to enroll in a STA 667 section. If the student has a consultant preference, they should contact the consultant directly to obtain permission to enroll in that consultant's section. If the student does not have a consultant preference, the student should send a brief description of the research topic, as well as the scope and type of assistance anticipated, to scc@uncg.edu, and the student will be referred to a consultant.

Summer: The SCC generally does not operate during the summer. Faculty, staff, and students with large problems or complex analyses should seek assistance during the regular academic year.

11.4 State Math Contest

Filip Saidak, Chair

The State Math Contest took place on April 26, 2012. There were 55 students from the Central Region (composed of 25 counties) of North Carolina taking part in the competition, in the following 3 categories: Algebra 1, Geometry and Algebra 2. The problems this year were more challenging that ever before; however the level of competition stayed very high. And while the attendance was slightly lower than in 2011, the number of female students taking part rose to 44%. Just like last year, our Central Region again had not only the highest average and the highest mean, but also all 3 overall winners for the whole state of North Carolina, and two of those overall winners were girls. Following the competition we have received a lot of positive feedback from students and parents, and we hope that the popularity of the contest will remain unchanged in the future.

12. Collaboration with IMA

Director of IMA, Dr. Fadil Santosa

Faculty and students during Dr. Santosa's talk

Joining The Institute for Mathematics and its Applications (IMA)

UNCG has become a participating institution member of the Institute for Mathematics and its Applications (IMA) at Minnesota. The Office of Research and Economic Development is paying the membership fee for this partnership this year.

To introduce some background, the Institute for Mathematics and its Applications connects scientists, engineers, and mathematicians in order to address scientific and technological challenges in a collaborative, engaging environment, developing transformative, new mathematics and exploring its applications, while training the next generation of researchers and educators. Founded in 1982, the Institute for Mathematics and its Applications (IMA) is an NSF-funded visitors' institute that has grown to become among the most influential math institutes in the world. Located on the University of Minnesota campus, it is one of eight NSF Mathematical Sciences Research Institutes. The IMA has no permanent faculty, but rather is a flux of visitors and postdoctoral researchers.

The IMA aims to achieve synergy between mathematics and its applications, develop transformative mathematical research through interdisciplinary exploration, strengthen and broaden the workforce that confronts pressing challenges facing science and society, and effectively communicate the role of mathematics in our world. The IMA utilizes many strategies and mechanisms to realize these goals, from its annual thematic program to hot topics workshops to seminars and public lectures.

Several meetings were held with Dr. Terri Shelton to discuss how the department can best support the university research enterprise, and in the process help itself by offering new avenues for our faculty and students resulted in the membership in IMA. The department has already been able to secure IMA funding for its Statistics conference in October 2012, and many faculty members and students made plans to participate in various IMA workshops.

For more information, see the website http://www.ima.umn.edu

13. Conferences
13.1 UNCG-RMSC: UNCG Regional Mathematics and Statistics Conference

The Department is home to a very prestigious NSF/MAA supported annual student research conference called UNCG-RMSC. The conference is expanding every year and attracts very bright student researchers.

Background and history

The UNCG Regional Mathematics and Statistics Conference started under the name UNCG – RUMC (The University of North Carolina at Greensboro – Regional Undergraduate Mathematics Conference). The first edition of the conference took place in 2005 and we have run the conference each year since.

Conference in numbers				
Year	Student presenters	Student attendees	Faculty	Schools Represented
2005	12	23	12	5
2006	12	30	13	9
2007	15	36	14	9
2008	11	28	12	10
2009	20	44	21	12
2010	26	64	22	16
2011	48	132	30	27

The emphasis of the conference used to be on interdisciplinary mathematics with particular focus on mathematical biology. However, the topics of conference presentation by students were always open to all areas of research in mathematical sciences since the opportunity to listen to a wide variety of talks gives undergraduate students a better foundation for their choice of a more focused study program.

In 2008 one former undergraduate presenter returned to the conference as a graduate student and in 2009 we already had 3 presentations by returning graduate students (6 presentations by graduate students in total). In 2010, out of 26 student presentations, 11 were delivered by graduate students. The

undergraduate students enjoyed the presentations of the more mathematically mature graduate students and the graduate students benefited as they tried to make their work accessible to an undergraduate audience.

The Seventh UNCG RMSC 2011

More than 160 participants, mostly students, from 27 different universities from many parts of the country, came to Greensboro on Saturday, November 5, 2011, to attend the 7th Annual UNCG Regional Mathematics and Statistics Conference hosted by the Department of Mathematics and Statistics. The program of this National Science Foundation co-sponsored conference featured 48 talks by undergraduate and graduate students on topics including Mathematical Biology, Biostatistics, Computational Mathematics, and Statistical techniques. The plenary talks have been given by two distinguished mathematicians,

- Dr. Laura Miller, UNC, Chapel Hill, and
- Dr. Heejung Bang, University of California-Davis, CA

Jan Rychtar,
Main Organizer

The highlight of the conference was the student paper competition sponsored by NCASA.

Graduate student best paper awards

1st place: Virginia Burger, University of Pittsburgh, PA
Computational Prognosis of Cancer in Barrett's Esophagus Patients.

Undergraduate student best paper awards

1st place: Nils Nelson, Utah State University
Relative Efficiency of Maximum Partial Likelihood Estimators Under Sampling Schemes.

2nd place: Olga Stulov, State University of New York at New Paltz
3D Computational Models of Flagella With and Without Hispid Hairs.

3rd place: Kathryn Ashley and Victoria Sincavage, Clemson University
Ecological Systems, Nonlinear Boundary Conditions, and S-shaped Bifurcation Curves

Conference funding

Funding and support for this conference is provided by the National Science Foundation (grant DMS–1132402), the Mathematical Association of America (MAA) Regional Undergraduate Mathematics Conferences program (grant DMS–0846477), the North Carolina Chapter of the American Statistical Association, the Department of Mathematics and Statistics, UNCG, and the UNCG Office of Undergraduate Research. The 2012 edition of the conference is expected to be even bigger due to enhanced NSF funding.

13.2. UNCG Summer School in Computational Number Theory: A Computational Approach to L-functions

From May 14 to May 18, 2012, the University of North Carolina at Greensboro hosted a summer school entitled “A Computational Approach to L-functions”. The external speaker was David Farmer of the American Institute of Mathematics.

On a typical day, external and local experts gave talks in the morning, and in the afternoon students solved problems related to this material. The talks early in the week introduced the students to the subject. Talks later in the week covered related areas of current research and unsolved problems. The problems given to the students might have been of a theoretical nature, but also involved programming problems and computer experiments. All problems were aimed at increasing the students’ understanding of the material by working with it.

The subjects that were covered included an historic approach to the Riemann zeta function, the derivatives of zeta and their zeros, evaluating zeta and its derivatives, related functions, Dirichlet L functions, and applications of special values.

There were five speakers at the conference including David Farmer (American Institute of Mathematics), Rick Farr (UNCG), Sebastian Pauli (UNCG), Filip Saidak (UNCG), Brett Tangedal (UNCG).

There were fifteen participants in the conference from many different schools including Abraham Abebe (UNCG), Dakota Blair (CUNY), Rick Farr (UNCG), Marvin Jones (Wake Forest), Jonathan Milstead (UNCG), Catherine Payne (UNCG), Joan Pharr (NCSU), Rick Shepherd (UNCG), Lauren Sher (UNCG), Brian Sinclair (UNCG), Jesse Thorner (Wake Forest), Caroline Turnage-Butterbaugh (UMiss), Daniel D. Warner (Clemson), Dan Yasaki (UNCG), Greg Zitelli (UT Knoxville).

Acknowledgements

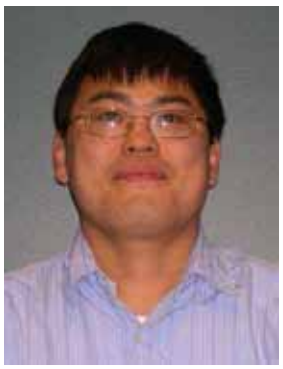
This workshop was supported by the College P3 grant and by the Number Theory Foundation.

The conference organizers were:

Sebastian Pauli

Filip Saidak

Brett Tangedal

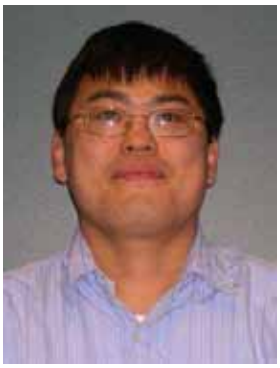


Dan Yasaki

14. Math Club & Pi Mu Epsilon Chapter

14.1 UNCG Math Club

Paula Hamby
President



Dan Yasaki,
Faculty Advisor

The 2011-2012 academic year was the first year of the UNCG Math Club, whose goal is to create a community for Undergraduate and Graduate Math enthusiasts. The club met every other Wednesday beginning the second week of each semester. Turnout was great and they quickly attracted a core group of members. Most meetings centered on talks given by the department's very talented Faculty and Graduate students. And the talks covered fun and glamorous topics such as the Fibonacci Sequence and Fractals, Jordan Separation Theorem, The World Cup Predictions and the math behind the game Spot It!. The Math Club has begun a research project with Dr. Filip Saidak, coordinated by Treasurer Steven Kaufmann, exploring the density of twin primes and other prime gaps. The project has produced interesting results and will continue into the new school year. UNCG's Math Club celebrated Pi Day with the speaking of "**π**" (at 1:59 pm to celebrate 3.14159), the eating of pie, and the watching of **π**. They had their first elections, with the winners Thomas Parrish as President, Adam Eury as Secretary, and Steven Kaufmann as Treasurer. The club has been so successful, with Dr. Dan Yasaki as the club's advisor that they drafted a constitution and applied for official recognition by UNC-G.

Inaugural Meeting: Wednesday, August 31st, 2011, Petty 227, 5:30-6:30
Introductory meeting with pizza, games, etc.

Second Meeting: Wednesday, September 28th, 2011, Petty 227, 5:30-6:30
Speaker: Dr. Roland Deutsch
Title: "Looking Forward to South Africa: Analyzing and Predicting the 2010 FIFA World Cup"

Third Meeting: Wednesday, October 26th, 2011, Petty 227, 5:30-6:30
Speaker: Dr. Gregory Bell
Title: "The Jordan Curve Theorem and Related Notions"

Fourth Meeting: Wednesday, November 16th, 2011, Petty 227, 5:30-6:30
Speaker: Dr. Dan Yasaki
Title: "Continued Fractions"

Fifth Meeting: Wednesday, November 30th, 2011, Petty 227, 5:30-6:30
Speaker: Dr. Gregory Bell
Title: "Spot It"

Sixth Meeting: Wednesday, January 18th, 2012, Petty 213, 5:30-6:30
Speaker: Dr. Filip Saidak
Title: "Prime Gaps and Prime Constellations

Seventh Meeting: Wednesday, February 1st, 2012, Petty 213, 5:30-6:30
Business and Games Meeting
Agenda: Pi Day activities, Permission forms, elections, fund-raising ideas, other business, games, pizza

Eighth Meeting: Wednesday, February 15th, 2012, Petty 213, 5:30-6:30
Speaker: Dr. Sat Gupta
Title: "Randomized Response Models"

Ninth Meeting, Wednesday, February 29th, 2012, Petty 213, 5:30-6:30
Speaker: George Merrill, UNCG Graduate Student

Tenth Meeting, Wednesday, March 14th, 2012, Petty 213, 5:30-6:30
Pi Day: Pizza, watched Pi

Eleventh Meeting, Wednesday, March 28th, 2012, Petty 213, 5:30-6:30
Speaker: Dani Moran
Title: Voronoi and Cech complexes

Twelfth Meeting, Wednesday, April 11th, 2012, Petty 213, 5:30-6:30
Speaker: Brian Sinclair
Final Meeting of Semester: Brian spoke on loops, games, finalizing Math Club business

Math Club members during August's meeting

14.2 Pi Mu Epsilon Chapter

Richard Fabiano
Faculty Advisor

Pi Mu Epsilon is the national honor society for outstanding students of mathematics.

Each year the faculty carefully screens the academic records of mathematics majors and other students studying advanced mathematics. Those students who satisfy the rigorous induction requirements and receive the approval of the faculty are extended an invitation to join Pi Mu Epsilon. This year our North Carolina Epsilon chapter inducted nine new members:

Matt Clark, Adam Eury, Lance Everhart, Arthur Huey, Yusuke Matsuzuki, Thomas Parrish, Keith Potter, Anthony Sparks, and Anna Tuck.

We held an induction banquet to honor these students on April 10, 2012, at the Saigon Vietnamese Restaurant. The banquet was attended by new inductees and their guests, and several faculty members.