317 College Ave.
Mary Macy Petty Building

UNCG
1891

Self-Study 2015 and Post-Review Documents
Department of Mathematics and Statistics
The University of North Carolina at Greensboro
http://www.uncg.edu/mat/

Self-Study 2015
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Sat Gupta, Associate Head
Greg Bell, Director of Graduate Studies
Dan Yasaki, Director of Undergraduate Studies

Contents

1 Context of the review

Departmental reviews at UNCG normally happen every 5 years. We conducted our last self-study review in 2007. The self-study review in 2012 was postponed because all of UNCG went through an Academic Program Review in 2011. This review covers the period starting AY 2010–11 through the end of AY 2014–15. It covers all activities of the Department for this period with particular focus on undergraduate and graduate curricula, instructional productivity, research productivity, external & internal relations, contributions to the College and University strategic plans, and future planning and projections. We also provide important departmental documents that reflect how we function.

1.1 Department mission statement

The mission of the Department of Mathematics and Statistics at the University of North Carolina at Greensboro is to provide intellectual leadership in the mathematical sciences that is of direct benefit to the State of North Carolina and that commands national and international respect for the quality of its educational programs and for its depth of scholarship.

1.2 Membership

The department's tenured/tenure-track faculty currently consists of 7 Full Professors, 10 Associate Professors, and 4 Assistant Professors. The department now has a more matured look with more senior personnel when compared to the department at the time of our last review. This transformation has had a profound impact on the research productivity of the department, as reflected by faculty publications and presentations, departmental colloquia and lectures series, external grants, and the research done by our undergraduate and graduate students. We will say more on this in subsequent sections.

We also have one member in an Academic Professional position. This member concentrates on mathematics education, advising freshman, as well as recruitment and retention efforts. Further, we have one member as a Senior Lecturer, and on a temporary basis one full time Lecturer and two part-time Lecturers. The lecturers teach mostly at the introductory level, and there are no research expectations from them.

We currently have 32 graduate students including 16 PhD students, 14 MA students, 2 PBC students and 104 undergraduate majors including 97 first majors and 7 second majors.[1]

Table 1: Undergraduate and graduate enrollment 2010–2015.

Year	2010	2011	2012	2013	2014	2015
PhD	12	12	14	15	16	16
MA	12	11	10	9	10	14
PBC	2	3	2	1	1	2
Undergrad.	101	131	143	109	111	104

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[1]This data was gathered from Fall numbers from Webfocus.

Fall Graduate Enrollments

Fall Undergraduate Enrollment
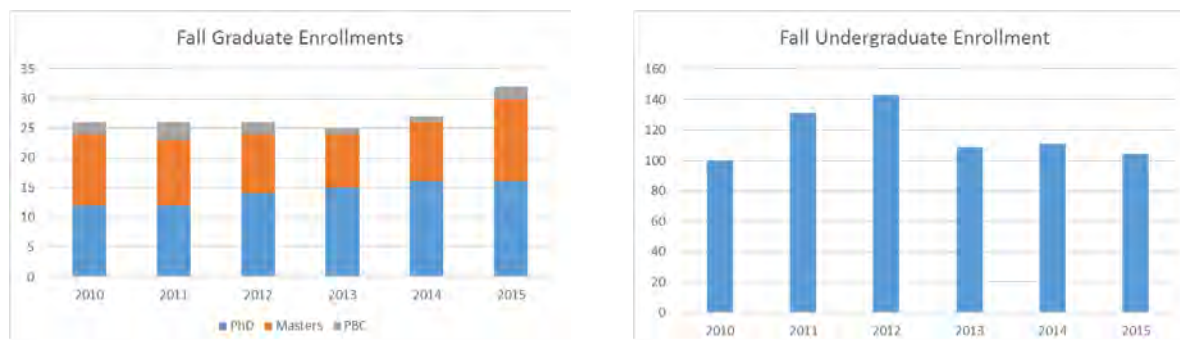
A list of current tenured and tenure-track faculty is given below. The list also includes a faculty member serving on an academic professional position and a senior lecturer. A more detailed profile of the departmental faculty is given by the faculty CVs in Appendix G.

Tenured/Tenure-track Faculty
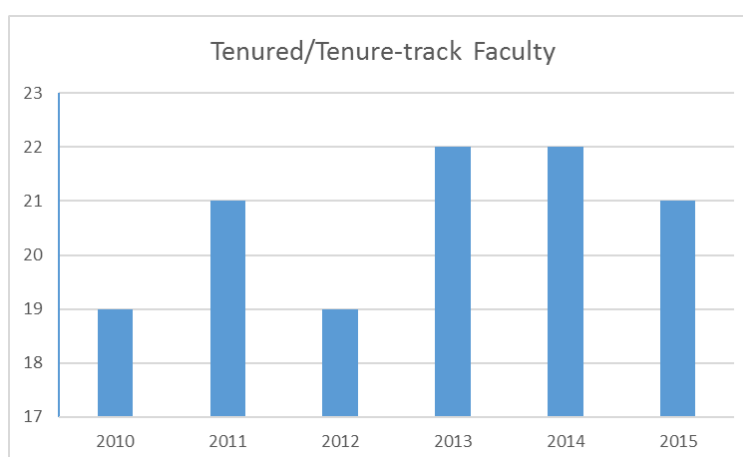
Professors.

Maya Chhetri
PhD in Mathematical Sciences, Mississippi State University (1999)
Research: Nonlinear Elliptic Partial Differential Equations, Control Theory, Mathematical Biology

Richard Fabiano
PhD in Mathematics, Virginia Tech (1986)
Research: Differential Equations, Control Theory, Applied Mathematics

Sat Gupta, Associate Head
PhD in Statistics, Colorado State University (1987)
PhD in Mathematics, University of Delhi, India (1977)
Research: Sampling, Mathematical Statistics, Mathematical Biology

Scott Richter, Director of Statistical Consulting Center
PhD in Statistics, Oklahoma State University (1997)
Research: Non-parametric Methods

Jan Rychtář
PhD in Mathematics, University of Alberta, Canada (2004)
Research: Mathematical Biology, Applied Mathematics, Game Theory, Functional Analysis

Ratnasingham Shivaji, Department Head and H. Barton Excellence Professor
PhD in Mathematics, Heriot-Watt University, United Kingdom (1981)
Research: Nonlinear Elliptic Boundary Value Problems, Mathematical Ecology

Jerry Vaughan
PhD in Mathematics, Duke University (1965)
Research: Set-theoretic Topology, General Topology, Set Theory & Logic, Functional Analysis

Associate Professors.

Greg Bell, Director of Graduate Studies
PhD in Mathematics, University of Florida (2002)
Research: Geometric Topology, Geometric Group Theory, Computational Topology

Igor Erovenko
PhD in Mathematics, University of Virginia (2002)
Research: Linear Groups, S-arithmetic Groups

Xiaoli Gao
PhD in Statistics, University of Iowa (2008)
Research: High Dimensional Data, Statistical Genetics

Sebastian Pauli
PhD in Mathematics, Concordia University, Canada (2001)
Research: Computational Number Theory, Algebraic Number Theory, Local Fields

Filip Saidak
PhD in Mathematics, Queens University, Canada (2001)
Research: Analytic Number Theory, Elementary Number Theory

Carol Seaman
PhD in Mathematics, Central Michigan University (2000)
Research: Math Education

Clifford Smyth
PhD in Mathematics, Rutgers University (2001)
Research: Combinatorial Probability, Computational Complexity, Discrete Geometry

Brett Tangedal
PhD in Mathematics, University of California at San Diego (1994)
Research: Algebraic Number Theory, Explicit Class Field Theory

Dan Yasaki, Director of Undergraduate Studies
PhD in Mathematics, Duke University (2005)
Research: Computational Number Theory, Automorphic Forms

Haimeng Zhang
PhD in Applied Mathematics (Statistics), University of Southern California (1998)
Research: Survival Analysis, Spatial Statistics and Applied Probability

Assistant Professors.

Talia Fernós
PhD in Mathematics, University of Illinois at Chicago (2006)
Research: Geometric Group Theory, Analytic Group Theory

Thomas Lewis
PhD in Mathematics, University of Tennessee (2013)
Research: Numerical Solutions of PDEs, Applied Mathematics

Jonathan Rowell
PhD in Applied Mathematics, Cornell University (2003)
Research: Mathematical Biology, Game Theory, Applied Mathematics

Dohyoung Ryang
EdD in Mathematics Education, University of Alabama (2010)
PhD in Mathematics, University of Alabama (2005)
Research: Math Education

Academic Professional/Senior Lecturers.

Tracey Howell
Academic Professional
PhD in Teacher Education and Higher Education, University of North Carolina at Greensboro (2013)

Walker Weigel
Senior Lecturer
MA in Mathematics, University of North Carolina at Chapel Hill (1967)

1.3 Academic programs

The Department of Mathematics and Statistics offers the BA, BA-HS, and BS degrees in mathematics. The BS has concentrations in mathematics and statistics. The Undergraduate Program also offers minors in mathematics and statistics. The Graduate Program offers a PhD in Computational Mathematics, a Master of Arts in Mathematics with either Mathematics or Applied Statistics concentration, and a Post-Baccalaureate Certificate in Statistics. Several new concentrations within the MA degree are being proposed. These new concentration areas are Actuarial Mathematics, Biomathematics, Data Analytics, and Teaching College Mathematics.

2 Undergraduate majors

The Department of Mathematics and Statistics offers undergraduate programs leading to

- BA Mathematics;
- BA-HS Mathematics with High School Teaching Licensure;
- BS Mathematics with concentration in Mathematics;
- BS Mathematics with concentration in Statistics.

We also offer minors in mathematics and statistics. The BA program is more flexible than the BS program, allowing students to follow a broad liberal arts program or to specialize in a second area. The BS program is more technically oriented; it provides solid preparation for work or study in mathematics or a related field. Students wanting to go to graduate school are encouraged to consider the BS degree or the Accelerated Degree Program (ADP) to earn a BS and MA in 5 years. The total number of 1st and 2nd majors in fall of each year is summarized in Table 2.

Table 2: Total number of 1st and 2nd majors in each program.

	2010	2011	2012	2013	2014	2015
BS	31	58	78	60	68	58
BS-HS/BA-HS	5/32	7/35	6/22	2/30	0/24	0/19
BA	32	31	37	17	19	27
Total	100	131	143	109	111	104

The degree requires 122–124 semester hours, to include at least 36 hours at or above the 300 course level or above. The discipline requirements are flexible enough to allow students to pick up a minor in a related area.

The programs with High School Licensure have undergone recent changes. The BS-HS was phased out in beginning in 2012. Beginning in 2015, the BA-HS is being phased out, and High School Licensure is being offered as a concentration in the BA degree. More information about other concentrations can be found in §2.2.

2.1 Rationale for undergraduate curriculum

What is the rationale for the structure of the curriculum for the undergraduate major(s)? Does the curriculum appropriately balance breadth and depth of study? Does the number of hours required at the various levels conform to similar degree programs at UNCG, in the UNC system, and/or peer institutions? Is a particular sequence of courses required or recommended? Why or why not? Do you require a culminating experience such as a capstone course? Why or why not?

The curricula for the programs we offer are generally consistent with the MAA's *2015 CUPM Curriculum Guide to Majors in the Mathematical Sciences* recommended cognitive and content goals. All programs require the full calculus sequence, linear algebra, and statistics. Students must also take MAT 253, a discrete math course with introduction to Python

programming, or CSC 130, an introduction to programming. All programs require the Senior Seminar as a culminating experience. This is a 1 credit hour seminar course that carries the General Education Speaking Intensive (SI) marker, consisting mainly of oral presentations by the students.

The mission of the BA program is to provide students with a solid foundation in mathematics and an appreciation for the structures and theories of advanced mathematics. This will prepare the student to be a competent mathematics educator or to be successful in a mathematics-related career. The Student Learning Outcomes (SLOs) for this program are

SLO1: Demonstrate an in-depth knowledge in at least one major area of mathematics;

SLO2: Demonstrate a well-rounded knowledge of major areas of mathematics;

SLO3: Cultivate the reasoning and analytical skills required for the understanding, appreciation, and application of mathematics; and

SLO4: Devise effective solution strategies to solve mathematical problems.

The mission of the BS program is to provide students with a solid foundation in mathematics and an appreciation for the structures and theories of advanced mathematics or statistics. This will prepare the student to be a competent mathematics educator or to be successful in a mathematics-based profession or to attend graduate school in mathematics, statistics, or other related field. The SLOs for this program are the same as for the BA with the strengthening of SLO1 to require in-depth knowledge of at least two major areas of mathematics.

Requirements specific to the program or concentration are given below. After the first year 100-level coursework, the student transitions to more proof-based courses at the 300-level. The 500-level courses generally represent the 2nd semester of a year-long sequence.

The BA, BA-HS, and BS mathematics concentration require a Mathematics Core of 10 courses (30 credit hours):

- Calculus sequence (MAT 191, 292, 293, 394): Traditional calculus sequence.
- Discrete Mathematical Structures (MAT 253): A basic introduction to discrete mathematical structures and the programming language Python. A first course in rigor.
- Introduction to Probability and Statistical Inference (STA 290): A first course in calculus-based statistics and the statistical package MINITAB.
- Elementary Linear Algebra (MAT 310): A proof-based introduction to linear algebra.
- Introduction to Abstract Algebra (MAT 311): The first of a two-semester sequence in abstract algebra. This course satisfies the General Education Writing Intensive requirement in the major.
- Ordinary Differential Equations (MAT 390): A first course in differential equations.
- Introduction to Mathematical Analysis (MAT 395): The first of a two semester sequence in real analysis.

BS mathematics concentration requirements

- Mathematics Core.
- One year sequence with labs in Physics with Calculus, Chemistry, or Biology.
- Three additional mid/upper-level electives: Choose from 200-level or above math courses or a selection from certain 300-level or above computer science or statistics courses.

- One upper-level elective in analysis—Introductory Functional Analysis (MAT 522), Intermediate Mathematical Analysis (MAT 525), or Introductory Complex Analysis (MAT 540).
- One course in algebra or topology—Theory of Numbers (MAT 514), Intermediate Abstract Algebra (MAT 516), or Intuitive Concepts in Topology (MAT 519).

BA-HS requirements

- Mathematics Core.
- Axiomatic Foundations of Geometry (MAT 330): A first course in axiomatic geometry.
- Foundations of Mathematics for Teaching I, II (MAT 405, 406): Capstone survey course sequence for students seeking high school licensure. Registration requires admission to student teaching. Course includes 50 hour internship.
- One additional upper-level elective: Any 500-level MAT course.

BA requirements

- Mathematics Core.
- One additional upper level elective: Any 500-level MAT course.

BS statistics concentration requirements
The statistics concentration requires some, but not all, of the courses in the Mathematics Core. From the core, it requires the Calculus sequence (MAT 191, 292, 293, 394), Introduction to Probability and Statistical Inference (STA 290), and Elementary Linear Algebra (MAT 310). Additionally, the concentration requires

- Introduction to Computer Science (CSC 130): A first course in computer programming.
- Statistical Methods (STA 291): A first stats methods course, and the only stats writing intensive course that students students in stats concentration take.
- Statistical Inference (STA 352): The first course on mathematical statistics that students in stats concentration take.
- Four additional mid/upper-level electives: Choose from 300-level or above statistics courses; up to two can be selected from certain 200-level or above computer science or mathematics courses.
- One additional upper-level elective: Any 500-level STA course.

Mathematics minor requirements

- Calculus I, II (MAT 191, 292).
- Elementary Linear Algebra (MAT 310) or Introduction to Discrete Mathematics (MAT 353).
- Two additional mid/upper-level MAT/STA/CSC courses that count for the major.

Statistics minor requirements

- Introduction to Probability and Statistical Inference (STA 290).
- Statistical Methods (STA 291).
- Three additional mid/upper-level electives (STA 300+).

The curriculum has room for improvement with regards to MAA's 2015 CUPM Cognitive Recommendation 3:

> Mathematical sciences major programs should teach students to use technology effectively, both as a tool for solving problems and as an aid to exploring mathematical ideas. Use of technology should occur with increasing sophistication throughout a major curriculum.

While our students use technology early in the curriculum, only those that pursue further high-impact experiences such as disciplinary honors or undergraduate research see more sophisticated applications of technology in mathematics.

The table below shows the credit hour requirements in mathematics, statistics, and computer science from the programs of a selection of our peer institutions: Florida Atlantic University (FAU), Old Dominion University (ODU), University of Colorado Denver (CU Denver), Univeristy of Mississippi (Ole Miss), and University of New Orleans (UNO). Our requirements seem a bit light in comparison. Part of this could stem from a lack of computer science course requirement in our BA, BA-HS, and BS mathematics concentrations. One should note that several of the other programs require specific science sequences as our BS mathematics concentration does. The BA from the University of Mississippi requires a minor in another discipline.

Table 3: Comparisons of math, statistics, and computer science credit hour requirements with other undergraduate programs at our peer institutions.

	UNCG	FAU	ODU	CU Denver	Ole Miss	UNO
BA, BA-HS	34, 41	48			33	
BS	43–46	57	52	48	45	48–49
minor	15–21	24–29	24	21	15	18

2.2 Concentrations

If there are concentrations, what benefit for students do they provide and what detriment to graduation might they pose? Are they adequately justified by disciplinary standards, the number of students enrolled, and the sizes of the required classes?

Due to pressure to increase enrollment numbers in certain programs and concentrations, the department discontinued several concentrations in 2012. We decided to focus on two primary concentrations. We left the statistics concentration as it was and combined the remaining concentrations (applied mathematics, computer science, interdisciplinary math, pure mathematics) into one mathematics concentration. The total number of 1st and 2nd majors in each concentration, combining as described above, is given in Table 4.

The students benefit from the more focused requirements of the concentrations. The BS students are better prepared to pursue graduate studies or enter the workforce in STEM fields. The detriment is a potential increase in time to graduation for those students that do not decide on their concentration until later in their studies. The specific course requirements for the two concentrations overlap in six courses. After this, the students are taking more

Table 4: 1st and 2nd majors in each concentration of the BS degree.

	2010	2011	2012	2013	2014
Mathematics	26	41	58	41	51
Statistics	10	17	20	19	17

specialized courses. To lessen the impact of this detriment, a portion of the upper level courses for each concentration can count toward the upper level elective requirement in the other concentration.

Beginning in 2015, High School Licensure is offered as a concentration in the BA degree.

The required coursework in all our concentrations is justified by disciplinary standards, generally meeting the recommendations of the CUPM as described in §2.1.

2.3 Freshmen retention

If a significant number of freshmen who declare the math major do not continue in the program in their sophomore year, what evidence can you provide to explain the lack of retention? How has the department addressed any identified problems with retention?

The department collected additional data for the freshmen 1st majors in 2010–14. We do have an apparent freshmen retention problem. We tracked the specific freshmen that left the program. Table 5 shows the total number of freshmen declared 1st majors, the total number that did not continue in the program in the following academic year. The latter fall into two categories:

1. students who left the university under academic probation, suspension, or dismissal;
2. students who graduated, left the university in good standing, or are currently enrolled at UNCG in a different department.

The numbers in each category are given in Table 5.

Table 5: Number of freshmen declared 1st majors and the number that do not continue in the program in their sophomore year.

	2010	2011	2012	2013	2014
freshmen 1st majors	13	20	16	9	13
did not continue	9	6	10	3	8
left in academic probation, suspension, or dismissal	3	1	7	2	5
left in good standing	4	2	2	1	3
graduated	2	2	0	0	0
currently enrolled	0	1	1	0	0

Of the 18 that graduated or left the university in good standing,

- 6 left the university as math majors,

- 2 retained mathematics as a second major,
- 1 switched to a math minor,
- 1 earned a middle grades education degree with mathematics,
- 8 moved to different departments.

Of the 18 that left the university on academic probation, suspension, or dismissal, most did not make it to the calculus sequence. These grade sanctions are not triggered by a single course, rather performance in courses overall. This signifies trouble in the transition to college coursework, rather than problems with mathematics.

A department's care for its student majors is a prominent factor in retention rates. One way we have tried to address retention is through advising. The department hired Tracey Howell as an Academic Professional in 2012. One of her duties is Advising Coordinator. She tracks and advises all student that enter the program for their first year. This includes freshmen and transfer students. After one year, the students are paired with an academic advisor that is best suited to that particular student's needs.

The MAA's *Guidelines for Programs and Departments in Undergraduate Mathematical Sciences* suggests the need for an informal gathering space for majors "for use by mathematical sciences majors for conversation and study." In Fall 2012, Petty 129 was converted to a Math Undergraduate Lounge. The following year, it was moved to a larger space housed in Petty 206, where it has been since. It is a quiet space for our majors to study, talk math, or just relax.

2.4 Time to graduation

If a significant number of majors do not graduate within six years, how might the department address this problem?

We do not have a significant number of majors that do not graduate within six years. We collected data from declared 1st majors in Fall 2010–14. In that time, we only had one major with more than 180 earned hours at UNCG. That particular student had previously earned a bachelor's degree from UNCG in a different discipline which explains the excess of credit hours.

2.5 21st century skills

How does the department provide opportunities for majors to acquire "21st century skills" such as critical thinking, communication (speaking and writing), and information literacy?

Students in our program acquire these skills through their required program of courses. Specifically, critical thinking skills are developed in our proof-based courses at the 300–500 level. Writing skills are introduced in MAT 311, which carries the General Education Writing Intensive (WI) marker. In such courses, students use multiple drafts of a writing assignment, applying feedback before resubmission. Speaking skills are taught in MAT 490, which carries the General Education Speaking Intensive (SI) marker. Such courses instruct students in effective oral communication, give students informed feedback, and provide opportunities for students to apply what they have learned to subsequent oral communication activities. These skills are developed in the other required 300–500 level courses. Some students further hone these skills in optional high-impact experiences described in §2.6.

2.6 High-impact experiences

How does the department provide opportunities for students to engage in disciplinary research, Honors, internships, service learning, or other "high-impact" experiences as defined by the AAC&U and as appropriate to your discipline? How could these opportunities be enhanced?

Undergraduate research. The major push for undergraduate research in the Department started in 2005 with the establishment of a math-biology research group by Rychtář, Chhetri, and Gupta from the Department of Mathematics and Statistics, Rueppell and Remington from the Department of Biology, and Crowe from the Office of Undergraduate Research. See Figure 1. The group has been funded by two major NSF grants; 0634182 (2006–10) and 0926288 (2009–13). Over the years, this research has involved 16 faculty and over 45 undergraduate students. The students and faculty received 33 awards and recognitions, gave over 250 presentations, and published over 40 research articles in major international journals.

Figure 1: Math-Biology at UNCG

Some other research opportunities that exist for our students are:

- The UNCG Undergraduate Research and Creativity Award (URCA) is designed to help faculty and students partner in meaningful projects that result in advances in understanding within their discipline. Support can be used to help defray the cost of material expenses and/or related travel, or can be used to provide a stipend for the students. The general URCA program is funded through the indirect costs generated by external grants awarded to UNCG. Many faculty in the department have been successful in securing these awards.

- Undergraduate Research Award in Mathematics and Statistics: The Department of Mathematics & Statistics currently provides this opportunity using H. Barton Excellence Professorship Funds. To date, four students have received this award.

- National Science Foundation funded Research Experiences for Undergraduates Program (REU site for 2014–16): This NSF-REU is an opportunity for students to engage in research in the summer. During the 10 weeks students get the opportunity to actively participate in all activities, including regular group research meetings to discuss related articles, brainstorm, discuss problems; propose solutions and work toward moving the research forward; write a paper about their research; present (both in written and oral form) to the group about their research project, and present their research at regional/national meeting(s).
  http://research.uncg.edu/spotlight/all-fun-and-game-theory/
  http://www.uncg.edu/mat/bio-math/REU/

- National Research Experience for Undergraduates Program: This program is funded by MAA (2013–15) and is a joint effort with Bennett College. This NREUP supports the participation of mathematics undergraduates from underrepresented groups in focused and challenging research experiences to increase their interest in advanced degrees and careers in mathematics.
  http://www.maa.org/programs/faculty-and-departments/underrepresented-groups/nreup
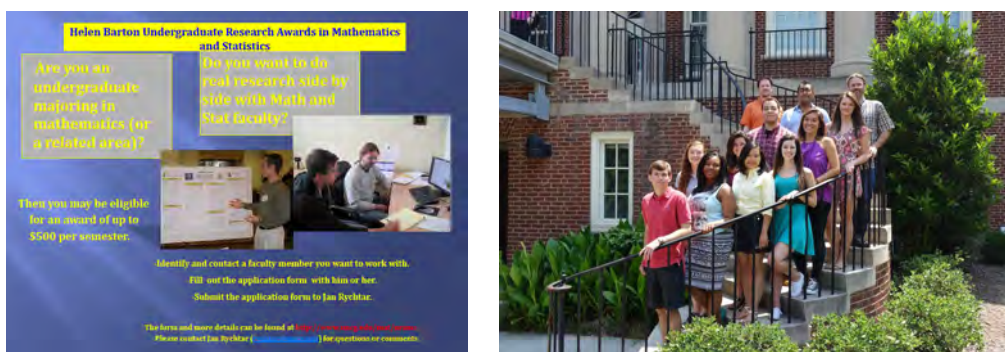
Figure 2: H. Barton Undergraduate Research Award and REU 2015.

The department will continue to nurture undergraduate research with the Center for Undergraduate Research in Mathematics (CURM) and Preparation for Industrial Careers in Mathematical Sciences (PIC) grants for 2015–16.

Disciplinary honors. Students who meet the academic qualifications can complete the Disciplinary Honors Program in Mathematics. While we do not currently offer dedicated honors courses or honors sections, students can take Honors Contract courses, which are enhanced versions of regular undergraduate courses arranged between the student, the course instructor, and the department's honors advisor. In addition to Honors Contract courses, students must complete a senior project. Since Fall 2011, we have had 9 contract courses and 3 students complete senior projects to graduate with disciplinary honors.

AToMS. From Fall 2012–Spring 2014 the department participated in supporting the STEM living-and-learning community, Achieving Together in Mathematics and Science (AToMS), for 50 incoming freshmen majoring in chemistry, computer science, mathematics, or physics. The community took introductory chemistry as a cohort and participated in weekly seminars to support their academic success. Specialized study groups and review sessions for their STEM courses, including mathematics, were provided. The program was discontinued in Fall 2014 due to lack of administration funding.

Clubs and organizations. There are also a number of math clubs and organizations for students to join.

- Alpha Student Chapter of The North Carolina Council of Teachers of Mathematics (NCCTM)
- UNCG Student Chapter of the Association for Women in Mathematics (AWM)
- UNCG Math Club
- Pi Mu Epsilon honor society

Pi Mu Epsilon   AWM

UNCG Math Club   Alpha NCCTM

Figure 3: Mathematics clubs at UNCG.

2.7   Results of annual assessment

What changes have occurred in the major as a result of the annual assessment? What areas of the curriculum, student learning outcomes, and assessment process are most in need of improvement or quality enhancement?

We have taken several other measures to help improve our student experience. Examples of these measures include lowering of class sizes for our 100 level courses; an enhanced Math

Help Center to provide answers and clarifications to student questions; and a new Math Emporium Lab combining the best components of traditional and online classes in College Algebra and Precalculus courses, see §8.1.

To help ease the transition from lower level mathematics to more proof-based courses, MAT 253 replaced CSC 130 in the Mathematics Core. While some programming is retained, the main goal of MAT 253 is to introduce the students to rigor. The course is now a prerequisite for our first algebra and first analysis courses, two courses that have students have struggled with in the past. We are beginning to see the consequences of this requirement as success rates in the algebra and analysis courses continue to improve.

Beginning in Fall 2015, a minimum grade of C (2.0) is required for all CSC, MAT, and STA courses to count toward the major. This is a change from the previous minimum requirement of an average 2.0 for CSC, MAT, and STA courses.

The drop, fail and withdrawal (DFW) rate totals for all Mathematics and Statistics courses at the 100 level since 2011 is given in Figure 4 below.[2] The department has started analyzing this data since 2011 on a continual basis and continues to discuss the outcome and ways to decrease the DFW rates.

In response to high DFW rates, beginning in Spring 2015, we began to administer a precalculus assessment test on the first day of Calculus I (MAT 191) to identify at-risk students early and get them the help they need. Students that performed poorly on the initial assessment test were directed to additional help sessions at the Math Help Center. See §8.1.

3   Graduate programs

3.1   Rationale for graduate curriculum
What is the rationale for the structure of the graduate program?

The Department of Mathematics and Statistics offers a Post-baccalaureate Certificate in Statistics, an MA degree in Mathematics with concentrations in Mathematics or Applied Statistics, and a PhD degree in Computational Mathematics.

The PBC offers working professionals the chance to improve their knowledge of statistics and apply this knowledge to their current position. Most of the MA students enrolling in the Statistics concentration are seeking advanced training for professional development and advancement and seek employment in the pharmaceutical, biotech, healthcare, or other local industries. Students enrolling in the MA program with a concentration in mathematics seek training to teach mathematics at four-year and/or community colleges or use the program as a stepping-stone to a PhD degree.

3.2   Distinguishing characteristics
What aspects of the curriculum distinguish your program(s) from others in your discipline in the UNC system, in the southeast and the nation?

[2]Data provided by the Office of Institutional Research.
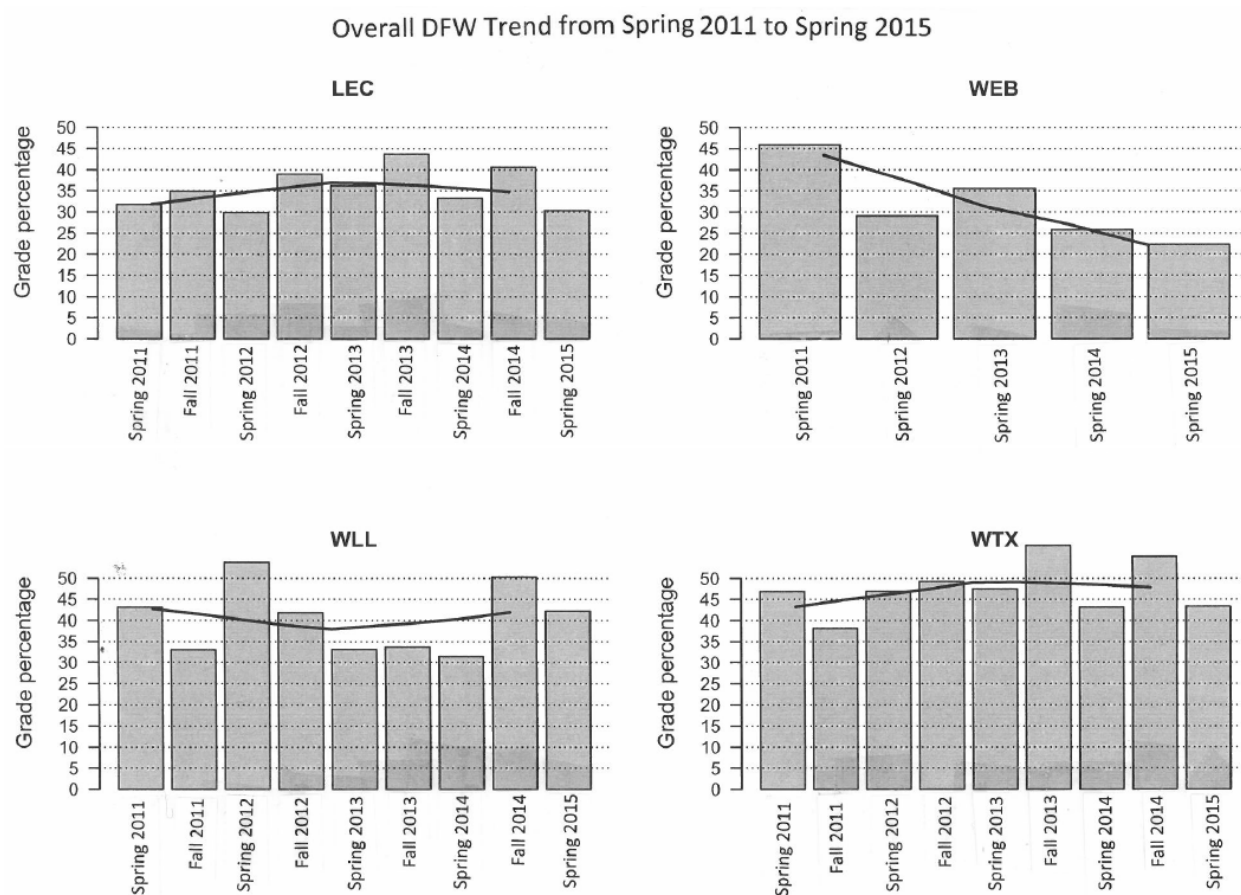
Figure 4: Drop, Fail Withdrawal Trend in 100-level Courses

The PhD in Computational Mathematics is unique in North Carolina and one of very few programs in computational mathematics in the United States. In addition to being unique in name, the program distinguishes itself from other PhD programs in NC by requiring its graduates to be strong theoretical mathematicians with a strong background in computational aspects of the chosen field of research.

3.3 Audience

Is the program strategically oriented to serve a particular audience and to meet University objectives? Is the schedule of course offerings appropriate to meet the needs of this audience?

Our programs meet the needs of our audience and those of the University of North Carolina at Greensboro. Indeed, Section 4.3 of the North Carolina Tomorrow Commission Final Report discusses the need for the University to address the shortage of mathematics and science teachers. Our programs produce well-trained mathematicians who contribute to this goal by becoming teachers as well as training the next generation of NC science and mathematics teachers.

We are able to meet the course needs of our students through our faculty teaching independent study courses as overloads. The department continues to examine efficient ways of offering a

Figure 5: GTAs helping undergraduates in the Math Help Center.

diverse schedule to our students while still providing incoming students with the core courses required for their program.

3.4 Concentrations

If there are difference concentrations within the degree program, are there sufficient disciplinary reasons and enrollment to maintain them?

Within the MA degree we currently have two different concentrations. These concentrations reflect the facets of our department: mathematics and statistics. Enrollments in these concentrations have declined slightly with our strategic shift in resources toward the PhD program, but we maintain approximately equal numbers in each concentration.

Additionally in 2015 the department has proposed four new concentrations in the MA degree (Actuarial Mathematics, Biomathematics, Teaching College Mathematics, and Data Analytics) in an effort to recruit more part-time and self-supported students. This will also help address UNC General Administration's desire to increase enrollment in our MA program.

3.5 Admissions

Are admissions appropriately selective and are top applicants successfully recruited and retained? If necessary, what steps could be taken to improve quantity and quality in applications and yield?

For both the PhD and MA programs, we have a two-tiered admission standard. A lower standard is required for admission to the program, while a much higher standard is applied to determine which students receive assistantships. Since the PhD program is only seven years old, we still lack the brand recognition that many other programs in North Carolina enjoy. Therefore, we are still not in the best position to recruit top students in the area. The department is currently exploring an advertising push with other STEM disciplines at UNCG with the help of the Graduate School. Among the planned steps to increase PhD enrollment are to send targeted emails to students taking the GRE with an indicated interest

in mathematics and to send targeted emails to students belonging to the undergraduate mathematics honor society, Pi Mu Epsilon.

In the past two years, the department has made a large push to recruit strong students from around the southeastern United States, with a particular focus on North Carolina residents. These recruitment efforts have resulted in a small increase in the number of applicants, and we are gradually seeing the quality of our applicants increase. While there is a population of strong international applicants we could target with our recruiting efforts, we lack the funding to support many of these students.

3.6 Waiver and assistantship increase request

Figure 6: Thomas Lewis and Maya Chhetri engaging in graduate recruitment at the Joint Mathematics Meetings.

If an increase in graduate assistantships and/or tuition waivers is requested, what evidence suggests that these increases would improve the recruitment and retention of outstanding students?

Support for graduate students comes in three forms: assistantships, in-state tuition waivers, and out-of-state tuition waivers. Only students who are offered an assistantship may be offered a tuition waiver. North Carolina residents pay in-state tuition and so can have their tuition waived by being granted an in-state waiver. Non-NC resident and foreign students' tuition are subject to an out-of-state surcharge, which is covered by an out-of-state waiver. A non-NC resident who is offered an assistantship may be offered an out-of-state waiver and an in-state waiver, or they may only be offered an out-of-state waiver (in which case they will be responsible for paying the in-state portion of their tuition), or they may be offered no waiver at all (in which case they are responsible for paying in-state tuition and the out-of-state surcharge). The college allocates the in-state and out-of-state tuition waivers and allows us to freely convert one out-of-state waiver for three in-state waivers.

Table 6: Graduate funding and waiver allocations.

	Current Allocation (2015–16)
Permanent GTA Money	$338,910
Out-of-state Waivers	9
In-state Waivers	6

The $338,910 includes the $36,910 added in Fall 2015 by the Office of the Provost. This funding was provided initially as a match of institutional support when we applied for a GAANN award in June 2015 for the first time. Although the GAANN proposal was not

successful, the Provost committed these funds to the department on a permanent basis. The department will submit another GAANN proposal when the next call is made in mathematics.

In the US, graduate students in Mathematics are almost always offered full support from the department. The request below would be used to raise the current MA stipend from $10,800 to $13,000, which is more competitive. We feel that our PhD stipend of $18,000 is competitive.

Table 7 shows the last three admissions cycles, comparing the number of applicants to the number of new students in these programs. The data from before Fall 2013 is difficult to obtain because the Graduate School's Apply Yourself software does not provide departments access to records before 2013.

Table 7: Graduate applications, admits & enrollments.

	Fall 2013	Fall 2014	Fall 2015
MA Applications/Accepted	17/12	20/13	17/16
New MA Enrollments/with Funding	5/2	7/5	6/3
PhD Applications/Accepted	11/7	23/10	16/13
New PhD Enrollments/with Funding	2/2	3/3	5/4

Based on the above data, ideally we would like to obtain extra GTA funds and waivers to support 8 MA students (6 NC residents and 2 out-of-state students) and 16 PhD students (8 NC residents and 8 out-of-state students). To do so we need:

	Requested Permanent Allocation
Permanent GTA Money	$392,000
Out-of-state Waivers	10
In-state Waivers	24

We understand that obtaining this many waivers is not practical. We propose to offer in-state residents higher stipends in lieu of tuition waivers. The extra stipend money ($6000 per student, per year) is sufficient to cover in-state tuition. Hence we would like to obtain:

	Requested Allocation	Increase from Current Allocation
Permanent GTA Money	$476,000	$137,090*
Out-of-state Waivers	10	1
In-state Waivers	10	4

*If the yearly allocation of $54,000 from the College that is currently used to fund the Math Emporium were to become permanent, we would only require a permanent increase of $83,090.

Summer support for graduate students comes in three ways. In recent years, the college has been providing funding for six students to work in the Math Help Center. The Graduate School provides up to $1000 in Graduate Dean Awards to graduate students who are within

one semester of graduation and can demonstrate financial need. Finally, some research support comes from both internal and external grants.

3.7 Graduate assistant contributions

How do graduate assistants contribute to the instructional program of the department?

Currently, we employ 12 graduate students in our Math Help Center and Math Emporium, see §8.1. These 12 students provide technical support and tutoring to students in every 100- and 200-level mathematics or statistics class as well as some 300-level classes. Students work 20 hours per week in this capacity. Eight of our PhD students are instructors of record for 100- and 200-level courses in the department. In Spring 2015, our PhD students taught 16 sections and generated 2688 student credit hours.

3.8 Graduate student professional development

What opportunities does the department provide for professional development of graduate students in teaching and/or research, scholarship, and creative activity?

Each new GTA is required to attend a (university-sponsored) day-long workshop covering policies and best practices for teaching assistants at UNCG.

Additionally, the Department of Mathematics and Statistics offers MAT 601 - Teaching Mathematics Seminar. All GTAs are required to enroll in this course during their first semester at UNCG, while unsupported students are strongly encouraged to enroll in it. In general, no graduate student may lead a section of a course on their own without first satisfactorily completing MAT 601. The course was revamped several years ago to improve mathematical science teaching, discuss department policies, discuss research methods and research ethics, and create a better sense of community among graduate students.

In MAT 601, students spend several weeks reading and discussing the textbook *How to Teach Mathematics* before beginning mock lectures to their classmates. Each student is assigned a section of a 100-level mathematics or statistics course that they are likely to find themselves teaching at UNCG. They are given a model syllabus, from which they construct their own syllabus. After delivering their syllabus to the class, they spend some time conducting a mock class session, while the remaining students in the class role-play as students. At the end of the lecture, students and the instructor give each other frank feedback including the best thing about the lecture and the thing that could most be improved. The instructor also provides written feedback to the student.

Students in this course also learn about mathematical typesetting, research ethics, and a brief introduction to standard research techniques and web resources available to them. Finally, this course also serves to create a sense of community among the incoming cohort of new graduate students. This aids in retention as our students come to the program with such diverse backgrounds that there are no standard "first-year courses" as there are in many larger programs.

We also have several departmental seminars that students participate in by giving talks on their research. Finally, each year, the department hosts the UNCG Regional Mathematics and Statistics Conference (UNCG-RMSC). This student-centered conference gives undergraduate

and graduate students the opportunity to present their research to a national audience. The conference includes a competition to determine the best student presentation at both graduate and undergraduate levels to ensure that students give their presentation the attention it deserves.

Part of each student's preparation includes delivering research talks about their research to their mathematical colleagues. Therefore, the department sets aside a small amount of money for the exclusive use of graduate students traveling to deliver talks on their research at conferences, workshops, or other universities. In the past few years we have been able to fund student travel to regional meetings as well as national conferences.

Our graduate students are mentored by our faculty and are helped to make the transition from the role of student to the role of faculty member. All students are invited and encouraged to interact with our colloquium and lecture series speakers. Moreover, several students help with organizational efforts in the many conferences the department has hosted over the years.

At least once a year the department has a graduate tea for our graduate students to socialize and interact with each other and faculty. Some photos are in Figure 7.

Figure 7: Faculty and graduate students socializing during a graduate tea.

3.9   Failure rate

What percentage of students fails to complete the program? What are their reasons for withdrawal?

Since the PhD program began in 2008, we have had 32 students enrolled in the program (as of August 2015). A total of 13 students have withdrawn from the program. Four withdrew to pursue careers that did not require the PhD degree. Two left for health-related issues. The remaining seven students were unable to meet our degree requirements. Of our 13 withdrawals, 3 transferred to the MA degree. To date, we have graduated 3 PhD students. Additionally, in AY 2015–16 we expect 3 PhD students to complete the degree. Three more PhD students are expected to complete the degree in AY 2016–17.

3.10   Alumni success

Provide evidence of the success of your alumni in obtaining appropriate employment and/or recognition in their field.

Typically, graduate students in Mathematics who earn an MA will either seek a PhD degree or become instructors at 2- or 4-year colleges. Typically, graduate students in Statistics will seek

a position in industry, although some seek academic positions. Most PhDs in Mathematics will seek employment in academia. We have (as of May 2015), three PhD graduates and 100% placement in academic or government positions:

1. Abraham Abebe, PhD (2014) is a non-tenure track visiting professor at Temple University.
2. Danielle Moran, PhD (2014) is a tenure-track assistant professor at Guilford College.
3. Brian Sinclair, PhD (2015) works for the Bureau of Labor Statistics.

It is more difficult to keep track of the accomplishments of our MA students. We have assembled the following recent information:

1. Heather Barker (née Allmond), MA Math (2010) is an instructor at Piedmont Community College.
2. Adam Eury, MA Math (2014) is a Systems Developer for Armstrong Transport Group.
3. William Ely, MA Math (2012) is a Quantitative Analyst at BB&T in Winston-Salem.
4. Lauren Farr (née Sher), MA Math (2011) is an instructor at High Point University.
5. Shierina Brown Fareed, MA Stats (2012) is Associate Project Manager/Clinical Research Associate at Wake Forest Baptist.
6. John D. Hardee, MA Math (2012) is a full-time faculty member at Davidson Community College in Thomasville, NC.
7. Michael Higgins, MA Stats (2012) is an analytic modeler at Brighterion in Alameda, CA.
8. Denise Rangel, MA Math (2008) completed her PhD at UT Arlington in August 2014 and is now a post-doctoral researcher at Syracuse University.
9. Qing Shi, MA Stats (2009) is currently a programmer in Biostatistics for PPD in Morrisville.
10. Jeong-Sep Sihm, MA Stats (2012) enrolled in the PhD in Computational Mathematics program at UNCG.
11. Michael Watts, MA Math (2013) has been an instructor at Pikes Peak College since August 2013.
12. Guolin Zhao, MA Stats (2008) completed her PhD in statistics at NCSU. She is currently a biostatistician with Biogen Idec in Boston, MA.

Our PhD students have published 14 papers since 2011 in quality refereed journals and conference proceedings such as the Journal of Mathematical Analysis and Applications (2), Topology and Its Applications, Topological Methods in Nonlinear Analysis, Involve - a Journal of Mathematics (2), Communications in Statistics - Simulation and Computation, Physics in Medicine and Biology, Fixed Point Theory and Applications, Boundary Value Problems, Dynamics of Continuous, Discrete, and Impulsive Systems, Series A, Sensors and Actuators B: Chemical, the Bulletin of the Belgian Mathematical Society - Simon Stevin, and the Topics from the 8th Annual UNCG Regional Mathematics and Statistics Conference. Several other papers have been submitted for publication. They have given 25 research talks in AMS conferences, MAA conferences, and regional conferences. Additionally, they have given dozens of seminar talks at UNCG.

3.11 Results of annual assessment

What changes have occurred in the graduate program(s) as a result of annual assessment? What areas of the curriculum, student learning outcomes, and assessment processes are most in need of improvement or quality enhancement?

Several changes to the MA and PhD programs have come about due to annual assessment.

In 2012, we reduced the number of concentrations in the MA program from three to two. Additionally, we determined that in the mathematics concentration, students were not choosing the exam option. In an effort to make the exam option more attractive to our students, we formalized the procedures for the exam option. In particular, we aligned the exam option for the MA program with the PhD qualifying exams, which did not exist when the MA program was created with the exam option. The purpose of this alignment was twofold: we wanted to elucidate the process for students and we wanted to create a mechanism whereby students in the MA program could make a smooth transition to the PhD program.

In Fall 2015, we proposed four new concentrations in the MA program in an effort to attract more self-supported students. These new concentrations are in Biomathematics, Teaching College Mathematics, Data Analytics, and Actuarial Mathematics. These proposed concentrations reflect the perceived needs of applicants to our programs and provide more well delineated career paths for our graduates.

In the PhD program, the department continues to revise curricula and formalize procedures and timelines for the PhD degree program. In particular, we have included several new exams in the list of potential qualifying exams, while still maintaining a mathematics core; we have expanded the areas of research in the computational mathematics degree to include the statistics faculty; and we have established clear expectations for our graduate students to remain in good standing with the department and continue to receive funding in the form of graduate assistantships.

Additionally, in 2014–15 the department proposed an Enhanced Doctoral Training program through the NSF. This proposal was based on the highly successful Mathematical Modeling in Industry Workshops held at the Institute for Mathematics and its Applications.


Figure 8: Advertising poster for our PhD program.

This program would be held over the sum-

mer months and give our PhD students experience in doing research with industrial and government partners and could eventually lead to internships and employment with these partners. This proposal was ranked in the top $^1/_3$ of all proposals and "recommended for funding if possible," but was ultimately not funded. However, based on the positive feedback we received we have worked with our industry partners to address the reviewers comments and have reapplied in 2015 in an effort to better prepare our PhD students for opportunities in industry and government.

In 2015, the department submitted a GAANN (Graduate Assistance in Areas of National Need) proposal to the Department of Education. This would provide up to 4 graduate students with three years of funding for graduate study as well as cover the cost of their tuition. The competition for this year's GAANN was extremely high. Although our proposal was ultimately unsuccessful, we received positive feedback from the reviewers, which we will use to resubmit the proposal when the next call is made in mathematics.

4 Instructional productivity, class sizes, and online courses

4.1 Delaware I and student credit hour history

Table 8 shows the Delaware Study Trend that compares our Department's Student Credit Hours (on the chart as UNCG SCH/FTE and UNCG Faculty FTE) compared to other Universities and UNCG's total SCH. Please note that Fall 2014 was added by us to the existing chart. Fall 2014 information was provided by the Office of Institutional Research since we do not have the current Delaware Study Trend.

Table 9 shows our student credit hour history (SCH) since 2006–07 through 2014–15.[3] The regular term is the academic year and the total row includes summer courses.

Table 8: Delaware Study Data Fall 2009–2014

Math & Stat	2009	2010	2011	2012	2013	2014
75th Percentile	337	328	336	660		
50th Percentile	284	287	283	303		
Delaware Mean	291	285	293	310		
UNCG SCH/FTE	353.4	350.3	427.9	337.4	281.3	295.7
UNCG SCH	7,510	7,618	9,770	9,027	8,440	8,648
UNCG Faculty FTE	21.3	21.8	22.8	26.8	30.0	29.3

Table 9: Student Credit Hour History

	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15
Regular	12,528	13,194	13,278	15,731	15,907	17,882	17,414	16,842	17,017
Total	13,801	14,656	14,256	16,709	17,065	19,352	20,060	19,062	19,126

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[3]Data provided by the Office of Institutional Research.
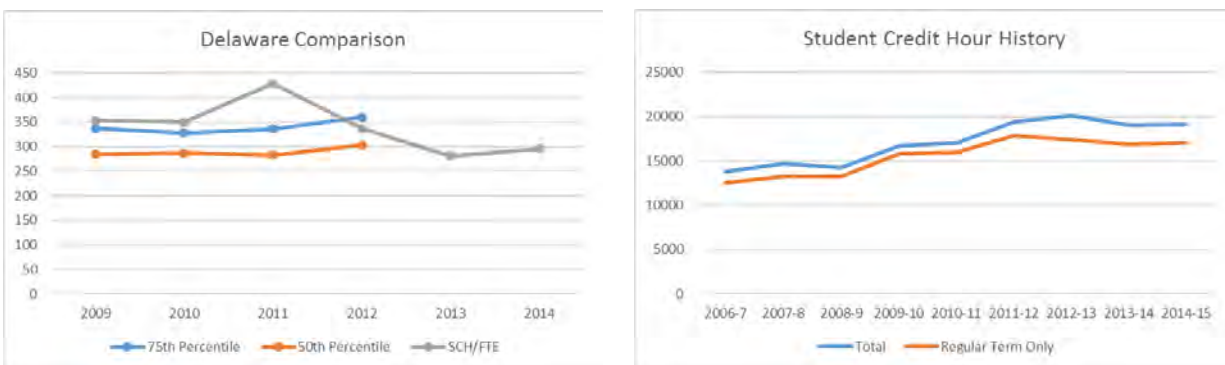
Kindly note that:

- Our Student Credit Hours (SCH) grew 38.6% during the period 2006–07 to 2014–15.
- During the period of this review (2010–11 to 2014–15), our student credit hours has increased by 12.1%.
- We are the fourth largest SCH producing unit (SCH: 19,126) in the College behind the Departments of Biology (SCH: 24,567), Languages, Literature & Cultures (SCH: 23,019), and English (SCH: 20,344).

4.2 Low enrollment classes

In Fall 2014, the department looked at course offerings and enrollment numbers going back several years to design a plan to increase course enrollments without significantly increasing time to graduation for our majors. We propose

- more consistent and open scheduling,
- stricter enforcement of prerequisites,
- larger enrollments in "bottleneck" courses,
- maintain our base courses,
- more variety in the 300 level MAT offerings, and
- less 500 level MAT offerings.

The detailed analysis can be found at

http://www.uncg.edu/mat/undergraduate/scheduling-proposal.pdf

4.3 Online course offerings and enrollments

The following are courses that our department offers with at least partial course credit through web work. The web-based course types are:

WTX: Web-based courses with on-campus tests and exams. These courses are well-suited for independent learners that want more flexibility in their schedule.

WLL: Enhanced versions of WTX classes. Students enrolled in WLL courses are required to attend a 1 hour class meeting every week and to spend a minimum of 3 hours per week in a Math Emporium Lab working on online learning assignments.

WEB: Completely on-line instruction and tests.

See Table 10 for the number of sections offered each year. Currently we are changing all of our WTX sections to WEB to adapt to the changing needs of our student populations.

Table 10: Number of WTX, WEB, and WLL sections offered.

Academic Year	WTX Courses	Web Courses	WLL Courses
2011–12	19	9	5
2012–13	22	7	3
2013–14	16	9	6
2014–15	25	6	16
Fall 15	8	1	8

5 Contributions to general education and special undergraduate programs

The Department of Mathematics and Statistics offers several courses that satisfy the Mathematics (GMT) requirement of the General Education Program. These include all of our 100 level mathematics and statistics courses:

- STA 108 Elementary Introduction to Probability and Statistics
- MAT 112 Contemporary Topics in Mathematics
- MAT 115 College Algebra
- MAT 120 Calculus for Business and the Social Sciences
- MAT 150–151 Precalculus I–II
- MAT 190 Precalculus
- MAT 191 Calculus I

Each is open to and appropriate for all undergraduate students, regardless of major. The General Education Learning Goals (LGs) attached to the GMT marker are as follows:

LG1 Foundational Skills: Think critically, communicate effectively, and develop fundamental skills in quantitative and and information literacies.

LG2 The Physical and Natural World: Understand fundamental principles of mathematics and statistics, and recognize their relevance in the world.

The GMT Student Learning Objectives (SLOs) were revised for 2015–19. The revised SLOs were approved by the General Education Council on March 31, 2014 and the Faculty Senate on September 3, 2014.

SLO1: Reason in mathematical systems beyond data manipulation.
SLO2: Formulate and use mathematical models to solve real-world problems.
SLO3: Communicate mathematical solutions clearly and effectively.

We regularly provide some reserved seating in our MAT 100 sections and Calculus II for Learning Communities and Grogan College. See §7.1 for additional details.

Since 2012, approximately 92% of the SCH production by the department has been to service majors in other departments in the university. The contributions are appropriate given the department's resources, and there are currently no plans to change its contributions over the coming years.

6 Research, scholarship, or creative activity

6.1 Faculty research profile

The department maintains a vibrant research program. Over the past five academic years, we published 191 refereed journal articles, 17 refereed proceedings papers, and 7 books and research monographs. We also gave 279 international, national, regional, or local research presentations. In contrast, the 5-year totals at the time of last review were 77 refereed journal articles and 33 research presentations. Of course there were fewer tenured or tenure-track members at that time. Year-wise data are provided in Table 11. Please refer to the faculty CVs in the Appendix G for more detailed information about faculty research.

Table 11: Faculty research output.

| Academic Year	Refereed Articles	Refereed Proceedings	Books	Research Talks
2010–11	29	4	0	46
2011–12	29	4	3	58
2012–13	39	4	2	85
2013–14	46	2	2	63
2014–15	48	3	0	47
Total	191	17	7	279

6.2 External funding effort

The department continues to exceed its targets in seeking external funding, submitting 20 grant proposals in 2014–15. See Table 12 for details.

Table 12: Grant proposals data, Award history by fiscal year, and recent major external award recipients, including awards from NSF, NSA, the Simons Foundation, and an MAA Project NExt fellowship.

Academic Year	Proposals Submitted	Amount Requested	Number of Awards
2011–12	13	$4,776,888.22	9
2012–13	18	$4,673,283.68	17
2013–14	15	$4,779,205.50	9
2014–15	20	$4,571,486.58	5
2015–present	1	$598,453.11	3

Math Award History by Fiscal Year
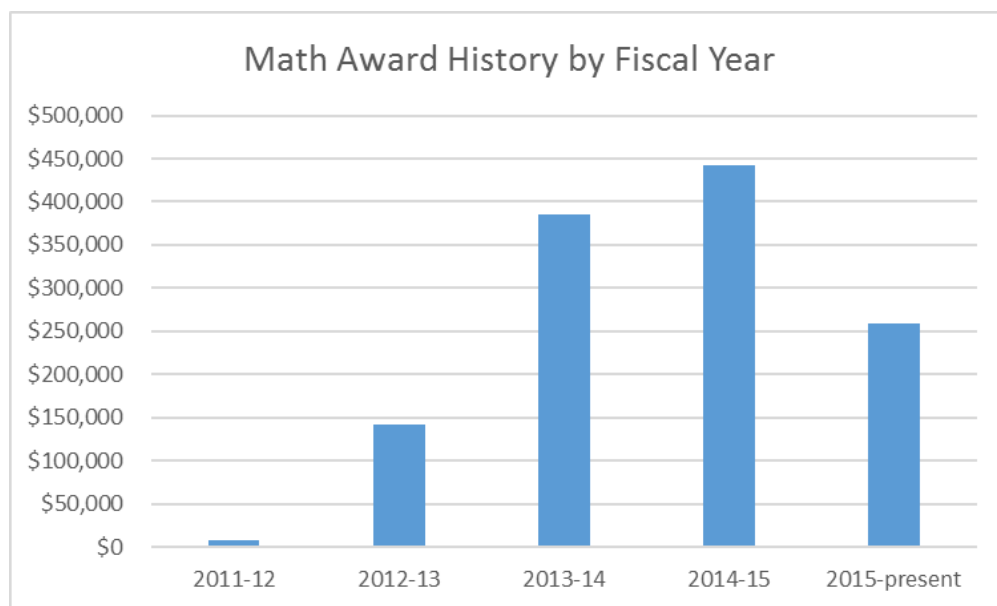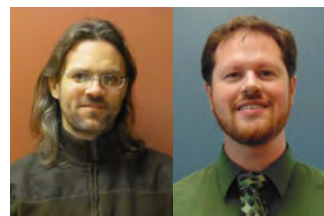
Fernós   Zhang   Shivaji   Lewis   Rychtář   Rowell
NSF Grants   NExT Fellow   NSF-REU Grant
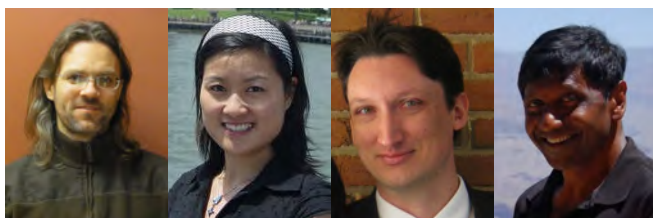
Rychtář   Gao   Smyth   Shivaji   Yasaki   Smyth
Simons Foundation Grants   NSA Grants

6.3 Research journals

The Department is now home to 3 research journals. Sat Gupta serves as Editor-in-Chief of the Journal of Statistical Theory and Practice. Jerry Vaughan serves as one of two Editors-in-Chief of Topology and its Applications. Jan Rychtář and Sebastian Pauli serve as Editors-in-Chief of the recently started North Carolina Journal of Mathematics and Statistics.
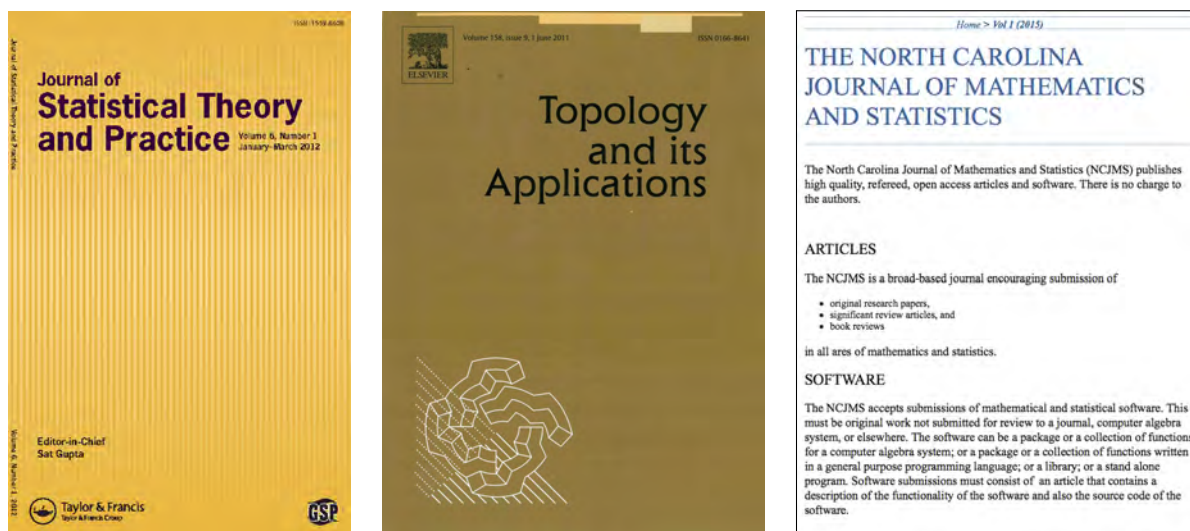

Figure 9: Research journals housed in the department.

6.4 Conferences hosted by the department

AISC. We host an International Conference on Advances in Interdisciplinary Statistics and Combinatorics, a NSF funded 3-day biennial international statistics conference. Sat Gupta serves as conference chair. The website for the latest conference in 2014 is http://www.uncg.edu/mat/aisc/2014/. It has links to previous conferences as well. Typical attendance at this conference is 200–250. Plenary speakers included two former ASA Presidents (Sastry Pantula and Marie Davidian). Another ASA President, Bob Rodrigues, will be a plenary speaker at the next conference.


Figure 10: International Biennial AISC Conference.

RMSC. The Department hosts UNCG Regional Mathematics and Statistics Conference, a one-day student conference every year since 2005. The conference is funded by the National Science Foundation. Jan Rychtář serves as conference chair. The link to the 2015 conference is http://www.uncg.edu/mat/rmsc/2015/. It has links to previous conferences as well. Typical recent attendance at these conferences is around 150.

The UNCG Regional Mathematics and Statistics Conference
Past Conference Highlights

Background & 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. The emphasis of the conference used to be on interdisciplinary mathematics with particular focus on mathematical biology. However, the topics of conference presentations by students were always open to all areas of research in the mathematical sciences, and recent conferences now include presentations by graduate students, as well as undergraduate students.

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
2012	56	120	44	36
2013	57	115	42	35
2014	65	127	42	31

Principal Speakers

Heejung Bang, *UC Davis*
Michael Dorff, *Brigham Young University*
Richard Fabiano, *UNCG*
Sujit Ghosh, *NC State University*
Jerome Goddard II, *Auburn University at Montgomery*
Katia Koelle, *Duke University*
Suzanne Lenhart, *University of Tennessee*
Laura Miller, *UNC Chapel Hill*
Jerry Reiter, *Duke University*
Stephen Robinson, *Wake Forest University*
Filip Saidak, *UNCG*
Jim Selgrade, *NC State University*
Simon Tavener, *Colorado State University*

Conference Funding

Funding and support for this conference series has been provided by the National Science Foundation, the Mathematical Association of America (MAA), Regional Undergraduate Mathematics Conferences program, the North Carolina Chapter of the American Statistical Association, the UNCG Department of Mathematics and Statistics, and the UNCG Office of Undergraduate Research.

Scientific Committee

Kristen Abernathy, Zachary Abernathy, Chad Awtrey, Maya Chhetri, Michael Dancs, Kumer Pial Das, Anda Gadidov, Jerome Goddard II, Sat Gupta, Elliot Krop, Hyunju Oh, Christopher Raridan, Jan Rychtář, Ratnasingham Shivaji, Shan Suthaharan, Irina Victorova

Figure 11: Summary of UNCG-RMSC over the years

PANTS XIII. The Number Theory Group (Pauli, Saidak, Tangedal, Yasaki) also organized the Palmetto Number Theory Series XIII (http://www.uncg.edu/mat/sermon/pants-xiii/) held at UNCG in September 2010. This is a series of number theory meetings held in South Carolina, the Palmetto State, and other places in the Southeast. The core members of the PANTS consortium are Clemson University and University of South Carolina. PANTS was funded for the 2010–11 academic year by grants from the NSF (DMS-1001553) and NSA. There were 38 participants.

UNCG Summer School in Computational Number Theory. We have also been hosting UNCG Summer School in Computational Number Theory each summer since 2012. Sebastian Pauli, Filip Saidak, Brett Tangedal, and Dan Yasaki are the lead organizers for this series. The summer school in computational number theory fills a gap in the education

of many graduate students. Most graduate courses in number theory take a mainly theoretic approach with very little emphasis on the computational aspects of the subject. The goal of the UNCG Summer School in Computational Number Theory is to complement this with a constructive-algorithmic approach. Many of the algorithms used for number theoretic computations are non-trivial, which makes it difficult to cover them in a standard course. Funding for these summer programs was provided by the Number Theory Foundation and UNCG in its first year. Subsequent years were funded by the NSF (DMS-1303565) and the NSA (H98230-13-1-0253). The number of participants has grown from 19 in 2012 to 29 in Summer 2015.

Figure 12: UNCG Summer School in Computational Number Theory

AMS Fall Sectional Meeting. The American Mathematical Society is the largest mathematical society in the United States. Founded in 1888, it boasts over 30,000 members. Each year, the society hosts eight sectional conferences. In November 2014, UNCG hosted the 2014 Fall Southeast Regional AMS conference at the School of Education Building. Greg Bell served as the main local organizer.

Over 420 mathematicians attended this conference, which featured 344 session talks, three invited addresses and a special Maclaurin lecture by James Sneyd from the University of Auckland, New Zealand.

Additionally, the Department of Mathematics and Statistics sponsored an evening reception for all participants on the first night of the conference. The participants came to UNCG from 38 states and 15 different countries representing North and South America, Europe, Asia, Africa, and Oceania.

AMS Special Sessions, which feature cutting-edge research talks were organized by UNCG faculty members Maya Chhetri, Tom Lewis, Sebastian Pauli, Jonathan Rowell, Jan Rychtář, Clifford Smyth, Jerry Vaughan, and Dan Yasaki. Four faculty members delivered invited talks, five UNCG graduate students gave invited talks, and one UNCG Computational Mathematics PhD alumnus gave an invited talk.

Figure 13: Greg Bell was the main local organizer of the Fall 2014 regional AMS meeting at UNCG.

35th SEARCDE fall meeting. The 35th Southeastern Atlantic Regional Conference on Differential Equations (http://www.uncg.edu/mat/searcdeconf/2015/) will take place at UNCG (for a second time) on Saturday and Sunday, October 10–11, 2015. We expect around 150 participants. The NFS-funded conference is a significant annual meeting in the differential equations community. It has evolved a tradition of bringing together senior researchers with younger recent PhD's and graduate students, and fosters an atmosphere of serious science and friendly communication of ideas.

6.5 Lecture series, colloquia, and seminars hosted by the department

From 2011 and forward the department has enhanced this activity considerably with two new lecture series added. (http://www.uncg.edu/mat/talks/)

Figure 14: SEARCDE 2015.

Table 13: Department talks

Year	H. Barton LCM	H. Barton LMS	Colloquia	Seminars – External Speakers	Seminars UNCG Speakers
2011–12	11	3	10	6	12
2012–13	10	6	8	6	29
2013–14	5	3	5	25	32
2014–15	4	3	7	16	11

H. Barton Lecture Series in Computational Mathematics.
The Lecture Series in Computational Mathematics (LCM) at UNCG has been organized

by the Department of Mathematics and Statistics since Fall 2011. The 2011–12 series was sponsored by the College and since has been funded by H. Barton Excellence Professorship funds. The target audience is graduate students and upper-level undergraduate students, as well as faculty members. Experts in their fields will cover a variety of topics in computational mathematics and computational statistics, as well as their applications in other disciplines. A particular aim of the lecture series is to spark interest among students in the newer trends in computational mathematics and its applications.

http://www.uncg.edu/mat/talks/lecture-series.html

H. Barton Lecture Series in Mathematical Sciences. The Lecture Series in Mathematical Sciences (LMS) at UNCG has been organized by the Department of Mathematics and Statistics since Spring 2012 funded by H. Barton Excellence Professorship funds. The target audience is graduate students and upper level undergraduate students, as well as faculty members. This lecture series features a very distinguished mathematician who gives a series of three lectures on a topic in the mathematical sciences. A particular aim of the lecture series is to spark interest among students in the newer trends in the mathematical sciences and its applications.

http://www.uncg.edu/mat/talks/lecture-series-mat.html

Figure 15: Recent H. Barton Lecture Series in Mathematical Sciences and Computational Mathematics

6.6 Research visitors

We have had several visitors to the department in recent years. In particular, during the period of 2011–12 to 2014–15 we have had a total of 68 research visits by external mathematicians and statisticians. Some are shown in Figure 16. Some of our recent external speakers/collaborators include Avner Ash (Boston College), Pavel Drabek (University of West Bohemia), John Harer

(Duke), Suzanne Lenhart (University of Tennessee), Philip Maini (Oxford), Yuri Matiyasevich (Steklov Institute of Mathematics), Michael Pohst (TU Berlin), Jerry Reiter (Duke), Fadil Santosa (IMA, University of Minnesota), Harold Stark (UC San Diego), Len Stefanski (NC State), William T. Trotter (Georgia Tech), Lalitha Venkataramanan (Schlumberger-Doll Research), Cem Yıldırım (Bogaziçi University, Istanbul), Dan Zelterman (Yale). See also http://www.uncg.edu/mat/researchvisitors/ for a complete list of departmental visitors since 2011.

| Lalitha Venkataramanan (Schlumberger-Doll) | John Harer (Duke University) | Philip Maini (Oxford University) |

| Harold Stark (UC San Diego) | Michael Pohst (TU Berlin) | Len Stefanski (NC State) |
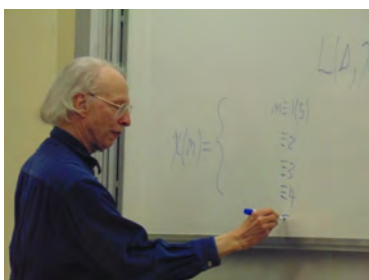
Figure 16: Some recent research visitors to our department.

7 External and internal relations

7.1 Internal relations

Business School. During the academic year we work with the Bryan Business School to reserve MAT 115 (College Algebra) and MAT 120 (Calculus for Business and Social Sciences) seats for their majors. To support the success rate of Business majors, our department provides a Teaching Assistant to teach Algebra review sections in Fall and Spring semesters for their students taking BUS 105 that will be taking our College Algebra and Business Calculus courses. These review sessions are funded by the Business School.

Learning Communities. Living-Learning Communities (LLCs) are residential programs open to students in all majors living on campus. LLC students live together and enroll in two to three common courses with dedicated faculty mentors teaching one of the courses. We reserve seats in requested sections.

Ashby and Grogan Residential Colleges. Open to students in their first and second years at UNCG, the Residential Colleges offer students the opportunity to work alongside faculty on 21st Century problems. Students can explore their interests and majors with the support of friends and colleagues in Core courses grounded in UNCG's General Education curriculum. Ashby College is a living-learning, holistic academic community focusing on the liberal arts and general education through an innovative, interdisciplinary curriculum. Grogan College provides a vibrant academic and social community for future professionals and performing artists. We reserve seats in requested sections.

Computer Science/Physics. We work with those departments to ensure that their are no class schedule conflicts for their majors who are required to take certain math or statistics courses.

7.2 External relations

IMA participation. UNCG is a participating institution member of the Institute for Mathematics and its Applications (IMA: http://www.ima.umn.edu/) at Minnesota since January 2012. 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. Our faculty and students have greatly benefited in participating in IMA events. More information can be found in our Annual Reports located on our webpage under highlights: http://www.uncg.edu/mat/

Figure 17: Left: IMA event, *Career Options for Women in Mathematical Sciences.* Attended by graduate students Paula Hamby and Catherine Payne and lecturer Dagny Butler. Right: Greg Bell was chosen in Fall 2014 to be one of two New Directions Professors at IMA.

State Math Contest. Our Department is proud to annually host the Central State Math Contest each Spring. The state math contest is a problem-solving competition (http://www.uncg.edu/mat/contest/) through which students interested in mathematics can become

Figure 18: State Math Contest 2015

familiar with more sophisticated and advanced mathematical concepts and ideas that are not covered in traditional school curricula. The contest has been in existence for over 40 years in the state of North Carolina. During that time, over 100,000 students have taken part in the qualifying rounds and over 2,500 students have advanced to the state finals. Each year, the culmination of the contest is a final test that determines statewide winners. Currently, North Carolina is divided into three regions (Eastern, Central, and Western) and the final test is administered simultaneously at one site in each region.

Alumni relations. Each year the Department's Annual Report is mailed to UNCG alumni, friends, and past donors. These efforts have been welcomed by these constituents and have resulted in some of them making financial contributions to the department.

8 Contributions to college and university strategic plans

8.1 Commitments for excellence in low-level math/stat classes

The department is committed to helping students succeed in our lower-level math and statistics courses. We offer three instruction styles: traditional lecture, WTX (online), and WLL (hybrid/Math Emporium). To help with success and retention of students in 100-, 200-, and many 300-level mathematics and statistics courses we offer free walk-in tutoring and assistance with homework in our Math Help Center. From 2011–12 through 2014–15, the average student visits per semester to Math Help Center is 1617. Starting in 2016, the web-based WTX sections are discontinued in favor of WEB and WLL. See §4.3 for a discussion of these types.

8.2 STEM education at UNCG

An advisory board, faculty facilitator, and network coordinator guide the network. One of our department colleagues, Carol Seaman, has been the faculty facilitator for the past five years. In addition to Seaman's efforts, the department supports the work of the RISE Network through annual monetary support, sponsorship of receptions for mathematics educator speakers, and participation in RISE events.
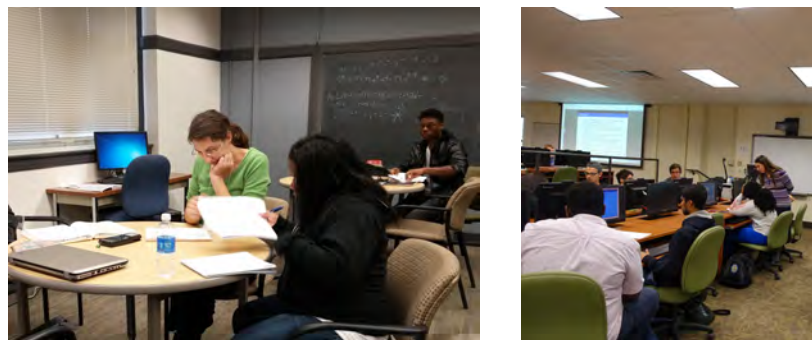
Figure 19: Left: Math Help Center. Right: Math Emporium Lab.

Launched in August 2010, the RISE (Research and Instruction in STEM Education) Network connects UNCG STEM educators with each other, with research and funding opportunities, and with the larger STEM community. Now in its fifth year, RISE Network membership includes over 160 faculty and staff, and approximately 15 Guilford County administrators, leaders, and teachers. The RISE Network sponsors speakers and working-group lunches; facilitates faculty collaborations about upcoming grant opportunities and participation in STEM-related conferences; connects faculty across disciplines and across units to break down silos, raising awareness of possible STEM research and education connections across all disciplines; and engages in the national conversation of STEM research and instruction.

8.3 Statistics consulting

The Statistical Consulting Center (SCC) at UNCG is a campus-wide service center available to faculty, staff, and students seeking statistical advice during any stage of research. The SCC emphasizes an integrated, comprehensive statistical consulting service, covering all aspects of a quantitative research project ranging from the initial study design through to the presentation of the final research conclusions. The faculty and students in the SCC often serve as active members of interdisciplinary research teams, especially on funded research projects. The SCC thus helps to fulfill the College and University mission to support programs and help faculty and student researcher engage in collaborative scholarship and creative activity.

Figure 20: Left and center: Statistical Consulting Center. Right: QMS 2015.

In addition to consulting activities, the SCC recently launched the Quantitative Methodology Series (QMS). The QMS provides workshops to help faculty, students and staff improve their

quantitative skills. Four workshops have been delivered since May, 2015, attracting over 90 participants from across campus. In addition to its role in helping to support programs of scholarship, research and creative activity, the QMS workshops also help the College accomplish its mission to encourage faculty to develop their skills as teachers and mentors of undergraduate and graduate students.

8.4   Research experience in statistics for undergraduates

The program is funded by the department and is designed to provide high performing UNCG undergraduate students an opportunity to get involved in quantitative research. The program is open to all students irrespective of major.

Depending on the student's background, the project may be computational in nature or it may involve derivation of new theoretical results. In all cases, the work on the project is expected to lead to at least a poster presentation at some conference in the student's field of study. In some cases, the work will lead to a peer-reviewed journal article. In this case the student will be eligible for a small scholarship from the department.

We would like to emphasize that the main motivation for prospective students in the program should be the research experience, and not the scholarship.

9   Resources

9.1   Current resources
Faculty.

Permanent:
    21 Tenured/Tenure-track, 1 Academic Professional, and 1 Senior Lecturer position
Temporary:
    1 Full-time Lecturer and 2 Part-time Lecturers

Staff.

SPA and EPA non-faculty:
    1 University Program Associate (Advanced Level)
    1 Lecturer/Program Associate (Technology Systems Administrator 50% time shared with Computer Science)
    1 Administrative Support Associate (Journey Level, $^3/_4$ time)

State-funded Operating Budget. The state-funded operating budget has been drastically declining in recent years:

State Funding Decline
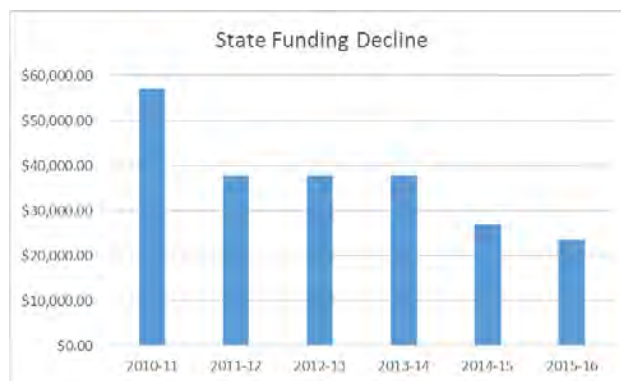
Our current operating state fund allocation is $23,514. The use of these funds include:

Travel: $8,800 (we guarantee faculty $400 per academic year for travel to participate in conferences).
Copier costs: $3,275 (amount received for printing/copying).
Supplies: $5,000.

Technology equipment. The Department of Mathematics and Statistics currently has a fleet of 163 computers, printers, and other mobile devices such as iPads and tablet computers. The table below breaks down the fleet into categories based on allocation and type.

Faculty Computers	GTA Computers	Staff Computers	Lab Computers	Research Computers	Printers	Mobile Devices	**Total**
52	23	7	6	40	24	11	**163**

The department shares a student computer lab with the Department of Computer Science in Petty 211. There are 20 Dell PCs, 2 iMacs available for general student use. The department runs a Math Emporium Lab in Graham 313 with 61 Dell PC computers provided and supported by the University's central ITS department. These systems are updated on a three to four year replacement cycle from funds directly from the College of Arts and Sciences and general technology funds at the University level, respectively.

Room space.

Petty Building: 26 faculty offices, 3 visitors offices, 3 staff offices, Graduate Office (9 desks), Statistics Consulting Center (4 desks), Conference Room (10 seats) (see Figure 21), Faculty Lounge, Student Lounge, Mailroom, 2 Workrooms, 1 Library, Computer Lab (shared with Computer Science)
Brown Building: 8 graduate offices, 1 printer room
Curry Building: Math Help Center
Graham Building: Math Emporium Computer Lab (owned and maintained by ITS)

Departmental student scholarships. We have nine active departmental scholarships for students, distributing tens of thousands of dollars each year. See Figure 22.
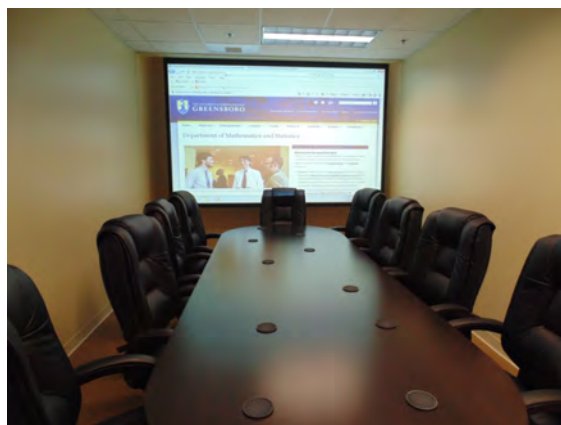
Figure 21: The Jerry and Theresa Vaughan Conference Room.

Figure 22: Departmental student scholarships: H. 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.

Graduate assistantships and waivers.

Source	College and Graduate School	Temporary Math Emporium Funds	Temporary Bryan Business School Funds	**Total for 2015–16**
Amount	$338,910	$54,000	$13,000	**$405,910**

Additionally, we are provided with 9 out-of-state tuition waivers and 6 in-state tuition waivers from the College.

Education and Technology Funds. Provided by the College based on our enrollment numbers and student credit hours generated. These funds are used to hire students for grading or tutoring in the Math Help Center. Our current allocation for 2015–16 is $18,530.

9.2   Resources critically needed

Faculty. Four tenured/tenure-track positions are needed. See §10 for more details on our request for three of these positions. The fourth requested position is due to the recent vacancy left by the retirement of Professor Paul Duvall, an expert in topology and combinatorics. Note that before Shivaji accepted the Head position in 2011, he discussed with the Dean the importance of adding new tenured/tenure-track positions to build the computational mathematics expertise in the department, which is essential to support the PhD program. The Dean agreed in writing that adding such positions will be a high priority for the College in the next 1–3 years. To date, these new positions have not been added. In fact, the department was also not allowed to rehire anyone when Professor Paul Duvall retired recently (in May 2015). We have today one less tenured/tenure-track line in the department compared to the number we had in 2011 when Shivaji accepted the position.

Staff. The activities in the department has grown considerably in the past four years. The Administrative Support Associate (Journey level) position needs to be full time (not ³/₄ time). This is a big necessity.

State-funded Operating Budget. We need to provide more travel funds to our faculty and need more funds to manage our copier and supply costs. Namely, we need:

Travel: Ideally we should be able to guarantee faculty up to $1,000 to participate in conferences. To do this would require an additional $600 per faculty member. Total $13,200.

Copier costs: We have joined the Managed Print Services (MPS) program with Systel in an effort to save printing and copying costs, but we still need at least an additional $8,725 to cover departmental printing costs.

Supplies: We need at least an additional $5,000 for general office supplies. We have been using saved supplies and cutting back on many things that our department needs to purchase annually to function efficiently. We have eliminated almost all faculty telephones in the department in an effort to save costs. We now only provide scantrons to students for final exams to help alleviate costs.

Graduate Assistantship and Waivers. Please see §3.6 and the table below for the details of this need.

	Requested Allocation	Increase from Current Allocation
Permanent GTA Money	$476,000	$137,090*
Out-of-state Waivers	10	1
In-state Waivers	10	4

If the yearly allocation of $54,000 from the College that is currently used to fund the Math Emporium were to become permanent, we would only require a permanent increase of $83,090.

9.3   Other significant needs

Visiting Researcher. One visiting position with reduced teaching load is needed. Visiting researchers benefit large groups of faculty and students simultaneously. They are able to interact with several faculty members and students throughout their visit, keep them up-to-date on the latest developments in their areas of research, deliver seminar talks and colloquia, and stimulate new research directions at the host institution.

Room Space. We need more rooms in Petty Building. The graduate offices recently allocated in Brown Building are helpful, but it would be much better if the students have space in Petty. Further, as we expand we will need more office spaces in Petty for faculty and GTAs.

Technology Equipment. Most of our computers (more than 70%) are over five years old and are well out of warranty status and outside the manufacturer's expected lifespan. Table 14 shows the breakdown of funds needed to execute a replacement plan during the next five years (more than $80,000 of the funds will be needed in the first year).

Table 14: Cost to maintain technological equipment.

Category	Number of Units	Cost
Faculty Computers	52	$80,120.50
Graduate Student Computers	23	$29,382.27
Office Staff Computers	7	$13,816.69
Lab Computers	6	$7,664.94
Total	88	$130,984.40

10   Planning and projections

10.1   Vision for the department

The Mathematics and Statistics Department and UNCG will have strong impactful computational research programs in (1) Number Theory, (2) Applied Mathematics (Differential Equations), (3) Combinatorics and Discrete Mathematics, (4) Topology, (5) Statistics, and (6) Mathematical Biology.

In 2008, the Department of Mathematics and Statistics began offering a PhD degree in Computational Mathematics. The goal of this program is to produce mathematicians with a strong background in theoretical mathematics and the ability to combine this knowledge with computational research in the chosen area. Our program is unique in North Carolina and one of just a few programs in the country specializing in Computational Mathematics. Graduates of our program can use their strong theoretical knowledge to launch a strong research career in academia or bring a background in computation to bear on difficult mathematical problems in industry.

The computational component to this degree is significant in Number Theory, Statistics and Mathematical Biology where we have senior faculty engaged in computational research.

Of the four associate professors in number theory, at least two engage in computational research and can direct strong dissertations in computational mathematics. In Statistics we have two professors and two associate professors; one professor and both associate professors engage in computational research. In Mathematical Biology we have one professor and one assistant professor and the senior professor engages in computational research and is capable of directing a strong computational dissertation. However, the department currently has only one junior faculty member working exclusively on computational aspects of problems that arise in Differential Equations and Applied Mathematics among the three professors and one assistant professor. Although our program's pure mathematics research is strong in Algebra, Combinatorics, and Topology, (among our one professor, three associate professors, and one assistant professor in these areas, we have a junior assistant professor who is supported by a prestigious NSF research grant) we lack senior computational researchers capable of directing dissertations in computational mathematics with a strong computational component.

Currently we have four PhD students in Differential Equations, two PhD students in Number Theory, one PhD student in Combinatorics, five PhD students in Statistics, and four PhD students yet to decide on their area of specialization. Recently we also graduated a PhD student in Differential Equations, a PhD student in Number Theory, and a PhD student in Topology.

The program is now at a critical stage. Although we have had some successes, we must continue to build on these successes to attract the best possible students who are capable of writing strong dissertations with significant emphasis on computation. The success of our PhD program is essential in order to attract and retain talented faculty with strong research programs and a history of funding.

Considering our current faculty and departmental makeup, we have a critical need to hire three tenured/tenure-track professors in the short term. At least one of the new hires will be at the senior level (Associate Professor/Professor) and all three will be engaged in high quality research in computational aspects of their field. The three areas of research are (in order of critical need) Computational Applied Mathematics, Computational Combinatorics and Discrete Mathematics, and Computational Topology. Thus, our critical needs will see our department expand from the current 21 tenured/tenure-track faculty to 24 tenured/tenure-track faculty members.

Our long-term needs are to continue to strengthen each of the areas of computation in the Vision for the Department. Thus, we will eventually need to add tenure-track faculty positions in Number Theory, Mathematical Biology, and Statistics, while also making secondary hires in the areas of Applied Mathematics, Combinatorics and Discrete Mathematics, and Computational Topology. Thus, through our vision, our Department will grow to 30 tenure-track faculty members. Here, we will focus on attracting faculty applications from women and underrepresented minorities.

Once we achieve our vision, UNCG will lead the region in computational mathematics, will garner a national reputation for computational mathematics in these six specialties, and will prepare students for rewarding research careers in academia, in government, or in industry.

10.2 Joint position with JSNN

A further goal of the department is to hire a computational mathematician who is working on nanoscience applications. A senior professor in this position will establish stronger ties between our department and the Joint School of Nanoscience and Nanoengineering (JSSN). This academic year we have begun discussing plans to establish a joint colloquium series between the two departments.

Site Visit Report

Review of Department of Mathematics and Statistics

University of North Carolina at Greensboro

Prepared by:

Dr. E. Bruce Pitman

Dean, College of Arts and Sciences

University at Buffalo

Dr. Jianping Zhu

Interim Provost and Senior Vice President for Academic Affairs

Cleveland State University

November 15 - 17, 2015

Executive Summary

A review team consisting of Professor E. Bruce Pitman, Arts and Sciences Dean, University at Buffalo, and Professor Jianping Zhu, Interim Provost, Cleveland State University, conducted a site visit to the Department of Mathematics and Statistics at the University of North Carolina at Greensboro (UNCG) during the period of November 15 – 17, 2015. The reviewers met with the UNCG Provost, College of Arts and Sciences (CAS) Dean and Associate Dean, the Associate Dean of the Graduate School, the Department Head and his leadership team, members of the faculty in the department, the department support staff, and a group of undergraduate and graduate students.

The following is a summary of our main findings and recommendations, followed by more detailed comments corresponding to the ten sections of the Department Self-Study Report as specified by the UNCG *College of Arts and Sciences Guidelines for Department/Program Reviews*.

- The UNCG Department of Mathematics and Statistics is on the smaller size, given the teaching and research expectations placed on it. Nonetheless the department faculty members are productive as measured by research, instructional, and service metrics on a per capita basis.
- A newer department head has helped change the profile of the department, in line with expectations of the UNCG leadership. The department started a new doctoral degree program in 2008, which has begun to take root. In response to campus concerns regarding enrollment, a renewed emphasis on the Master's degree has started, with several new tracks either initiated or being proposed. The PhD and Master's initiatives have been started in good faith with the CAS dean, and the department is excited about the prospects for these programs. Campus budget difficulties have slowed progress, especially in the PhD program. We believe allocation of university resources for additional faculty hiring and graduate assistantship support is very important to continue improving the profile of the department as a research enterprise and maintaining the good morale of the faculty, while continuing the good work being done in introducing undergraduates to research mathematics.
- Significant efforts to raise the research profile of the department have been made by the faculty under the leadership of the new department head. There is evidence of this in the number and quality of publications and in the number of grant proposals submitted and awards received. At the same time, the

department has organized conference and speaker series, bringing exceptional mathematicians onto the UNCG campus; the effect of these conferences and speaker visits in helping to elevate the stature of the department and the campus as a whole is significant.

- There are opportunities to tailor the Master's tracks to attract paying students, both traditional students as well as those working in the greater Greensboro area. In particular, the Actuary and the Data Analytics tracks, combining department expertise in statistics and computations, may be very appealing to students and the business community in the region. We urge the department to investigate campus and national resources that help detail employer demand.

- The Department can and should actively participate in the emerging campus Strategic Plan. At the same time, we urge the CAS dean and the Provost to better articulate and incentivize enrollment and other entrepreneurial activities that can help both the campus and the Department. For example, might there be revenue sharing with the Department for meeting certain enrollment targets, or for enrollment in courses offered outside of the traditional academic semesters.

- The Provost speaks optimistically about campus enrollment. This is encouraging, as higher education battles swings in enrollment among STEM and business fields, health fields, and education, and the consequent impacts on Arts and Sciences that are essential to general education that impacts undergraduate students in all majors. We urge the campus to clearly articulate enrollment priorities and put in place resources and incentives to support both efforts that directly generate enrollment growth and those that support the new students. One example to consider is the resource needs of departments that are essential to the general education program. We urge the campus to examine new ideas to generate revenue and ways to facilitate degree completion, perhaps by considering course offerings outside of the traditional academic semesters, or rigorous advising requirements for students to either withdraw from courses or to sign up to repeat a course in which they had previously enrolled.

1. Context for the Review

The department has a clearly defined mission and is making important contributions to UNCG and the scientific community through teaching, research, and various service activities. The governing structure of the department is reasonable and appears to function effectively. The faculty members are productive as measured by several metrics on a per capita basis in research (publications, grants, and conference presentations), instruction (both in classroom and in working with students outside formal class, for example informal advising, independent study, and mentoring), and service (university, regional, and scientific community at large). Given the teaching, research, and service expectations placed on the department, however, it needs more faculty, particularly in the area of computational mathematics.

2. Undergraduate Education

- The undergraduate curricula for the BS and BA degrees appear to be appropriate with clearly defined student learning outcomes.

- The Math Emporium appears to be working. It is important for the department to conduct a longitudinal study to see if the investment in the Emporium is worthwhile – whether student success rate surpasses traditional classroom and online versions of the courses, and whether to further invest and expand the Emporium.

- Undergraduate students (those we met at least) seem happy with the atmosphere in the department and with their interactions with faculty.

- We applaud the efforts by the department to streamline course offerings to reduce the number of low enrollment courses and to provide students with the mechanism to plan their course schedule several semesters in advance. We also note that given the undergraduate major and graduate enrollment in the department, it is inevitable that occasionally an upper level or graduate level course will be under enrolled. These situations should be handled as exceptions, as done at other institutions with departments of similar sizes.

- We applaud department efforts in supporting undergraduate research experiences, particularly the NSF funded REU program started in 2006. The department should further enhance this effort and consider hosting regional undergraduate research conferences to showcase undergraduate student

research projects. We also recommend that UNCG establish a campus wide program to fund undergraduate research on competitive basis.

o We recommend that a numerical method course be required for the BS degree given the prevalent use of computational methods in solving interdisciplinary problems. Computational skill should be considered as one of the "21st century skills". For the BA degree, a numerical method course should be one of the recommended electives.

3. Graduate Education

o The department offers a unique Ph.D. program in computational mathematics, with a special emphasis on theoretical background and application of computational methods to problems in applied mathematics, combinatorics, discrete mathematics, and topology. It appears that students in the program receive good mentoring and research training, and interact closely with faculty. However, program enrollment still needs to grow to a critical mass – at least 25 to 30 students. This is based on the estimate that each year there should be 5 – 6 new students to form a reasonable cohort and support networking among new students, and to allow the offering of regular core courses so that students can interact and discuss with each other in a classroom setting. This growth necessitates the resources to recruit talented students and the faculty to teach them:

   ▪ The stipend issue should be addressed by both new allocation of funds from the university/college and redeploying some of the funds currently used to recruit Master's students toward doctoral students. While this move may negatively affect recruitment of traditional Master's students, the department may be able to minimize its negative impact by tailoring the Master's tracks to attract fee-paying students from the greater Greensboro business community. The current doctoral stipend level is competitive with peer institutions.

   ▪ The faculty issue is more difficult and we fully understand the challenge given the financial reality. The department sees the issue in stark terms – the Department was promised hires, and moved on the PhD program expecting those promises to be delivered upon. The Dean's office must deal with budget cuts that have – literally – decimated faculty ranks, and

from that perspective the Department of Mathematics and Statistics has been treated well.

- The department should clearly articulate its hiring plan for the next 3 – 4 faculty positions, being specific about technical areas, the critical needs, and the potential for collaborations with other units on campus. We strongly recommend that the University and the College move as quickly as financially practical to allocate resources for these faculty positions.

o The department should modify the curriculum for the Ph.D. program to allow students who were admitted into the Ph.D. program with only a bachelor's degree to receive a master's degree along the way.

o We applaud the Provost's support in additional GA funds for the department's GANN proposal, and for making that support permanent in spite of not receiving the award. This is a tremendous demonstration of university support that will stimulate more submission of proposals in the future.

o The department should take advantage of a high concentration of banks and insurance companies in the region to develop MA tracks in Data Analytics and Actuarial Mathematics and attract more self-supported students to its MA program. The goal should be that most students in the MA program are self-supporting and the limited graduate assistantship funds are used to grow the Ph.D. program.

o Graduate students report they benefit significantly from the department's teaching seminar when they arrive on campus. Many report they are able to ask faculty for assistance when they begin classroom instruction, but several ask for additional formal support during their initial semesters of teaching in the classroom. Perhaps the department could offer a professional development seminar that discusses, among other topics, the issues encountered by these students who teach in the classroom. In addition, graduate students would love to have more opportunities for them to get together from time to time, and to be included in timely communication on program changes, potential issues related to their programs, and major events in the Department.

4. Instructional Productivity, Class Sizes, and On-line Courses

The Department faculty members' instructional productivity seems to be comparable with peers. We were impressed by the high percentage of mathematics courses taught by full-time faculty at UNCG. Research has shown that full-time

faculty are essential to student success, retention, and graduation. Given that instruction in mathematics affects all majors through the general education program, the University should continue to invest in mathematics faculty to maintain instruction quality as enrollment grows at UNCG.

The Department offers 30 – 40 online sections each year and is planning to change all WTX sections, which require on campus tests and exams, to WEB sections, which is completely online including all tests. We recommend that the Department carefully review its online course test security policy and student test performance to ensure the integrity of online course testing. Cheating during online testing has been a rising concern nationally. Some institutions that offer fully online courses similar to WEB sections at UNCG are now considering requiring on campus proctored midterm and final exams. Students who live far away from the campus are required to make arrangement with a local site, such as a community college or a community learning center, for proctored exams.

If the Department has not done so, we recommend that the Department review the profile of students who enroll in its online mathematics courses to understand

- the proportion of students who regularly come to campus, or even live on campus, to take other courses at UNCG vs. those who would not have attended UNCG without the online course option;
- whether they perform better, the same as, or worse than students in the same courses offered in traditional in-classroom format; and
- whether it takes more, the same, or less resources to offer online courses as compared to traditional in-classroom courses of similar sizes at UNCG.

Information obtained through this exercise will help the Department decide whether to expand, maintain, or reduce its online course offerings with the goal to attract additional students, enhance student success, and optimize the use of resources.

5. Contributions to General Education and Special Undergraduate Programs

The Department makes appropriate contributions to UNCG's general education programs – in line with other mathematics departments at similar institutions. Given that 92% of the SCH produced by the Department has been in service courses for other

majors, additional instructional resource should be allocated to the Department of Mathematics and Statistics as the university overall enrollment grows.

6. Research, Scholarship, or Creative Activity

The Department faculty members have been very productive in research and scholarly activities as compared with faculty in similar departments. Of the 21 tenure track/tenured faculty members, 20 have published regularly over the last 5 years. The Department faculty have been very active in pursuing external funding and contributing to the scientific community by hosting professional conferences and workshops, serving as editors/reviewers for professional journals, and organizing distinguished visiting scholar programs.

- o The Department's efforts in bringing research conferences, seminar/colloquium speakers, and outstanding scholars to campus has been excellent. These events not only enhance the research and teaching in mathematics, but also bring significant national and international visibility to the Department and UNCG.

- o Given that 10 of the 21 tenure track/tenured faculty members in the department are associate professors and 8 of them received their Ph.D. in 2002 or earlier, we recommend that the Department establish a mentoring/professional development program to encourage and support these mid-career faculty to continue and enhance their research program and career advancement.

7. External & Internal Relationships

The Department has been active in collaborating with other UNCG departments and programs and in developing partnership with organizations outside of UNCG. We recommend the department to

- o Enhance the Statistics Consulting Center, which already serves various internal customers within UNCG, attract external clients from regional business community, and explore ways to generate revenue for the department. The Statistics Consulting Center is a potentially valuable resource, but we feel its potential has not yet been fully realized. Although it is not likely that all statistics efforts on campus could ever be united into a single entity, efforts to promote

conversations among statisticians from the several departments might prove valuable. Given the constraints on faculty time, one possible vehicle for promoting dialog is to have an undergraduate research fair for all students working on statistical projects.

- o Focus on hiring new faculty who can collaborate with researchers or qualify for joint appointment in other campus units, for example the Biology Department and the Joint School of Nanoscience and Nanoengineering.

- o Expand the current collaboration with Business to other Colleges to improve student success in gateway mathematics courses and also leverage resources in other Colleges to support the graduate students in mathematics.

- o Consider highlighting alumni accomplishments and involvement with the department in the Annual Report to attract more donors, and invite more alumni to visit the department as speakers, mentors, and consultants. We are impressed by the quality of the Department Annual Report produced in recent years and believe it could be an effective means for the department to communicate with its alumni and to promote their participation in and support of the programs in mathematics and statistics.

8. Contributions to College and University Strategic Plans

One of the major current challenges facing institutions similar to UNCG is student success, retention, and degree completion. The Department of Mathematics and Statistics can play a major role in addressing this challenge by improving student success in gateway mathematics courses. We are pleased to see that the Department already began to review the DFW rate of some gateway courses over the last 5 years and implement strategies to improve the success rate in those causes, for example administering a pre-calculus test to identify students who may not be well-prepared for calculus. We recommend that the department review the DFW rates of all gateway mathematics courses, especially high enrollment general education courses for non-majors. For the courses with high DFW rates, the department should implement intervention measures, for example supplemental instruction sessions, to improve student success in those courses. In addition, the department should review all general education courses in mathematics and statistics to ensure the curriculum and learning outcomes are up to date and appropriate for the current student population and career needs. For online general education courses, the Department should review and analyze student performance and benchmark it with in-classroom sections. First year students, particularly those with weak preparation in high school mathematics, often have a

higher failure rate in online mathematics courses than in-classroom courses due to lack of maturity and self-discipline, among many other factors. If such performance gap does exist at UNCG, the Department should either develop intervention measures to help students succeed in online courses or set appropriate criteria to restrict enrollment in online courses to students with adequate preparation. We would like to note that the University and College need to support and invest in such departmental efforts given the centrality of mathematics in overall student success of all majors.

9. Resources

We agree with the general resource analyses and requests for staff, operating budget, space, and computing equipment presented in the Department Self-Study Report. In particular, we strongly recommend that the following resource requests be addressed as soon as financially practical for the University:

- New faculty positions to replace retired faculty and to add much needed new faculty in the area of computational mathematics as outlined in Section 9 and Section 10 of the Department Self-Study Report, which are essential to maintaining quality of instruction, enhancing student success, and expanding the Ph.D. program to a critical mass.

- New funds, in addition to the funds recently allocated to the Department by the Provost as cost share for the GAANN proposal, for graduate assistantships and tuition waivers to attract strong graduate students and to grow the Ph.D. program in computational mathematics.

- Upgrade of the current Administrative Support Associate position from ¾ time to full time. This modest investment will go a long way to sustain and expand the recent success of the department in hosting events and organizing outreach activities that both enhance research, teaching, and learning in the department and also bring significant visibility to UNCG and the department.

10. Planning and Projections

A new Department Head has helped foster many positive changes in the department, energized by the Ph.D. program in Computational Mathematics. There has been good

progress to date. To continue the progress necessitates additional investment in the program – faculty lines, graduate assistantship funds, and staff. The next five years will be critical for the department to grow its Ph.D. and Master's programs to reach a desirable critical mass, and to play an important role in UNCG's strategic plan and campus wide initiatives. The biggest challenge is resources. A firm commitment of support from the University and College is essential to maintaining faculty morale and continuing the momentum.

We realize the university's financial constraints and urge the senior university administration to develop a clear budget model that incentivizes efforts that support university strategic priorities and create new revenue. The model should be flexible enough to allow departments to keep some of the revenues generated through their creative and entrepreneurial endeavors.

We encourage the Department of Mathematics and Statistics to play an active role in the university wide strategic planning efforts and look for ways to contribute to campus wide student success, degree completion, and other initiatives. Like similar departments with relatively small major enrollments at other campuses, being an active player in campus wide initiatives, contributing to campus wide success, and collaborating with other campus units are the key for the Department of Mathematics and Statistics to thrive.

Departmental Response
Review of Department of Mathematics and Statistics
University of North Carolina at Greensboro

We sincerely appreciate the careful attention the reviewers gave to the Department's self-study document. We find the overall review very positive and the recommendations constructive. Our responses to specific comments and recommendations are given below.

- **New Hires:** New hires in computational mathematics/statistics are desperately needed, as pointed out by the reviewers as well. In its recent submission to Dean Johnston, the Department has articulated its hiring plan for the academic year 2017-18 and will submit a hiring plan for the next five years before the end of the current academic year. The current plan is to hire research faculty needed to support the Ph.D. program in Computational Mathematics and those who can interact with other units/departments on campus.

- **Longitudinal Study for Math Emporium Efficacy:** The Department will continue to collect data to compare the success rate of Math Emporium (WLL) courses as compared to traditional lecture and online versions of the courses and conduct appropriate statistical analyses to see if there are significant trends over time.

- **Low-enrollment Courses**: We agree with the reviewers that in a program of our size, under-enrollment in upper-level courses is inevitable. As noted by the reviewers, the Department has begun to adapt its course offerings to reduce the number of low-enrollment classes with the hope that the campus will continue to allow low-enrollment exceptions when needed to produce a quality program of study for our majors.

- **Undergraduate Research Enterprise:** The Department has been hosting the UNCG Regional Mathematics and Statistics Conference -- a one-day student conference -- every year since 2005 (http://www.uncg.edu/mat/rmsc/). We plan to continue to host this conference. Currently a limited number of scholarships are offered (via Shivaji's H.Barton Excellence Professorship funds) for broader undergraduate research projects and for a quantitative research program (RESU). We would appreciate receiving departmental funding to support and expand these programs. (The reviewers recommend that a campus-wide program to fund undergraduate research on a competitive basis be established. They were probably unaware that this already exists at UNCG.)

- **Numerical Methods Course:** We are planning to propose a numerical methods course at the 500 level. The course will be strongly recommended for BS students in mathematics and for BA students when appropriate. We expect demand from other disciplines as well, such as physics, computer science, economics, biology, chemistry, and nanoscience. We would like to collect data about the course enrollment and student success rate before considering a program revision to have the course required for the BS mathematics major.

- **PhD Enrollments:** The Department agrees that the PhD enrollment should be at least 25. We have submitted a funding request that would allow us to increase the

number of funded students to a total of 20, which would bring us closer to the number described in the report. Provided we can allow students to enter a combined PhD/MA program (as described later), the Department could redirect all funds currently used to support MA students to PhD students only. Then, majority of the terminal MA students would be required to be self-supported. In particular, students who are drawn to our new MA concentrations that offer a more career-directed focus can be expected to be self-funded.

The Department has investigated modifying the PhD to allow a dual program PhD/MA, but it seems that such a change would require establishing a new program. The Department would like to create such a program or modify the existing program to allow this.

- **New MA Concentrations**: The Department has recently created new concentrations in Data Analytics and Actuarial Mathematics within the MA degree. These concentrations are set to begin enrolling students in Fall 2016. Moreover, the Department has begun to create two new career-oriented concentrations in Biomathematics and Teaching College Mathematics within the MA degree. We anticipate that these concentrations will begin enrolling students in Fall 2017.

- **Teaching Training Program for Graduate Students:** The Department has proposed a new course MAT 603, Practicum in Teaching Mathematics, which is currently being considered by the University Graduate Studies Committee. This course will give beginning student-teachers hands-on experience in the classroom before they're asked to lead a class on their own.

- **Professional development for Graduate Students:** Each student will be assigned a faculty mentor. This mentor will be committed to helping the student build a successful professional career upon graduation. The mentor will guide the student towards essential resources (many already offered by the Graduate School) such as planning guides, skills development tools, and career support resources to help them achieve their professional goals. The Department will also plan on hosting professional development seminars specially focused for mathematicians and statisticians. We will also increase the number of Graduate Tea events and enhance the opportunities for student-faculty interaction.

- **Instructional Productivity, Class Sizes, and On-line Courses:** All online courses are now WEB courses. The exam policy for WEB courses has been amended. All such courses now require proctored exams, either via UNC Online (https://online.northcarolina.edu) or using the option of coming to UNCG to take the exam on a specific date and time. Only the final exam will be a proctored exam for winter sessions.

The Department has not profiled students enrolled in WEB courses yet. With the aid of the College and Institutional Research office, we will collect information about the students who take WEB courses to better plan for student success.

- **Contributions to General Education and Special Undergraduate Programs:** The external reviewers recognized the contributions of the Department to UNCG's general education program. We are in favor of their recommendations for shared revenue with the Department for meeting enrollment targets or offering courses outside traditional academic semesters, and for additional instructional resource allocations for the Department as the University's overall enrollment grows

- **Research, Scholarship, or Creative Activity:** All faculty members have a productive research program. In some cases, research productivity may currently be slower due to a shift in research direction. The Department will aim to maintain a vibrant research program with the faculty publishing papers in highly ranked journals and seeking external grants to support their research and that of their students.

- **Mentoring Program for Associate Professors:** We have a well-established mentoring program that is geared more towards tenure-track faculty. Tenured associate professors are currently offered mentoring at their request. We agree with the reviewers that all tenured associate professor-level faculty can benefit from a formal mentoring program and we plan to introduce it starting Fall 2016. Recently, we have started a formal mentoring program for our office staff also.

- **External & Internal Relationships:**

  Statistics Consulting Center: So far the role of the SCC has been to serve campus community. We have developed the Quantitative Methodology Series, a joint effort with ERM Department on campus to provide workshops on statistical methods and software. We have started offering workshops to the campus community, and plan to develop offerings that will attract off-campus participants. In addition to the QMS, we have organized a statistics luncheon to promote conversations among quantitative faculty from across campus, out of which grew the UNCG Quantitative Network, an online listing of campus faculty engaged in quantitative research.

  We have started discussions with some off campus entities to attract external clients and develop a business model to be able to generate revenue for the Department. We are currently negotiating a possible contract with High Point University to provide consulting services for faculty in their School of Pharmacy.

Collaborations with Other Units on Campus: We have articulated a short-term plan to hire faculty who can work with colleagues in health sciences, biology, computer science, chemistry, and/or economics. This plan was submitted to the Dean's office on February 22, 2016. Looking ahead, we will continue to focus on hiring computational researchers who can collaborate with colleagues around UNCG. We will also pursue a joint (new) faculty appointment with JSNN.

We will offer extending the type of collaboration we have with Business School to the Nursing School to help their students prepare better and be successful in the STA 108 course, provided they are willing to provide adequate resources.

Alumni Contacts: We have begun to make efforts to contact alumni. As the number of PhD alumni grows we will be able to showcase their work more easily. Our department regularly sends thank you notes when we receive any donations from donors (including student award donations, scholarship donations, and enrichment funds donations). We include thanks to these donors in our Annual Report, and send each donor a copy of the Annual Report each year. Since December 2012, we have received 22 scholarship donations and 27 enrichment fund donations from alumni and well-wishers totaling $34,700. This does not include new scholarship endowments. In the future, we will include a section in the Annual Report highlighting alumni accomplishment and involvement. We will also invite alumni to visit the Department as speakers, mentors, and consultants.

We have recently received a high-priority list of 58 alumni from the College of Arts and Sciences Development Office and have sent those alumni a copy of our Annual Report and an invitation to visit our department.

Also, we have regularly been sending our Annual Reports to various UNCG Administrators including the Provost, Research Office, Directors, Deans, Associate Deans and Department Heads, as well as neighboring Department Heads related to mathematics and statistics, and several visitors and well-wishers of our department.

- **Contributions to College and University Strategic Plans:** At this point, walk-in tutoring service at Math Help Center is a tremendous resource for students seeking help in lower level courses offered by the Department. The Department will also continue to offer, on demand, supplemental instruction sessions to students in courses with high DFW rates.

  All WEB GMT marker courses take the same common final exam as traditional Lecture (LEC) and Hybrid (WLL) courses. The performance across various instruction types are compared via the final course grade. We have not compared the performance of WEB courses with LEC courses in final exam for all GMT courses. However, we do compare the performance of WLL courses with LEC

and WEB courses in the final exam. As per the reviewers' suggestion, we will start comparing performance using common final exam rather than final course grade.

The Department will work with CASA to set appropriate criteria to restrict enrollment in WEB courses only to students with adequate preparation.

- **Resources**: In addition to the new faculty positions, there is an urgent need for upgrading of Administrative Support Associate position from ¾ time to full time. This is required to support several new successful departmental activities that have been initiated. Having this position at ¾ time has resulted in frequent resignations as those holding the position move to other full time positions at UNCG and outside. The reviewers strongly endorse that this modest investment will go a long way to sustain and expand the recent successful activities of the Department.

We also need new funds for the graduate assistantships and tuition waivers to recruit strong graduate students and to grow the PhD program in Computational Mathematics. Some of the additional GTAs we hire using these funds will help us support more WLL sections. We may mention that the Department has already doubled its WLL offerings since we first introduced these courses but more WLL offerings are needed as we go forward.

Planning and Projections: The Department plans to improve its graduate and undergraduate programs. Our primary objectives will be to strengthen our PhD program in Computational Mathematics, to continue to attract strong students to our MA program, in particular in the new career-oriented concentrations, and to enhance the experience of our undergraduate students by expanding our successful undergraduate research program. We plan to add computational faculty not only to support our own programs, but also to strengthen UNCG's focus on interdisciplinary research. Finally, we will propose a formal Accelerated Degree Program (ADP) that allows strong undergraduate students to get a BS and MA degree in five years and we will continue to explore the creation of a MA/PhD degree as suggested by the reviewers.

However, as noted by the reviewers, receiving adequate funding from the administration is essential to achieve these goals, maintain faculty morale, and continue the current momentum.
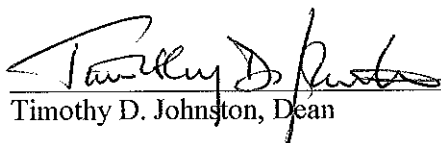
Memorandum of Understanding
Department of Mathematics and Statistics Review, 2015-16

The Dean's Office of the College agrees to the following:

1. To address current faculty needs and expected requirements over the next five years by giving a high priority to the department's request for additional tenure-track faculty, especially to support the doctoral program in computational mathematics, as soon as resources are available.
2. To address the department's need for increased funding for doctoral students, as funding becomes available. The College recognizes the department's need for additional tuition waivers, and will attempt to address that need if additional waivers are ever allocated to the College.
3. To address to the department's need to increase the Administrative Support Associate position from ¾-time to full-time, as resources become available.
4. To work with the department to identify funds to support the Undergraduate Research Enterprise.

The Department agrees to the following:

1. To develop a faculty hiring plan for the next five years that will address the need in computational mathematics/statistics and will attract hires who have high potential for and interest in collaborating with other departments (e.g., biology, chemistry, psychology, computer science, economics, public health, and JSNN).
2. To continue to collect longitudinal data on the success of Math Emporium course compared to traditional lecture and online courses and use these data to evaluate the goals and plans for the Math Emporium.
3. To develop a plan to reduce the number of low enrollment courses following the guidelines from the Provost's Office.
4. To enhance professional development for graduate students by assigning each student a faculty mentor and increasing professional development seminars and social events.
5. To establish a mentoring program for associate professors to complement the mentoring program for assistant professors.
6. To enhance the Statistics Consulting Center by developing a business model and seeking external clients.
7. To work with the CAS Office of Research and OSP to identify and apply for undergraduate and graduate training grants.
8. To enhance alumni relations – including improving records of alumni, contact with alumni, and inclusion of alumni in departmental events
9. To develop new MA concentrations that may attract more masters students (e.g, data analytics and actuarial mathematics)
10. To develop a 500-level numerical methods course that will serve mathematics students, as well as students in other disciplines.
11. To consider any other recommendations made by the consultants and adopt them as the faculty deem appropriate.

Timothy D. Johnston, Dean   Date 5/12/16

Ratnasingham Shivaji, Head   Date 5-10-16

Dana Dunn, Provost   Date 6 12 16

Governance Document

Department of Mathematics and Statistics
University of North Carolina Greensboro

1 Departmental Administration

The Head of the Department shall be the final authority in all administrative matters concerning the Department. Administrative responsibilities of the Head include, but are not limited to, program oversight, management of budgeted resources, general coordination of departmental personnel and resources, and professional development of faculty in addition to the specific duties and powers described in the Handbook for Faculty.

The Head shall also have the primary responsibility in the day-to-day running of the Department. In this endeavor, the Head may be assisted, as needed, by an Associate Head, the office staff, and the faculty represented through various standing and ad hoc committees.

2 Faculty

2.1 Membership

Faculty includes all tenured and tenure-track faculty, academic professional faculty, and lecturers. Academic professional faculty and lecturers may not participate in some personnel-related matters, as described below. Phased retirees shall not be able to vote on promotion and tenure decisions. However, they are eligible to vote on other departmental matters.

2.2 Meetings

The Head shall call at least one meeting each semester. Additional meetings may be called as deemed necessary by the Head, or on a petition from at least 1/3 of the faculty. The Head shall frame the agenda with input from the faculty. The Head shall preside over the meetings. Formal voting procedures may be used if deemed appropriate by the Head and/or the faculty. In such cases a quorum shall consist of a majority of faculty. Non-tenure-track faculty shall have no vote in personnel matters.

2.3 Responsibilities

The full faculty may consider and make recommendations to the Head, as appropriate, concerning all major departmental issues, including curriculum, recruitment, tenure, and governance.

3 Committees

The Head may delegate some responsibilities to various standing and ad hoc committees.

3.1 Standing Committees

3.1.1 Peer-Personnel Committee

Membership   The Peer-Personnel Committee shall consist of 4 tenured faculty members elected by the tenured/tenure-track faculty through a secret ballot for a term of two years. In unusual circumstances, the Head may call for election of a 5th member. A retiring member of the Peer-Personnel Committee shall be eligible for re-election after being off the committee for one year. The Head shall appoint one of the members of the committee to serve as committee chair.

Meetings   The Chair of the Peer-Personnel Committee shall call committee meetings as necessary, in consultation with the Head.

Responsibilities   The primary responsibility of the Peer-Personnel Committee shall be to conduct annual faculty evaluations as per the departmental guidelines, and make recommendations to the Head.

3.1.2 Undergraduate Committee

Membership   The Undergraduate Committee shall consist of the Director of Undergraduate Studies and four to six other members of the faculty. The Head shall appoint the Director for an initial term of two years but shall have the discretion to shorten or extend this term. The Head shall appoint other members of the committee to a one-year terms (renewable) ensuring appropriate representation on the committee from the broader academic sub-units within the Department.

Meetings   The Undergraduate Director shall call meetings of the committee, as needed.

Responsibilities   The Undergraduate Committee shall exercise general supervision of the undergraduate program, including curriculum, awards, and honors.

3.1.3 Graduate Committee

Membership   The Graduate Committee shall consist of the Director of Graduate Studies and four to six other members, and the Head, acting as an ex officio member. The Head shall appoint the Director of Graduate Studies for an initial term of two years but shall have the discretion to shorten or extend this term. The Head shall appoint the other members of the committee to one-year terms (renewable).

Meetings   The Graduate Director shall call meetings of the committee, as needed.

Responsibilities   The Graduate Committee shall exercise general supervision of the graduate program, including curriculum, awards, and honors. The committee shall screen graduate admission applications and make recommendations to the Head on Graduate Assistantship Awards and tuition waivers. The committee shall administer qualifying exams for the PhD program in computational mathematics and comprehensive exams for the MA program in mathematics.

3.1.4 Committee on Progress Towards Tenure and Promotion

Membership   This committee shall consist of all tenured professors in the Department. The Head shall appoint a chair for this committee.

Responsibilities   The primary responsibility of this committee shall be to review progress towards tenure and promotion of eligible faculty in the department and make recommendations to the Head, as per College and University guidelines.

3.1.5 Search Committees

Membership   The Head shall appoint the Search Committee chair and members, as needed.

Meetings   The Seach Committee chair shall call meetings of the committee, as needed.

Responsibilities   The committee shall screen the applications and give a small pool of three to five top candidates to the Head, who shall make his or her own evaluation and invite some of the candidates for a campus visit in consultation with the Dean. After the candidates have visited the Campus, the Head may seek input from the search committee and the faculty to determine their preference. Ultimately the Head shall make a recommendation to the Dean.

3.1.6 Evaluation of Classroom Teaching Committee (ECTC)

Membership   The Head shall appoint the ECTC chair and six to nine other tenured or tenure-track faculty members to the ECTC for a one-year term (renewable).

Meetings   The ECTC chair shall call meetings of the committee, as needed.

Responsibilities   Each tenure-track faculty member shall be reviewed each year. Tenured Associate Professors shall be reviewed no less frequently than every other year, and Full professors shall only be reviewed on request. The ECTC chair shall appoint a two-member review team for each member to be reviewed and oversee the review process. All ECTC reviews shall be submitted to the Head at the end of the Spring semester.

3.2 Ad Hoc Committees

The Head may appoint a variety of ad hoc committees, as needed. Members of ad hoc committees shall be appointed for a one-year term.

4 Changes to the Governance Document

This governance document shall become the instrument of governance immediately upon acceptance by a majority vote of the faculty in the Department of Mathematics and Statistics. The Governance Document may be amended or altered as deemed appropriate by the faculty as determined by a simple majority vote.

Adopted on April 24, 2015.
Updated on June 16, 2015.

UNIVERSITY OF NORTH CAROLINA AT GREENSBORO
COLLEGE OF ARTS AND SCIENCES
DEPARTMENT OF MATHEMATICS AND STATISTICS
Faculty Workload Guidelines

Introduction

The UNCG and the CAS Faculty Workload Guidelines have been laid out in the following documents:

    a) Faculty Workload Guidelines UNCG (April , 2002), see
        http://provost.uncg.edu/faculty/facultyworkload.html
    b) The Addendum to the College Teaching Assignment Guidelines (December 2002), see
        http://www.uncg.edu/aas/Addendum.pdf

The present document assumes these standards and develops more concrete guidelines relevant to the Department of Mathematical Sciences. Basic principles of these guidelines are designed to ensure equity, fairness and predictability in overall workload among faculty with different allocations of time to teaching, research, service and other obligations to the Department, College, University, and Profession. By following these guidelines and while recognizing that the departmental mission, goals and needs are likely to change over time, the Department Head is responsible for assuring that faculty obligations are distributed among faculty members within the department in such a way that the department's instructional productivity is maintained at the expected level and that service and other requirements are adequately discharged.

Policies

1. Faculty members negotiate work assignments with the Department Head.
2. Faculty can be assigned up to 24 credit hours (or equivalent) of teaching per academic year. Workloads for tenured or tenure-track faculty who are engaged in scholarship or creative activity are based on the assumption that they can be assigned to teach a maximum of 12 credit hours (or equivalent) of teaching per academic year, regardless of rank.
3. All tenured, tenure-track and full time faculty are routinely expected to advise students (if needed), serve on Departmental committees, and – when the opportunity arises – College and University committees. All tenured and tenure-track faculty are expected to be actively involved in the professional life of their discipline, which can include attending and participating in local, regional, national and international conferences and meetings; and have a clearly articulated research plan to enhance their career development.
4. Tenured faculty who do not maintain a satisfactory level of research productivity, or do not assume sufficient administrative responsibilities of the Department, or who prefer to concentrate on undergraduate teaching will teach more classes or take on additional administrative duties commensurate with equity. The merit assessment of these faculty members will be based on their particular assignments.
5. The department will have available a small number of course releases each year contingent on the number of faculty teaching full time each semester. Normally the Department Head

will make available one course reduction for every 7 tenured or tenure-track faculty not on research or administrative assignment outside the department or on personal leave.

6. Faculty who agree to assume major administrative responsibilities such as Director of Graduate Studies, Director of Undergraduate Studies, Director of Math Help Center, Program Coordinator for Secondary Licensure in Mathematics will be given release time commensurate with their duties and will also be eligible for release time for research.

7. Tenured faculty may be awarded a course release for specific research projects in compensation for a high level of research productivity combined with a higher than normal level of graduate theses direction in a given year, or in compensation for a high level of research productivity combined with some other assignment or project (or combination of projects) of vital importance to the department.

8. Faculty may request a reduction in their in-class teaching assignment and the Department Head may grant course load reductions to faculty members to compensate for instructional responsibilities, accumulated over a period of time, that were not counted as part of a faculty member's official teaching load. Examples of such instructional responsibilities include the supervision of undergraduate and graduate student research projects, reading courses, independent studies, and supervision of student internships. The Department Head may grant course load reductions to faculty members in compensation for instructional overloads during one or more prior academic years.

Standards for Reappointment, Tenure and Promotion
Department of Mathematics and Statistics
College of Arts and Sciences
University of North Carolina at Greensboro

PART I. General Principles

The standards for Tenure and Promotion in the University of North Carolina at Greensboro and, in particular, in the College of Arts and Sciences have been laid out in several documents entitled, respectively,

 "The Code of the Board of Governors of the University of North Carolina, Chapter 6: Academic Freedom and Tenure"
"Promotion, Tenure, Academic Freedom, and Due Process Regulations: The University of North Carolina at Greensboro"
"University-Wide Evaluation Guidelines for Promotions and Tenure"
Current versions of all these documents may be accessed through links on the Provost's web site at:
http://provost.uncg.edu/publications/personnel/pt.html

"The University of North Carolina at Greensboro, College of Arts and Sciences,
Guidelines on Reappointment, Tenure, and Promotion"

"The University of North Carolina at Greensboro, College of Arts and
Sciences, Best Practices in Tenure, and Promotion"

"College of Arts and Sciences Reappointment Review"
Current versions of all these documents may be accessed through links on the College's web site at:
http://www.uncg.edu/aas/about/promotion.htm

The present document assumes these standards as a basis and concerns itself with delineating the parts of those documents relevant to Mathematics and Statistics, and explicating the meaning of the various terms used in them. In the case of any conflict the above mentioned documents take precedence.

The Department of Mathematics and Statistics holds to the scholar-teacher-participant model of faculty responsibility and requires a record to provide evidence of corresponding achievements in the categories of research and scholarly activities, teaching, and service. Meeting the criteria in one area alone is insufficient; contributions in all categories are necessary.

The purpose of developing these standards is four-fold: a) to assist faculty members in better understanding the criteria required for reappointment, tenure and promotion, b) to assist departmental committees in arriving at their decisions in an uniform, professional and fair manner, c) to assist external reviewers in properly assessing strength of each case, and d) to assist College and University Promotion and Tenure Committees in reviewing cases submitted by the Department of Mathematics and Statistics.

I.1. TEACHING

Good teaching is expected of all faculty and evaluation of teaching will form an essential component of tenure and promotion considerations. University teaching requires more than classroom performance. Candidates will be expected to demonstrate mastery of their subject areas or disciplines, to make thorough preparation for their classes, to communicate effectively with their students, to show a willingness to respond to student's questions and concerns, and to exhibit fairness in evaluating students.

Both before and after tenure is awarded, faculty are expected to remain committed to improving/enhancing their teaching performance and to remedy problems identified with their teaching. As faculty progress through the ranks, they will be expected to extend their knowledge of their fields or disciplines, i.e. with respect to classes, currency of the material presented, and new teaching methods.

Assessment of teaching performance will be based on **a series of evaluations** of a candidate's teaching performance and teaching materials **over a period of time**. The assessment will involve both peer and student evaluation of aspects of teaching and evidence of performance described below (items (T1) - (T4)). Evaluations, both peer and student, will be obtained on **an ongoing basis** (each semester for non-tenured faculty and every two years for tenured associate professors) and should be shared with candidates for formative purposes.

Assessment of the quality of teaching and contribution to teaching will be made under the following categories:

(T1) Peer evaluation of classroom teaching in undergraduate/graduate courses;

(T2) Official student evaluations;

(T3) Course management and appropriateness of course materials;

(T4) Curriculum design and program development; advising students and directing individual or collaborative student research or creative projects; developing instructional technology and innovative pedagogies; and preparing instructional materials;

Other categories described in College P&T guidelines may also be considered.

All aspects of teaching performance will be evaluated by the Head of the Department or by other members of the department designated by the Head. Such an evaluation will be done by attending lectures given by the candidate and by reviewing course materials provided by the candidate. The teaching performance will be judged for

(a) Adequacy of preparation appropriate to teaching strategies adopted for the class,

(b) Clarity of communication,

(c) Appropriateness of the material presented in relation to the course syllabus (as per university documents) and the level of the class, and

(d) Students' engagement in class proceedings

Documented additional information regarding assignments, examinations, availability and willingness to help students will also be considered.

I.2. RESEARCH

Research and/or scholarly work is expected of all tenured or tenure-track faculty. For the purposes of this document, and for faculty evaluated under this category, **research, and/or scholarly work is creative, intellectual work which is in the public realm and which has been subjected to external peer review.**

Although academic disciplines (Mathematics, Mathematics Education, and Statistics) within the Department of Mathematics and Statistics differ in the avenues for publication or presentation of scholarly activity, **the primary and essential evidence in this category is publication of high quality articles in reputable peer-reviewed journals.**

Evaluation of research and/or scholarly work for tenure and promotion at all ranks will address the **quality and significance of the work**. Evidence will include the peer reviewed publications and

presentations referenced above, but may also include other works including, but not limited to, what is described below.

(R1) Papers published in refereed journals;

(R2) Presentations of invited talks and conference papers;

(R3) Efforts to seek individual or collaborative external grants;

(R4) Directing PhD dissertations

(R5) Supervision of research projects of undergraduate and graduate students and/or directing master's theses;

(R6) Papers published in refereed conference proceedings and refereed research monographs;

(R7) Research level books and book chapters in Mathematics, Mathematics Education, or Statistics;

(R8) Documented research related scientific consulting and patents or copyrights for developing applications of research;

Other categories described in College P&T guidelines may also be considered. However, the Department considered category of community engaged research and decided not to include it in these standards at this point in time.

Category (R1) provides a clear indication of research. Activities under the categories (R2)-(R5) will also be considered very important. Activities under the categories (R6) - (R8) may carry additional weight.

The following general information is relevant in the assessment of the activities under Research category.

General Comments:

(a) Neither the length nor the number of publications in Mathematics, Mathematics Education or Statistics can be taken as an indication of the importance of the research. In fact, brevity and conciseness are usually considered to be quite normal in mathematical research papers. Only experts in the candidate's area of specialization can make reasonable judgments as to the significance and impact of an individual's research;

(b) A publication record with reasonable consistency in reputed peer reviewed journals clearly demonstrates a consistent commitment to research.

(c) Securing research grants funded by major external agencies is a strong indicator of the presence of an ongoing research program. Recognizing that independent research grants in mathematical sciences are less common, a broader view of the grant activity will be taken which includes collaborative grants. Securing grants is not a requirement for reappointment, tenure or promotion but there is a general obligation on the part of faculty to seek such support for their research.

4

(d) It is recognized that activities under (R4) may involve substantial research work. The usual supervisor/student relationship implies a considerable input of research ideas by the supervisor into a student's work.

 (e) Both solo-authored and multi-authored papers are common in mathematical sciences. However, papers with no more than two-to-three co-authors are expected with some regularity. It should be noted that in mathematics authors are generally listed in alphabetical order and hence the order in which the authors are listed is not indicative of the significance of their contribution. For coauthored papers it is customary to assume an equal contribution by each coauthor, regardless of the order in which the names appear in a paper, unless specific mention is made about the contributions. In mathematical sciences, conference proceedings are secondary outlets of publication.

External evaluation of research by at least three external referees (see III.3) will be required in all tenure and promotion (but not reappointment) cases.

I.3. SERVICE

Assessment of the administrative work and public service will be based on the following activities:

(S1) **Service to departmental, college or university committees** is considered essential. Departmental administration and participation in activities supported by the department are also very important. Documented evidence of a candidate's record of participation in the academic community is required;

(S2) **Contributions to the scholarly profession** are considered vital. To be recognized within this category, service to academic or professional organizations must go beyond membership in an organization. Relevant activities might include: service on the committees or as executives of academic or professional organizations; service on selection committees of external granting agencies; service on the editorial boards of academic, professional or scientific journals; reviewing and refereeing of scientific papers, and organization of conferences or workshops; etc.;

(S3) **Public service** to the community is also considered favorably. This type of service includes developing professional relationships with organizations, businesses, and public agencies; developing and participating in outreach programs beyond the confines of the University; developing and participating in partnerships (such as internship programs) between departmental programs and external agencies, etc.

PART II. Reappointment, Tenure and Promotion Standards

Standards for different categories and ranks in the Department of Mathematics and Statistics are given here. Minimum academic credentials required for tenure are the possession of a PhD degree or equivalent.

II.1. REAPPOINTMENT AS ASSISTANT PROFESSOR

APPLICATION AND TIME IN RANK: Assistant Professors are normally appointed initially to a term of four years and reviewed in the third year for reappointment to a second term of three years as Assistant Professor.

STANDARDS:

Teaching: For the reappointment to be recommended, a candidate must show evidence of strong effort to excel in the categories (T1), (T2) and (T3). There should also be an evidence of the candidate's willingness to participate in activities in (T4).

Research: For the reappointment to be recommended there must be compelling evidence that a body of high quality research in categories (R1) and (R2) has been completed beyond that demonstrated at appointment. There must also be evidence of the promise of future development as a scholar, including the presence of a defined program of research.

Service: For the reappointment to be recommended there should be a clear record of activities in category (S1). Contributions in (S2) will add more weight to the case for reappointment.

Promise: The candidate must show promise of satisfying the criteria for promotion to Associate Professor and conferral of permanent tenure.

II.2. PROMOTION TO ASSOCIATE PROFESSOR WITH PERMANENT TENURE

APPLICATION AND TIME IN RANK: Assistant Professors are normally reviewed for promotion to Associate Professor with permanent tenure in their sixth year of employment. However, the review for promotion and conferral of permanent tenure may occur before that time if it is deemed appropriate by the candidate's Department Head in consultation with tenured department faculty.

STANDARDS:

Teaching: For the award of tenure or promotion to be recommended candidate must show evidence of strong record in categories (T1), (T2), and (T3). There should be an evidence of effort in (T4).

Research: For the award of tenure or promotion to be recommended there must be compelling evidence of significant achievement in research and scholarly activities beyond that demonstrated at appointment. **Candidates will demonstrate through contributions in (R1) and (R2) that they are in the process of acquiring national reputation in their research field**. There must also be evidence of a program of research clearly defined and executed by the candidate, and a positive indication that the candidate will maintain activity in research and scholarly work. There should also be an evidence of effort in (R3). Contributions in all other categories will carry additional weight.

Service: For the award of tenure or promotion to be recommended candidate must show evidence of strong record in categories (S1) and (S2). Contributions in (S3) will carry additional weight.

Promise: The candidate must show promise of satisfying the criteria for promotion to Professor.

II.3. PROMOTION TO PROFESSOR

APPLICATION AND TIME IN RANK: Individuals appointed as Associate Professor without permanent tenure (for an initial term of five years) are reviewed for conferral of permanent tenure and/or promotion to the rank of Professor during the fourth year of appointment. However, this review may occur before that time if it is deemed appropriate by the candidate's Department Head in consultation (for conferral of permanent tenure alone) with all tenured faculty or (for promotion with tenure) with faculty who hold the rank of Professor.

Promotion to the rank of Professor is based upon achievements, distinction, and the impact of one's contributions**, not duration of employment**. An Associate Professor may be recommended for promotion at any time. However, time in rank may be a salient consideration to the extent that the impact of certain contributions accumulates and gathers force over time. An individual's aggregate contributions over a period of time may yield a level of achievement or recognition that might not be accorded to any of them individually considered.

STANDARDS:

Teaching: Standards must be met at a superior level in categories (T1)-(T4).

Research: For promotion to the rank of Professor to be recommended there must be compelling evidence of significant achievement in research and scholarly activity. Candidates will demonstrate, through high quality publications in reputable, peer reviewed journals that the results of their research have made a contribution to the field of specialization, sufficient for this contribution to be recognized as substantial by authorities in the field nationally or internationally. There must also be evidence of leadership in the establishment and execution of a clearly defined program of disciplinary research. Involvement in interdisciplinary research projects with significant Mathematics, Statistics, or Math Ed. research component will also be viewed favorably. **There should be a positive indication that the candidate will maintain activity in research and scholarly work in the future also.**

Standards must be met at the superior level in categories (R1)-(R3) and at least one of (R4)-(R8). Superior contributions in multiple categories from (R4)-(R8) will carry additional weight. **There will be a clear expectation that the candidate should have established a national reputation as a researcher in his/her specialty**.

Service: Standards must be met at a superior level in (S1). Record of activities in at least one of (S2) and (S3) should also be at a superior level.

PART III. PROCESS

III.1. Dates: Reappointment, tenure and promotion reviews begin in the spring semester and follow the timeline mandated by the College. The process for cases involving reappointment and promotion to associate professor with tenure begins in the spring semester before the mandatory review year. For

promotion to Professor, interested candidates shall notify in writing the Head of the Department regarding their desire to be considered for promotion (see II.3). These requests must be made before the College mandated timeline.

III. 2. **Internal Review:** Department Head will call a meeting of the eligible faculty to initiate the process. The eligible faculty will select a Chair and will also designate three members to write in-depth "preliminary reviews" of the candidate's Teaching, Research and Service record. These "preliminary reviews" will be discussed and finalized later by the eligible tenured faculty and will form the basis of the "final" evaluation report. These final reviews and an overall abbreviated summary, along with eligible faculty vote by secret ballot will be submitted to the Head.

III.3. External Review: Processes constructed for the selection of the external referees will ensure that the candidate has an opportunity to put forward names for consideration and to identify potential referees with a perceived personal bias. The Department will ensure that this aspect of the process will be conducted in a fair and open manner by following the following steps:

- A three member sub-committee elected by the eligible faculty will prepare two ordered disjoint lists of acceptable external reviewers. The first list will contain four names provided by the candidate. The second list (suggested by the sub-committee) will contain at least four names. The Head will use these lists to invite and obtain acceptance from at least three reviewers but ensuring at least one reviewer coming from each list.
- The external referees will have established national or international reputations in their field and will be able to judge whether the candidate's work is of the required standard. They should have no conflict of interest and should not be closely connected to the candidate through joint research work so as to provide an objective assessment of performance; i.e., must not have been the candidate's colleagues, former supervisors or students, frequent co-authors or co-investigators.
- The candidate will be permitted to ask that one or more referee(s) chosen by the review committee be dropped on grounds such as suspected personal prejudice, but may in turn be asked to provide a convincing explanation of why a name should be dropped. When names are dropped, others will be added so that a minimum of eight names is available to the Department Head. The Department Head will approve the final list and a description of the credentials/background of the external referees will be provided to the College Tenure and Promotion committee for information.

- The Department Head will write letters to these experts requesting an assessment of the candidate's research and /or scholarly work. The Head will go by the order recommended by the departmental review committee in each list. The letters to external referees should indicate that comments are sought only on the research or scholarly work of the candidate. Enclosed with the letter should be the candidate's *curriculum vitae*, the relevant portions from the departmental P&T document, and appropriate sections of the case file including all materials germane to the category of evaluation.

D Teaching evaluation procedures

The Department has always maintained a mechanism for monitoring classroom teaching. This monitoring has become much more structured since 2011 when we constituted a standing committee for this purpose. The committee is called ECTC (Evaluation of Classroom Teaching Committee). The Head appoints the ECTC chair and six to nine other tenured or tenure-track faculty members to this committee for a one-year term (renewable). The ECTC chair calls meetings of the committee, as needed. Tenure-track faculty member are reviewed each year. Tenured Associate Professors are reviewed no less frequently than every other year, and Full Professors are reviewed only on request. The ECTC chair appoints a two-member review team for each member to be reviewed and oversees the review process. The member being reviewed is provided the two individual reviews and a cumulative review. All ECTC reviews are finally submitted to the Head at the end of the Spring semester.

E Mission Statement

The mission of the Department of Mathematics and Statistics at the University of North Carolina at Greensboro is to provide intellectual leadership in the mathematical sciences that is of direct benefit to the State of North Carolina and that commands national and international respect for the quality of its educational programs and for its depth of scholarship.

F Departmental Goals

Each year, the Department establishes specific goals (SPOs) and ways to measure them (SPMs) in consultation with the Dean. Current goals and measures are as follows:

SPO1: The department faculty will maintain a high level of research activity.
SPM1: The faculty in the department will produce on an average at least one peer-reviewed journal article per tenured/tenure track faculty in the department during AY 2015–16.
SPO2: The department will recruit and retain a diverse student body.
SPM2: The proportion of students who are women and students from traditionally under-represented backgrounds will meet or exceed the proportions found in the college as a whole.
SPO3: The Department will offer graduate students an opportunity to participate in professional activities appropriate to their program of study.
SPM3: At least 50% of our PhD students graduating in AY 2015–16 will submit at least one journal article. Additionally, at least 50% of our PhD students who have been in the program for three years or longer will make research presentations at conferences or in seminars during AY 2015–16.

G Faculty Vitæ

Short CVs for the current 7 Full Professors, 10 Associate Professors, 4 Assistant Professors, 1 Academic Professional, and 1 Senior Lecturer are given below, in alphabetical order by last name.

Gregory C. Bell
Associate Professor and Director of Graduate Studies
Department of Mathematics and Statistics
The University of North Carolina at Greensboro, Greensboro, NC 27402
Phone: 336 334 5836
gcbell@uncg.edu

Professional Preparation
University of Florida, Gainesville, FL Mathematics B.S. (1997)
University of Florida, Gainesville, FL Mathematics M.S. (1999)
University of Florida, Gainesville, FL Mathematics Ph.D. (2002)

Appointments
Associate Professor, University of North Carolina at Greensboro 2011-present
Assistant Professor, University of North Carolina at Greensboro 2005-2011

IMA New Directions Professor, IMA, Minneapolis, 2013
VIGRE Post-Doctoral Research Professor, Penn State University 2003-2005
Visiting Assistant Professor, University of Louisville, 2002-2003

Relevant Publications
Bell, G. (2015) Asymptotic dimension, to appear in *Office hours with a geometric group theorist*, Princeton Univ. Press (accepted).
Bell, G., and Nagórko, A. (2013) A new construction of universal spaces for asymptotic dimension. Topology Appl., 160(1), 159-169.
Bell, G., and Dranshnikov, A. (2011) Asymptotic dimension in Będlewo. Topology Proc., 38, 209-236.
Bell, G., and Dranishnikov, A. (2008) Asymptotic dimension. Topology Appl. 155(12), 1265-1296.
Bell, G., and Fujiwara, K., (2008) The asymptotic dimension of a curve graph is finite. J. Lond. Math. Soc. (2), 77(1) 33-55.
Bell, G., and Dranishnikov, A. (2006) A Hurewicz-type theorem for asymptotic dimension and applications to geometric group theory. Trans. Amer. Math. Soc. 358 (11) 4749-4767.
Bell, G., (2005) Asymptotic properties of groups acting on complexes, Proc. Amer. Math. Sco., 133 (2) 387-396.
Bell, G., Dranishnikov, A., (2004) On asymptotic dimension of groups acting on trees, Geom. Dedicata, 103, 89-101.
Bell, G., Dranishnikov, A., Keesling, J. (2004) On a formula for the asymptotic dimension of free products. Fund. Math. 183 (1), 39-45.
Bell, G. (2003) Property A for groups acting on metric spaces. Topology Appl. 130 (3) 239-251.
Bell, G., Dranishnikov, A. (2001) On asymptotic dimension of groups. Algebr. Geom. Topol. 1, 57-71.

Selected Invited Research Talks
2014 **SIAM SEAS**, *Melbourne, FL*, Topological Data Analysis and Directed Persistence.
2014 **UNCG Topology Seminar**, *Greensboro, NC*, Topological Data Analysis and Directed Persistence.
2013 **28th Summer Topology Conference**, *North Bay, ON, Canada*, Asymptotic dimension of graph products.
2011 **Joint Meeting of the Israeli and Polish Mathematical Societies**, *Łódź, Poland*, On coarse property C.
2011 **Workshop in Geometric Group Theory**, *Heilbronn Institute, Bristol, England*, Property A.
2010 **MAA Math Fest**, *Pittsburgh, PA*, An invitation to asymptotic dimension.
2009 **Spring Topology and Dynamical Systems Conference**, *Gainesville, FL*, The asymptotic dimension of a free product.
2006 **Spring Topology and Dynamical Systems Conference**, *Greensboro, NC*, The asymptotic dimension of a curve graph is finite.
2005 **International Conference on Geometric Topology**, *Bedlewo, Poland*, Some problems in asymptotic dimension theory.
2005 **Spring Topology and Dynamical Systems Conference**, *Rome, Georgia*, Semi-Plenary Talk: Gluing Techniques in Asymptotic Dimension.
2005 **Cornell Topology and Geometry Seminar**, *Ithica, NY*, Asymptotic dimension of groups.
2004 **Penn State Topology Seminar**, *University Park, PA*, A Hurewicz theorem for asymptotic dimension.
2004 **A Conference in Geometric Group Theory**, *Bedlewo, Poland*, A Hurewicz-type theorem for asymptotic dimension and applications to geometric group theory.
2004 **Spring Topology and Dynamical Systems Conference**, *Birmingham, AL*, A Hurewicz theorem for asymptotic dimension.
2004 **Coarse Geometry Workshop**, *Kyoto, Japan*, Asymptotic dimension and group actions.
2004 **Winter Meeting of the Canadian Mathematical Society**, *Montreal, QC, Canada*, Growth of asymptotic dimension of groups.
2002 **19th Annual Conference on Geometric Topology**, *Calvin College, MI*, Property A for groups acting on metric spaces.
National Conferences
2004 **Sectional Meeting of the AMS**, *Nashville, TN*, A Hurewicz-type theorem for asymptotic dimension.
2002 **Sectional Meeting of the AMS**, *Orlando, FL*, On a formula for the asymptotic dimension of amalgamated products.
2002 **UF Year of Emphasis in Topology**, *Gainesville, FL*, Property A for groups acting on metric spaces.
2002 **National Meeting of the AMS**, *San Diego, CA*, On asymptotic dimension of groups acting on trees.
Local Events
2005 **University of Utah Max Dehn Seminar**, *Salt Lake City, UT*, Asymptotic dimension of a curve graph.

Funding
UNCG Faculty First Grant $4,417 internal.
IMA New Directions Fellowship, $20,000, IMA, University of Minnesota.

Synergistic Activities
• Local organizer for sectional meeting of the AMS, 2014. Organized session on Geometric Topology and Geometric Group Theory at the Spring Topology and Dynamical Systems meeting, 2010.
• Directly supervised 2 MA students and one PhD student. Results from PhD dissertation have been submitted.
• Refereed articles for Topology and its Applications, Fundamenta Mathematicae, Topology Proceedings, Tsukuba Journal of Mathematics, Central European Journal of Mathematics, Transactions of the American Mathematical Society.

Collaborators and Other Affiliations
Collaborators: *A. Nagórko,* (University of Warsaw), *K. Fujiwara* (Tokyo University), *J. Keesling* (University of Florida), *A. Dranishnikov* (University of Florida), *D. Moran* (Guilford College).

Graduate Advisor: A. Dranishnikov (University of Florida).

MA Advisees:
Lauren Farr (nee: Sher), (MA 2011) currently teaching at High Point University;
Michael Watts, (MA 2013);
Joshua Martin, (MA expected 2016)
Austin Lawson, (MA expected 2016)

PhD Advisees:
Danielle Moran, (PhD 2014), currently Assistant Professor at Guilford College.

Total number of graduate students advised: 5

Maya Chhetri

E-mail: maya@uncg.edu
Website: www.uncg.edu/~m_chhetr

Professional Preparation:

Ph.D. in Mathematical Sciences (August 1999), Mississippi State University, Mississippi, USA

Appointments:

Professor of Mathematics**,** UNC Greensboro, 2013-present
Associate Professor of Mathematics, UNC Greensboro, 2005-2013
Assistant Professor of Mathematics, UNC Greensboro, 1999-2005

Selected Research Publications:

- M. Chhetri, Pavel Drabek and R. Shivaji, "Existence of positive solutions for a class of p-Laplacian superlinear semipositone problem," accepted for publication in the Proceedings of the Royal Society of Edinburgh.
- M. Chhetri and Petr Girg, "Asymptotically linear system at and near resonance", Boundary Value Problems, (2014), 2014:242.
- A. Abebe*, M. Chhetri and R. Shivaji, "Positive solutions for a class of multiparameter elliptic systems, accepted for publication" in Dynamics of Continuous, Discrete and Impulsive Systems (DCDS-A) (2014).
- M. Chhetri and Pavel Drabek, "Principal eigenvalue of p-Laplacian operator in exterior domain," Results in Mathematics}, 66 (2014), 461-468.
- Abraham Abebe*, M. Chhetri, Lakshmi Sankar and R. Shivaji, "Positive solutions for a class of superlinear semipositone systems on exterior domains," Boundary Value Problems, (2014), 2014:198.
- Maya Chhetri and Petr Girg, "Existence of positive solutions for a class of superlinear semipositone systems," Journal of Math. Anal. Appl., 408, (2013), 781-788.
- Maya Chhetri, Sarah Raynor and Stephen Robinson, "Existence of Multiple Positive Solutions to Some Semipositone Systems," Proceedings of the Royal Society of Edinburgh, 142(A), (2012), 39-59.
- Matthew Wilhelm, Maya Chhetri, Jan Rychtar and Olav Ruepell, A Game Theoretical Analysis of the mating Sign Behavior in the Honey Bee, Bulletin of Mathematical Biology, 73, no. 3, (2011), 626--638.
- Matthew Wilhelm, Maya Chhetri, Jan Rychtar and Olav Ruepell, A Game Theoretical Analysis of the mating Sign Behavior in the Honey Bee, Bulletin of Mathematical Biology, 73, no. 3, (2011), 626--638.

- M. Chhetri, N. Johnson*, O. Rueppell and J. Rychtar, "Revisiting the variance-based selection model of diploid drone production for multiple mating in honey bees," Journal of Interdisciplinary Mathematics, 12 (2009) 141--160.
- Maya Chhetri and Petr Girg, "Existence and Nonexistence of Positive Solutions for a Class of Superlinear Semipositone Systems," Nonlinear Analysis, 71 (2009), 4984--4996.
- Maya Chhetri and Stephen Robinson, "Existence and Multiplicity of Positive solutions for classes of singular elliptic PDEs," Journal of Mathematical Analysis and Applications, 357 (2009), 176--182.
- Maya Chhetri, Pavel Drabek, Sarah Raynor and Stephen Robinson, "Nonvariational problems with Critical Growth," Nonlinear Analysis, 68 (2008), 2092--2103. Maya Chhetri and Petr Girg, "Existence and Nonexistence of Positive Solutions for a Class of Superlinear Semipositone Systems,
- Maya Chhetri and Stephen Robinson, "Multiple Positive Solutions for Singular Boundary Value Problems", Communications on Applied Nonlinear Analysis, 14, no. 1, (2007), 15--29.
- Maya Chhetri and Petr Girg, "Nonexistence of Non-negative Solutions for a Class of (p-1)-superhomogeneous Semipositone Problems," Journal of Mathematical Analysis and Applications 322, no. 2, (2006), 957--963.

Invited talks (last 5 years):
- January 2015 –Joint Mathematics Meeting, San Antonio TX.
- July 2014 - The 10th American Institute of Mathematical Sciences (AIMS) in Madrid, Spain. Two talks.
- March 2014 – Differential Equations Seminar, UT Knoxville, TN.
- January 2014 - The 2014 Joint Mathematics Meeting, Baltimore, MD.
- October 2013 - Sectional AMS meeting, Philadelphia, PA.
- August 2013 - Nonlinear Analysis 2013, Czech Republic.
- August 2013 – The mathematical Congress of Americas, Guanajuato, Mexico.
- January 2013 - The 2013 Joint Mathematics Meeting, San Diego, CA.
- July 2012 – The 9th American Institute of Mathematical Sciences (AIMS) in Orlando, FL.
- January 2012 – The Joint Mathematics Meetings in Boston, MA.
- July 2011 – The Colombian Mathematical Congress in Bucaramanga, Colombia.
- May 2011 - The Sixth International Conference on Dynamic Systems and Applications held in Atlanta, GA.
- December 2010 – The Nineteenth International Conference: (IMST 2010-FIM XIX) on Interdisciplinary Mathematical and Statistical Techniques at Patna University, Patna, Bihar, India.

- June 2010 - The 8th American Institute of Mathematical Sciences (AIMS) conference in Dresden, Germany.

Selected Synergistic Activities (last 5 years):

- Co-organized a special session at the Fall AMS Sectional meeting held at the University of North Carolina at Greensboro, Greensboro, NC November 2014.
- Co-organized the conference *Variational and Topological Methods: Theory, Applications, Numerical Simulations and Open Problems* in Flagstaff, AZ, 2012.
- Co-organized a special session at the *Fall AMS meeting* held at Wake Forest University, Winston-Salem NC September 2011.
- Co-organized the Annual UNCG-RMSC (*UNC Greensboro Regional Mathematics and Statistics Conference*) since 2006.
- Reviewed manuscripts for the following journals:
Revista de la Real Academia de Ciencias Exactas, Físicas y Naturales. Serie A. Matemáticas, Electronic Journal of Differential Equations, Journal of Mathematical Analysis and Applications, Abstract Analysis and Applications, Canadian Mathematical Bulletin, Dynamics of Discrete Continuous and Impulsive Systems, International Journal of Mathematical Sciences, Acta Mathematica Sinica, Positivity, Topological Methods in Nonlinear Analysis, London Mathematical Society, Mathematika Slovaka, Discrete and Continuous Dynamical Systems, Abstract and Applied Analysis, Nonlinear Analysis, Mathematical Modeling and Analysis, Applied Mathematics Letters, Boundary Value Problems, Positivity, Topological Methods in Nonlinear Analysis, and Mathematical Methods in the Applied Sciences.

Collaborators and other affiliations:

Abraham Abebe (Temple University Philadelphia, PA), Alfonso Castro (Harvey Mudd College, CA), Mary Crowe (Florida Southern College, FA), Hai Dang (Mississippi State University, MS), Pavel Drabek (University of West Bohemia, Czech Republic), Petr Girg (University of West Bohemia, Czech Republic), Robert Gove (UNC Greensboro, NC), Sat Gupta (UNC Greensboro, NC), John M. Neuberger (Northern Arizona University, AZ), Sarah Raynor (Wake Forest University, NC), David Remington (UNC Greensboro, NC), Stephen Robinson (Wake Forest University, NC), Olav Rueppell (UNC Greensboro, NC), Jan Rychtar (UNC Greensboro, NC), Lakshmi Sankar (Regional Institute of Education, Bhubaneswor, India), PhD Thesis Advisor: R. Shivaji.

Students:

Abraham Abebe, PhD 2014 (currently in Temple University)

CURRICULUM VITAE

Igor V. Erovenko

Address

Work

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Education

↪ Ph.D. in mathematics, University of Virginia, September 1997 – August 2002.

↪ Diploma with honors, Department of Mathematics and Mechanics, Belarusian State University, September 1991 – June 1996.

Academic Employment

↪ Associate Professor, Department of Mathematics and Statistics, University of North Carolina at Greensboro, August 2008 – present.

↪ Assistant Professor, Department of Mathematics and Statistics, University of North Carolina at Greensboro, August 2002 – July 2008.

Administrative Positions

↪ Director of Undergraduate Studies, Department of Mathematics and Statistics, University of North Carolina at Greensboro, August 2010 – August 2013.

Research Area

Combinatorial group theory, geometric group theory, arithmetic groups; mathematical biology.

Publications

1. Evolution of cooperation in sparse mobile populations, working paper.

2. Bounded elementary generation and triviality of bounded comohology of S-arithmetic subgroups of Chevalley groups, in preparation.

3. Bounded generation and second bounded cohomology of wreath products (with N. Nikolov and B. Sury), revised version in preparation.

4. Commutativity degrees of wreath products of finite abelian groups (with B. Sury), *Bull. Austral. Math. Soc.* **77** (2008), 31–36.

5. Bounded generation of S-arithmetic subgroups of isotropic orthogonal groups over number fields (with A.S. Rapinchuk), *J. Number Theory* **119** (2006), no. 1, 28–48.

6. $SL_n(F[x])$ is not boundedly generated by elementary matrices: explicit proof, *Electron. J. Linear Algebra* **11** (2004), 162–167.

7. On bounded cohomology of amalgamated products of groups, *Int. J. Math. Math. Sci.* (2004), no. 40, 2103–2122.

8. Bounded generation of some S-arithmetic orthogonal groups (with A.S. Rapinchuk), *C. R. Acad. Sci. Paris Ser. I Math.* **333** (2001), no. 5, 395–398.

Invited Talks/Conference Talks

1. Bounded generation and second bounded cohomology of wreath products. AMS Eastern Section Meeting, Penn State University, Fall 2009.

2. Bounded generation and second bounded cohomology of wreath products. SERMON, University of North Carolina at Greensboro, Spring 2009.

3. Bounded generation of S-arithmetic subgroups of isotropic orthogonal groups over number fields. AMS Eastern Section Meeting, University of Delaware, Spring 2005.

4. On bounded cohomology of amalgamated products of groups. AMS Southeastern Section Meeting, University of North Carolina, Chapel Hill, Fall 2003.

5. Witt's Theorem for local lattices. SERMON, University of North Carolina at Greensboro, Spring 2003.

6. Bounded generation of some S-arithmetic orthogonal groups. Karcher Colloquium, University of Oklahoma, Spring 2002.

7. $SL_3(\mathbb{C}[x])$ is not boundedly generated by elementaries: explicit version of van der Kallen's proof. Algebra Seminar, University of Oklahoma, Spring 2002.

Teaching Experience

⇝ College algebra and precalculus.

⇝ Entire calculus sequence for science majors, non-science majors, and engineers.

⇝ Differential equations.

⇝ Introduction to mathematical analysis.

⇝ Linear algebra.

⇝ Abstract algebra.

⇝ Graduate level algebra.

⇝ Coordinator of multiple section courses in college algebra, precalculus, and business calculus.

Prizes, Honors, Scholarships, Fellowships, and Grants

⇝ New Faculty Grant, University of North Carolina at Greensboro, 2003.

⇝ Travel Research Grant, University of Virginia, Spring 2002.

⇝ Dupont Fellowship, University of Virginia, Fall 1999 – Spring 2000, Fall 2000 – Spring 2001.

⇝ Summer Research Support, University of Virginia, 1998–2000.

⇝ Pratt Fellowship, University of Virginia, Fall 1997 – Spring 1999.

⇝ Selected and named as a Soros Student by the International Soros Science Education Program in recognition and appreciation of outstanding achievements in the study of science at the university level, Fall 1994.

⇝ Honors Fellowship, Belarusian State University, Fall 1991 – Spring 1996.

⇝ Winner of a nationwide mathematical olympiad for high school students, Minsk, Belarus, Spring 1991.

Richard H. Fabiano

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University North Carolina at Greensboro
Greensboro, NC 27412
336-334-5836
email: fabiano@uncg.edu

Professional Preparation

St. Joseph's University, Philadelphia, PA	Mathematics	B.S., 1980
Virginia Tech, Blacksburg, VA	Mathematics	M.S., 1982
Virginia Tech, Blacksburg, VA	Mathematics	Ph.D., 1986
Brown University, Providence, RI	Applied Mathematics	Postdoc, 1986-1989

Appointments

2013-present	Professor, University of North Carolina at Greensboro
2000-2013	Associate Professor, University of North Carolina at Greensboro
1996-2000	Assistant Professor, University of North Carolina at Greensboro
1995-1996	Assistant Professor, University of St. Thomas (TX)
1989-1995	Assistant Professor, Texas A&M University

Selected Publications

1. *A stability result for a scalar neutral equation with multiple delays*, Proceedings of the 52nd IEEE Conference on Decision and Control, Florence, Italy, December, 2013, pp. 1089-1094.

2. *A semidiscrete approximation scheme for neutral delay-differential equations*, International Journal of Numerical Analysis and Modeling, Vol. 10, Number 3, 2013, pp. 712-726.

3. *Semidiscrete approximation schemes for LQR control of equations in thermoelasticity*, Proceedings of the 50th IEEE Conference on Decision and Control, Orlando, FL, December, 2011, pp. 609-614.

4. *Approximation of feedback gain in LQR control of a neutral delay-differential equation*, Proceedings of the 49th IEEE Conference on Decision and Control, Atlanta, GA, December, 2010, pp. 876-880.

5. *Semidiscrete approximation and renorming in control of distributed parameter systems*, Proceedings of the 2010 American Control Conference, Baltimore, MD, June 30-July 2, 2010, pp. 4887-4892.

6. *Stability for semidiscrete Galerkin approximations of neutral delay equations*, Proceedings of

the 47th IEEE Conference on Decision and Control, Cancun, Mexico, December, 2008, pp. 191-196 (with J. Turi).

7. *Stability conditions for differential-difference systems of retarded and neutral type: the single delay case*, International Journal of Qualitative Theory of Differential Equations and Applications, Vol. 1, 2007, pp. 59-75 (with J. Turi).

8. *Stability for Retarded Delay Equations with Multiple Delays*, Proceedings of the 45th IEEE Conference on Decision and Control, San Diego, CA, December, 2006, pp. 4712-4716 (with J. Turi).

9. *Stability and Galerkin approximation in thermoelastic models*, Proceedings of the 44th IEEE Conference on Decision and Control, and the European Control Conference 2005, Seville, Spain, December, 2005, pp. 2481-2486.

10. *Making the numerical abscissa negative for a class of neutral equations*, Discrete and Continuous Dynamical Systems, June, 2003, pp. 256-262 (with J. Turi).

Selected Presentations

1. 34th Southeastern Atlantic Regional Conference on Differential Equations, University of Memphis, Memphis, TN, (contributed) October 11 & 12, 2014.

2. 52nd IEEE Conference on Decision and Control and European Control Conference, Florence, Italy, (invited), December 10-13, 2013.

3. 33rd Southeastern Atlantic Regional Conference on Differential Equations, University of Tennessee, Knoxville, TN, (contributed) September 21 & 22, 2013.

4. 32nd Southeastern Atlantic Regional Conference on Differential Equations, Wake Forest University, Winston-Salem, NC, (contributed) October 19 & 20, 2012.

5. Workshop on 'Nonlocal continuum models for diffusion, mechanics, and other applications', Research Triangle Park, NC (sponsored by SAMSI - Statistics and Applied Mathematical Sciences Institute), (invited), June 25-29, 2012.

6. 50th IEEE Conference on Decision and Control and European Control Conference, Orlando, FL, (invited), December 12-15, 2011.

7. 2010 American Control Conference, Baltimore, MD, (invited), June 30-July 2, 2010.

8. 29th Southeastern Atlantic Regional Conference on Differential Equations, Mercer University, Macon, GA (contributed) October 16 & 17, 2009.

9. 18th International Symposium on Mathematical Theory of Networks and Systems (MTNS), Virginia Tech, Blacksburg, VA (invited), July 28 - August 1, 2008.

10. 7th AIMS International Conference on Dynamical Systems, Differential Equations and Applications, University of Texas at Arlington, Arlington, TX, (invited), May 18-21, 2008.

Synergistic Activities

1. Co-organizer (with M. Chhetri, T. Lewis, R. Shivaji) of the 35th annual Southeastern Atlantic Regional Conference on Differential Equations, October 10-11, 2015 at UNCG

2. Associate Editor, 53rd IEEE Conference on Decision and Control, Los Angeles, December, 2014, for SIAM regular paper submissions.

3. SEARCDE Steering Committee, 2013-2015.

4. Co-organizer (with Maya Chhetri) of the 26th annual Southeastern Atlantic Regional Conference on Differential Equations, October 27-28, 2006 at UNCG

5. Co-organizer (with H.T. Banks, C.Byrnes and K. Ito) of an AMS/IMS/SIAM Summer Conference on "*Control and Identification of Partial Differential Equations,*" held July 11-18, 1992 at Mt. Holyoke College, South Hadley, Massachusetts.

6. Co-organizer (with B.B. King) of the Student Session *Modeling and Computation in Control and Optimal Design*, at the 4th SIAM Conference on Control and its Applications, May 7-9, 1998 in Jacksonville, Florida.

7. Graduate Students:

   Ms. Melinda Auman, *Pseudospectra and numerical range for linear systems*, MA in Mathematics, Spring, 2003.

   Mr. John Hardee, *Pseudospectra and structured pseudospectra*, MA in Mathematics, December, 2012.

   Ms. Catherine Payne, *Stability and approximation for neutral delay differential equations*, PhD in Computational Mathematics, expected December, 2016.

Collaborators and Other Affiliations

- **Collaborators:** Janos Turi (University of Texas at Dallas), Scott Hansen (Iowa State University), Kazi Ito (North Carolina State University), John Burns (Virginia Tech), H.T. Banks (North Carolina State University), Dan Inman (Virginia Tech), Belinda Batten (Oregon State University)

- **Ph.D. Advisor:** John Burns (Virginia Tech)

- **Postdoc Advisor:** H.T. Banks (North Carolina State University)

T A L I A   F E R N Ó S

CURRENT AND PREVIOUS APPOINTMENTS:

University of North Carolina, Greensboro; Assistant Professor, 2010-current

Hebrew University Einstein Institute of Maths; Research Fellow, 2009-2010

MSRI Semester in Geometric Group Theory; General Member, 2007

NSF Mathematical Sciences Postdoctoral Fellow, 2006 - 2010

UCLA Hedricks Assistant Adjunct Professor, 2006 - 2009

EDUCATION:

M.S. and Ph.D., University of Illinois at Chicago, 2002 and 2006

B.S. Mathematics and Physics, The Evergreen State College, 1998

HONORS AND AWARDS:

Candace Bernard and Robert Glickman Dean's Professorship; awarded 2015

Institut Henri Poincaré, Research In Paris, with Indira Chatterji; awarded 2014

NSF Grant DMS-1312928, awarded 2013

UNCG New Faculty Research and Summer Excellence Research Grants, awarded 2013

NSF Mathematical Sciences Postdoctoral Research Fellow, awarded 2006

Herbert Alexander Award for Excellence in Thesis Research, 2005

Abraham Lincoln UIC-Diversity Fellow, awarded 2004

Illinois Minority Graduate Incentive Program Fellow, awarded 2001, 2002, 2003

NSF-VIGRE Fellow, 2001

PUBLICATIONS AND PREPRINTS:

The Poisson Boundary and Groups Acting on CAT(0) Cube Complexes *submitted*

The Mayer-Vietoris Sequence for Graphs of Groups, Property (T), and the First ℓ^2-Betti Number *submitted* with Alain Valette, 35 pages

The Median Class and Superrigidity of Actions on CAT(0) Cube Complexes with Indira Chatterji and Alessandra Iozzi, appendix by Pierre-Emmanuel Caprace *accepted to Journal of Topology*, 61 pages

Images of Real Representations of $SL_n(\mathbb{Z}_p)$ with Pooja Singla *accepted to Glasgow Mathematical Journal*, 10 pages

Reduced 1-cohomology and relative property (T) with Alain Valette *Mathematische Zeitschrift*, Volume 266, Number 4, (2010) 20 pages

Relative Property (T) and the Vanishing of the first ℓ^2-Betti number *Bull. Belg. Math. Soc. Simon Stevin* Volume 17, Number 5 (2010), 851-857

Relative Property (T) and Linear Groups *Les Annales de L'Institut Fourier* 56 no. 6 (2006), p. 1767-1804

SELECTED TEACHING ACTIVITIES:

Speaker; Representing MSRI at the Modern Math Workshop, Fall 2015.
How to Play Ping Pong with Free Groups

Module Designer and Supervisor; AAUW Tech Savvy Workshop, Spring 2015.
Three Geometries is Better Than One

Oranizer and Speaker Fall 2014
Geek Open Mic: Science and Math Showcase

Speaker; Math Club, UNCG, 2013.
Euclidean and Non-Euclidean Geometry, Understanding the Geometry of Space-Time

Speaker; Undergraduate Seminar, Trinity University, 2013.
Trees and their Automorphisms

Speaker; Math Club, UNCG, 2012.
The Geometry of Trees

Mini-course Lecturer; Matematik Köyü, Sirince, Turkey, 2008 and 2010.
Growth Dichotomy for Solvable Linear Groups: Introduction to Geometric Group Theory
and *A Tits-type Alternative for Groups Acting on Trees*

SERVICE ACTIVITIES:

Conference Co-Organizer

✧ *Connections for Women: Geometric Group Theory*, MSRI, Berkeley, CA, Fall 2016

✧ *The Haagerup Property and Yu's Property A*
The Heilbronn Institute, Bristol England, Summer 2011

✧ *CAT(0) Spaces and Affine Buildings*; Sde-Boker, Israel, Winter 2010

✧ *Analysis on Groups*, University of Puerto Rico, Rio Piedras, Spring 2008

Seminar Organizer, Co-Organizer;

✧ *Groups and Dynamics Seminar*; 2009-2010, Hebrew University, Jerusalem, Israel;

✧ *Lecture Series in Computational Math*; 2012-2013, UNCG

Mentor

✧ *University of North Carolina, Association for Women in Mathematics*
Student Chapter Founding Faculty Mentor; 2013–present

✧ *University of Illinois at Chicago, AWM Student Chapter Mentoring Event*; 2012

✧ *Association for Women in Mathematics Mentor*; 2007

Referee

✧ *Ergodic Theory and Dynamical Systems*; 2014-2015

✧ *Proceedings of the AMS*; 2014

✧ *Banach Journal of Mathematical Analysis*; 2012

✧ *American Journal of Mathematics*; 2010

✧ *Proceedings of the Conference in Honor of R.J. Zimmer's 60th birthday*; 2008

✧ *Groups, Geometry, and Dynamics*; 2008

SELECTED TALKS:

Spring Topology and Dynamics Conference, Bowling Green, OH, May 2015

Cornell Topology Festival, Ithaca, NY, May 2015

Algebra, Combinatorics, and Number Theory Seminar,
University of North Carolina, at Greensboro; April 2015

Geometry and Topology Seminar, University of Oklahoma, October 2014

Random Walks Seminar
IHP Trimester on Random Walks and Asymptotic Geometry of Groups
Paris, FRANCE, April 2014

Geometry Seminar, Institute for Advanced Mathematics Research
Strasbourg, FRANCE, April 2014

Algebra Seminar Nicolas Oresme Mathematics Laboratory
Caen, FRANCE, February 2014

Séminaire du MAPMO,
l'Université d'Orléans, Orléans, FRANCE; February 2014

Ergodic Theory Seminar, Mathematics Research Institute of Rennes
Rennes, FRANCE, February 2014

Dynamics-Geometry-Topology at University of Aix-Marseille
Marseille, FRANCE, January 2014

Basic Notions; Introductory School on Geometric Group Theory and Random walks,
CIRM, Luminy, FRANCE, January 2014

Geometric Group Theory and Topology Seminar,
Tufts University, Medford, MA; April 2013

Hot Topics: Surface subgroups and cube complexes,
Mathematical Sciences Research Institute, Berkeley, CA; March 2013

Geometry-Topology Seminar,
University of Maryland, at College Park; December 2012

Geometry, Topology, and Dynamics Seminar,
University of Illinois, at Chicago; October 2012

Algebra, Combinatorics, and Number Theory Seminar,
University of North Carolina, at Greensboro; September 2012

Geometry and Topology Seminar,
University of Wisconsin, at Madison; February 2012

Algebra Seminar Ben Gurion University, Be'er Sheva, Israel; November 2010

Geometry Seminar
Eidgenössische Technische Hochschule Zürich, Switzerland; September 2010

Groupes et Analyse , Universit de Neuchâtel, Switzerland; October 2010

Examples of Groups Ohio State University, Columbus Ohio, June 2010

Advances in Mathematics, Focus on Women in Mathematics
Jawaharlal Nehru University, New Delhi, India; October 2009

BIOGRAPHICAL SKETCH
Xiaoli Gao
`https://www.uncg.edu/~x_gao2/`

PROFESSIONAL PREPARATION

- University of Iowa, Ph.D. in Statistics, 2008
- University of Iowa, M.S. in Statistics, May 2005
- Univ. of Sci. & Tech. of China, Stat. M.S. equiv. in Stat., 2003
- Anhui University, China, B.S. in Statistics and Probability, July 2000

APPOINTMENTS

- August 2013–present, Tenure Track Associate Professor, Department of Mathematics and Statistics,
  University of North Carolina at Greensboro
- August 2008–2013, Assistant Professor, Department of Mathematics and Statistics,
  Oakland University
- May 2007–August 2007, Biometrician Intern, Research Laboratories, Merck & Co.
- June 2005–August 2005, Research Assistant, Statistical Consulting Center, University of Iowa

SELECTED PAPERS

- **Gao, X.L.** and Fang, Y.X. (2015). Penalized Weighted Least Squares for Simultaneous Outlier Detection and Robust Regression, *Journal of Business Statistics and Economics*, in revision.
- **Gao, X.L.** and Ahmed, S.E. (2014). Efficient Adaptive Estimation Strategy in Partially Linear Regression Model with Diverging Number of Parameters, in *Perspectives on Big Data Analysis, Contemporary Mathematics, Amer. Math. Soc.*,**622**, 61-80. See more at: `http://dx.doi.org/10.1090/conm/622/12441`
- **Gao, X.L.** (2013). KLAN for Complex Grouped Variable Selection, Computational Statistics and Data Analysis, in second revision.
- **Gao, X.L.** and Ahmed, S.E. (2013). Shrinkage Estimation for High Dimensional Data Analysis, *Canadian Journal of Statistics*, in the second revision.
- **Gao, X.L.**, Wu, Y. and E.S. Ahmed. (2013). Joint Linear Trend Recovery Using L1 Regularization, *Electronic Journal of Statistics*, in revision.
- Gillies, C. E., **Gao, X.L.** , Patel, N.V., Siadat, M.R., Wilson, G.D.(2012). Improved Feature Selection by Incorporating Gene Similarity into the LASSO, *International Journal of Knowledge Discovery in Bioinformatics*, **3(1)**, 1-13, DOI: 10.4018/jkdb.2012010101.
- Wu, Y. and **Gao, X.L.** (2011).Sieve estimation with bivariate interval censored data, *Journal of Statistics, Application and Theory*, **5**, 37–61.
- **Gao, X.L.** and Fang, Y.X. (2011). A note on the generalized degrees of freedom under the L1 loss function. *Journal of Statistical Planning and Inference*, 141, 677–686.
- **Gao, X.L.** and Huang, J. (2010) A Robust Penalized Method for the Analysis of Noisy DNA Copy Number Data. BMC Genomics, 11:517.
- **Gao, X.L.** and Huang, J. (2010). Asymptotic analysis of high-dimensional LAD regression with Lasso. *Statistica Sinica*, 20 1485–1506.
- Jiang, X. **Gao, X.L.**, Xu, W., Qian, X. and Sweeeney, L. (2008). Bias variance machine. CSAIL Student Workshop Paper.

- Belzunce, F., **Gao, X.L.**, Hu, T. and Pellerey, F (2004). Characterizations of the hazard rate order and IFR aging notion. *Statistics & Probability Letters*, 70, 235–242.

INVITED TALKS

- August 2015: The 2015 International Workshop on Perspectives on High-Dimensional Data Analysis (HDDA) V, University of Victoria, Victoria, British Columbia

- May, 2015: The 24th International Workshop on Matrices and Statistics, Hainan, China

- October, 2014: International Conference on Advances in Interdisciplinary Statistics and Combinatorics, UNC Greensboro

- June 2014: International Symposium on Business and Industrial Statistics/ Conference of the ASA Section on Statistical Learning and Data Mining Data Mining in Business and Industry, Duke University.

- December 2013: 6th International Conference of the ERCIM WG on Computational and Methodological Statistics (ERCIM 2013), London, UK

- August 2013: 22nd International Workshop on Matrices and Statistics, Toronto, Canada

- May 2013: International Workshop on the Perspectives on High-dimensional Data Analysis III, Montreal, Canada

- December 2012: 5th International Conference of the ERCIM WG on Computing & Statistics (ERCIM 2012), Oviedo, Spain

- July 2012: Ims-aprm2012, Tsukuba, Japan

- May 2012: International workshop on perspectives on high-dimensional data analysis II, Montreal, Canada

- November 2011: Informs Annual Meeting, Charlotte, North Carolina

- Department of Mathematics and Statistics, Bowling Green State University, Ohio, December 2011

- INFORMS Annual Conference, Charlotte, North Carolina, November 2011

- Colloquium Talk, Department of Statistics and Actuarial Sciences, University of Iowa, October 2011

- International Workshop on Perspectives on High-dimensional Data Analysis Fields Institute, Toronto, Canada, June 2011

- Statistics 2011 Canada: 5th Canadian Conference in Applied Statistics Together with the 20th Conference of The Forum for Interdisciplinary Mathematics, Concordia University, Montreal, Canada, July 2011

- Colloquium Talk, Department of Mathematics and Statistics, University of Windsor, Canada, April 2011

- Colloquium Talk, Department of Mathematics and Statistics, Oakland University, Rochester, MI, November 2010

- Colloquium Talk, Department of Mathematics and Statistics, Georgia State University, Atlantic, GA, May 2009

SYNERGISTIC ACTIVITIES

- PI, *Simons Foundation, 2015–2020*
- PI, *UNCG New Faculty Grant, 2015*
- Funding support for participating IMA and the Hong Kong University of Science and Technology sponsored workshop, "Statistics and Computational Interface to Big Data, January 3-16, 2015
- PI, *OU-Beaumont Multidisciplinary Research Award,2011–2012*
- PI, *OU Faculty Research Fellowships, 2009–September 2009*
- AWM-NSF Travel Grant, The 8th ICSA International Conference, Guangzhou, China, 2010
- One of the local organizers for International Conference on Advances in Interdisciplinary Statistics and Combinatorics, UNC Greensboro, October 10-12, 2014
- One of the local organizers for SIAM Great Lakes Section 2011 Spring Meeting, Modeling and numerical PDEs in mathematical biology and applications, Oakland University, Rochester, Michigan. Organizing committee: Dorin Drignei, Xiaoli Gao, Harvey Qu, Libin Rong (Co-chair), Meir Shillor, and Wen Zhang (Co-chair), April 2011, April 2011
- One of the international organizers for International Workshop on the Perspectives on High-dimensional Data Analysis III, University of British Columbia, Vancouver, Canada. Organizing Committee: S. Ejaz Ahmed (chair), Timothy D. Johnson(vice chair), Jiahua Chen (vice chair).

COLLABORATORS

Ejaz Ahmed, (Brock University, Canada), *Jingxiang Chen* (UNC), *Yixin Fang* (New York University), *Yang Feng* (Columbia University), *Yulia Gel* (University of Waterloo, Canada), *Xiaoqian Jiang* (UC San Diego), *Yufeng Liu* (UNC), *Bin Luo* (UNCG), *Sijian Wang* (University Wisconsin-Madison) *Yuan Wu* (Duke University), *Xiangqun Zeng* (Oakland University)

GRADUATE ADVISEES

Bin Luo (Current M.S. Student, University of North Carolina at Greensboro)

Yu Song (M.S. thesis Committee Chair, Sr. Associate Risk III, Ally Financial Inc.)

SAT GUPTA
BIOGRAPHICAL SKETCH
http://www.uncg.edu/mat/faculty/sngupta/

PROFESSIONAL PREPARATION

Colorado State University	Statistics	Ph.D., 1987
University of Delhi	Mathematics	Ph.D., 1977

APPOINTMENTS

Aug 2004-Present	Professor of Statistics, University of North Carolina at Greensboro
August 2001 – Present	Associate Head, Department of Math/Stats, UNC Greensboro
Sep 1977-Aug 2004	Professor of Statistics, University of Southern Maine
Sep 1990-Aug 1997	Associate Professor of Statistics, University of Southern Maine
Sep 1986-Aug 1990	Assistant Professor of Statistics, University of Southern Maine

SELECTED PUBLICATIONS (out of 107 till date)

- Boes, D., Davis, R., and Gupta, S. (1989): Parameter Estimation in Low Order Fractionally Differenced ARMA Processes, *Journal of Stochastic Hydrology and Hydraulics*, Vol. 3, 97-110
- Gupta, S. (1992): Estimation in Long Memory Time Series Models. *Communications in Statistics: Theory and Methods*, Vol. 21, no.5, 1327-1338
- Gupta, S., Gupta, B., Singh, S. (2002: Estimation of the Sensitivity Level of Personal Interview Survey Questions. *Journal of Statistical Planning and Inference,* Vol. 100, pp. 239-247
- Shabbir, J. and Gupta, S. (2006): A New Estimator of Population Mean in Stratified Sampling. *Communications in Statistics – Theory and Methods,* Vol. 35, No. 7, 1201-1209
- Gupta, S. and Shabbir, J. (2007): On Improvement in Variance Estimation Using Auxiliary Information. *Communications in Statistics – Theory and Methods*, Vol. 36, No 12, 2177-2185
- Gupta, S. and Shabbir, J. (2007): On the Use of Transformed Auxiliary Variables in Estimating Population Mean by Using Two Auxiliary Variables. J*ournal of Statistical Planning and Inference,* Vol. 137, No. 5, 1606-1611
- Shabbir, J. and Gupta, S. (2008): On Improvement in Estimating the Population Mean in Simple Random Sampling. *Journal* of *Applied Statistics,* Vol. 35, No.5, 559-566
- Shabbir, J. and Gupta, S. (2010). Some Estimators of Finite Population Variance of Stratified Sample Mean. *Communications in Statistics – Theory and Methods,* Vol. 39, 3001-3008
- Gupta, S., Shabbir, J. and Sehra, S. (2010). Mean and Sensitivity Estimation in Optional Randomized Response Models. *Journal of Statistical Planning and Inference,* Vol. 140, 2870-2874
- Shabbir, J. and Gupta, S. (2011). On Estimating Finite Population Mean in Simple and Stratified Random Sampling. *Communications in Statistics – Theory and Methods*, Vol. 40, No. 2, 199-212.
- Gupta, S., Shabbir, J., Sousa, R., Corte-Real, P. (2012): Estimation of the Mean of a Sensitive Variable in the Presence of Auxiliary Information. *Communications in Statistics – Theory and Methods,* Vol. 41, No. 13-14, 2394-2404
- Gupta, S., Mehta, S., Shabbir, J. and Dass, B. K. (2013). Generalized scrambling in quantitative optional randomized response models, *Communications in Statistics - Theory and Methods*, Vol. 42, No. 22, 4034-4042
- Shabbir, J. and Gupta, S. (2014): An improved generalized difference-cum-ratio type estimator for the population variance in two phase sampling using two auxiliary variables. *Communications in Statistics – Simulation and Computation*, Vol. 43 (10), 2540-2550
- Shabbir, J., Haq, A. and Gupta, S. (2014): A New Difference-Cum-Exponential Type Estimator of Finite Population Mean in Simple Random Sampling. *Revista Colombiana de Estadística,*

Vol. 37, No. 1, 199-211

- Gupta, S., Kalucha, G. and Shabbir, J. (2015): A Regression Estimator for Finite Population Mean of a Sensitive Variable Using an Optional Randomized Response Model. To appear in *Communications in Statistics – Simulation and Computation.*
- Shabbir, J., Gupta, S. (2015): On Generalized Exponential Chain Ratio Estimators Under Two-Phase Stratified Random Sampling. To appear in *Communications in Statistics - Theory and Methods*

SELECTED RESEARCH TALKS (out of 104 till date)

- Validation of Partial Randomized Response Technique to Circumvent Social Desirability Response Bias in Personal Interview Survey Questions - at the International Conference on Statistics, Combinatorics and Related Areas held at University of Wollongong, Australia from Dec 19-21, 2001.
- Improved Estimation of Finite Population Mean under Different Sampling Designs - at New University of Lisbon, December 2004.
- Estimation of Population Mean using Transformed Auxiliary Variables - at Indian Agricultural Statistics Research Institute, New Delhi, December 13, 2005.
- Circumventing Social Desirability Response Bias using RRT Models – **KEYNOTE TALK** at the 8th Islamic Countries Conference on Statistical Sciences held at Lahore, Pakistan, December 19, 2005.
- Mean Estimation using Transformed Auxiliary Variables - at the International Statistics Conference on Statistics in the Technological Age, Kuala Lumpur, Malaysia, December 27-31, 2005.
- A Two-Stage Optional Randomized Response Model – at the International Conference on Interdisciplinary Mathematical and Statistical techniques, Institute of Science and Technology, Shanghai, China, May 20-23, 2007
- Two-Stage Optional RRT Models – invited talk at The Bowling Green State University, October 17, 2008
- Additive vs. Multiplicative Scrambling in Two-step Optional RRT Models – Invited talk at the University of Texas at San Antonio, January 15, 2010
- Optimality Issues in Two-Stage Optional RRT Models – Invited talk at University of Memphis, October 27, 2011
- Additive, Multiplicative and Generalized Scrambling in Two-Stage Optional RRT Models - Invited talk at Lehigh University, November 18, 2011
- Two-Stage Optional RRT Models – Invited talk at the UAE University, Al Ain, March 11, 2012
- Recent Developments in RRT Models – Invited talk at the LSU Health Sciences Center, New Orleans, May 14, 2012
- Randomized Response Models: Efficiency vs. Privacy Protection – Invited talk at Statistics Department, Hacettepe University in Ankara, March 14, 2013
- Optional Randomized Response Models: Efficiency vs. Privacy Protection – Invited talk at UNC-Chapel Hill, March 25, 2013
- New Paradigms in RRT Models, invited talk at the University of Louisiana, Lafayette, February 11, 2014
- Ratio and Regression Estimation of Finite Population Mean Using Optional Randomized Response Models - Invited talk at the LinStat International Conference held at Linkoping University, Sweden, August 25-28, 2014

SYNERGISTIC ACTIVITIES

- Organized and chaired three large NSF- funded international conferences at UNCG (http://www.uncg.edu/mat/aisc/2014/index.html). A special feature of these conferences was to groom young researchers.
- Co-organizer of annual NSF funded UNCG student research conferences since 2007
- Collaborated with researchers from many disciplines including anthropology, biology, education, marine biology, medicine, nursing, public health, and psychology.

EDITED BOOK VOLUMES AND JOURNALS

- Chief Editor, *Journal of Statistical Theory and Practice (*http://www.tandfonline.com/loi/UJSP20*),*
- Edited Volume: *Imprecision in Statistical Theory and Practice* (with Pauline Coolen Schrijner, Frank P.A. Coolen, Matthias C.M. Troffaes and Thomas Augustin), Grace Scientific Publishing (USA), 2009
- Edited Volume: *Advances in Quantitative Methods* (with C. R. Rao), Grace Scientific Publishing (USA), 2011

GRADUATE ADVISORS/ADVISEES

PhD Advisors:

Duane Boes (Colorado State University); Richard Davis (Columbia University); B. D. Sharma (University of Delhi, India)

PhD Dissertations Advisees:

Samridhi Mehta (University of Delhi, completed 2013)), Rita Sousa (New University of Lisbon, completed 2013)), Geeta Kalucha (University of Delhi, completing 2015), Jeong Sep Sihm (UNC Greensboro, ongoing), Tanja Zatezalo (UNC Greensboro, ongoing), Anu Chhabra (University of Delhi, ongoing)

Master's Thesis Advisor:

- **University of Southern Maine** - Sharat Gupta, Jacqueline Iannuzzi, Pradeep Jain, Xiaoyan Ji, Ashish Sharma, Chang Yu,
- **University of North Carolina at Greensboro** - Supriti Sehra, Jeong Sep Sihm

POST-DOCTORAL FELLOWS SPONSORED: 2

Nursel Koyuncu (Hacettepe University, Turkey) , Javid Shabbir (Quaid-I-Azam University)

COLLABORATORS AND OTHER AFFILIATIONS

Collaborators and Co-Editors:

Pedro Corte-Real (New University of Lisbon), Anu Chhabra (University of Delhi), L. W. Cowgill (University of Missouri), Mary Crowe (UNC Greensboro), B. K. Dass (University of Delhi), Tracy Spears Gill (UNC Greensboro), A. Haq (Quaid-I-Azam University), Eric Jones (UNC Greensboro), Geeta Kalucha (Delhi University), Nursel Koyuncu (Hacettepe University, Turkey) , Hasseb Kazi (Emory University), Zaheen Khan (Quaid-I-Azam University), Susan Letvak (UNC Greensboro), Samridhi Mehta (Delhi University), Art Murphy (UNC Greensboro), F. Norris (UNC Greensboro), G.Prabavathy (Pondicherry University), C. R. Rao (Penn State University), Erin Raspet (UNC Greensboro), Dave Remington (UNC Greensboro), Olav Rueppell (UNC Greensboro), Chris Ruhm (University of Virginia), Jan Rychtar (UNC Greensboro), Paul Sciulli (Ohio State University), S. Shaik (St. Lukes Hospital, Bethleham, PA), Supriti Sehra (UNCG), Javid Shabbir (Quaid-I-Azam University), Gwen Schug (Appalachian State University), Jeong Sep Sihm (UNC Greensboro), Rita Sousa (New University of Lisbon), J. Subramani (Pondicherry University, India), Anna Tuck UNC Greensboro)

Tracey Holliday Howell
Academic Professional, Department of Mathematics and Statistics
The University of North Carolina at Greensboro, Greensboro, NC 27402
Phone: 336 334 5836
thhowell@uncg.edu

Professional Preparation

The University of North Carolina at Greensboro, North Carolina, USA Mathematics B.A. (1994)
The University of North Carolina at Greensboro, North Carolina, USA Mathematics M.A. (1998)
The University of North Carolina at Greensboro, North Carolina, USA Mathematics Ph.D. (2013)

Appointments

Academic Professional, The University of North Carolina at Greensboro 2013-present
Project Manager, The University of North Carolina at Greensboro 2006-2013
Lecturer, The University of North Carolina at Greensboro 1998-2006

Publications

Blanchet-Sadri, S., & Howell, T. (2002). Note on decipherability of three-word codes. *International Journal of Mathematics and Mathematical Sciences*, *30*, 491-504.

Howell, T. & Wilson, P. H. (2014). The role of teachers' questions in support of students' articulation of their mathematical reasoning. In G. T. Matney & S. M. Che (Eds.), *Proceedings of the 41th Annual Meeting of the Research Council on Mathematics Learning* (pp. 105-112). San Antonio, TX.

Howell, T., & Berenson, S. (2011). Developing students' informal understanding of the commutative property of addition. In Wiest, L. R., & Lamberg , T. (Eds.), *Proceedings of the 33rd Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education,* p. 1892, Reno, NV.

Presentations

Howell, T. & Seaman, C. (2015). Using an emporium model in Precalculus: Lessons learned and next steps. Paper presented at the annual meeting of the *Research Council on Mathematics Learning*, Las Vegas, NV.

Howell, T. (2014). The role of teachers' questions in support of students' articulation of their mathematical reasoning. Paper presented at the annual meeting of the *Research Council on Mathematics Learning*, San Antonio, TX.

Wilson, P.H., & Howell, T. (2013). Supporting secondary mathematics teachers in the implementation of the CCSSM: Math II. Professional development presented at the annual meeting of the *North Carolina Council of Teachers of Mathematics*, Greensboro, NC.

Howell, T. & Wilson, P.H. (2013). Supporting mathematics classroom discourse in traditionally low performing schools. Paper presented at the annual meeting of *Association of Mathematics Teacher Educators*, Orlando, FL.

Howell, T. & Wilson, P.H. (2013). Teachers' support for developing students' mathematical argumentation. Paper presented at the *Research Pre-session of the National Council of Teachers of Mathematics*, Denver, CO.

Howell, T. (2012). The four-year evolution of a professional development series and its positive impact on participating teachers. Paper presented at the 39th Annual Meeting of the *Research Council on Mathematics Learning*, Charlotte, NC.

Howell, T., & Berenson, S. (2011). Developing students' informal understanding of the commutative property of addition. Poster presented at the 33rd Annual Meeting of the *North American Chapter of the International Group for the Psychology of Mathematics Education,* p. 1892, Reno, NV.

Holcombe, A., Sonricker, L., Wilds, R., Rose, G., Miller, J., & Howell, T. (2010). Increasing math teacher effectiveness for student achievement gains. Presentation at the meeting of *Charting the Course for School-Based Professional Learning*, Seattle, WA.

Synergistic Activities
- Advise all first year mathematics majors, 2014-present.
- Advise incoming freshman during UNCG's SOAR sessions, 2014, 2015.
- Serve as faculty advisor for Alpha Student Chapter of NCCTM, 2014-present.
- Organize State Mathematics Contest held annually at UNCG, 2014, 2015.
- Serve as NCCTM Conference Committee Co-Chair, 2014, 2015.
- Co-led team of mathematics educators to deliver professional development sessions across North Carolina for high school mathematics teachers as a part of a NC Department of Public Instruction project, 2013-2014.
- Managed a six-year, $3.2 million project working with the teachers in ten traditionally low-performing high schools, planned professional development experiences, mentored teachers, and assisted with technology in the classroom, 2006-2013.

Collaborators and Other Affiliations
Collaborators: *S. Berenson*, UNCG emeritus, *F. Blanchet-Sadri*, UNCG, *C. Seaman*, UNCG, *P. Wilson*, UNCG, *A. Uprichard*, UNCG emeritus
Graduate Advisors: Dr. F. Blanchet-Sadri (UNCG), Dr. S. Berenson (UNCG), Dr. P. Wilson (UNCG)

Petty 141
317 College Avenue
Greensboro, NC 27412

EDUCATION

The University of Tennessee	Mathematics	Ph.D.	2013.
Georgia College and State University	Mathematics	B.S.	2007.

APPOINTMENTS

Assistant Professor	UNCG	Fall 2013 – Present.
Graduate Teaching Associate	UTK	Fall 2008 – Summer 2013.
Graduate Teaching Assistant	UTK	Fall 2007 – Summer 2008.

PUBLICATIONS

Refereed Publications

1. T. Lewis. *Distributional derivatives and the stability of discontinuous Galerkin finite element approximation methods.* Elec. J. Diff. Eq. *Accepted.* 2015.

2. W. Feng, T. Lewis, and S. Wise. *Discontinuous Galerkin derivative operators with applications to second order elliptic problems and stability.* Mathematical Meth. in App. Sciences, DOI: 10.1002/mma.3440. 2015.

3. X. Feng and T. Lewis. *Mixed interior penalty discontinuous Galerkin methods for fully nonlinear second order elliptic and parabolic equations in high dimensions.* Numer. Methods Partial Differential Equations, Special Issue on Geophysical Flows. Volume 30, Issue 5, p. 1538 – 1557. 2014.

4. T. Lewis and M. Neilan. *Convergence analysis of a symmetric dual-wind discontinuous Galerkin method.* J. Sci. Comput. Volume 59, Issue 3, p. 602 – 625. 2014.

5. X. Feng and T. Lewis. *Mixed interior penalty discontinuous Galerkin methods for one-dimensional fully nonlinear second order elliptic and parabolic equations.* J. Comp. Math. Volume 32, Issue 2, p. 107 – 135. 2014.

6. X. Feng and T. Lewis. *Local discontinuous Galerkin methods for one-dimensional second order fully nonlinear elliptic and parabolic equations.* J. Sci. Comput. Volume 59, Issue 2, p. 129 – 157. 2014.

7. X. Feng, C. Kao, and T. Lewis. *Convergent finite difference methods for one-dimensional fully nonlinear second order partial differential equations*, J. Comput. Appl. Math. Volume 254, p. 81 – 98. 2013.

8. Y. Liu, C. C. Havener, T. L. Lewis, A. Galindo-Uribarri, and J. R. Beene. *Purification of Radioactive Ion Beams by Photodetachment in a RF Quadrupole Ion Beam Cooler.* AIP Conf. Proc. 1097 – Proceedings of the 1st International Symposium on Negative Ions, Beams and Sources, pp. 431-442. 2009.

Journal Papers in Review

9. X. Feng, T. Lewis, and M. Neilan. *Discontinuous Galerkin finite element differential calculus and applications to numerical solutions of linear and nonlinear partial differential equations.* submitted. `arxiv.org/abs/1302.6984`.

Journal Papers in Preparation (Expected Fall 2015 Submission)

10. X. Feng and T. Lewis. *Generalized monotone finite difference methods for approximating viscosity solutions of second order partial differential equations.*

11. X. Feng and T. Lewis. *Nonstandard local discontinuous Galerkin methods for fully nonlinear second order elliptic and parabolic equations in high dimensions.*

PRESENTATIONS

Conference Presentations

1. *The Dual-Wind Discontinuous Galerkin Method.* SIAM Central States Section Meeting – Special Session on Recent Advances in Finite Element Methods, Rolla, MO, April 12, 2015.

2. *Convergent Finite Difference Methods for Fully Nonlinear Second Order Partial Differential Equations.* Joint Math Meetings – AMS Session on Numerical Analysis and Computer Science, San Antonio, TX, January 11, 2015.

3. *A discontinuous Galerkin differential calculus and applications to numerical partial differential equations.* MSU Conference on Differential Equations and Computational Simulations, Starkville, MS, October 25, 2014.

4. *Motivating a Penalty-Free DG Method for Elliptic Problems.* The Finite Element Circus, Detroit, MI. March 28, 2014.

5. *The Dual-Wind Discontinuous Galerkin Method.* AMS Spring Southeastern Section Meeting – Special Session on Discontinuous Galerkin Finite Element Methods for Partial Differential Equations, Knoxville, TN. March 22, 2014.

6. *Nonstandard local discontinuous Galerkin methods for fully nonlinear second order elliptic PDEs.* The Finite Element Circus, Pittsburgh, PA. October 19, 2012.

7. *Local discontinuous Galerkin methods for fully nonlinear second order elliptic PDEs.* The Finite Element Circus, Piscataway, NJ. April 10, 2012.

8. *Mixed and local discontinuous Galerkin methods for fully nonlinear second order partial differential equations.* AMS Spring Southeastern Section Meeting – Special Session on Recent Developments of Finite Element Methods for Partial Differential Equations, Tampa, FL. March 10, 2012.

9. *Numerical methods for second order elliptic PDEs of non-divergence form.* SIAM Southeastern Atlantic Section Meeting – Special Session on Numerical Partial Differential Equations, Charlotte, NC. March 26, 2011.

10. *Selective Suppression of Sulfur by Photodetachment in an RF Quadrupole Ion Cooler.* Annual Meeting of the DNP of the APS – Mini-Symposium on the CEU 10th Anniversary, Newport News, VA. October 11, 2007.

11. *Selective Suppression of Sulfur by Photodetachment in an RF Quadrupole Ion Cooler.* Sixth Summer School on Exotic Beam Physics, East Lansing, MI. August 6-11, 2007.

Invited Seminar Presentations

12. *Numerical Differentiation and its Application to Boundary Value Problems.* Winthrop University REU – Bridging Applied and Theoretical Mathematics, Rock Hill, SC. June 11, 2015.

13. *Finite Difference Methods for Nonlinear Partial Differential Equations.* NC A&T Joint Physics and Mathematics Colloquium, Greensboro, NC, October 27, 2014.

14. *Numerical Differentiation and the Approximation of Boundary Value Problems.* WFU Mathematics Colloquium, Winston-Salem, NC, September 10, 2014.

15. *Finite Difference and Discontinuous Galerkin Methods for Fully Nonlinear Second Order PDEs.* PITT Computational Mathematics Seminar, Pittsburgh, PA. February 18, 2014.

16. *Finite Difference Methods for Fully Nonlinear Second Order PDEs and Applications.* UNCG Math Dept. Colloquium, Greensboro, NC. March 1, 2013.

17. *Finite Difference and Discontinuous Galerkin Numerical Methods for Fully Nonlinear Second Order PDEs with Applications to Stochastic Optimal Control.* CSM Applied Math Seminar, Oak Ridge National Laboratory, TN. January 23, 2013.

UNCG Seminar Presentations

18. *Numerical Differentiation and its Application to Boundary Value Problems.* Math-Bio REU at UNCG, Greensboro, NC. June 16, 2015.

19. *An Introduction to Numerical Differentiation and its Application to Differential Equations.* Math-Bio REU at UNCG, Greensboro, NC. July 16, 2014.

20. *Survey of Numerical PDEs – The Interior-Penalty Discontinuous Galerkin Method (IPDG).* UNCG Applied Math Seminar, Greensboro, NC. October 21, 2013.

21. *Survey of Numerical PDEs – The Finite Element Method.* UNCG Applied Math Seminar, Greensboro, NC. October 7, 2013.

SYNERGISTIC ACTIVITIES

Organizer

M. Chhetri, R. Fabiano (Chair), T. Lewis, and R. Shivaji, *The 35th Southeastern Atlantic Regional Conference on Differential Equations*, The University of North Carolina at Greensboro, Greensboro, NC, October 10 – 11, 2015.

S. Brenner, J. Gedicke, and T. Lewis, *Special Session on Discontinuous Galerkin Finite Element Methods*, AMS Southeastern Sectional Meeting, The University of North Carolina at Greensboro, Greensboro, NC, November 8 – 9, 2014.

Referee

North Carolina Journal of Mathematics and Statistics.

HONORS and AWARDS

Faculty First Summer Scholarship Support Award Recipient, 2015.

Faculty Excellence in Research and Creative Activity Honoree, 2015.

MAA Project NExT (New Experiences in Teaching) Fellow, 2014 – 2015.

COLLABORATORS

Xioabing Feng (University of Tennessee), Wenqiang Feng (University of Tennessee), Chiu-Yen Kao (Claremont McKenna College), Michael Neilan (University of Pittsburgh), Steven Wise (University of Tennessee).

Biographical Sketch

Sebastian Pauli

www.uncg.edu/~s_pauli

Professional Preparation

Technische Universität Berlin, Germany	Mathematics	Diplom (MA), 1997
Concordia University in Montreal, Quebec, Canada	Mathematics	PhD, 2001
Concordia University in Montreal, Quebec, Canada	Mathematics	PostDoc 2002
Technische Universität Berlin, Germany	Mathematics	PostDoc 2002–2006

Appointments

The University of North Carolina Greensboro, Associate professor since 2012

The University of North Carolina Greensboro, Assistant professor from 2006 to 2012

Publications

(1) T. Binder, S. Pauli, and F. Saidak, *Zeros of high derivatives of the Riemann zeta function*, Rocky Montain Journal of Mathematics (2015), to appear

(2) J. Milstead, S. Pauli, and B. Sinclair, *Computing splitting fields of polynomials over local fields*, Collaborative Mathematics and Statistics Research – Topics from the 9th UNCG Regional Mathematics and Statistics Conference, Proceedings in Mathematics and Statistics, vol. 109, Springer, New York, 2014

(3) R. Farr and S. Pauli, *More zeros of the derivatives of the Riemann zeta function on the left half plane*, Topics from the 8th UNCG Regional Mathematics and Statistics Conference, Proceedings in Mathematics and Statistics, vol. 64, Springer, New York, 2013

(4) A. Boseman and S. Pauli, *On the zeros of $\zeta(s) - c$*, Involve **6** (2013), no. 2, 137–146

(5) C. Greve and S. Pauli, *Ramification polygons, splitting fields, and Galois groups of Eisenstein polynomials*, Int. J. Number Theory **8** (2012), no. 6, 1401–1424

(6) J. Guàrdia, E. Nart, and S. Pauli, *Single-factor lifting and factorization of polynomials over local fields*, J. Symbolic Comput. **47** (2012), no. 11, 1318–1346

(7) S. Pauli, *Factoring polynomials over local fields II*, Algorithmic number theory, Lecture Notes in Comput. Sci., vol. 6197, Springer, Berlin, 2010, pp. 301–315

(8) J.-F. Jaulent, S. Pauli, M. E. Pohst, and F. Soriano-Gafiuk, *Computation of 2-groups of narrow logarithmic divisor classes of number fields*, J. Symbolic Comput. **44** (2009), no. 7, 852–863

(9) J.-F. Jaulent, S. Pauli, M. E. Pohst, and F. Soriano-Gafiuk, *Computation of 2-groups of positive classes of exceptional number fields*, J. Théor. Nombres Bordeaux **20** (2008), no. 3, 715–732

(10) S. Freundt, A. Karve, A. Krahmann, and S. Pauli, *KASH: recent developments*, Mathematical software—ICMS 2006, Lecture Notes in Comput. Sci., vol. 4151, Springer, Berlin, 2006, pp. 170–181

(11) A. Karve and S. Pauli, *GiANT: graphical algebraic number theory*, J. Théor. Nombres Bordeaux **18** (2006), no. 3, 721–727

(12) S. Pauli, *Constructing class fields over local fields*, J. Théor. Nombres Bordeaux **18** (2006), no. 3, 627–652

(13) J. Klüners and S. Pauli, *Computing residue class rings and Picard groups of orders*, J. Algebra **292** (2005), no. 1, 47–64

(14) F. Diaz y Diaz, J.-F. Jaulent, S. Pauli, M. Pohst, and F. Soriano-Gafiuk, *A new algorithm for the computation of logarithmic l-class groups of number fields*, Experiment. Math. **14** (2005), no. 1, 65–74

(15) S. Pauli and F. Soriano-Gafiuk, *The discrete logarithm in logarithmic l-class groups and its applications in K-theory*, Algorithmic number theory, Lecture Notes in Comput. Sci., vol. 3076, Springer, Berlin, 2004, pp. 367–378

(16) C. J. Cummins and S. Pauli, *Congruence subgroups of* PSL(2, ℤ), Symmetry in physics, CRM Proc. Lecture Notes, vol. 34, Amer. Math. Soc., Providence, RI, 2004, pp. 23–29

(17) C. J. Cummins and S. Pauli, *Congruence subgroups of* PSL(2, ℤ) *of genus less than or equal to 24*, Experiment. Math. **12** (2003), no. 2, 243–255

(18) D. Ford, S. Pauli, and X.-F. Roblot, *A fast algorithm for polynomial factorization over* $\mathbb{Q}_p$, J. Théor. Nombres Bordeaux **14** (2002), no. 1, 151–169

(19) F. Hess, S. Pauli, and M. E. Pohst, *Computing the multiplicative group of residue class rings*, Math. Comp. **72** (2003), no. 243, 1531–1548 (electronic)

(20) S. Pauli, *Factoring polynomials over local fields*, J. Symbolic Comput. **32** (2001), no. 5, 533–547

(21) S. Pauli and X.-F. Roblot, *On the computation of all extensions of a p-adic field of a given degree*, Math. Comp. **70** (2001), no. 236, 1641–1659 (electronic)

Synergistic Activities

Conference and Workshop Organization

- with Filip Saidak, Brett Tangedal, and Dan Yasaki: UNCG Summer School in Computational Number Theory – Zeta Functions – New Theory and Computations in May 2015
- with Filip Saidak, Brett Tangedal, and Dan Yasaki: UNCG Summer School in Computational Number Theory – Modular Forms and Geometry in May 2014
- with Filip Saidak, Brett Tangedal, and Dan Yasaki: UNCG Summer School in Computational Number Theory – Computational Algebraic Number Theory in May 2013
- with Filip Saidak, Brett Tangedal, and Dan Yasaki: UNCG Summer School in Computational Number Theory – A Computational Approach to L-functions in May 2012
- with Filip Saidak, Brett Tangedal, and Dan Yasak: Palmetto Number Theory Series (PANTS XIII) at UNCG in September 2010
- with Filip Saidak, Brett Tangedal, and Dan Yasaki: SERMON 2009 (Southeast Regional Meeting On Numbers) at UNCG in April 2009
- with Florian Hess and Michael Pohst: ANTS VII (Algorithmic Number Theory Symposium) at Technische Universität Berlin in July 2006

Software Development

- Contributions to the computer algebra systems KANT and Magma since 1995.
- With Sebastian Freundt and Robert Fraatz: QaoS Databases for Algebraic Objects
- With Brian Sinclair: SpartanTeX (`http://tex.uncg.edu`)

Collaborators & Other Affiliations

Collaborators and Co-Editors

Thomas Binder, Universität Lübeck, Germany
John Cannon, Computational Algebra Group, University of Sydney, Australia
Chris Cummins, Concordia University, Montreal
Claus Fieker, Computational Algebra Group, University of Sydney, Australia
David Ford, Concordia Univeristy, Montreal
Jordi Guardia, Universitat Politècnica de Catalunya, Spain
Florian Hess, , Universität Oldenburg, Germany
Jean François Jaulen, Université Bordeaux I, France
Jürgen Klüners, Universtät Paderborn, Germany
Enric Nart, Universitat Autònoma de Barcelona, Spain
Michael Pohst, TU Berlin
Xavier Roblot, Université Lyon, France
Filip Saidak, The University of North Carolina Greensboro
Florence Soriano-Gafiuk, Université Metz, France

Graduate Advisors and Postdoctoral Sponsors

Michael Pohst, Diplomarbeit advisor and Post-doctoral sponsor, TU Berlin
David Ford, PhD advisor, Concordia University, Montreal
Chris Cummins, Post-doctoral sponsor, Concordia University, Montreal
John Cannon, Visiting scholar sponsor, University of Sydney

Thesis Advisor and Postgraduate-Scholar Sponsor

Lance Everhart, MA student (current), UNCG
Ricky Farr, PhD student (current), UNCG
Jonathan Milstead, PhD advisor (current), UNCG
Thomas Parrish, Honors advisor (2014), UNCG
Brian Sinclair, PhD student (2015), UNCG

To date I have advised one PhD student and ond disciplinary honors student. Currently I am directing two PhD students and one Masters student.

SCOTT RICHTER
BIOGRAPHICAL SKETCH

PROFESSIONAL PREPARATION

Jacksonville University	Mathematics	B.S. 1986
University of North Florida	Mathematical Science	M.A. 1991
Oklahoma State University	Statistics	PhD 1997

APPOINTMENTS

2014-Present	Professor, University of North Carolina at Greensboro
2005-2014	Associate Professor, University of North Carolina at Greensboro
2003-Present	Director, Statistical Consulting Center, University of North Carolina at Greensboro
2001-2005	Assistant Professor, University of North Carolina at Greensboro
1997-2001	Assistant Professor, Western Kentucky University

SELECTED PUBLICATIONS

- Phillips, S., Richter, S., Teglas, S., Bhatt, I., Morehouse, R., Hauser, E & Henrich, V. (2015). Feasibility of a bilateral 4-6kHz notch as a phenotype for genetic association analysis. *International Journal of Audiology*.
- Richter, S. J. & Stavn, R. (2014). Determining Functional Relations in Multivariate Oceanographic Systems: Model II Multiple Linear Regression. *Journal of Atmospheric and Oceanic Technology*, 31, 1663-1672. (DOI: 10.1175/JTECH-D-13-00210.1)
- Saari, S., Richter, S. J. & Faeth, S. (2014). Bottom-up regulates top-down: hybridization of plant symbionts negatively affects predators. *Oikos*, 123(5), 545-552. (DOI: 10.1111/j.1600-0706.2013.00690.x)
  Richter, S. J. and McCann, M. H. (2013). Simultaneous Multiple Comparisons with a Control Using Medians and Permutation Tests. *Statistics and Probability Letters*, 83(4) 1167-1173. (DOI:10.1016/j.spl.2013.01.014)
- Richter, S. J. and McCann, M. H. (2012). Using the Tukey-Kramer Test as the Omnibus Test in the Hayter-Fisher Procedure. *British Journal of Mathematical and Statistical Psychology*, 65, 499-510. (DOI:10.1111/j.2044-8317.2012.02041.x)
- Richter, S. J. and McCann, M. H. (2009). Step-down Multiple Comparison Procedures based on Medians and Permutation Tests. *Communications in Statistics: Simulation and Computation,* 38 (8), 1551-1561. (DOI: 10.1080/03610910903039465)
- Phillips, S. L., Richter, S. J., McPherson, D. (2009). Voiced initial consonant perception deficits in older hearing-impaired listeners with good and poor speech perception. *Journal of Speech, Learning and Hearing Research*, 52, 118-129.
- Stavn, R. H. and Richter, S. J. (2008). Biogeo-optics: Particle Optical Properties and the Partitioning of the Spectral Scattering Coefficient of Ocean Waters. *Applied Optics*, 47(14) 2660-2679.
- Richter, S. J. & McCann, M. H. (2007). Multiple Comparisons Using Medians and Permutation Tests. *Journal of Modern Applied Statistical Methods*, 6(2), 399-412.
- Kirchoff, B. K., Richter, S. J., and Remington, D. L. (2007). Characters as Groups: A New Approach to Morphological Characters in Phylogenetic Analysis. *Taxon*, 56, 479-492.
- Payton, M. E., Richter, S. J., Giles, K., L., & Royer, T. A. (2006). On Transformations of Count Data for Tests of Interaction in Factorial and Split-Plot Experiments. *Journal of Economic Entomology*, 99(3): 1002-1006.

- Richter, S. J. and Payton, M. E. (2005). An Improvement to the Aligned Rank Statistic for Two-factor Analysis of Variance. *Journal of Applied Statistical Science,* 14(3/4), 225-236.
- Kirchoff, B. K., Richter, S. J., Remington, D. L. and Wisniewski, E. (2004). Complex Data Produce Better Characters. *Systematic Biology*, 53(1), 1-17.
- Richter, S. J. and Payton, M.E. (2003). Using SAS to Perform Two-Way Analysis of Variance Under Variance Heterogeneity. *Journal of Modern Applied Statistical Methods*, 2(2), 520-524.
- Richter, S. J. and Payton, M.E. (2003). Performing Two-Way Analysis of Variance Under Variance Heterogeneity. *Journal of Modern Applied Statistical Methods*, 2(1), 152-160.
- Richter, S. J. & Richter, C. (2002). A method for determining equivalence in industrial applications. *Quality Engineering*, 14(3), 375-380.
- Richter, S. J. & Payton, M. E. (1999). Nearly Exact Tests in Factorial Experiments Using the Aligned Rank Transform. *Journal of Applied Statistics,* 26(2), 203-217.

SELECTED RESEARCH TALKS

- *Nonparametric methods for comparing particle size distributions* (with M. H. McCann). 2014 Joint Statistical Meetings, Boston, MA.
- *Comparing scale using medians and permutation tests* (with M. H. McCann). 2013 Joint Statistical Meetings, Montreal, Quebec.
- *Using the Tukey-Kramer Omnibus Test in the Hayter-Fisher Procedure.* (with M. H. McCann), 2012 Joint Statistical Meetings, San Diego, CA.
- *Simultaneous Confidence Intervals for Location Using Medians and Permutation Tests* (with M. H. McCann), 2011 Joint Statistical Meetings, Miami, FL.
- *Simultaneous Pairwise Comparisons with a Control Using Medians and Permutation Tests* (with M. H. McCann), 2010 Joint Statistical Meetings, Vancouver, BC.
- *A Step-down multiple comparison procedure using medians and permutation tests* (with M. H. McCann), 2008 Joint Statistical Meetings.
- *A Step-down multiple comparison procedure based on Tukey's HSD and the "Tukey 2-step"* (with M. H. McCann), 2007 International Conference on Advances in Statistics and Combinatorics.
- *Step-down Multiple Comparison Based on the Studentized Range Distribution* (with M. H. McCann), 2007 Joint Statistical Meetings.
- *Stepwise Permutation Tests Using Medians* (with M. H. McCann), 2006 Joint Statistical Meetings.
- *Multiple Comparisons of Medians Using Permutation Tests* (with M. H. McCann), 2005 Joint Statistical Meetings.
- *On Transformations of Count Data for Tests of Interaction in Factorial and Split-Plot Experiments* (with M. E. Payton), 2005 Joint Statistical Meetings.
- *Multiple Comparisons Using Medians* (with M. H. McCann), 2004 Joint Statistical Meetings.
- *An Improvement to the Aligned Rank Statistic for Two-factor Analysis of Variance* (with M.E. Payton), 2003 Joint Statistical Meetings.
- *Using Rank Transformations in Multifactor Analysis of Variance* (with M.E. Payton), Fall 2001 Mathematical Sciences Department Colloquium, UNCG.
- *Introduction to Equivalence Testing* (with C. Richter), Fall 2000 Mathematics Department Colloquium, Western Kentucky University.
- *The Aligned Rank as an Alternative to Traditional Ranking Methods for the Analysis of Factorial Experiments* (with M.E. Payton), 2000 Joint Statistical Meetings.
- *Using Ranks to Perform Exact and Estimated Exact Tests in Designed Experiments* (with M.E. Payton), 1997 Joint Statistical Meetings.

SYNERGISTIC ACTIVITIES
- Organizing Committee: UNCG—International Conference on Interdisciplinary Statistics and Combinatorics (2007, 2012, 1014)
- Faculty mentor, National Science Foundation Grants: UMB Group--Mathematical and Biological Undergraduate Research Training at UNCG, $233,820, 2009-20012.
- Faculty mentor, National Science Foundation Grants: REU Site--Interdisciplinary Quantitative Science REU at UNCG, $60,321, 2009-20011.
- Co-PI, National Institutes of Health Grants: Noise Induced Hearing Loss: Threshold, Exposure and Genetic Susceptibility, $384,000, 2010-2013; TRIAD 2 Center for Health Disparities Research, $4,792,825, 2012-2016.
- Presented workshops for researchers at UNCG: *Introduction to R for Data Analysis* (2015), *Regression Analysis* (2015), *Power and Sample Size for Research Studies* (2012), *Connecting Your Aims, Design and Quantitative Analyses* (with C. Buehler, 2012).

GRADUATE ADVISORS/ADVISEES
- *PhD Advisor*: Mark Payton (Oklahoma State University
- *Graduate Advisees*: R. L. Jenkins (UNCG, 2004), D. E. Poole (UNCG, 2005), W. M. Wilder (UNCG, 2006), Q. Shi (UNCG, 2008), R. White (UNCG, 2008), M. Higgins (UNCG, 2012), S. Brown (UNCG, 2012), J. Lail (UNCG, 2015).

COLLABORATORS AND OTHER AFFILIATIONS
Collaborators and Co-Editors

S. Phillips, S. Teglas, V. Henrich, R. Stavn, S. Saari, S. Faeth, J. Taylor, J. Waxman, S. Shultz, E. P. Lacey, E. R Anderson, M.B Lovin, R. Cannon, N. H. Oberlies, N. Cech, B. Kirchoff, J. Su, V. Gargeya, D. Remington, D. Wallace, J. Dharod, S. Gupta, S. Suthaharan, M. Chhetri, J. Rychtar (UNCG); M. McCann, M. Payton (Oklahoma State University)

BIOGRAPHICAL SKETCH – JONATHAN T. ROWELL

PROFESSIONAL PREPARATION

University of North Carolina at Wilmington, Mathematics B.S. (1995)
University of North Carolina at Wilmington, Physics B.A. (1995)
North Carolina State University, Applied Mathematics M.S. (1997)
North Carolina State University, Biomathematics M.BMA. (2000)
Cornell University, Applied Mathematics Ph.D. (2003)

APPOINTMENTS (SINCE 2006)

Assistant Professor, University of North Carolina at Greensboro 2013-present
Lecturer, University of North Carolina at Greensboro 2012-2013
Postdoctoral Research Associate, University of North Carolina at Chapel Hill 2007-2010
Postdoctoral Research Associate, University of Tennessee 2006-2007.

PUBLICATIONS – CURRENT AND IN SUBMISSION

Galanter*, Nina, Dennis Silva, Jr.*, Jonathan T. Rowell, and Jan Rychtar. (In review) "The Territorial Raider Model Applied to Multi-Group Interactions."

Galanter*, Nina, Dennis Silva, Jr.*, Jonathan T. Rowell, and Jan Rychtar. (In review) "The Territorial Raider Game and Graph Derangements."

Thompson*, Eli, Jasmine Everett*, Jonathan T. Rowell, Jan Rychtar, and Olav Rueppell. (In review) "Neighborhood Size and MemoryEffects in a Spatial Prisoner's Dilemma Game."

Reding*, Ilona, Michael Kelley*, Jonathan T. Rowell, and Jan Rychtar. (In review) "Friend or Foe? A Continuous Ideal Free Distribution Approach to the Dynamics of Individualistic, Cooperative, and Kleptoparasitic Populations."

Rowell, Jonathan T. (In review) "Solution Sequences to the Keyboard Problem and its Generalizations."

Suarez*, David, Praveen Suthaharan*, Jonathan Rowell, and Jan Rychtar. (2015) "Evolution of Cooperation in Mobile Populations." Spora, 1(1), pp. 2-7.

Rowell, Jonathan T. and Rychtar, J. (2015) "Cooperative Behavior in Theory and Practice: Leading Undergraduate Research in Behavioral Mathematical Biology," Letters in Biomathematics, 2:1, pp. 29-45, DOI: 10.1080/23737867.2015.1035571.

Bergen*, Elizabeth L., Rowell, Jonathan T., Gould, Fred, and Servedio, Maria R. (2012) "Stochasticity in Sexual Selection Enables Divergence: Implications for Moth Pheromone Diversification." Evolutionary Biology, DOI: 10.1007/s11692-012-9176-5.

Rowell, Jonathan T. and Servedio, Maria R. (2012) "Vocal Communications and the Maintenance of Population Specific Songs in a Contact Zone." PLoS ONE 7(5): e35257.

Rowell, Jonathan T. (2010) "Tactical Population Movements and Distributions for Ideally Motivated Competitors," The American Naturalist, 176(5), pp. 638-650.

Rowell, Jonathan T. (2009) "The Limitation of Species Range: A Consequence of Searching Along Resource Gradients," Theoretical Population Biology, 75(2-3), pp. 216-227.

Rowell, Jonathan T. and Maria R. Servedio. (2009) "Gentlemen Prefer Blondes: The Evolution of Mate Preference Among Strategically Allocated Males." The American Naturalist, 173 (1), pp. 12-25.

Rowell, Jonathan T., Stephen P. Ellner, and H. Kern Reeve. (2006) "Why Animals Lie: How Dishonesty and Belief Can Coexist in a Signaling System," The American Naturalist, 168, pp. E180-204.

Rowell, Jonathan T. (2004) "Coexistence, Permanence and Resilience in Lotka-Volterra Reaction-Diffusion Systems," IMA Journal of Applied Mathematics, 69, pp. 111-129.

Rowell, Jonathan T. (2001) "Extending Coexistence and Permanence Conditions to Generalized Food Web Models," Dynamic Systems and Applications 10, pp. 387-394.

Rowell*, Jonathan T. and Wei Feng. (1996) "Population Dynamics in Complex Predator-Prey Interactions," Proceedings of the 2nd International Conference on Dynamical Systems and Applications, pp. 493-499.

Rowell*, Jonathan T. and Wei Feng (1995) "Coexistence and Permanence in a Four-Species Food Chain Model," Nonlinear Times and Digest 2, 1995, pp. 191-212.

(** denotes an undergraduate student*)

OTHER SCHOLARLY PRODUCTS

Rowell, Jonathan T. 2014. Paradigm Shift Sequences with Lengthy Implementations, On-Line Encyclopedia of Integer Sequences.

> A246074 A246075 A246076 A246077 A246078 A246079 A246080 A246081 A246082 A246083 A246084 A246085 A246086 A246087 A246088 A246089 A246090 A246091 A246092 A246093 A246094 A246095 A246096 A246097 A246098 A246099 A246100 A246101 A246102 A246103

Rowell, Jonathan T. 2011. Paradigm Shift Sequences, On-Line Encyclopedia of Integer Sequences.

> A193455 A193456 A193457

RESEARCH GRANTS

Rychtar, J. & Rowell, JT (co-PI). REU Site: Mathematical Biology at the University of North Carolina at Greensboro, GOV-National Science Foundation (NSF), May 2014-May 2017.

SELECTED RESEARCH TALKS (SINCE 2013)

Rowell, JT. November 2014. "Harvesting Ideally Motivated Populations: Ecological and Evolutionary Implications." 2014 American Mathematical Society, Greensboro, NC.

Rowell, JT. October 2014. "Cooperative Behavior in Theory and Practice: Leading Undergraduate Research in Behavioral Mathematical Biology." 2014 International Symposium on Behavioral Ecology, Education and Research. Claremont, CA.

Rowell, JT. March 2014. "Adaptive Population Movement amid Incomplete Information: Implications for Harvesting and Community Dynamics." Evolution 2014, Raleigh, NC.

Rowell, JT. March 2014. "A Dynamic Paradox in a Model of Auxin-Mediated Growth of Hypocotyl Plant Cells." UNC/Duke Integrative and Mathematical Physiology Seminar, Chapel Hill, NC.

Rowell, JT. February 2014. "Replicator Dynamics and Sexual Selection on Mate Preferences." UNC Greensboro Mathematical Biology Seminar, Greensboro, NC.

Rowell, JT. February 2014. "Replicator Dynamics and Public Signals." UNC Greensboro Mathematical Biology Seminar, Greensboro, NC.

Rowell, JT. January 2014. "A Primer in Game Theory, Replicator Equations, and Directed Movement." UNC Greensboro Mathematical Biology Seminar, Greensboro, NC.

Rowell, JT. April 2013. "Adaptive Movement Dynamics: Concepts and Consequences of Ideal Motivation within Populations." UNC Greensboro Mathematics & Statistics Department Colloquium, Greensboro, NC.

SYNERGISTIC ACTIVITIES

- Co-PI for NSF funded summer REU in Mathematical Biology (2014-2015), which to date has resulted in 2 publications and 4 additional papers under current review.
- Directly supervised two undergraduate honors students in biology. To date, this has resulted in two undergraduate symposium presentations and one peer-reviewed paper co-authored by a student.
- For four years supervised mathematical modeling projects conducted by advanced high school students as part of the residential program North Carolina Summer Ventures Program.
- Served as research consultant for multiple undergraduate biology courses at UNC.
- 2010 UNC Postdoctoral Award for Excellence in Undergraduate Mentoring
- Refereed articles for Animal Behaviour, The American Naturalist, Ecology, Evolution, Journal of the Royal Society Interface, Journal of Theoretical Biology, Mathematical and Computer Modelling, PRIMUS, Proceedings of the Royal Society of London Series B, Springer Proceedings in Mathematics & Statistics, Theoretical Population Biology

COLLABORATORS AND OTHER AFFILIATIONS

Collaborators: *Wei Feng* (University of North Carolina at Wilmington), *Elizabeth Bergen* (Cornell University), *Fred Gould* (North Carolina State University), *Nicholas Panchy* (Michigan State University), *Candace Ohm* (Florida State University), *Jan Rychtar* (University of North Carolina at Greensboro), *Olav Rueppell* (University of North Carolina at Greensboro)

Graduate Advisors: S. Ellner (Cornell University), H. K. Reeve (Cornell University)

Postdoctoral and Research Advisors: M. Servedio (UNC-CH), J. Reed (UNC-CH), S. Gavrilets (University of Tennessee Knoxville)

To date, I have directed 2 undergraduate honors students and 8 REU students, and co-advised 10 additional REU students.

DOHYOUNG RYANG
BIOGRAPHICAL SKETCH
d_ryang@uncg.edu

PROFESSIONAL PREPARATION

University of Alabama	Mathematics Education	Ph.D., 2010
University of Alabama	Mathematics	Ph.D., 2006

APPOINTMENTS

Aug. 2010 – Present	Assistant Professor Mathematics Education University of North Carolina at Greensboro, NC
Aug. 2008 – July 2010	Assistant Professor of Mathematics University of Southern Mississippi, MS
Aug. 2006 – May 2008	Assistant Professor of Mathematics, Talladega College, AL

PUBLICATIONS

- Han, I., Ryang, D. & Kim, J. (2015). Devleopment of Mathematics Educationin Korea: The role of the Korean Society of Mathematical Education. In J. Kim, I. Han, M. Park, & J. Lee (eds.), Mathematics Education in Korea Vol. 2: Curricular and Teaching and Learning Practices (pp.133-152). Hackensack, NJ: World Scientific Publishing.

- Ryang, D. & Kwon, N. (2014). The development of the teaching and learning conceptions questionnaire short form. *Korean Journal of Teacher Education Research*, 31, 81-101. In Korean, English abstract.

- Ryang, D. (2014, May) Development and validation of the Mathematics Teaching Efficacy Scale: Confirmatory factor analysis. *The Mathematical Education 53*(2), 185-200.

- Ryang, D. (2014, March). How to develop a scale in mathematics education research. *Research in Mathematical Education 18*(1), 75-86.

- Ryang, D. (2013, August). Development of the Mathematics Teaching Efficacy Beliefs Instrument Korean version for elementary preservice teachers, *The Mathematical Education 52*(3), 363-377.

- Ryang, D. (2013, May). Developing the Mathematics Teaching Efficacy Beliefs Instrument Korean version for secondary prospective mathematics teachers, *The Mathematical Education 52*(2), 231-245.

- Ryang, D. (2012, November). Groups acting on median graphs and median complexes, *Pure and Applied Mathematics, 19*(4), 349-361.

- Han, I., Ryang, D. & Suh, B. (2012 September). Assessments administered by the local schools, by the provincial education offices, and by the ministry of education. In J. Kim, I. Han, M. Park, & J. Lee (eds.), Mathematics Education in Korea Vol. 1: Curricular and

Teaching and Learning Practices (pp.289- 320). Hackensack, NJ: World Scientific Publishing.

- Ryang, D. (2012, September). Exploratory analysis of Korean elementary preservice teachers' mathematics teaching efficacy beliefs. *International Electronic Journal of Mathematics Education, 7*(2), 45-61.
- Ryang, D. (2012, July). The viability of the Mathematics Teaching Efficacy Beliefs Instrument for Korean secondary preservice teachers. The Proceedings of the 12th International Congress on Mathematics Education, 5811-5819.
- Ryang, D. & Thompson, T. (2012, August). Sums of positive integer powers, *Mathematics Teacher, 106*(1), 71-76.
- Ryang, D., Thompson, T., & Shwery, C. (2011, September.). Analysis of Korean mathematics teacher educators' response to the Mathematics Teaching Efficacy Beliefs Instrument. *Research in Mathematical Education, 15*(3), 229-250.
- Ryang, D. & Thompson, T. (2011, March). A revision of the Mathematics Teaching Efficacy Beliefs Instrument for Korean Preservice Teachers. *Proceedings of the 38th Annual Meeting of Research Council of Mathematics Learning 2011*, 144-150.
- Ryang, D. (2011, March). Exploratory analysis of Korean elementary preservice teachers' personal efficacy and outcome expectancy in mathematics teaching. *Proceedings of the 38th Annual Meeting of Research Council of Mathematics Learning 2011*, 18-26.
- Ryang, D. (2009, June). Attitudes toward mathematics and mathematics self-efficacy on a learning community model: A case study, *Research in Mathematical Education, 13*, 109-122.
- Corson, J., Ryang, D., & Brick, S. (2008, December). A Quasi-isometry invariant loop shortening property for groups, *International Journal of Algebra and Computation, 18*(8), 1243-1257.
- Ryang, D. (2008, November). Finite extensions of weighted word L-delta groups, *The Pure and Applied Mathematics, 15*(4), 353-364.
- [Mathematics] Corson, J. & Ryang, D. (2007, January). Isoperimetric functions of groups acting on L-delta metric spaces, *Glasgow Mathematical Journal, 49* (1), 23-28.
- Ryang, D. (2007, August). Reliability and validity of Mathematics Teaching Efficacy Beliefs Instrument among Korean pre-service mathematics teachers, *The Mathematical Education, 46*(3), 263-273. (in Korean).
- Corson, Jon & Ryang, D. (2006, November). Direct product of L-delta groups, *The Pure and Applied Mathematics, 13*(4), 269-280.

RESEARCH TALKS (since 2011)
- Ryang, D. (2014, April) Establishing factorial validity of a mathematics teaching efficacy scale: Confirmatory factor analysis. Paper presented at the KSME spring conference 2014 at Hankuk University of Foreign Studies, Seoul, Korea on April 4-5, 2014.

- Ryang, D. (2013, October). Cardano's method to solve a cubic equation, NCCTM Conference, Geensboro, NC
- Ryang, D. (2013, March). Does gender affect the mathematics teaching efficacy? MAA-SE Conference, Winthrop University, Rock Hill, SC
- Ryang, D. (2012, October). Is there a general formula for the sum of t-cubes of first n consecutive positive integers? NCCTM Conference, Greensboro, NC
- Overby, N. & Ryang, D. (2012, October). Fractions, ratios, and rational numbers, NCCTM Conference, Greensboro, NC
- Ryang, D. (2012, July). Can we use the Mathematics Teaching Efficacy Beliefs Instrument for Korean secondary preservice teachers? Presented at the 12th International Congress on Mathematics Education TSG-27 session, COEX, Seoul Korea; July 8-15, 2012.
- Ryang, D. (2012, February). Developing the MTEBI for middle grade preservice teachers. Presented at the Annual Conference of Research Council of Mathematics Education, Charlotte, NC.
- Ryang, D. (2011, October). Mathematics problem-solving ability of middle grade prospective teachers.   NCCTM Conference, Greensboro, NC.
- Ryang, D. (2011, April). The Mathematics Teaching Efficacy Beliefs Instrument for a Non-Western Culture. Paper presented at the Mathematical Association of America Southeastern Sectional Meeting, University of Alabama, Tuscaloosa, AL; April 1-2, 2011.
- Ryang, D. & Shim, I. (2011, April). The Mathematics Teaching Efficacy Beliefs Instrument for secondary preservice teachers. Paper presented at the Mathematical Association of America Southeastern Sectional Meeting, University of Alabama, Tuscaloosa, AL; April 1-2, 2011.

SYNERGISTIC ACTIVITIES

- Co-leader of UNCG Science and Math Learning Community Proposal (2012 Fall) Group
- Editorial board member of an international journal, Research in Mathematical Education (ISSN: 1226-6191)
- Developing an instrument to measure mathematics teaching efficacy of elementary/secondary preservice teachers in a different culture
- Share knowledge by reviewing an article submitted in Topology and its Applications

COLLABORATORS

Stephen Brick (University of South Alabama), Jon Corson (University of Alabama), Craig Schwery (University of Alabama), Anthony Thompson (East Carolina University), Thomas Ratkovich (University of West Alabama), Young Han Choe (Korean Society of Mathematical Education), Hyunyong Shin (Korean National University of Education), Nayoung Kwon (Inha University), Inki Han (Kyeongsang National University), Boeuk Suh (Chungnam National Uninversity)

JAN RYCHTAR
BIOGRAPHICAL SKETCH

http://www.uncg.edu/mat/faculty/rychtar/

PROFESSIONAL PREPARATION

Charles University	Prague, Czech Republic	Mathematics	B.S., 1998
Charles University	Prague, Czech Republic	Mathematics	M.S., 2000
University of Alberta	Edmonton, Canada	Mathematics	Ph.D., 2004

APPOINTMENTS

2014-present   Professor, University of North Carolina at Greensboro

2012-2013   Interim Director of the Office of Undergraduate Research

2010-2014   Associate Professor, University of North Carolina at Greensboro

2004-2010   Assistant Professor, University of North Carolina at Greensboro

AWARDS

2015: Thomas Undergraduate Research Mentor Award. UNCG.

2014: Distinguished service award. Department of Mathematics and Statistics.

2012-2013 Junior Research Excellence Award. UNCG.

2008 College of Arts and Sciences Teaching Excellence Award. UNCG.

SELECTED PUBLICATIONS (out of 62 total)

Ross, C., Rychtar, J., & Rueppell, O. (2015). A structured population model suggests that long life and post-reproductive life span promote the evolution of cooperation. Journal of Theoretical Biology, 369, 85-94, doi: 10.1016/j.jtbi.2015.01.020.

Broom, M. & Rychtar, J. (in press, 2015). A model of food stealing with asymmetric information. Ecological Complexity.

Broom, M., Lafayette, C., Pattni, K., & Rychtar, J. (in press, 2015). A study of the dynamics of multi-player games on small networks using territorial interactions. Journal of Mathematical Biology.

Johanis, M. & Rychtar, J. (in press, 2015). A three player singled out game. Journal of Statistical Theory and Practice.

Rowell, J. & Rychtar, J. (in press, 2015). Cooperative Behavior in Theory and Practice: Leading Undergraduate Research in Behavioral Mathematical Biology. Letters in Biomathematics.

Suarez, D., Suthaharan, P., Rowell, J., & Rychtar, J. (in press, 2015). Evolution of Cooperation in Mobile Populations. SPORA - A journal of Biomathematics.

Everett, J., Smith, H., Jasim, M., Rychtar, J., & Oh, H. (2015). Modeling the Asian Carp Invasion Using Mathematical Evolutionary Game Theory. Springer Proceedings in Mathematics & Statistics, 81-90.

Broom, M. & Rychtar, J. (in press, 2015). Nonlinear and multiplayer evolutionary games. Annals of International Society of Dynamic Games..

1

Sun, S. & Rychtar, J. (in press, 2015). The screening game in plant-pollinator interactions. Evolutionary Ecology.

Broom, M., Rychtar, J., & Sykes, D. (2014). Kleptoparasitic interactions under asymmetric resource valuation. Mathematical Modelling of Natural Phenomena, 9 (3), 138-147.

Bruni, M., Broom, M., & Rychtar, J. (2014). Analysing territorial models on graphs. Involve, 7 (2), 129-149.

Broom, M. & Rychtar, J. (2014). Asymmetric games in monomorphic and polymorphic populations. Dynamic Games, 4, 391-406.

Seifertova, D., Skupa, P., Rychtar, J., Lankova, M., Parezova, M., Petre Dobrev, Klára Hoyerová, Jan Petrásek, and Eva Zazímalová (2014). Characterization of transmembrane auxin transport in Arabidopsis suspension-cultured cells. Journal of Plant Physiology, 171, 429-437.

Rychtar, J., Frynta, D., Tomek, J., Varadimova, Z., & Brom, C. (2014). Waste recycling can promote group living: A cockroach case study. Letters in Biomathematics, 1 (1), 17-22.

Broom, M., Johanis, M., & Rychtar, J. (in press, 2014). The effect of fight cost structure on fighting behaviour. Journal of Mathematical Biology.

BOOK

Broom, M. & Rychtar, J. (2013). Game-Theoretical Models in Biology CRC Press.

PRESENTATIONS

Rychtar, J. & Broom, M. (2015). Habitat selection game in structured populations. 2015 Joint Mathematics Meeting, San Antonio, Texas.

Rychtar, J. (2015). Mentoring Interdisciplinary Research Projects. 2015 Joint Mathematics Meeting, San Antonio, Texas.

Rychtar, J. (2014). The evolution of cooperation – kin selection and greenbeard genes. 2014 Joint Mathematics Meetings, Baltimore, Maryland.

Rychtar, J. & Broom, M. (2014). Ideal cost-free distributions in structured populations for general payoff functions. AISC 2014, Greensboro, North Carolina.

Rychtar, J. (2014). Mentoring Interdisciplinary Research Projects. AISC 2014, Greensboro, North Carolina.

Rychtar, J. (2013). The evolution of cooperation – kin selection and greenbeard genes. 67th Annual Conference of ISAS, Varanasi, India.

Rychtar, J. (2013). Producer-scrounger games and the effect of fighting cost. Modelling Biological Evolution 2013: Recent Progress, Current Challenges and Future Directions, Leicester, United Kingdom.

Rychtar, J. (2013). Producer-scrounger games. Oxford University, Center of Mathematical Biology seminar, Oxford, United Kingdom.

Rychtar, J. (2013). Math Biology Research for UNCG Undergraduate students. DRS(SAP) Programme University of Delhi, New Delhi, India.

Rychtar, J. (2013). The effect of information asymmetry in Producer-Scrounger games. 2013 Joint Mathematics Meeting, San Diego, California.

Rychtar, J. (2013). The evolution of cooperation – kin selection and greenbeard genes. Recent

Developments on Statistical Theory and Practice, Puducherry, India.

GRANTS (Major grants and PI only, out of over 20 total grants worth over $1mil)
NSF REU Math biology (2014-2017)
NSF UBM Math Biology (2009-2013)
NSF REU Interdisciplinary Quantitative Science (2009-2013)
NSF UBM Math Biology (2006-2009)

EDITORIAL ACTIVITIES
NC Journal of Mathematics and Statistics (Managing Editor),
Journal of Statistical Theory and Practice , Austin Mathematics. Journal of Statistics and Management Systems, Computational and Mathematical Methods in Medicine (Associate Editor).

SYNERGISTIC ACTIVITIES
1. Organized Annual UNCG Regional Mathematics and Statistics Conferences (for student presentations), UNCG, 2005-present
2. Directly supervised over 50 undergraduate students. In most cases, research resulted in conference presentations done by students and/or a student coauthored paper(s).
3. Organized sections devoted to undergraduate research during the International Conference on Interdisciplinary Mathematical and Statistical Techniques, UNCG 2012, University of Memphis, Memphis, TN, May 2008; UNCG 2007 and Tomar, Portugal 2006.
4. Refereed articles for Physica A, Bulletin of Mathematical Biology, Journal of Theoretical Biology, Frontiers in Behavioral Neuroscience, Animal Ecology, Journal of Applied Mathematics, Topology and its Applications, Game, Explorations, Tbilisi Math Journal

Graduate Advisors and Postdoctoral Sponsors
P. Hajek, Czech Academy of Sciences; *N. Tomczak-Jaegerman*, University of Alberta, Canada; *V. Zizler*, Czech Academy of Sciences

Thesis Advisor
Heather Allmond (UNCG, 2010), *William Ely* (UNCG, 2012)
Total number of graduate students advised: 2

CURRICULUM VITAE
(8/8/2015)

Name:	**FILIP SAIDAK**
Current Position:	Associate Professor
Address:	Department of Mathematics and Statistics
	University of North Carolina
	Greensboro, NC 27403
	U.S.A.
E-mail:	f_saidak@uncg.edu
WWW:	http://www.uncg.edu/f_saidak.html

EDUCATION

Ph.D. 2001 - *Non-abelian Generalizations of the Erdős-Kac Theorem,*
    Queen's University, Kingston, Ontario, Canada
    (Advisor Ram M. Murty, FRSC).
M.Sc. 1999 - Queen's University, Kingston, Ontario, Canada
B.Sc. 1997 - The University of Auckland, Auckland, New Zealand

RESEARCH INTERESTS

Elementary, Analytic and Probabilistic Number Theory (emphasis on prime numbers, arithmetic functions, and the Riemann zeta function); Complex & Harmonic Analysis; History and Philosophy of Science.

PUBLICATIONS

24. *New zero-free regions for derivatives of the Riemann zeta function, Rocky Mountains J. Math. Vol. 45, No. 3, 2015, (to appear) (jointly with T. Binder and S. Pauli)*

23. *Horizontal monotonicity of the modulus of the zeta function, L-functions, and related functions, Acta Arithmetica, 166 (2014), 189–200, (jointly with Yu. Matiyasevich and P. Zvengrowski)*

22. *Remarks on linear recurrences of the form $y_n = y_{n-1} + a_{n-2}y_{n-2}$, Congr. Numer. 200 (2010), 141-151, (jointly with K. Berenhaut and A. O'Keefe)*

21. *Zhou's theory of constructing identities, Congr. Numer. 200 (2010), 225-237 (jointly with F. Howard)*

20. *On the prime number lemma of Selberg, Mathematica Scandinavica, Vol. 103, No. 1, pp. 5-10, 2008*

19. *Descartes Numbers, CRM Proceedings & Lecture Notes, Vol. 46, 167–174, 2008 (jointly with W. Banks, A. Güloglu, and W. Nevans)*

18. *Note on the maximal coefficients of squares of Newman polynomials, J. Number Theory, Vol. 125, No. 2, 285-288, 2007 (jointly with K. Berenhaut)*

17. *Bounds for recurrences on ranked posets, International J. Contemp. Math. Sci., Vol. 2, no. 19, 929-942, 2007 (jointly with K. Berenhaut and A. O'Keefe)*

16. *Kloosterman sums and van der Corput-type sequences, Uniform Distribution Theory, Vol. 2 (2007), no. 1, 39-52 (jointly with W. Banks and M. Sakata)*

15. *A new proof of Euclid's theorem, American Math. Monthly, Vol. 113, No. 10, 937–938, 2006*
[This paper is being reprinted in Chapter 2 of the collection entitled "Biscuits of Number Theory" by A. Benjamin and E. Brown, MAA, to appear in 2009.]

14. *On Goldbach's Conjecture for integer polynomials, American Math. Monthly, Vol. 113, No. 6, 541–546, 2006*

13. *Riemann and his zeta function, Morfismos, Vol. 9, No. 2, 1–48, 2006 (jointly with E. Kudryavtseva and P. Zvengrowski)*

12. *Recursive sequences of the form $y_n = a_n y_{n-1} + y_{n-2}$ with integer coefficients, Indian J. Math., Vol. 48, No. 1, 1–16, 2006 (jointly with K. Berenhaut and A. O'Keefe)*

11. *Arithmetic properties of class numbers of imaginary quadratic fields, JP J. Algebra, Number Theory Appl., Vol. 6, No.1, 129–148, 2006 (jointly with S. Hamdy)*

10. *New Erdős-Kac type theorems, Archiv der Mathematik (Basel), Vol. 85, No. 4, 345–361, 2005*

9. *Compositions with the Euler and Carmichael functions, Abh. Math. Sem. Univ. Hamburg, 75, 215–243, 2005 (jointly with W. Banks, F. Luca and P. Stanica)*

8. *Values of arithmetical functions equal to a sum of two squares, Quart. J. Math. Oxford, Vol. 56, No. 2, 123–139, 2005 (jointly with W. Banks, F. Luca and I. Shparlinski)*

7. *On the logarithmic derivative of the Euler Product, Tatra Mountain Math. Publ. (Tatracrypt '03), Vol. 29, 113-122, 2004*

6. *Non-abelian generalizations of the Erdős-Kac theorem, Canadian J. Math., Vol. 56, No. 2, 356 - 372, 2004 (jointly with R. Murty)*

5. *Squarefree values of the Carmichael function, J. Number Theory, Vol. 103, No. 3, 122-131, 2003 (jointly with F. Pappalardi and I. Shparlinski)*

4. *On the modulus of the Riemann zeta function in the critical strip, Math. Slovaca, Vol. 53, #2, 145-172, 2003 (jointly with P. Zvengrowski)*

3. *The normal number of prime factors of $f_a(n)$, J. Ramanujan Math. Soc., Vol. 17, #1, 19-33, 2002*

2. *An elementary proof of a theorem of Delange, Comptes Rendus Acad. Sci. Canada, Vol. 24, #4, 144-151, 2002*

1. *Erdős Conjecture I., Smarandache Notions J., Vol. 9, #1-2, 106–112, 1998*

EDITORIAL WORK

I have served on the editorial board of Involve: a journal of Mathematics *(2008–2015), based at Wake Forest University (NC), with focus on undergraduate research.*

REFEREEING WORK

I have served as a referee for the following academic journals:

Acta Mathematica Univ. Comenianae
American Mathematical Monthly
Ars Combinatoria
Boletin Soc. Mat. Mexicana
Discrete Applied Mathematics
Dynamics of Continuous, Discrete and Impulsive Systems
Electronic Journal of Combinatorial Number Theory
Fields Institute Communications
Indian Journal of Mathematics
Journal of Integer Sequences
Journal of Number Theory
Journal of Zhejiang University (Science)
Mathematics of Computation
Utilitas Mathematica

TEACHING EXPERIENCE

I have taught the following courses so far:

GRADUATE LEVEL
MAT 709 - Topics in Number Theory (Spring 2013), U. of North Carolina
MAT 540 - Complex Analysis (Fall 2008), U. of North Carolina
MAT 540 - Complex Analysis (Fall 2007), U. of North Carolina

BIOGRAPHICAL SKETCH

Carol E. Seaman

PROFESSIONAL PREPARATION

Ph.D.   Central Michigan University, Mt. Pleasant, MI, Mathematics, 2000

M.A.   University of Illinois at Chicago, Chicago, IL, Mathematics, 1971

B.A. (Hons)   Newberry College, Newberry, SC, Mathematics, 1969

APPOINTMENTS (Since 1999)

August 1999 – May 2000	Visiting Professor of Mathematics, Albion College, Albion Michigan
August 2000 – June 2006	Assistant Professor of Mathematics, University of Wisconsin Oshkosh, Oshkosh, Wisconsin
June 2008 – July 2008	Associate Professor of Mathematics, University of Wisconsin Oshkosh, Oshkosh, Wisconsin
August 2008 – present	Associate Professor of Mathematics, University of North Carolina Greensboro, Greensboro, North Carolina

PUBLICATIONS

1. Seaman, C. E. & Szydlik, J. E. (2012). Sociomathematical norms and mathematical sophistication: A qualitative case study of an inquiry-based mathematics course for preservice elementary teachers. *15th Conference on Research in Undergraduate Mathematics Education*.
2. Seaman, C. E. & Szydlik, J. E. (2012). Prospective Elementary Teachers' Evolving Meanings for Generalizing, Doing Mathematics, and Justifying. *15th Conference on Research in Undergraduate Mathematics Education*.
3. Szydlik, J. E., Kuennen, E., & Seaman, C. E. (2009). Development of an Instrument to Measure Mathematical Sophistication. *Conference on Research in Undergraduate Mathematics Education*.
4. Szydlik, J. E. & Seaman, C. E. (2013). *Big Ideas in Mathematics for Future Elementary Teachers: Big Ideas in Arithmetic* McGraw-Hill Publishing.
5. Szydlik, J. E. & Seaman, C. E. (2012). *Big Ideas in Mathematics for Future Elementary Teachers: Big Ideas in Data Analysis and Probability* McGraw-Hill Publishing.
6. Seaman, C. E. & Szydlik, J. E. (2012). *Big Ideas in Mathematics for Future Elementary Teachers: Big Ideas in Geometry* McGraw Hill Publishing.

7. Seaman, C. E., Szydlik, J. E., & Kuennen, E. (2011). *Big Ideas in Euclidean and Non-Euclidean Geometries* McGraw Hill.
8. Szydlik, J. E., Beam, J., Kuennen, E., & Seaman, C. E. (2013). Probability and Statistics for Prospective Middle Grades Teachers, Resources *for Preparing Middle School Mathematics Teachers: MAA Notes #80*. Mathematical Association of America.
9. Szydlik, J. E., Beam, J., Kuennen, E., & Seaman, C. E. (2013). The Middle School Program at the University of Wisconsin Oshkosh, Resources *for Preparing Middle School Mathematics Teachers: MAA Notes #80*. Mathematical Association of America.

SYNERGISTIC ACTIVITIES

2014 [Year 1 of 1]: Wilson, P. H., Seaman, C. E., Hewitt, K. K., Richardson, K. NC Quest_Wilson_2013_Core Math III (Continuation) ($149,928), GOV-Department of Education (DE).

2014 [Year 2 of 2]: Wilson, P. H., Seaman, C. E., Hewitt, K., & Downs, H. A. , NC Quest_Wilson_2012_Core Math II ($299,929.00), GOV-Department of Education (DE).

2013 [Year 1 of 2]: Wilson, P. H., Seaman, C. E. , Hewitt, K., & Downs, H. A. , NC Quest_Wilson_2012_Core Math II ($299,929.00), GOV-Department of Education (DE).

2012 [Year 2 of 2]: Seaman, C. E. & Wilson, P. H., NC Quest - Core-Math: Supporting the Implementation of the Common Core State Standards Using Learning Trajectories ($299,922.00), GOV-Department of Education (DE)

2011 [Year 1 of 2]: Seaman, C. E. & Wilson, P. H., NC Quest - Core-Math: Supporting the Implementation of the Common Core State Standards Using Learning Trajectories ($299,922.00), GOV-Department of Education (DE)

COLLABORATORS

John Beam (UWOshkosh), Holly Downs (UNCG), Kim Hewitt (UNCG), Eric Kuennen (UWOshkosh), Kerri Richardson (UNCG), Jennifer Earles Szydlik (UWOshkosh) P. Holt Wilson (UNCG),

<div align="center">

BIOGRAPHICAL SKETCH
Ratnasingham Shivaji
`http://www.uncg.edu/~r_shivaj/`

</div>

PROFESSIONAL PREPARATION

University of Sri Lanka	Special degree in Mathematics	B.S. 1977 (First class honors)
Heriot-Watt University, Scotland	Mathematics	Ph.D. 1981

APPOINTMENTS (Since 1990)

August 2011–Present	H. Barton Excellence Professor and Head, Dept. of Mathematics and Statistics, The University of North Carolina at Greensboro
May 2006–July 2011	Director, Center for Computational Sciences, Mississippi State University
April 1999–July 2011	W. L. Giles Distinguished Professor, Mississippi State University
July 1994–August 1996	Head, Dept. of Mathematics and Statistics, Mississippi State University
August 1990–July 2011	Tenured Full Professor, Mississippi State University
August 1999–May 2000	Karl E. Peace Endowed Chair in Mathematics, Georgia Southern University

SELECTED PUBLICATIONS *(out of 130 to date)*

1. A three solution theorem for singular nonlinear elliptic boundary value problems, R. Dhanya, Eunkyung Ko, and R. Shivaji, J. Math. Anal. Appl., Vol. 424, 2015, No. 1, pp. 598–612.

2. Diffusive logistic equation with constant yield harvesting and negative density dependent emigration on the boundary, Jerome Goddard II and R. Shivaji, J. Math. Anal. Appl., Vol. 414, 2014, No. 2, pp. 561–573.

3. A uniqueness result for a singular nonlinear eigenvalue problem, Alfonso Castro, Eunkyung Ko and R. Shivaji, Proc. Royal Soc. Edin., Vol. 143A, 2013, pp. 739-744.

4. Uniqueness of nonnegative solutions for semipositone problems on exterior domains, Alfonso Castro, Lakshmi Sankar and R. Shivaji, J. Math. Anal. Appl., Vol. 394, 2012, No. 1, pp. 432–437.

5. Multiplicity results for classes of infinite positone problems, Eunkyung Ko, Eun Kyoung Lee and R. Shivaji, Z. Anal. Anwend., Vol. 30, 2011, No. 3, pp. 305–318.

6. Diffusive logistic equation with nonlinear boundary conditions, Jerome Goddard II, Eun Kyoung Lee and R. Shivaji, J. Math. Anal. Appl., Vol. 375, 2011, No. 1, pp. 365–370.

7. Positive solutions for $n \times n$ elliptic systems with combined nonlinear effects, Jaffar Ali, K. J. Brown and R. Shivaji, Differential Integral Equations, Vol. 24, 2011, No. 3–4, pp. 307–324.

8. Classes of singular pq-Laplacian semipositone systems, Eun Kyoung Lee, R. Shivaji and Jinglong Ye, J. Discrete and Continuous Dynamical Systems, Vol. 27, 2010, No. 3, pp. 1123–1132.

9. Classes of infinite semipositone systems, Eun Kyoung Lee, R. Shivaji and Jinglong Ye, Proc. Royal Soc. Edin., Vol. 139A, 2009, No. 4, pp. 853–865.

10. Positive solutions of multiparameter semipositone p-Laplacian problems, Kanishka Perera and R. Shivaji, J. Math. Anal. Appl., Vol. 338, 2008, No. 2, pp. 1397–1400.

11. Uniqueness of positive solutions for a class of semipositone elliptic systems, D. D. Hai and R. Shivaji, J. Nonlinear Analysis, TMA, Vol. 66, 2007, No. 2, pp. 396–402.

12. Persistence in reaction diffusion models with weak Allee effect, J. Shi and R. Shivaji, J. Math. Biol., Vol. 52, 2006, No. 6, pp. 807–829.

13. Multiple positive solutions for classes of p-Laplacian equations, Mythily Ramaswamy and R. Shivaji, Differential Integral Equations, Vol. 17, 2004, No. 11–12, pp. 1255–1261.

14. An existence result on positive solutions for a class of semilinear elliptic systems, D. D. Hai and R. Shivaji, Proc. Royal Soc. Edin., Vol. 134A, 2004, No. 1, pp. 137–141.

15. Existence and uniqueness for a class of quasilinear elliptic boundary value problems, D. D. Hai and R. Shivaji, J. Differential Equations, Vol. 193, 2003, No. 2, pp. 500–510.

16. Diffusive logistic equation with constant yield harvesting, I: Steady States, S. Oruganti, J. Shi and R. Shivaji. Trans. Amer. Math. Soc., Vol. 354, 2002, No. 9, pp. 3601–3619.

17. Positive solutions of quasilinear boundary value problems, D. D. Hai, K. Schmitt and R. Shivaji, J. Math. Anal. Appl., Vol. 217, 1998, No. 2, pp. 672–686.

18. Existence results for superlinear semipositone BVP's, V. Anuradha, D. D. Hai and R. Shivaji, Proc. Amer. Math. Soc., Vol. 124, 1996, No. 3, pp. 757–763.

19. Uniqueness of non-negative solutions for a semipositone problem with concave nonlinearity, A. Castro, M. Hassanpour and R. Shivaji, Comm. Partial Differential Equations, Vol. 20, 1995, No. 11–12, pp. 1927–1936.

20. Branches of radial solutions for semipositone problems, A. Castro, Sudhasree Gadam and R. Shivaji, J. Differential Equations, Vol. 120, 1995, No. 1, pp. 30–45.

21. Uniqueness and stability of nonnegative solutions for semipositone problems in a ball, A. Castro, Ismael Ali and R. Shivaji, Proc. Amer. Math. Soc., Vol. 117, 1993, No. 3, pp. 775–782.

22. Non-negative solutions to a semilinear Dirichlet problem in a ball are positive and radially symmetric, A. Castro and R. Shivaji, Comm. Partial Differential Equations, Vol. 14, 1989, No. 8–9, pp. 1091–1100.

23. Non-negative solutions for a class of non-positone problems, A. Castro and R. Shivaji, Proc. Royal Soc. Edin., Vol. 108(A), 1988, No. 3–4, pp. 291–302.

24. Uniqueness of positive solutions for a class of elliptic boundary value problems, A. Castro and R. Shivaji, Proc. Royal Soc. Edin., Vol. 98(A), 1984, No. 3–4, pp. 267–269.

25. S-shaped bifurcation curves, K. J. Brown, M. M. A. Ibrahim, and R. Shivaji, J. Nonlinear Analysis, TMA, Vol. 5, 1981, No. 5, pp. 475–486.

SYNERGISTIC ACTIVITIES

1. PI, *National Science Foundation Grants:* Mathematical Analysis of Semipositone Problems, $111,514, 1989-1993; Semipositone problems II, $120,000, 1993-1997, Mathematical and Experimental Analysis of Ecological Models, $203,834, 2015-2018.

2. PI, Simons Foundation Collaboration Grant for mathematicians, $35,000, 2014–2019. This award ended in 2015 due to receiving an NSF award.

3. Main Organizer: *Mississippi State–UAB Conferences on Differential Equations and Computational Simulations*, (1993, 1995, 1997, 1999, 2001, 2005, 2007, 2009)

4. Co-PI, *National Science Foundation Grants:* REU Site Projects–Undergraduate Research in Applied Mathematics, $193,296, 2003-2006, Research Experiences for Undergraduates in Applied mathematics and Biostatistics, $200,000, 2009-2011.

COLLABORATORS

Abraham Abebe (Temple University), *Jaffar Ali* (Florida Gulf Coast University), *Dagny Butler* (Blue Cross Blue Shield), *Alfonso Castro* (Harvey Mudd), *Maya Chhetri* (UNCG), *David Costa* (University of Nevada–Las Vegas), *Hai Dang* (MSU), *R. Dhanya* (Universidad de Concepcion, Chile), *Pavel Drabek* (Univ. of West Bohemia, Czech Republic), *Jerome Goddard II* (Auburn University, Montgomery Campus), *Peter Gordon* (University of Akron), *Lakshmi Sankar Kalappatti* (NISER, India), *Eun-Kyung Ko* (Seoul National Univeristy, South Korea), *Eun Kyoung Lee* (Pusan National University, South Korea), *Hyeona Lim* (MSU), *Marcello Lucia* (CUNY), *Quinn Morris* (UNCG), *Kanishka Perera* (Florida Tech), *Mythily Ramaswamy* (TIFR-India), *Sarath Sasi* (NISER, India), *Byungjae Son* (UNCG), *Jinglong Ye* (Mississippi Valley State University)

GRADUATE AND POSTDOCTORAL STUDENTS

1. Nalin Fonseka (Current Ph.D. Student, University of North Carolina at Greensboro)
2. Quinn Morris (Current Ph.D. Student, University of North Carolina at Greensboro)
3. Byungjae Son (Current Ph.D. Student, University of North Carolina at Greensboro)
4. Dagny Butler, Ph.D 2014 (Now at Blue Cross Blue Shield, Jackson MS)
5. Lakshmi Sankar Kalappattil, Ph.D. 2013 (Now at NISER, India)
6. EunKyung Ko. Ph.D. 2012 (Now at Seoul National Univeristy, South Korea)
7. Sarath Sasi, Ph.D. 2012 (Now at NISER, India)
8. Jerome Goddard II, Ph.D. 2011 (Now at Auburn University, Montgomery Campus)
9. Jinglong Ye, Ph.D. 2009. (Now at Mississippi Valley State University)
10. Jaffar Ali Shahul Hameed, Ph.D. 2008. (Now at Florida Gulf Coast University)
11. Dr. Eun Kyoung Lee (Now at Pusan National University, South Korea). She was a postdoctoral student under my supervision from 2007-2009.

To date I have directed 1 postdoctoral student, 11 Ph.D. students, and 14 Masters students. Currently I am directing 3 Ph.D. students.

BIOGRAPHICAL SKETCH – CLIFFORD D. SMYTH
http://www.uncg.edu/mat/people/people.php?username=cdsmyth

PROFESSIONAL PREPARATION

Rutgers University	Mathematics	Ph.D. 2001
Stevens Institute of Technology	Mathematics	M.S. 1993
Stevens Institute of Technology	Mathematics	B.S. 1992

APPOINTMENTS

August 2014–Present	Tenured Associate Professor, The University of North Carolina at Greensboro
August 2008–August 2014	Assistant Professor, The University of North Carolina at Greensboro

PUBLICATIONS

(1) Karl Mahlburg and Clifford Smyth, *Symmetric Polynomials and Symmetric Mean Inequalities.* Electronic Journal of Combinatorics (EJC, http://www.combinatorics.org/), Volume 20, Issue 3 (2013), P34.

(2) Clifford Smyth, *Equilateral sets in ℓ_p^d* in research volume *Thirty Essays in Geometric Graph Theory*, Janos Pach ed. Algorithms and Combinatorics Series, Springer, 2013.

(3) Clifford Smyth, *The BKR inequalities on finite distributive lattices.* Combinatorics, Probability and Computing (CPC), Volume 22, Issue 04, pages 612–626, July 2013.

(4) Dan Cranston, Clifford Smyth, and Douglas West, *Revolutionaries and spies on trees and unicyclic graphs.* Journal of Combinatorics, Volume 3, Number 2, pages 195–206, 2012.

(5) David Howard and Clifford Smyth, *Revolutionaries and spies.* Discrete Mathematics, Volume 312, Issue 22, pages 3384–3391, 28 November 2012.

(6) Clifford Smyth, *Approximate Query Complexity.* Association for Computing Machinery - Transactions on Computation Theory (ACM - TOCT), Volume 3, Number 1, pages 3.1–3.11, 2011.

(7) Jeffry Kahn, Michael Saks, and Clifford Smyth, *The dual BKR inequality and Rudich's conjecture.* Combinatorics, Probability, and Computing (CPC), Volume 20, Number 2, pages 257–266, 2011.

(8) Todd Kemp, Karl Mahlburg, Amarpreet Rattan, and Clifford Smyth, *Enumeration of non-crossing pairings on bit strings.* Journal of Combinatorial Theory, Series A, Volume 118, Number 1, pages 129–151, 2011.

(9) Thomas Bohman, Alan Frieze, Oleg Pikhurko, and Clifford Smyth, *Anti-Ramsey properties of random graphs.* Journal of Combinatorial Theory B, Volume 100, Number 3, pages 299–312, 2010.

(10) József Balogh and Clifford Smyth, *On the variance of Shannon products of graphs.* Discrete Applied Mathematics, Volume 156, Number 1, pages 110–118, 2008.

(11) Uri Abraham, James Cummings, and Clifford Smyth, *Some results in polychromatic Ramsey theory.* Journal of Symbolic Logic, Volume 72, Number 3, pages 865–896, 2007.

(12) Thomas Bohman, Allan Frieze, Ryan Martin, Miklòs Ruszinkó, and Clifford Smyth. *On randomly generated intersecting hypergraphs II.* Random Structures and Algorithms (RSA), Volume 30, pages 17–34, 2007.

2

(13) Alan Frieze, Michael Krivelevich, and Clifford Smyth. *On the chromatic number of random graphs with a fixed degree sequence.* Combinatorics, Probability, and Computing (CPC), Volume 16, pages 733–746, 2007.

(14) Alan Frieze, Julian Moncel, Miklòs Ruszinkó, Ryan Martin, and Clifford Smyth. *Codes identifying sets of vertices in random networks.* Discrete Math, Volume 307, Number 10, pages 1094–1107, 2007.

(15) Thomas Bohman, Alan Frieze, Tomasz Luczak, Oleg Pikhurko, Clifford Smyth, Joel Spencer, and Oleg Verbitsky, Oleg. *First order definability of trees and sparse random graphs.* Combinatorics, Probability, and Computing (CPC), Volume 16, pages 375–400, 2007.

(16) Irit Dinur, Oded Regev, and Clifford Smyth, *The hardness of 3-uniform hypergraph coloring.* Combinatorica, Volume 25, Number 5, pages 519–535, 2005.

(17) József Balogh, Oded Regev, Clifford Smyth, William Steiger, and Mario Szegedy. *Long monotone paths in line arrangements.* Discrete and Computational Geometry (DCG), Volume 32, Number 32, pages 167–176, 2004.

(18) József Balogh, Oded Regev, Clifford Smyth, William Steiger, and Mario Szegedy, *Long monotone paths in line arrangements.* Proceedings of the Symposium on Computational Geometry (DCG), Association for Computing Machinery, New York, NY, pages 124–128, 2003.

(19) Clifford Smyth, *Reimer's inequality and Tardos' conjecture.* Proceedings of the Symposium on Theory of Computing (STOC), Association for Computing Machinery, New York, NY, pages 218-221, 2002.

(20) Irit Dinur, Oded Regev, and Clifford Smyth, *The hardness of 3-uniform hypergraph coloring.* Proceedings of the Symposium on Foundations of Computer Science (FOCS), IEEE, Los Alamitos, CA, pages 33–40, 2002.

(21) Jeffry Kahn, Michael Saks, and Clifford Smyth, *A dual version of Reimer's inequality and a proof of Rudich's conjecture.* Proceedings of the Conference on Computational Complexity (CCC), IEEE Computer Society, Los Alamitos, CA, pages 98-103, 2000.

SELECTED TALKS

(1) *Revolutionaries and Spies.* Special Session on Recent Developments in Graph Theory and Hypergraph Theory, AMS Sectional Meeting, UNCG, November 2014.

(2) *Means and Row-Column Correlation.* Algebra and Combinatorics Seminar, North Carolina State University, December 2, 2013.

(3) *Percolation.* Seminar, Faculty research overview talks, UNCG, January 23, 2013.

(4) *Symmetric polynomials and quasi-mean inequalities.* Combinatorics Seminar, Louisiana State University, Oct 22, 2012.

(5) *Some open problems in combinatorics.* Seminar, UNCG, May 3, 2012.

(6) *Combinatorial Game Theory.* Seminar, UNCG, May 2012.

(7) *The BKR inequality on finite distributive lattices.* Seminar, UNCG, January 2012.

(8) *Revolutionaries and Spies.* Special Session on New Developments in Graph Theory and Hypergraph Theory, AMS Sectional Meeting, Wake-Forest University, September 2011.

(9) *The BKR inequality on finite distributive lattices.* Logic and Combinatorics Seminar, University of Notre Dame, December 2011.

(10) *The BKR inequality on finite distributive lattices.* Seminar, Louisiana State University, November 2011.

(11) *Non-crossing pairings compatible with a binary word.* Algebra and Combinatorics Seminar, State University of North Carolina, Raleigh, September 2009.

(12) *Long monotone paths in line arrangements.* Southeast Regional Meeting On Numbers (SERMON), UNCG, April 2009.

(13) *Non-crossing pairings compatible with a binary word.* UNCG Computational Math Seminar, March 2009.

(14) *Linear Algebra Methods in Combinatorics.* UNCG Computational Math Seminar, October 2008.

(15) *Non-crossing pairings compatible with a binary word.* Combinatorics seminar, MIT, October 2007.

(16) *Anti-Ramsey Problems.* Combinatorics Seminar, MIT, November, 2005.

SYNERGISTIC ACTIVITES

(1) PI, Simons Foundation, Collaboration Grants for Mathematicians, Collaborations in Combinatorics, $35,000, 2015–2020

(2) PI, The National Security Agency, Mathematical Sciences Program, Correlation Inequalities, $55,786, 2013-2015.

(3) Chair of the Organizing Committee, Triangle Lectures in Combinatorics, Penny Haxell, Jeff Kahn, Greta Panova, Peter Winkler, UNCG, Spring 2016

(4) Co-organizer, Special Session on Recent Developments in Graph Theory and Hypergraph Theory, AMS Sectional Meeting, UNCG, November 2014.

(5) Co-organizer, Special Session on New Developments in Graph Theory and Hypergraph Theory, AMS Sectional Meeting, Wake-Forest University, September 2011.

(6) Academic Scholarship Committee Member, STAMPS (Science Technology and Math Preparation Scholarships), $598,000, 2009-2014.

COLLABORATORS

Uri Abraham (Ben Gurion University), József Balogh (UIUC), Tom Bohman (CMU), Dan Cranston (Virginia Commonwealth University), James Cummings (CMU), Irit Dinur (Weizmann Institute of Science), Alan Frieze (CMU), David Howard (Colgate University), Jeffry Kahn (Rutgers), Todd Kemp (UCSD), Michael Krivelevich (Tel-Aviv University), Karl Mahlburg (Lousiana State University), Ryan Martin (Iowa State University), Julian Moncel (IUt de Rodez), Oleg Pikhurko (University of Warwick), Amarpreet Rattan (Birkbeck University of London), Oded Regev (NYU), Miklòs Ruszinkó (Renyi Institute), Michael Saks (Rutgers), William Steiger (Rutgers), Mario Szegedy (Rutgers), Douglas West (UIUC)

GRADUATE STUDENTS

(1) James Rudzinski (current Ph.D. student, The University of North Carolina at Greensboro)

(2) Davorin Stajsic (M.A., 2010, now at US Postal Service)

(3) David Howard (M.A. 2009, CMU, now at Colgate University)

To date I have directed 2 Masters students.
Currently I am directing 1 Ph.D. student.

Personnel

Brett A. Tangedal

Professional Preparation

University of California at San Diego	Physics	B.A., 1985
University of Colorado at Boulder	Physics	M.S., 1987
University of California at San Diego	Mathematics	C. Phil., 1991
University of California at San Diego	Mathematics	Ph.D., 1994

Appointments

University of North Carolina at Greensboro, Tenured Associate Professor, 2007–present

College of Charleston, Tenured Associate Professor, 2003–2007

College of Charleston, Assistant Professor, 1997–2003

Clemson University, Visiting Assistant Professor, 1996–1997

University of Vermont, Visiting Assistant Professor, 1994–1996

Selected Publications

[1] Brett A. Tangedal and Paul T. Young, *Explicit computation of Gross-Stark units over real quadratic fields*, J. Number Theory **133** (2013), no. 3, 1045–1061. MR2997786

[2] ———, *On p-adic multiple zeta and log gamma functions*, J. Number Theory **131** (2011), no. 7, 1240–1257. MR2782839 (2012e:11198)

[3] Jonathan W. Sands and Brett A. Tangedal, *Functorial properties of Stark units in multiquadratic extensions*, Algorithmic number theory, Lecture Notes in Comput. Sci., vol. 5011, Springer, Berlin, 2008, pp. 253–267. MR2467852 (2010c:11136)

[4] Brett A. Tangedal, *Continued fractions, special values of the double sine function, and Stark units over real quadratic fields*, J. Number Theory **124** (2007), no. 2, 291–313. MR2321363 (2008m:11225)

[5] David S. Dummit, Brett A. Tangedal, and Paul B. van Wamelen, *Stark's conjecture over complex cubic number fields*, Math. Comp. **73** (2004), no. 247, 1525–1546 (electronic). MR2047099 (2005b:11181)

[6] Cornelius Greither, Xavier-François Roblot, and Brett A. Tangedal, *The Brumer-Stark conjecture in some families of extensions of specified degree*, Math. Comp. **73** (2004), no. 245, 297–315 (electronic). MR2034123 (2004k:11173)

[7] David S. Dummit, Jonathan W. Sands, and Brett A. Tangedal, *Stark's conjecture in multi-quadratic extensions, revisited*, J. Théor. Nombres Bordeaux **15** (2003), no. 1, 83–97. MR2019002 (2004j:11138)

[8] Xavier-François Roblot and Brett A. Tangedal, *Numerical verification of the Brumer-Stark conjecture*, Algorithmic number theory (Leiden, 2000), Lecture Notes in Comput. Sci., vol. 1838, Springer, Berlin, 2000, pp. 491–503. MR1850628 (2002e:11158)

2

[9] David S. Dummit and Brett A. Tangedal, *Computing the lead term of an abelian L-function*, Algorithmic number theory (Portland, OR, 1998), Lecture Notes in Comput. Sci., vol. 1423, Springer, Berlin, 1998, pp. 400–411. MR1726088 (2001d:11110)

[10] David S. Dummit, Jonathan W. Sands, and Brett A. Tangedal, *Computing Stark units for totally real cubic fields*, Math. Comp. **66** (1997), no. 219, 1239–1267. MR1415801 (97i:11110)

Conferences Organized

Modular Forms and Geometry, May 2014
    The University of North Carolina Greensboro
Computational Algebraic Number Theory, May 2013
    The University of North Carolina Greensboro
A Computational Approach to L-functions, May 2012
    The University of North Carolina Greensboro
Palmetto Number Theory Series (PANTS XIII), September 2010
    The University of North Carolina Greensboro
Southeast Regional Meeting on Numbers (SERMON 2009), April 2009
    The University of North Carolina Greensboro
Southeast Regional Meeting on Numbers (SERMON 2004), April 2004
    The College of Charleston

Collaborators & Other Affiliations

Collaborators and Co-Editors

David S. Dummit, University of Vermont
Cornelius Greither, Universität der Bundeswehr München
Xavier-François Roblot, Université Claude Bernard (Lyon I)
Jonathan W. Sands, University of Vermont
Paul B. van Wamelen, Louisiana State University
Paul T. Young, College of Charleston

Graduate Advisors and Postdoctoral Sponsors

Harold M. Stark, Ph.D. Advisor, University of California at San Diego

Thesis Advisor and Postgraduate-Scholar Sponsor

Nancy Buck, M.A. advisor, completed 2010, University of North Carolina Greensboro
Rick Shepherd, M.A. advisor, completed 2013, University of North Carolina Greensboro
Total number of graduate students advised: 2

Jerry E. Vaughan
Three-page CV
j_vaugha@uncg.edu

Professional Preparation
Davidson College, BS, 1961.
Duke University, Ph.D., 1965

Appointments
Assistant Professor, University of North Carolina at Chapel Hill, 1967-1973.
Associate Professor, University of North Carolina at Greensboro, 1973-1976.
Professor, University of North Carolina at Greensboro, 1976-present.
Visiting Professor, Universita' di Missina (CNR, Italy), May 7 -June 7, 1994.

Selected Publications
Articles (total 68)
"The Scarborough-Stone Problem," in "Open Problems in Topology," Elliott Pearl, ed., Elsevier, Amsterdam 2007. Pages 249-256

"Countably compact hyperspaces and Frolik sums" with Istvan Juhasz, Topology and Appl. Volume 154, Issue 12, 15 June 2007, Pages 2434-2448

"Mrowka maximal almost disjoint families for uncountable cardinals," with Alan Dow, Topology and Appl. 157 (8) (2010), 1379-11394.

"Ordinal remainders of ψ-spaces," with Alan Dow, Topology and Appl., (Special Issue in memory of Melvin Henriksen) volume 158, issue 14, (1 September 2011) pp. 1852 - 1857.

"Ordinal Remainders of classical ψ-spaces" with Alan Dow, Fundamenta Mathematicae, 217 (2012) 83-93

Edited Books
The Handbook of Set-Theoretic Topology, editors K. Kunen and J. E. Vaughan, North-Holland Pub. Co., Amsterdam 1984, (1273 pages).

The Encyclopedia of General Topology, edited with J. Nagata and K. Hart, Elsevier BV 2005 (526 pages).

Invited Research Talks (since 2007)
Invited speaker at the MatsuyamaTopology Workshop, Ehime University, Matsuyama, Japan, December 2007. Invited speaker at the Serbian Analysis, Topology and

Applications International Workshop, May 2008, Vrnjacka Banja, Serbia. Invited Plenary Speaker at the Advances in Set-Theoretic Topology: Conference in Honor of Tsugunori Nogura on his 60th Birthday, Erice, Sicily, June 2009. Invited Plenary Speaker at The 2008 Summer Conference on Topology and its Applications, July 2009, Mexico City, Mexico. Invited Special Session Speaker, at the Regional meeting of the American Mathematical Society, Huntsville, Alabama, March 2009. Invited speaker at the Serbian Analysis, Topology and Applications International Worksohp, May 2010, Vrnjacka Banja, Serbia., Title of Talk: Ordinals homeomorphic to Stone-\v{C}ech remainders of $\psi(\kappa,\mathcal M)$-spaces. 2010 International Conference on Topology and its Applications, Nefpaktos, Greece. Title of talk: Ordinal remainders of ψ-spaces. Invited Plenary talk, University of Pittsburgh, May 11, 2015. Title of Talk "On Psi spaces."

Synergistic Activities

Main organizer (co-PI with Alex Chigogidze) for the Fortieth Annual Spring Topology and Dynamics Conference 2006) March 23-25, 2006. Supported by the National Science Foundation Grant $40,000.

Spring 2006, I was the host for a visiting scholar, Professor Istvan Juhasz of the Hungarian Academy of Science. Our joint research resulted in the first publication listed above.

Organizer and Chair of the Carolina Topology Seminar (2000- present). The seminar meets approximately every two week during the semesters at various universities in North and South Carolina.

Member of the Spring Topology steering Committee 2005-2009.

Member of the Summer Topology Steering Committee 2013-present.

Graduate Advisors and Postdoctoral Sponsors
Ph. D.'s directed and Ph. D. committee member
I directed three Ph.D. dissertations at UNC-CH. I was co-chair of a Ph.D. committee at NC State University (with G. Faulkner; degree granted by N.C. State, May 1999). I was member of three Ph.D. committees at UNC-Charlotte, most recently Roberto Pichardo Mendoza "T-algebras and Efimov's problem" 2010, and I was a member of a Mathematical Education Ph. D. committee at UNCG.

Master's Thesis Directed
I directed 5 MA theses at UNCG. During the past eight years: David Chodounsky, "Relative topological properties, "2006, Jonathn Verner, "The 17th topological type of [omega-star]," 2006, Catherine Payne , "On $\psi(\kappa, M)$ spaces with $\kappa = \omega$", 2010.

Collaborators and other Affiliations

Co-Authors

B. R. Wenner (Retired), H. Tamano (Deceased), R. M. Stephenson, Jr. (Retired), R. E. Hodel (Retired), E. E. Posey (Deceased), Peter Nyikos (University of South Caroliona), Togo Nishiura (Retired), Jan Pelant (Deceased), Petr Simon (Charles University, Prague, Czech Republic), Alan Dow (UNC-Charlotte), Eric van Douwen (Deceased), Jan van Mill (University of Amsterdam, Netherlands), Suzanne M. Lea (Retired), Ian S. Stares(Vice President of a bank in London), Mary Ellen Rudin (Deceased), Elise Grabner (Slippery Rock University, Slippery Rock, PA), Gary Grabner (Retired), Paul J. Szeptycki (York University, Canada), Istvan Juhasz (Alfréd Rényi Institute of Mathematics, Hungarian Academy of Sciences, Catherine Payne (UNC-Greensboro).

Co-editors

Jan van Mill (Amsterdam University, Amsterdam, Netherlands), D. Gonclaves (Departamento de Matemática, Universidade de São Paulo, São Paulo, Brazil), Darren Long (Department of Mathematics, University of California, Santa Barbara, CA), Henk Bruin (University of Vienna,Vienna, Austria), Alan Dow (UNC-Charlotte), Jerzy Dedak (University of Tennessee, Knoxville, TN), K. Kunen (Retired), J. Nagata (Deceased), K. Hart (Delft University of Technology, Delft, Netherlands).

Biographical Sketch
Walker Weigel
http://www.uncg.edu/mat/people/people.php?username=wgweigel

EDUCATION: BS in mathematics, Westhampton College, University of Richmond, VA (1964)

MA in mathematics, University of North Carolina, Chapel Hill, NC (1967)

Post graduate studies at UNCG - Mathematical Sciences: four computer science courses 1986-87

Statistics workshop in June 1997 Framingham, MA

EMPLOYMENT: Senior Lecturer at UNCG in 2013, Department of Mathematics and Statistics 1985-present

Division of Continual Learning, UNCG, teaching GRE and GMAT preparation 1992-2004

Math Teacher at Guilford Technical Community College, 1985-86

Systems Designer and Programmer, Western Electric, Greensboro, NC 1970-1972

Programmer, Computer Sciences Corporation, San Diego, CA 1969

Systems Designer and Programmer, North American Rockwell. Downey, CA 1967-69

MOST RECENT COURSES TAUGHT AT UNCG – Department of Mathematics and Statistics:
Sta-108 Elementary Introduction to Probability and Statistics
Sta-271 Fundamental Concepts of Statistics
Mat-112 Contemporary Topics in Mathematics
Mat-115 College Algebra
Mat-150 Precalculus I
Mat-151 Precalculus II
Mat-120 Business Calculus

Most recent duties at UNCG in the Department of Mathematics and Statistics:
1. Course coordinator for Sta108, Mat120, Mat150, and Mat151
2. Member of the Math Education Committee and the Math Emporium Committee
3. Mentor for lecturers

Dan Yasaki
Biographical Sketch

Office

Department of Mathematics & Statistics
The University of North Carolina
Greensboro, NC 27402
email: `d_yasaki@uncg.edu`   web: `http://www.uncg.edu/~d_yasaki`

Professional Preparation

The University of North Carolina Chapel Hill, Mathematics B.S., 1998
Duke University, Mathematics M.A., 2000
Duke University, Mathematics Ph.D., 2005
University of Massachusetts Amherst, Number Theory postdoc, 2005–2008

Research interests

Number theory (automorphic forms, quadratic forms), Topology of singular spaces (locally symmetric varieties).

Appointments

The University of North Carolina Greensboro, Associate professor, 2014–present
The University of North Carolina Greensboro, Assistant professor, 2008–2014
University of Sydney, Visiting scholar, April 22–May 19, 2009
University of Massachusetts Amherst, Visiting assistant professor, 2005–2008

Selected Publications

[13] S. Donnelly, P. E. Gunnells, A. Klages-Mundt, and D. Yasaki, *A table of elliptic curves over the cubic field of discriminant* -23, Exp. Math. **24** (2015), no. 4, 375–390.

[12] D. Yasaki, *Computing modular forms for* GL_2 *over certain number fields*, Computations with Modular Forms, Contributions in Mathematical and Computational Sciences, no. 6, 2014, pp. 363–377.

[11] D. Yasaki, *Integral cohomology of certain Picard modular surfaces*, J. Number Theory **134** (2014), 13–28.

[10] D. Yasaki, *Perfect unary forms over real quadratic fields*, J. Théor. Nombres Bordeaux **25** (2013), no. 3, 759–775.

[9] P. E. Gunnells and D. Yasaki, *Modular forms and elliptic curves over the cubic field of discriminant* -23, Int. J. Number Theory **9** (2013), no. 1, 53–76.

[8] P. E. Gunnells, F. Hajir, and D. Yasaki, *Modular forms and elliptic curves over the field of fifth roots of unity*, Exp. Math. **22** (2013), no. 2, 203–216, With an appendix by Mark Watkins.

[7] D. Yasaki, *On modular forms and elliptic curves over* $\mathbb{Q}(\zeta_5)$, RIMS Conference Proceedings: Automorphic forms, trace formulas, and zeta functions, 2011.

[6] D. Yasaki, *Hyperbolic tessellations associated to Bianchi groups*, Algorithmic number theory, Lecture Notes in Comput. Sci., vol. 6197, Springer, Berlin, 2010, pp. 385–396.

[5] D. Yasaki, *Binary Hermitian forms over a cyclotomic field*, J. Algebra **322** (2009), no. 11, 4132–4142.

[4] D. Yasaki, *Elliptic points of the Picard modular group*, Monatsh. Math. **156** (2009), no. 4, 391–396.

[3] P. E. Gunnells and D. Yasaki, *Hecke operators and Hilbert modular forms*, Algorithmic number theory, Lecture Notes in Comput. Sci., vol. 5011, Springer, Berlin, 2008, pp. 387–401.

[2] D. Yasaki, *An explicit spine for the Picard modular group over the Gaussian integers*, J. Number Theory **128** (2008), no. 1, 207–234.

[1] D. Yasaki, *On the existence of spines for $\mathbb{Q}$-rank 1 groups*, Selecta Math. (N.S.) **12** (2006), no. 3-4, 541–564.

Selected grants and awards

NSA (Grant 209090), *Voronoi Reduction Theory and Applications to Arithmetic Groups*, 2015–2016.

NSF (DMS-1303565), *UNCG Summer School in Computational Number Theory*, 2013–2015.

NSA conference grant, H98230-13-1-0253, *UNCG Summer School in Computational Number Theory*, 2013.

AIM SQuaREs, *Computation with Explicit Reduction Theories*, 2011–2013.

NSF (DMS-0921700), *Southeast Regional Meeting on Numbers*, 2009.

Number Theory Foundation, *Southeast Regional Meeting on Numbers*, 2009.

Number Theory Foundation, *UNCG Summer School in Computational Number Theory*, 2012.

NSF, US Junior Oberwolfach Fellow, 2011.

Number Theory Foundation, *Explicit Methods in Number Theory*, 2011.

Conferences Organized

UNCG Summer School in Computational Number Theory, *Zeta Functions – New Theory and Computations*, with Sebastian Pauli, Filip Saidak, and Brett Tangedal, May 2015.

AMS Fall Southeastern Sectional Meeting, *Special Session on Automorphic Forms and Related Topics*, with Matthew Boylan and Jayce Getz, November 2014.

UNCG Summer School in Computational Number Theory, *Modular Forms and Geometry*, with Sebastian Pauli, Filip Saidak, and Brett Tangedal, May 2014.

UNCG Summer School in Computational Number Theory, *Computational Algebraic Number Theory*, with Sebastian Pauli, Filip Saidak, and Brett Tangedal, May 2013.

UNCG Summer School in Computational Number Theory, *A Computational Approach to L-functions*, with Sebastian Pauli, Filip Saidak, and Brett Tangedal, May 2012.

Palmetto Number Theory Series XIII, The University of North Carolina at Greensboro, with Sebastian Pauli, Filip Saidak, and Brett Tangedal, September 2010.

Southeast Meeting on Numbers 2009, The University of North Carolina at Greensboro, with Sebastian Pauli, Filip Saidak, and Brett Tangedal, April 2009.

Selected invited talks

Computational Representation Theory in Number Theory, Oregon State University, *Torsion in the cohomology of arithmetic groups*, July 2015.

Curves and Automorphic Forms, *Modular Forms and Elliptic Curves Over the Cubic Field of Discriminant -23*, Arizona State University, March 2014.

AMS Eastern sectional meeting special session on Arithmetic Cohomology, *Modular Forms and Elliptic Curves Over the Cubic Field of Discriminant* -23, Boston College, April 2013.

Torsion in the Homology of Arithmetic Groups, Banff International Research Station, Alberta, Canada, *Some explicit* $\delta = 1, 2$ *computations*, July 2012.

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

Computations with Modular Forms 2011, Mathematics Center Heidelberg, *Computation of modular forms using Voronoi polyhedra*, September 2011.

Explicit Methods in Number Theory, Oberwolfach, Germany, *Computing modular forms using Voronoi polyhedra*, July 2011.

The University of Tokyo Graduate School of Mathematics, *Spines for* $\mathbb{Q}$-*rank* 1 *groups*, January 2011.

Automorphic forms, trace formulas, and zeta functions, Research Institute for Mathematical Sciences, Kyoto, Japan, *On modular forms and elliptic curves over* $\mathbb{Q}(\zeta_5)$, January 2011.

2nd Conference on the Cohomology of Arithmetic Groups, Wesleyan University, *The Gunnells algorithm for* 1-*sharblies*, July 2010.

Galois Theory and Explicit Methods, Warwick, UK, *Hecke operators, automorphic forms, and the cohomology of arithmetic groups II*, September 2009.

Computations with modular forms, Heilbronn Institute, Bristol, UK, *Hecke operators and Hilbert modular forms*, August 2008.

Locally Symmetric Spaces, Banff International Research Station, Alberta, Canada, *Spines for* $\mathbb{Q}$-*rank* 1 *groups*, May 2008.

Collaborators & Other Affiliations

Collaborators and Co-Editors

Adriano Bruno, MassMutual Financial Group
Steve Donnelly, University of Sydney
Mathieu Dutour Sikirić, Rudjer Bosković Institute
Herbert Gangl, Durham University
Paul Gunnells, University of Massachusetts Amherst
Farshid Hajir, University of Massachusetts Amherst
Jonathan Hanke, Metis
Ariah Klages-Mundt, Locus Analytics
Achill Schürmann, University of Rostock

Graduate Advisors and Postdoctoral Sponsors

Leslie Saper, Ph.D. advisor, Duke University
Paul Gunnells, Postdoctoral sponsor, University of Massachusetts Amherst
John Cannon, Visiting Scholar sponsor, University of Sydney

Thesis Advisor and Postgraduate-Scholar Sponsor

Paula Hamby, MA advisor, The University of North Carolina Greensboro
Total number of graduate students advised: 1

BIOGRAPHICAL SKETCH

Haimeng Zhang

Professional Preparation

University of Southern California	Applied Mathematics (Statistics)	Ph.D.	1998
University of Southern California	Computer Engineering	M.S.	1996

Appointments

July 2013 - Present	Associate Professor
	Department of Mathematics and Statistics
	University of North Carolina at Greensboro
August 2008 - July 2013	Associate Professor
	Department of Mathematics and Statistics
	Mississippi State University
August 2004 - 2008	Associate Professor
	Department of Mathematics and CS, Concordia College
August 1998 - 2004	Assistant Professor
	Department of Mathematics and CS, Concordia College
August 1993 - May 1998	Teaching Assistant
	Department of Mathematics, University of Southern California
February 1987 - August 1993	Instructor and Assistant Professor
	Jimei University, China

Selected Publications

1. Zhang, H. and Huang, C. (2014). *A Note on Processes with Random Stationary Increments.* Statistics and Probability Letters, **94**, 153 - 161.

2. Rao, M. B., Zhang, H., Huang, C., and Cheng, F. (2013). *A Discrete Probability Problem in Card Shuffling.* Communications in Statistics - Theory and Methods, in press.

3. Huang, C., Zhang, H., and Robeson, S. (2012). *A simplified representation of the covariance structure of axially symmetry processes on the sphere.* Statistics and Probability Letters, **82**, 1346 - 1351.

4. C. Huang, H. Zhang, and S. Robeson. *On the validity of commonly used covariance and variogram functions on the sphere.* Mathematical Geosciences, **43** (2011), 721-733.

5. L. Goldstein and H. Zhang. *A Berry Esseen theorem for the lightbulb process.* Advances in Applied Probability, **43** (2011), 875 - 898.

6. L. Goldstein and H. Zhang. *Efficiency calculations for the maximum partial likelihood estimator in nested-case control sampling.* Bernoulli, **15** (2009), 569 - 597.

7. H. Zhang and M.B. Rao. *A note on the generalized maximum likelihood estimator in partial Koziol-Green model.* Statistics and Probability Letters, **76** (2006), 813 - 820.

8. H. Zhang and C. Huang. *Nonparametric survival analysis on time-dependent covariate effects in case-cohort sampling design.* Statistica Sinica, **16** (2006), 267 - 285

9. H. Zhang and M.B. Rao. *Maximum likelihood estimation in linear models with equi-correlated random errors*, Australian and New Zealand Journal of Statistics, **48** (2006), 79 - 93

10. H. Zhang. *Asymptotic efficiency for estimation in the partial Koziol-Green model.* Journal of Statistical Planning and Inferences, **124** (2004), 399 - 408.

11. H. Zhang and L. Goldstein. *Information and asymptotic efficiency of the case-cohort sampling design in Cox's regression model.* Journal of Multivariate Analysis, **85** (2003), 292 - 317.

Research Talks (Since 2009)

1. August 2015, Joint Statistical Meetings, Seattle, WA
"Intrinsic random functions and universal Kriging on the circle."

2. July 2015, ICSA China Statistics Conference, Shanghai, China
"Intrinsic random functions and universal Kriging on the circle."

3. July 2015, 2015 IMS-China Conference on Statistics and Probability, Kunming, China
"Covariance structures of axially symmetric spatial processes on the sphere."

4. October 2014, AISC 2014, Greensboro, NC
"Covariance structures of axially symmetric spatial processes on the sphere."

5. September 2013, Math Club Presentation, UNCG
"Probabilistic Recurrence Relations."

6. September 2013, Department of Mathematics and Statistics, Statistics Seminar, UNCG
"One bulb? Two bulbs? How many bulbs light up? - A discrete probability problem involving dermal patches."

7. February 2013, Department of Mathematics and Statistics Colloquium, UNCG
"Estimation Efficiency in Cox's Model and Spatial Modeling on the Sphere."

8. February 2012, RET (Research Experiences for Teachers) Workshop, Center of Computational Sciences, Mississippi State University, Mississippi State, MS
"Sampling Schemes and Relative Efficiencies."

9. September 2011, Department of Mathematics and Statistics Colloquium, MSU, MS State, MS
"One bulb? Two bulbs? How many bulbs light up? - A discrete probability problem involving dermal patches."

10. March 2010, Department of Mathematics and Statistics Graduate Student Weekly Seminar, MSU
"Probabilistic Recurrence Relations"

11. August 2009, Joint Statistical Meetings, Washington D.C.
"Efficiency of the Maximum Partial Likelihood Estimator under Nested-Case Control Sampling"

12. March 2009, Mathematical Association of America MS/LA Regional Meetings
    Mississippi College, Clinton, MS
    "Probability in the Construction of Spaghetti"

13. February 2009, Department of Statistics Colloquium, Indiana University, Bloomington, IN
    "Efficiency of the Maximum Partial Likelihood Estimator for Sampling Designs in Cox Regression Model"

Synergistic Activities

- National Science Foundation, Collaborative Research: Axially symmetric processes and intrinsic random functions on the sphere, DMS# 1208847, PI, $64,718, 9/15/2012 - 8/31/2015. (Transferred to UNCG, DMS# 1412343, PI, $47,468, 12/2/2013 - 8/31/2015)

- National Science Foundation, Research Experiences for Undergraduates (REU) in Applied Mathematics and Biostatistics, DMS# 0852032, Senior Personnel (PI: Hyeona Lim), $200,000 (with $54,646 of matching funds from Mississippi State University), 9/15/2009 - 8/31/2012.

- International Joint Commission (IJC), International Water Institute of North Dakota State University, 2005 - 2007, $62,000 (subcontract $14,000: statistical data analysis).

- National Institutes of Health - R21. Spatiotemporally adaptive influenza surveillance based on genomics, subcontract $16,964, Co-PI (PI: Henry Wan, Mississippi State University). Pending.

- Reviewer: Journal of Multivariate Analysis, Test, Journal of Statistical Planning and Inference, Mathematical Review. University of Missouri Research Board, Scandinavian Journal of Statistics, "Workshop on Copula Theory and Applications, " published by Springer-Verlag, College Mathematics - Classroom Capsule, Communications in Statistics: Theory and Methods, Statistics in Medicine, Journal of Nonparametric Statistics, Mathematical Reviews, Statistics and Probability Letters, Springer: Springer Proceedings in Mathematics and Statistics series.

Students Advised

- Master student graduated: Yuan Yuan (2009), Zhifa Liu, Daniel Krywaruczenko (2010), Chad Blackshear, Zirui Gu (2011), Chris Vanlangenberg, Seth Lirette, Yang Xu (Spring 2012), Wei Chen (Summer 2013) - Mississippi State University.

- Current Ph.D students: Wenshuang Wang (Mississippi State University), Chris Vanlangenberg, Wei Chen (UNCG).

Collaborators & Other Affiliations

Name	Affiliation	Relationship
Goldstein, L.	University of Southern California	Thesis Advisor, Collaborator
Huang, C.	Indiana University	Collaborator
Rao, M.B.	University of Cincinnati	Collaborator
Robeson, S.	Indiana University	Collaborator

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