For ALUMNI and FRIENDS

Proof Reader

From the School of Mathematics, College of Sciences @ Georgia Tech®

Georgia Tech

Notes from the Chair

Anyone who remembers his or her college days will recall that a lot of learning takes place in the process of reviewing for an exam, taking the exam, and analyzing the aftermath. So it is here in the School of Mathematics as well, where we have recently completed an "Academic Program Review." This is a once-every-five-years examination of all of our efforts, focused principally on the degree programs we administer solely (the BS degrees in Applied and Discrete Mathematics, and the MS and PhD degrees in Mathematics) and also on our research, our outreach and service, and our interdisciplinary degree programs (in Statistics; Quantitative and Computational Finance; Bioinformatics; and Algorithms, Combinatorics, and Optimization).

We spent a great deal of time in the fall of 2011 preparing a self-study which you can think of as our index cards and notes for the exam. In February 2012 came the exam itself—a two-day visit by a distinguished panel of experts during which they spoke with faculty, staff, and students, both in the School and in some of our client departments. They then reported to the dean and provost with several findings and recommendations.

How did we do? There are, of course, no letter grades in this process, but if there were, I think it would be fair to say that we earned an A. The panel's report praised our educational efforts, both undergraduate and graduate, and our research programs. They pointed out that we have "many top-notch faculty at all levels" and "excellent, loyal staff who clearly enjoy working in the School." They also liked that the School has made "a serious effort in connecting with its alumni."

Of course there are areas for improvement. Many of them are related to the huge demand for our courses. The self-study points out that we see over half of all Georgia Tech students on campus in our courses every year! And this is not just in basic courses. In fact, students not majoring in math outnumber our majors in 3000-level courses by ten to one, and they are the majority even in 4000-level courses.

Partly to address this huge demand and partly to advance our research effort, the School has proposed a major new postdoctoral program. This would bring the best new PhDs to campus for two or three-year appointments. They would help with teaching, do research with our senior faculty, and then move on to tenure-track positions at leading universities.

The visiting panel was very enthusiastic about this plan and made a strong recommendation in favor of it. The panel also recommended an increase in the size of our graduate programs, both in recognition of our successes so far and to help keep the size of our course recitation sections reasonable. Both recommendations were well received by Dean Houston and Provost Bras, and we have been given additional funds as a start toward a postdoctoral program and increased graduate enrollments. We in the School are delighted with this outcome.

In addition to the program review, there were many other exciting developments this year in the School, several of which you can read about in this edition of ProofReader.

Our faculty continues to be competitive for the highest national honors in recognition of research and education. For example, Assistant Professor Greg Blekherman was awarded a Sloan Foundation Research Fellowship, Professor Stavros Garoufalidis was awarded a Guggenheim Fellowship, and Associate Professor Maria Westdickenberg won the Presidential Early Career Award for Scientists and Engineers, the highest honor bestowed by the federal government on an early-career faculty member. These and several other awards are discussed on pages 14–15.

Our students are also regularly recognized by campus research prizes and by highly competitive programs from agencies such as the US National Science Foundation, the Natural Sciences and Engineering Research Council of Canada, and the US Department of Defense. See pages 16–17 for more on our amazing students.

Our staff continues to be a phenomenal resource. Several staff members were nominated for well-deserved campus-wide awards. See page 18 for a profile of Joanne Cook. Joanne keeps all of our work on faculty recruitment, promotion and tenure, and post-tenure review on track, and she is a sharp-penned editor whom I rely on to vet all of my correspondence.

We are also proud of our outreach and service efforts. The High School Mathematics competition continues to grow every year, and we have obtained new support from the Office of the Provost and the Georgia Tech Admissions Office to continue awarding scholarships to the winners.

Last but not least, we are grateful for the interest and support of our friends and alumni. The Friends of the School of Mathematics (FoSoM) sponsored two events during the 2011–2012 academic year. One was an all-school barbecue held during homecoming weekend. School alumni Gary Robinson (BS 1967) and Bill Wise (BS 1970, MS 1972), both of whom are expert barbecue judges, prepared fabulous meats and sauces to feed a crowd. See page 36 for photos. In the spring, the Friends sponsored a panel discussion on technology and teaching. We discussed our experiments using personal response systems ("clickers") and online homework, as well as Tech's Distance Calculus Program in support of talented high school students who have progressed beyond their school's math offerings. See page 35 for more on this event.

I continue to be impressed by the quality of our faculty, the talent of our students, and the dedication and skill of our staff. I'm very grateful for the strong support of our friends and alumni. All these things make Georgia Tech a great place to do mathematics. I hope you enjoy reading about our activities, and we invite your suggestions and comments and look forward to hearing from you.

Best wishes,
Doug Ulmer
Professor and Chair

SoM Statistics Spring 2011

Faculty	54	(tenured or tenure track)
Emeritus Faculty	15	
Academic Professionals	3	
Instructors	3	
Visitors and Postdocs		
Visitors	10	(for semester or more)
Postdocs	9	
Staff	11	full-time
	1	part-time
Graduate Students	71	
Undergraduate Students		
Math	158	
Discrete Math	30	

About the Cover:

The cover's collage focuses on the history of computing in the School of Math and incorporates photos of the UNIVAC 1108 and of Professor Les Karlovitz with students in the Apple II computer lab. Both are superimposed over the image of a hand-wired circuit board that was used to compute iterated functions that generated many of the figures in Michael Barnsley's book *Fractals Everywhere*. Students did this programming in hardware to achieve greater computational speed. The collage uses photographs from the Georgia Tech archives and was created by our graphic designer, Janet Ziebell.

Computing in the School of Mathematics

For most of us in the School of Mathematics (SoM), it is second nature to use a computer while doing our daily work, be it email, surfing the web, typing papers, or—god forbid—doing some computations. Needless to say, it was not always that way, and Ron Shonkwiler's feature article tells us the story of the beginnings of our computer system.

In multiple ways, Ron was responsible for creating the efficient network we all enjoy. While many of us had learned how to program in some of the "old" programming languages, running a network of workstations was (and still is) a task that required a much higher level of expertise. At the same time he was setting up the network, Ron, with great patience, helped us "uninitiated" become a little more expert in working with computers. In fact, Annette Rohrs, who manages the SoM web pages, learned her craft from Ron. It is hard to imagine a better person to recount the history of computing in the SoM.

—The Editors

...A Brief History up to the Inception of Its Modern Form

By Ron Shonkwiler

Serious computing started here at the Institute with the 1954 acquisition of a UNIVAC 1101 (or ERA 1101) computing system built by Remington Rand. The Rich Electronic Computer Center was built on campus to house this machine, and the Center was dedicated in 1955. The computer measured 38 feet long and 20 feet wide and had a rotating drum memory equivalent to 48 kilobytes. (See http://www.gtri.gatech.edu/history/our-history/age-automation-arrives)

The machine was procured primarily through the efforts of I.E. Perlin who was the first PhD hired by the SoM at the end of WWII. Along with Perlin, many faculty and students in the SoM worked on the ERA 1101, including faculty members Cecil Currie, Richard Garrett, Ralph Willoughby, and Bert Drucker, with students Bill Lyons, Woody Bartlett, and Jamie Goode.

In the late 1960s the Rich building became the home of a CDC Cyber 6600. This machine had a 100ns clock cycle and was capable of one megaflop (1,000,000 floating point operations per second). The 6600 could address only 128K of memory and introduced peripheral processing units (PPUs) to handle disk input/output (I/O).

Jobs could be submitted to the 6600 in "batch" mode. This meant punching the lines of your Fortran program on IBM cards measuring $3^1/_4$ inches by $7^3/_8$ inches and then submitting the stack, wrapped in rubber bands, to the I/O window in Rich. (Please don't drop them!) Later that day or the next, you received your results printed on large fanfold papers (15 inches by $8^1/_2$inches) placed in an output bin in the Rich building.

In the early 1970s things improved somewhat in that jobs could now be submitted remotely via a teletype terminal. These were wired connections to the 6600 with a typewriter-style keyboard but with only uppercase letters. (Each character in the 6600 used six bits, so there could be only 64 characters altogether. The computer used 60-bit words, so each memory location could store 10 characters.)

The School of Mathematics' terminal was located in a classroom, converted for the purpose, on the east side of the second floor of Skiles. Upon request, a faculty member got a login name/code and password and had a small amount of disk space to store programs and results. The 6600 used the very limited Network Operating System (NOS).

Meanwhile the 1970s saw rapid development in the computer industry. As integrated circuits, or chips, became smaller and more powerful, smaller computers became available that were more powerful than their predecessor mainframes.

First there were minicomputers. The most famous of these was the PDP-1. Then came "scientific workstations" using fewer and even smaller chips. Finally, in 1974, Intel succeeded in producing the first "computer on a chip," the 8080 Central Processing Unit (CPU).

In 1975, the Altair 8800, the first personal computer hit the market. It was designed by Ed Roberts and built in his garage. The IMSAI 8080 and the SOL-20, both using the Intel 8080 CPU, quickly followed this. It was at this time that some SoM faculty acquired home computers and began experimenting with them.

Shortly after the 8080 machines became available, a brand new start-up called the Apple Computer Company introduced the Apple II, based on the MOS 6502 CPU. It was a breakthrough machine in that it was attractive and lightweight, came with the BASIC programming language, and featured the {\em graphical} display.

The SoM Chair at the time, Les Karlovitz, saw potential in the Apple II as a teaching tool in mathematics and won a National Science Foundation (NSF) grant to set up a computer lab sporting software to help teach calculus. The lab used the old teletype room and featured around a dozen Apple IIs programmable in Pascal. Several faculty members were involved in writing the interactive calculus programs that featured graphical illustrations of two- and three-dimensional functions and their derivatives as tangent lines and planes. Mark Christensen headed up the software effort.

UNIVAC Scientific (ERA 1101) Computer

Inevitably the Apple IIs became outmoded. But thanks to a grant from the Burroughs Corporation procured by Mark Christensen (Mark's wife worked for Burroughs), a new, expanded student lab was created, this time on the west side of Skiles. The new lab consisted of approximately 24 Burroughs B20 computers. One of the most interesting student programs developed on the B20 was the famous "Land O' Lakes" logo done entirely in fractals by a graduate student taking Michael Barnsley's fractal graphics course.

In time the Burroughs machines became obsolete. But then the School acquired an allotment of IBM PS2s as part of an Institute-wide grant from the IBM Corporation. The School hired an electrical engineering undergraduate student, Darren Hunt, to maintain these computers.

Meanwhile a completely separate initiative was taking place. In 1986 Michael Barnsley and Alan Sloan received a major grant from the NSF to study fractal image compression. They set up a lab consisting of four ethernetted, Masscomp high-end graphics workstations along with a file server. These computers ran the Unix operating system and were also connected by ethernet to the burgeoning internet. (The lab was spared attack from the famous internet "worm", the program that started the hacking craze.) The "Fractals lab" occupied the former location of the old Apple II lab on the East side of the building.

The Fractals lab was a very important precursor to the current computing environment in the SoM because it brought together all the components that we find today: graphical scientific workstations; the Unix multiuser, multi-process operating system; ethernet connectivity to the internet using communication protocol TCP/IP; email, and a wide range of utility and application software, including text processing, network printing, and program development. It also served as a training ground for faculty members who would later be responsible for the Sun computer system.

The present form of the computing environment in the SoM began when Jack Hale and Shui-nee Chow came to Tech and set up the Center for Dynamical Systems and Nonlinear Studies (CDNS) in 1988. A year later Shui-nee Chow became the Chair of the School. He negotiated a package from the Institute that included the construction of an SoM-CDNS computational infrastructure that has grown into our current environment.

...A Brief History continued...

The parameters for the new system were that it be built around the Sun Microsystems product line. After extensive negotiations with a Sun representative, the package came down to a Sun-4 file server with two 1024 megabyte disk drives and 12 SPARC I workstations.

The Sun computational philosophy was the pioneering vision we enjoy today. In this vision, individual computers are networked to a file server that contains all the application software as well as user identity and workstation information. It also holds the user's home directory or work space. A user can log in from any workstation; the software flows from the file server to the user. Changes made to the home directory are saved between sessions. In addition, system resources such as printers and modems for off-campus access are networked.

As a result of my experience managing the Fractals lab while the lab's co-principals devoted themselves to their start-up company, I was put in charge of implementing the Sun system. Upon my recommendation, the School hired Mark Nailor as its first System Administrator in 1990. Mark was the first of many talented technical people the School has attracted to this and the other support positions. Frank Seto, a student who was hired about a year later, also comes to mind.

Mark quickly had the system going shortly after its delivery. He ran the thick yellow coaxial ethernet cable through the ceilings, up and down the hallways; cored the "drops" to individual workstations; and wrote the "book," later used by his successors, for setting up new workstations, performing backups, setting up email, and much more.

Since then the system has grown by degrees. More workstations were added year by year. By 1994 virtually all offices had a workstation or, as some faculty preferred, a Mac. (The Macs were not file served but did enjoy email.) Mark left the job after about a year and a half. In the interim during the search for his replacement, I handled the system administration duties. Eventually the School hired one of its own graduate students, Richard Coleman, who had enthusiastically applied for the position. Richard was the second of our highly dedicated and knowledgeable administrators. He specialized in automating tasks and installing third-party software, and it was at this time that the World Wide Web phenomenon took place with the Mosaic web browser.

The UNIVAC 1108 computing system with the operator (Mr. Tillirson) at the control console and the assistant operator (Mr. Knight) mounting a data storage magnetic tape on one of the four tape units.

Of course much has happened since those early times, but the basic structure and philosophy of the system have remained. It was a pioneering, but fondly remembered, struggle.

Wilfrid Gangbo...Transportation theory research by Michael Loss

If one looks at a Paris street map, one is struck by the place scientists occupy in French society. Many streets are named after them: Rue Lagrange, Rue Legendre, Rue Monge, Place Monge, and Rue Lavoisier, just to name a few. Readers might point out that Lagrange is also the name of a city in Georgia. However, Lagrange, Georgia, is, according to Wikipedia, "named after the country estate near Paris of the Marquis de La Fayette, who visited the area in 1825."

A scientist not very well known outside the world of mathematics is Gaspard Monge (1746-1818). He made fundamental discoveries in differential geometry and partial differential equations (the Monge cone). Of particular interest to us is the fact that he was the first to formulate the transportation problem encountered when considering how to move soil in an optimal manner to create earthworks. He posed this problem in a 1781 memoir, and it has not lost its appeal to this day. Furthermore, discussing the solution of this problem gives us an opportunity to highlight the research of our School of Mathematics Professor, Wilfrid Gangbo, who made fundamental contributions to this subject. More about that later!

In the following sections, we will describe the transportation problem and give an application. The prerequisites for the reader are a bit of Calculus III, such as Jacobi determinants and Gauss' theorem, as well as a bit of linear algebra like eigenvalues.

Imagine that you are given two densities, $\rho_1(x)$, which lives in a bounded subset X of $\mathbb{R}^n$, and $\rho_2(y)$, which lives in a bounded subset Y of $\mathbb{R}^n$. We assume that they have the same integral, i.e., $\int_X \rho_1(x)dx = \int_Y \rho_2(y)dy$. Think of $\rho_1(x)$ as the density of the amount of ore that can be extracted from a mine at point x and $\rho_2(y)$ as the density of ore that gets used in a factory at point y. If $c(x, y)$ measures the cost to transport one unit of ore from point x to point y, what is the most efficient way, i.e., with the least cost, to transport the ore produced in the mines to the factories? Note: The condition that the two densities have the same integral means that all the ore produced in the mines gets used up in the factories. In Monge's original paper the cost function was the Euclidean distance $|x - y|$.

To give a precise mathematical formulation of this problem Monge introduced a transference plan, which is a function or map $T : X \to Y$, i.e., it associates to every point $x \in X$ a unique point $T(x) \in Y$. Using this map T, the transference plan works in the following fashion. Pick a region $C \subset X$. Then the amount of ore produced there is given by

$$\int_C \rho_1(x)dx \ .$$

The ore produced in C is moved by T to a region $T(C)$, and there it is used up by the factory. The amount the factory uses is given by

$$\int_{T(C)} \rho_2(y)dy = \int_C \rho_1(x)dx \ .$$

So far, no tricky mathematics has been used. If we know for some reason that $T(x)$ is differentiable, then we set $y = T(x)$, i.e., change variables, and get

$$\int_{T(C)} \rho_2(y)dy = \int_C \rho_2(T(x))|\det(DT(x))|dx \ ,$$

Wilfrid Gangbo

Wilfrid Gangbo continued

where $DT(x)$ is the Jacobi matrix of T at x. Hence,

$$\int_C \rho_2(T(x))|\det(DT(x))|dx = \int_C \rho_1(x)dx \ ,$$

which must hold for every region $C \subset X$. If we divide both sides of the above expression by the volume of C and let the region shrink around x, we find

$$\rho_1(x) = \rho_2(T(x))\det(DT)(x) \ . \tag{1}$$

The total cost of this transference plan is then given by

$$\int_X c(x, T(x))\rho_1(x)dx \ ,$$

and the Monge-problem is to minimize this cost among all functions $T : X \to Y$ that satisfy (1). The reader may notice that in order to turn this into a true mathematical statement, various conditions have to be spelled out about ρ_1, ρ_2, and T, which we shall not do. Also note that the existence of such a map is by no means clear, because it might well be that the optimal way of transporting a certain amount is by driving it with one truck for a while and then splitting it and loading it onto two trucks that then drive in different directions.

Monge did not solve this problem, although he had a good idea of how the solution was supposed to look. The French Academy of Science created the Bordin Prize to stimulate the study of this important area of mathematics. Indeed, over the the years many people contributed. One should mention the Russian economist Leonid Vitaliyevich Kantorovich, (Nobel Prize in 1975), who created a different but useful formulation of the transportation problem. Vladimir Nikolaevich Sudakov, a Russian mathematician, was the first to solve the Monge problem, although there is a caveat that we will mention later. Mathematicians working in probability theory also made important contributions.

The general view of this field changed dramatically when it was realized that the transportation problem was related to a whole host of other interesting mathematical problems. Yann Brenier, a French mathematician, showed that if the cost is quadratic, i.e., $c(x, y) = |x - y|^2$, the optimizing function T exists and is of the form $T(x) = \nabla\psi(x)$, where ψ is a convex function. He also realized that transportation theory leads to polar factorization for maps, i.e., any map from X to Y can be written as the composition $T \circ S$, where T is the gradient of a convex function and S is a map that preserves the volume. This is analogous to the factorization of complex numbers $z = re^{i\phi}$. It was then discovered that atmospheric scientists have been using the solution of the transportation problem to understand certain equations governing atmospheric fronts (semi-geostrophic equations).

A real breakthrough was made by Georgia Tech Professor Wilfrid Gangbo. He came up with a new way of solving the transportation problem that proved to be very powerful. In joint work with Canadian mathematician Robert McCann, Gangbo found the solution for a large class of costs, not just the quadratic one. The cost function that Monge used, however, was excluded. As mentioned before, Sudakov made great advances toward a solution of the problem where the cost is given by the distance $|x - y|$, but there was a gap in the proof for three and higher dimensions. Professor Gangbo, jointly with Craig Evans at the University of California at Berkeley, developed a different strategy, and theirs worked. It is fair to say that their proof is the first complete solution of the problem that Monge posed in 1781, and it was achieved in 1999, more than 200 years later.

We cannot resist presenting one more application of the transportation problem. We shall prove the isoperimetric inequality, which states that among all shapes in n-dimensional space that have the same volume, the ball has the smallest surface area. This problem has a very long history and has occupied many excellent mathematicians. It is therefore really surprising that the transportation problem can be used to understand this deep question. The argument we are going to present is that of Misha Gromov, a Russian-born mathematician who works in Paris. For simplicity we will restrict ourselves to two dimensions, in which case the inequality is given by

$$|S| \leq \frac{|\partial S|^2}{4\pi} \ . \tag{2}$$

Here S is a region in the plane, $|S|$ is its area, ∂S is its boundary, and $|\partial S|$ denotes the perimeter. The reader can easily verify that the inequality is an equality for S being a disk.

The idea is to transport the set S to a disk. Think of $\rho_S(x)$ as the characteristic function of this set, i.e., it has value 1 for points in the set and 0 otherwise. Let D be a disk centered at the origin that has the same area as S. Let ρ_D be the characteristic function of this disk. Now we use Brenier's Theorem that furnishes an optimal transference plan to transport ρ_D to ρ_S, i.e.,

$$\rho_S(x) = \rho_D(\nabla\psi(x))\det(H_\psi)(x) \ , \tag{3}$$

where ψ is a convex function. Here H_ψ is the Hessian of ψ, and because ψ is convex, the Hessian has positive eigenvalues λ_1, λ_2. We have $|S| = \int_S [\rho_S(x)]^{1/2}dx$ because the function ρ_S equals 1 exactly on the set S. Now using (3),

$$|S| = \int_S [\rho_D(\nabla\psi(x))]^{1/2}[\det(H_\psi)(x)]^{1/2}dx \ .$$

Note that $[\det(H_\psi)(x)]^{1/2} = \sqrt{\lambda_1\lambda_2} \leq \frac{1}{2}(\lambda_1 + \lambda_2)$ because of the inequality between the geometric and arithmetic means. In terms of the Hessian $H_\psi(x)$,

$$\frac{1}{2}(\lambda_1 + \lambda_2) = \frac{1}{2}\left[\frac{\partial^2\psi}{\partial x^2} + \frac{\partial^2\psi}{\partial y^2}\right] = \frac{1}{2}\Delta\psi(x) \ .$$

Hence we have found that

$$|S| \leq \int_S [\rho_D(\nabla\psi(x))]^{1/2}\frac{1}{2}\Delta\psi(x)dx = \frac{1}{2}\int_S \Delta\psi(x)dx = \frac{1}{2}\int_S N \cdot \nabla\psi(x)dx$$

by Gauss' theorem. Here N is the unit outward normal vector on ∂S. Clearly we have that $N \cdot \nabla\psi(x) \leq |\nabla\psi(x)|$. On the set S, $|\nabla\psi(x)| \leq R$, where R is the radius of D. This follows, because $\nabla\psi(x)$ ranges through the disk as x ranges through S, and hence we find that

$$|S| \leq \frac{1}{2}R|\partial S| \ .$$

Because D and S have the same volume and $|D| = \pi R^2$, we find that $R = (|S|/\pi)^{1/2}$ and hence

$$|S| \leq \frac{|\partial S|^2}{4\pi} \ ,$$

which is precisely the isoperimetric inequality.

This is but one example among many that demonstrates the effectiveness of the transportation problem, whose development has been one of the most exciting mathematical advances in the past 15 years.


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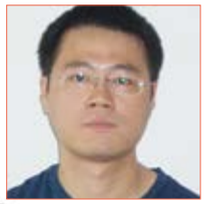
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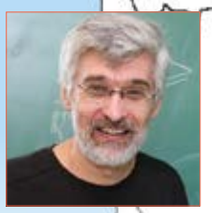
Where in the World Are Georgia Tech Mathematicians?

From time to time, they are in Belgium, Bulgaria, Canada, Chile, China, England (UK), Finland, France, Germany, Hungary, Israel, Italy, Japan, Romania, Russia, Spain, Sweden, Switzerland, Turkey, and throughout the United States working with their research collaborators! As you look at the maps, you will see photos of some faculty members who are doing research throughout the world; we are a well-traveled group.

—The Editors

1. Jean Bellissard is working with Antoine Julien in Canada.
2. Michael Lacey is working with Ignacio Uriate-Tuero.in Canada.
3. Zhiwu Lin is working with Walter Strauss in the USA.
4. Michael Loss is working with Rafael Benguria in Chile.
5. Tom Morley is working with Allen Butler, William Anderson, Wayne Lobb, and George Trapp in the USA.
6. Tom Trotter is working with Dwight Duffus and Hal Kierstead in the USA.
7. Howard Weiss is working with Bruce Levin, Vicki Hertzbert, and Henry Wan in the USA.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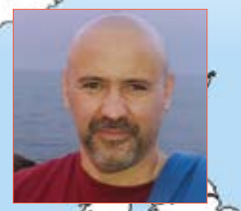
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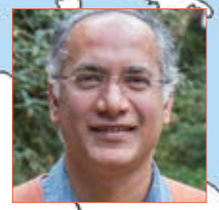
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8. Federico Lonetto is working with Maurizio Iacopetta in France.
9. Leonid Lunimovich is working with Ruedi Stoop in Switzerland.
10. Jeff Geronimo is working with Walter Van Assche in Belgium and Paco Marcellan in Spain.
11. Michael Lacey is working with Tumoas Hytonen in Finland and Maria Reguera in Sweden.
12. Thang Le is working with Anna Beliakova in Switzerland.
13;. Karim Lounici is working with Pierre Alquier in France and Massimilian Pontil in the UK.
14. Andrzej Swiech is working with Fausto Gozzi in Italy.
15. Prasad Tetali is working with Cyril Roberto, Paul-Marie Samson, and Nathael Gozlan in France.
16. Tom Trotter is working with Graham Brightwell in the UK and Stefan Felsner in Germany.

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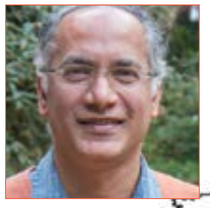

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17. **Tom Trotter** is working with Endre Szemer and Laszlo Lovasz in Hungary.
18. **Wing Li** is working with Dan Timotin in Romania.
19. **Prasad Tetali** is working with Andrei Raigorodskii in Russia.
20. **Plamen Iliev** is working with Emil Horozov and Alberto Grunbaum in Bulgaria.
21. **Jean Bellissard** is working with Semail Yildirim in Turkey.
22. **Doron Lubinsky** is working with Eli Levin in Israel.

23. **Xingxing Yu** is working with Genghua Fan and Baogang Xu in China.
24. **Xu-Yan Chen** is working with Yoshihisa Morita, Eiji Yanagida, and Hiroshi Kokubu in Japan.
25. **Andrzej Swiech** is working with Shigeaki Koike in Japan.

Awards July 2010–June 2011

August 2011

Our new colleague, Professor **Rafael de la Llave**, has recently been named a Fellow of the Institute of Physics (IoP), the main professional organization of physicists in the UK. The only other faculty member of the School to be named a Fellow of the IoP is Professor Lyonia Bunimovich.

In May 2012 the research article "Time-dependent scattering theory for ODEs and applications to reaction dynamics" by Professor de la Llave was selected for the Highlights of 2011 Collection of the Journal of Physics A.

September 2011

Associate Professor **Maria Westdickenberg** received the Presidential Early Career Award for Scientists and Engineers (PECASE). The PECASE Award is the highest honor bestowed by the United States government on outstanding scientists and engineers beginning their independent careers. Dr. Westdickenberg is one of 94 recipients of the PECASE, and she received the award from President Obama on October 14.

November 2011

Regents Professor **Robin Thomas** was awarded the 2011 Neuron Award for Lifetime Achievement in the Field of Mathematics. The annual Neuron Awards were established by the Karel Janecek Endowment Fund (Nadacni Fond Karla Janecka) in 2010 and are awarded in medicine, economics, and mathematics. Robin received the prize on November 9 at a ceremony held at the Academy of Performing Arts in Prague, Czech Republic. The ceremony was preceded by a daylong conference in his honor, "The Robin Thomas Fest," with many international scholars participating.

January 2012

Professor **Michael Loss** was inducted as a Foreign Corresponding Member of the Chilean Academy of Sciences in Santiago, Chile, at a formal meeting. The Academy citation noted that Michael "... combines, with elegance and style, physical intuition and mathematical rigor, obtaining profound and highly interesting results in physics as well as in mathematics."

February 2012

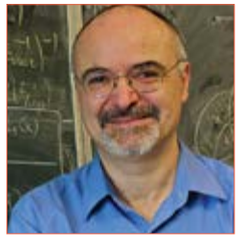
Instructor **Klara Grodzinsky** has been awarded the Class of 1934 Course Survey Teaching Effectiveness Award. This award is based on high response rates and high scores in Course Instructor Opinion Survey evaluations. Klara received a congratulatory letter from Donna Llewellyn, Center for the Ehancement of Teaching and Learning (CETL) Director, and a monetary bonus.

Professor **Greg Blekherman** received a Sloan Foundation Research Fellowship. In the words of the Sloan press release, "the fellowships are given to early-career scientists and scholars whose achievements and potential identify them as rising stars, the next generation of scientific leaders."

March 2012

Professor **Michael Lacey** is one of the inaugural Simons Fellows in Mathematics. There were 77 awards given in mathematics and theoretical physics, each allowing a distinguished scientist to extend an academic leave from a semester to a year.

Professor Lacey also received the Georgia Tech College of Sciences Mentorship Award in recognition of the time and effort that he has spent in mentoring. The award expresses the Institute's appreciation for the mentor's services to the community.



April 2012

Professor **Stavros Garoufalidis** was awarded a prestigious Guggenheim Fellowship. The foundation's web site notes that the "fellowships are intended for men and women who have already demonstrated exceptional capacity for productive scholarship." Garoufalidis plans to use the award to support his faculty development leave at the Max Planck Institute in Bonn.

In June Professor Garoufalidis gave an invited lecture at the Clay Research Conference at Oxford University, UK, during the June meeting. These lectures bring the latest research advances to a wide mathematical audience.

Professor **Liang Peng** was named a Fellow of the American Statistical Association in recognition of his outstanding contributions to the statistical profession. Fellows were presented their awards in July in San Diego during the Joint Statistical Meetings.

Professor **Prasad Tetali** was given the Outstanding Senior Faculty Research Award by the College of Computing. The award is based on the quality, impact, and significance of research and publications.

Graduate Students' Awards

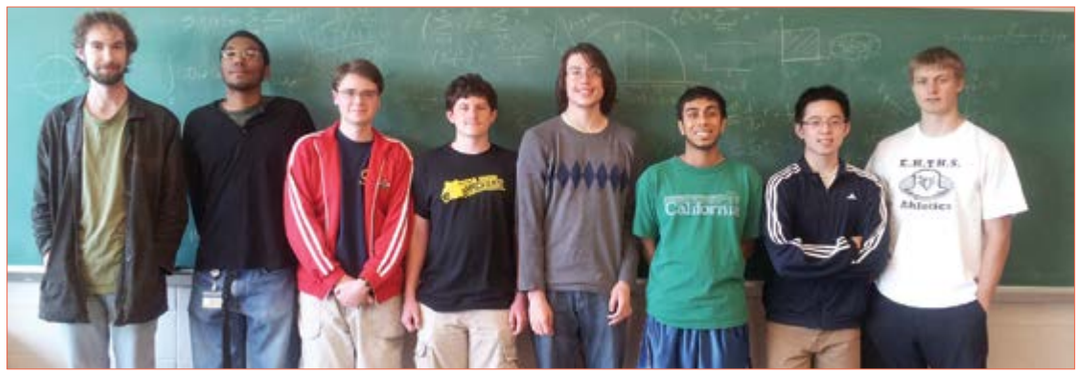
July 2011—June 2012

- First-year A,CO student **Jennifer Townsend** was selected as a Microsoft Research Graduate Women's Scholar. This is a one-year scholarship program for outstanding women graduate students and is designed to help increase the number of women pursuing a PhD Jennifer is one of only 10 winners selected this year and her selection recognizes her accomplishments and potential.
- Top Graduate Students: **Ruoting Gong, Chun-Hung Liu** (SoM award for evidence of superior academics and research)
- Outstanding Graduate Teaching Assistant: **Ashley Bentley** (SoM award for superior TA performance)
- Best PhD Thesis Defended April 1, 2010–April 1, 2011: **Amit Einav** (Advisor: Michael Loss)
- School of Mathematics graduate student **Ruodu Wang** received the Laha Travel Award from the Institute of Mathematical Statistics and was able to present a paper at the IMS Annual Meeting at the Eighth World Congress in Probability and Statistics in Istanbul, Turkey in July.

Undergraduate Awards

July 2011—June 2012

- Outstanding Undergraduate Teaching Assistants: **Andrew Dicks, Henry Mei**
- Outstanding Student Evaluation Recipients: **Andrea Crews, Nick Keith, Moreed Khosravanipour, Shane Lympany, Katie Pierce, Stacey Touset**
- In recognition of the following students' outstanding academic accomplishments and excellence:
  Senior Prize: **Melanie Dunn**
  Undergraduate (Freshman-Junior) Prize: **Martin Copenhaver, Ross Granowski**
- Club Math elections for the 2012-2013 school year were held on Monday, April 16.
  Election Results:
  President: **Peter Woolfitt,** Puzzlemeister: **Eric Huang,** Treasurer: **Ian Best,**
  Webmaster: **Yating Wang,** Publicitymeister: **Andrew LaFrenier**



Left to right: Andrew LaFrenier, Jeremy, Martin Copenhaver, Nolan Hackett, Peter Woolfitt, Kunal Shah, Eric Huang, and Ian Best.

Undergraduate Awards

July 2011—June 2012

Martin Copenhaver won the College of Sciences' Roger M. Wartell and Stephen E. Brosett Award for Multidisciplinary Studies in Biology, Physics, and Mathematics for his research into the secondary structure of RNA. He was supervised by Professor Christine Heitsch.

Georgia Tech undergraduate students **Peter Woolfitt** (applied math), **Dustin Morado** (applied math), and **Gautam Goel** (discrete math) won first place in the undergraduate team problem-solving competition at the Second Eagle Undergraduate Mathematics Conference 2012. The event was hosted by the Mathematical Sciences Department at Georgia Southern University (Statesboro). The students received a trophy that is on display in the School of Mathematics.

Professor Christine Heitsch's current undergraduate student, **David Esposito,** tied for first place in the 2012 Undergraduate Research Opportunities in Computing Research Symposium. David's work, "Improved RNA Secondary Structure Prediction Using Stochastic Context-Free Grammars," began as a School of Mathematics–funded Rresearch Experiences for Undergraduates (REU) project during the summer of 2011 and has continued through the year. Besides Christine Heitsch, Shel Swenson and Svetlana Poznanovik were also David's advisors on the project.

Undergraduate **Melanie Dunn** won the CETL/BP Outstanding TA Award in the Undergraduate TA category. This award is the only Institute-wide award given to Georgia Tech's teaching assistants.

Sheridan Ackiss, a senior mathematics major, talks about her research looking for hydrated minerals on the planet Mars in the video at the YouTube URL listed below. Ackiss had interned with NASA and is currently working with Earth and Atmospheric Sciences Assistant Professor James Wray in looking for signs of water on the Red Planet.
http://www.youtube.com/watch?v=G8zfbWJVg0Q&feature=youtu.be

Staff Profile: Joanne Cook

by Michael Loss

Our Senior Administrative Professional in the School of Mathematics, Joanne Cook started at Tech in 1986 in the Office of Human Resources (OHR). In 1989 she moved to Math, where she quickly became known for her excellent work. In recognition of her contributions to the School, Joanne was recently nominated for the Institute's Outstanding Staff Performance Award.

Joanne has a wide range of duties, all related to faculty recruitment, support, mentoring, and review. It starts with faculty hiring, where she places our advertisements, maintains our accounts on the MathJobs system, and schedules interviews. (This is a big job because we typically get several hundred applications for faculty positions and often interview a dozen or more candidates.) Last but not least, Joanne serves as a sharp-penned and trusted editor for the Chair, improving the clarity and impact of many documents representing the School.

Joanne's background is ideal for a job heavily involved in preparing and editing sensitive documents. She has a degree in English from the University of South Alabama, and her first job was as an editor with the Government Accountability Office. Also, her previous contacts and experience in OHR have been valuable when we recruit and employ new faculty.

Joanne likes several aspects of her job, including the variety of roles she plays, the independence she has in her day-to-day tasks, and the opportunity to interact with faculty members, and faculty members certainly enjoy working with Joanne. Doug Ulmer describes her as "supremely organized, diligent, and absolutely reliable." Both he and former chair Tom Trotter count on Joanne for careful criticism and analysis of sensitive documents. Tom says she provided "thoughtful, right-on-target analysis, and in the end, my communications as Chair were greatly strengthened." Professor Wing Li, chair of the School's Senior Promotion and Tenure Committee, wrote, "I find most remarkable how much she is on top of things, making sure that we do not become the victims of some absent-minded professors who from time to time forget a deadline, or a signature, or write some ill-constructed, ambiguous sentences."

Her staff colleagues are equally enthusiastic. Jan Lewis, SoM Administrative Manager, says, "Joanne is just a joy to work with. To have someone so knowledgeable, efficient, and completely trustworthy would be reason enough to celebrate. For that person to have a positive attitude, wisdom, and a thoroughly enjoyable sense of humor makes us very lucky indeed to have Joanne in the School of Mathematics!"

Our Financial Manager, Christy Dalton, describes Joanne as "an undiscovered artist. Her talents as an artist are underutilized in the SoM but have benefited all who get to know her. Her skills range from calligraphy and drawings to crochet, rubbings, decoupage, botany, etc. She could be the Leonardo da Vinci of the SoM—a real Renaissance woman. Joanne is the key contact person for all the visitors. She gets to know most visitors from the very beginning and develops many lasting relationships."

Joanne's interests include reading, indoor gardening, and art, especially sketching and decoupage. She also enjoys collecting old magazines and postcards on eBay, which earned her the title "eBay queen." Joanne has beautiful penmanship, perfected when she developed an interest in calligraphy. Her interest was given a boost when Emeritus Professor George Cain gave her a calligraphy pen and encouraged her to practice every day. Joanne likes to return to her hometown, Mobile, Alabama, for Mardi Gras, and she tells us that Mobile, not New Orleans, is its true home.

We in the School of Mathematics are blessed with a hardworking, talented, and high-performance staff. Joanne is a key member of the team, and we are delighted to have her working with us.

Fred Andrew

by Bill Green, Evans Harrell, and Michael Loss

In December 2011, the School of Mathematics celebrated the career of Professor Alfred David Andrew after 35 years on the faculty at Tech. During his time on campus not only was Fred a popular teacher and colleague, but he also served in essential roles as Graduate Coordinator, two stints as Associate Chair, and one term as Acting Chair. It would be hard to overstate how much the School of Mathematics owes to Fred for its many successes.

Fred Andrew grew up in Simsbury, Connecticut, not far from the infamously expensive residence that Mark Twain built for himself. ("I have $75 in the bank, on account of my plumber doesn't know about it.") Fred studied mathematics at Yale and then in 1968 enrolled in the Stanford University doctoral program. After serving in Vietnam with the US Army's First Cavalry Division in 1969-70, he returned to Stanford, where he wrote his dissertation, titled "Perturbations of Schauder Bases in Classical Banach Spaces," under the direction of Per Enflo. Upon completing his studies there in 1976, he came to Georgia Tech as an Assistant Professor of mathematics, where he quickly established himself as an expert researcher, with a particular interest in James space and the James tree space.

Fred's year as an infantryman in Tay Ninh Province, Vietnam, was a formative experience that shaped his views, and he has carried it with him ever since. He has said, "I am proud of my service and also proud that I marched with the Vietnam Veterans Against the War on Veterans Day 1971." He has kept up with fellow veterans and can identify the GPS coordinates where he was in Vietnam and the action he saw there.

Fred is outspoken, but his views are always good-natured and often humorous. As a consequence, his publications may be the most widely read of the entire mathematics faculty, if you count the more than 50 pithy comments that have appeared in the Atlanta Journal Constitution column "The Vent." In the heyday of his anonymous publishing, some of his colleagues would read The Vent regularly in order to spot characteristic barbs and confront Fred afterward for confirmation that he had penned them.

Fred is fond of outdoor activities, especially bird watching and fishing. To give a sense of Fred's interest in fishing, Professor Yang Wang recalls:

Fred taught me trout fishing. In many ways he was my mentor; in particular he inspired me by constantly reminding me that 'to be successful in fishing you must have the intelligence of a trout.' I have taken this advice to heart and have not hesitated to apply it to other experiences.

I did teach him one thing that was extremely valuable to his subsequent claim as the king of fishing in the department, beating the heavyweights like Ron Shonkwiler: I taught him Photoshop and how to make a catch look much bigger than it actually was. He used the technique routinely to cement his position as king.

I taught many classes for Fred, and vice versa. Each time I would ask the students whether Fred had told them why he was absent. The students usually said yes. Then I would tell them that Fred had actually won a lottery for a fishing trip in the Bahamas or something like that, and I would show a picture of Fred and me each holding a fish, mine being enlarged in Photoshop while his looked tiny. He then started to do likewise, with even more outlandish stories.

Faculty, staff, and students will miss Fred for his dedication to Tech, his inspiring teaching, and his friendship. We hope his busy schedule of fishing, bird watching, and travel allows him to return frequently to the campus to share his humor and see the continuing fruits of his service to Georgia Tech.

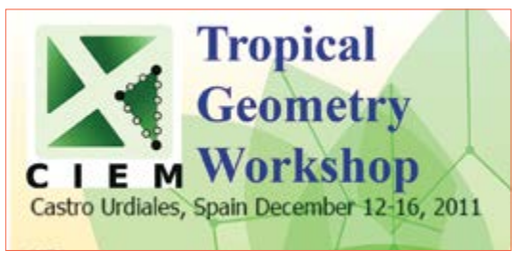
Conferences and Events

June 2011–June 2012

October 28, 2011, Alumni Homecoming and REU Poster Session (see Friends SoM page 36)

December 9-11, 2011
Tech Topology Conference

Organized by Professor **John Etnyre** and Associate Professor **Dan Margalit**, this annual conference brought together established and young topology researchers from around the country for a weekend of mathematics. Georgia Tech's Bulent Tosun, PhD 2012, was one of the featured speakers.



December 12-16, 2011
Tropical Geometry Workshop

Assistant Professor **Josephine Yu** was among the organizers of this workshop that took place at the Centro Internacional de Encuentros Matematicos (CIEM) in Spain. The objective was to bring together leading experts in the field in order to promote Tropical Geometry within the Iberian mathematical community and to promote mentoring opportunities for students and young researchers.

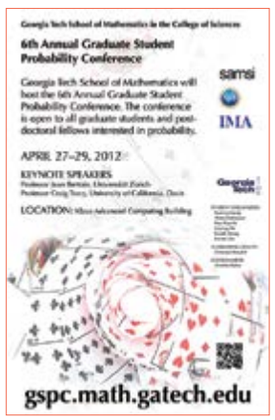
March 9-10, 2012
28th Southeastern Analysis Meeting (SEAM)

Professor **Michael Lacey** of Georgia Tech was one of the plenary speakers at the 28th annual SEAM held at the University of Alabama at Tuscaloosa. It brings together experienced researchers, junior faculty, and graduate students to discuss recent work and advances in Operator Theory, Classical Complex Analysis, Harmonic Analysis, Function Theoretic Operator Theory, and related areas.

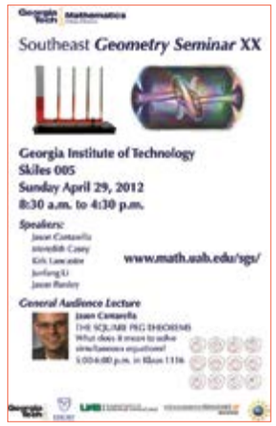
March 19, 2012
Modern Aspects of Submodularity Workshop

The Algorithms and Randomness Center (ARC) of Georgia Tech hosted a workshop providing a forum for researchers from a variety of backgrounds for exchanging results, ideas, and problems on submodular optimization and its applications. Organizers included Professor **Prasad Tetali**.

April 27-29, 2012
Graduate Student Probability Conference (GSPC)

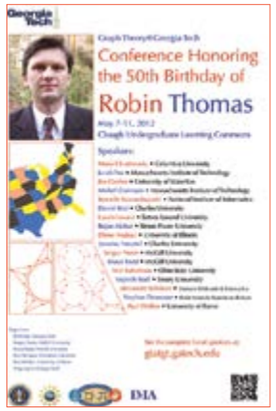


The Georgia Tech School of Mathematics hosted the 6th annual GSPC, open to all graduate students and postdoctoral fellows interested in probability. Objectives included introducing recent developments in the field and establishing connections for potential future collaborations. The student organizers, Ruoting Gong, Allen Hoffmeyer, Huy Huynh, Jinyong Ma, Ruodu Wang, and Linwei Xin, were supervised by Professor **Christian Houdré**.



April 29, 2012
Southeast Geometry Seminar XX

School of Math Professors **Mohammad Ghomi** and **John McCuan** helped organize and host the 20th seminar at Georgia Tech. A series of semiannual, one-day events focusing on geometric analysis, it rotates among the University of Alabama at Birmingham, Emory University, the University of Tennessee, Knoxville, and the Georgia Institute of Technology. Presentations on geometric analysis topics and related fields were made, including one by Meredith Casey on "Branched Covers on Contact Manifolds."



May 7-11, 2012
Graph Theory Conference

In honor of Regents Professor **Robin Thomas'** 50th birthday, the School hosted a Graph Theory Conference at Georgia Tech. The program included 50 invited speakers and various poster presentations. His students gifted him with a "Genealogy Poster," and a banquet celebrated his achievements. Among the organizers were Professors **Xingxing Yu** and **Bill Cook.** This event was held in conjunction with the Atlanta Lecture Series in Combinatorics and Graph Theory VI.

June 11-15, 2012
Internet Analysis Workshop

This annual workshop is funded by Associate Professor **Brett Wick's** career grant, in which 10 participants are chosen after 15 weeks of following online lectures on various topics proposed by Brett. At the end of the lecture series, participants select projects to present at the workshop.

June 11-15, 2012
Topology Students Workshop

Organized by Associate Professor **Dan Margalit,** the workshop was geared toward graduate students in the areas of geometry and topology. In addition to research talks by leading mathematicians in these areas, there were panel discussions on professional development topics. Mentors included Professor **John Etnyre.**

June 18–22, 2012
Workshop on the Corona Problem: Connections between Operator Theory, Function Theory and Geometry

Associate Professor **Brett Wick** organized this Fields Institute workshop. Students Philip Benge and Daniel Bernucci and postdoc student Mishko Mitkovski received support from Brett's NSF conference grant to attend. Mishko and Brett gave presentations. The workshop brought together researchers from three different areas: harmonic analysis, operator theory, and

Conferences and Events

June 2011–June 2012

several complex variables that will lead to further collaborations and interactions among these areas.

It should be noted that there had never before been a workshop that focuses on the Corona problem in one and several variables and, in particular, one that focuses on the interactions between this problem and other areas of analysis.

June 18– July 6, 2012 Algebraic Geometry for Applications: IMA Summer Graduate Program

The School of Mathematics hosted the graduate student 2012 Institute for Mathematics and its Applications summer program in Algebraic Geometry for Applications. The program was structured around a course in computational algebraic geometry and treated foundational material as well as current applications. The organizers were Associate Professor Greg Blekherman and Assistant Professors Anton Leykin and Josephine Yu.

Promotions

Promotions to Associate Professor with Tenure


Silas Alben


Dan Margalit


Brett Wick

Promotion to Full Professor


Haomin Zhou

A Week in the Life of the SoM

January 23–27, 2012

Have you ever wondered what is going on in Skiles these days? In addition to teaching more than 200 classes (one-fourth graduate and three-fourths undergraduate) to almost 14,000 enrolled students, our faculty organized/presented around 400 events (seminars, colloquia, and conferences) during the 2011-2012 school year. We thought we would give you a look at a sample week's offerings of seminars and colloquia that drive education and research among our students and scholars. —*The Editors*

Monday, January 23, 2012
11:00am—Skiles 114

Discrete Mathematical Biology Working Seminar

by Shel Swenson (School of Mathematics, Georgia Tech)

A discussion of the paper "Beyond energy minimization: approaches to the kinetic folding of RNA"

by Flamm and Hofacker (2008)

Organizer: Christine Heitsch

Monday, January 23, 2012
11:05am—Skiles 006

CDSNS Colloquium: A numerical algorithm for the computation of periodic orbits of the Kuramoto-Sivashinsky equation

by Jordi-Lluis Figueras (Uppsala University)

Organizer: Rafael de la Llave

Monday, January 23, 2012
12:05pm—Skiles 006

Math Physics Seminar: Parallel heat transport in reverse shear magnetic fields

by Daniel Blazevski (University of Texas)

Organizer: Michael Loss

Monday, January 23, 2012
2:05pm—Skiles 006

Applied and Computational Mathematics Seminar: Linear and nonlinear vibration-based energy harvesting

by Alper Ertuk (School of Mechanical Engineering, Georgia Tech)

Organizer: Silas Alben

Monday, January 23, 2012
2:05pm—Skiles 005

Geometry Topology Seminar: The cohomology groups of the pure string motion group are uniformly representation stable

by Jenny Wilson (University of Chicago)

Organizer: Dan Margalit

Monday, January 23, 2012
3:05pm—Skiles 005

Geometry Topology Seminar: Sheaf theory and the Laplace-transformed Schroedinger equation

by Alexander Getmanenko (IPMU Japan)

Organizer: Stavros Garoufalidis

Wednesday, January 25, 2012
11:00am—Skiles 006

Mathematical Biology and Ecology Seminar: Chemical reaction systems with toric steady states

by Anne Shiu (University of Chicago)

Organizer: Christine Heitsch

Wednesday, January 25, 2012
12:05pm—Skiles 005

Research Horizons Seminar: A survey of some results related to Roth's theorem

by Ernie Croot (School of Mathematics, Georgia Tech)

Organizer: Bulent Tosun

Wednesday, January 25, 2012
2:00pm—Skiles 006

Analysis Seminar: Two weight inequality for the Hilbert transform

by Michael Lacey (School of Mathematics, Georgia Tech)

Joint work with Eric Sawyer, Chun-Yun Shen, and Ignacio Uriate-Tuero

Organizer: Michael Lacey

Wednesday, January 25, 2012
2:00pm—Skiles 005

Geometry Topology Student Seminar: Characteristic classes

by Bulent Tosun (School of Mathematics, Georgia Tech)

Organizer: Meredith Casey

Wednesday, January 25, 2012
3:05pm—Skiles 006

Mathematical Finance/Financial Engineering Seminar: Modeling insurance in the presence of dependent extreme risks

by Qihe Tang (Department of Statistics and Actuarial Science, University of Iowa)

This talk is based on recent joint works with Raluca Vernic and Zhongyi Yuan

Hosts: Christian Houdré and Liang Peng.

Thursday, January 26, 2012
2:05pm—Skiles 005

Joint Combinatorics and Geometry Topology Seminar: Combinatorics of Surface Deformations

by Satyan Devadoss (Williams College)

Organizer: Josephine Yu

Thursday, January 26, 2012
3:05pm—Skiles 006

Stochastics Seminar: L-Moments: Inference for distributions and data using linear combinations of order statistics

by Jon Hosking (IBM Research Division, T. J. Watson Research Center)

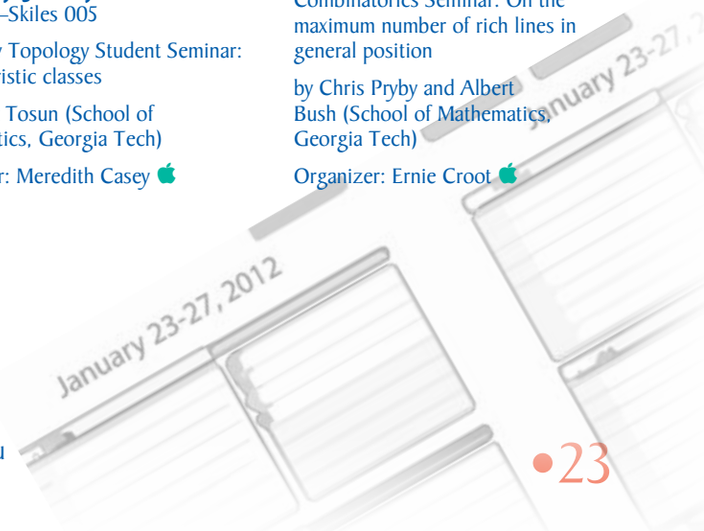
Organizer: Liang Peng

Friday, January 27, 2012
3:05pm—Skiles 005

Combinatorics Seminar: On the maximum number of rich lines in general position

by Chris Pryby and Albert Bush (School of Mathematics, Georgia Tech)

Organizer: Ernie Croot



How to Build a Graduate Program

by Michael Loss


Luca Dieci

In higher education, graduate programs are more important than ever for both Master's and PhD levels. In particular, PhD programs with research as the main educational thrust require multiple components. To have a successful graduate program, research-active faculty must provide a distinctive environment that offers interesting graduate courses and stimulating research topics. Likewise, the school needs the right kind of students who have curiosity and intellectual ability as well as energy to successfully complete a Master's or PhD. Creating a graduate program from this mix is the graduate coordinator's job.

The School of Mathematics has been fortunate to have had excellent graduate coordinators in the past. We think of Professor Bill Green and Professor Evans Harrell, who both successfully built the program on their predecessors' foundations. Professor Luca Dieci, who has been the graduate coordinator for the past six years, has taken the program to new heights and created one that is on a par with programs at our peer institutions.

I remember times when virtually none of the entering graduate students passed the preliminary exams on the first try, and even later the passing rate was very low, with students dropping out of the program. This is no longer the case. There were recent exams in which all the students passed,, certainly not because the exams were in any way easier.

The quality of the students has very much improved; we are getting graduate students with undergraduate degrees from schools such as Princeton, Caltech and Cambridge. As can be expected, the quality of the research has also improved. Students now publish their work in leading journals, such as Proceedings of the American Mathematical Society, Journal of Functional Analysis, and Proceedings of the National Academy of Sciences, to name a few. Another measure of quality is the

improvement in the diversity of students, with more minority representation. It is fair to say that the improvement in all these respects can be credited to Professor Dieci.

The ultimate test of a PhD program, however, is the placement of its graduates: Do they get good positions and fellowships? The SoM has also improved dramatically in this category. Our students get postdoctoral positions at top academic institutions, such as the Courant Institute at NYU, Yale, and Brown, to name a few. Some of our students have also found positions at competitive nonacademic institutions, such as ATT, Verizon, Microsoft, and the Bank of America.

Being a graduate coordinator requires a mastery of multitasking. One has to worry about administrative hurdles which are considerable—in particular the rules and regulations concerning international students—and worry about the faculty and the students. For example, Professor Dieci began tracking student progress. This is particularly important because students can hit a roadblock in their work, and if corrective action is not taken, valuable time is lost. The various cultural backgrounds of the students have to be taken into account as well, for some students do not dare to ask for help. They get stuck in their work and then get depressed—a vicious cycle that, with better supervision, can be broken.


John Etnyre

A graduate coordinator also has to foster international contacts and apply for grants. (Luca successfully applied for and received a grant from the National Science Foundation.) And when the day is over, graduate coordinators have to tend to their own research. Professor Dieci has done a marvelous job during the past six years. He, together with the faculty, has been able to attract excellent students and has put an invaluable structure in place for tracking their progress. Thanks to Luca's leadership, the SoM is now the graduate program of choice for many talented students.

It is a tradition that administrative positions in academic institutions rotate among the faculty. This helps them respond to the various changes that occur in research and teaching and spreads the faculty workload in an equitable manner. Professor Dieci's tenure as graduate coordinator has ended, and Professor John Etnyre is now the graduate coordinator. Whatever changes John may make to the current system, he can rely on the top-notch infrastructure that Luca has created over the years. Thanks, Luca, for a job well done!

Undergraduate World

by Doron Lubinsky


Martin Copenhaver


Ross Granowski


Melanie Dunn

What do the structure of RNA (yes, as in DNA), combinatorics, statistics, and metric spaces have in common? At first sight, it seems, very little. Yet they are all essential ingredients in the prizewinning research of **Martin Copenhaver** into the secondary structure of RNA. Martin is a rising senior in the School of Mathematics and was supervised by Professor **Christine Heitsch**. He recently won the *College of Sciences' Roger M. Wartell and Stephen E. Brosett Award for Multidisciplinary Studies in Biology, Physics, and Mathematics.*

This is not the only feather in his cap. Martin also received the School of Mathematics prize for the best junior, jointly with **Ross Granowski**, in honor of his outstanding academic performance. Martin enjoys teaching and is very active in Club Math, serving as its "puzzlemeister." He attributes his interest in mathematics to a teacher and a math club at Lassiter High School in Marietta, Georgia, as well as to stimulating courses from School of Mathematics faculty, starting with Professor **Wing Li**'s challenging Calculus II Honors class. This fall, he will participate in the elite Mathematics Advanced Study Semester (MASS) at Penn State University as preparation for graduate study.

Melanie Dunn is another of our star students. She initially intended to study engineering, but was lured to mathematics by Professor **Ernest Croot**'s challenging course in Abstract Vector Spaces. Her academic excellence was rewarded with this year's Senior Prize for the best graduating senior in the School of Mathematics. However, still more impressive is that Melanie received *Georgia Tech's CETL/BP Award, for the best Undergraduate Teaching Assistant* in the entire Institute. Like Martin, Melanie has been very active in Club Math and Pi Mu Epsilon. Melanie has graduated and plans on becoming an actuary.

Club Math continues to play an important social role within the School. Apart from celebrating Weierstrass' birthday and Pi Day, one notable highlight was the talk of Dr. Frank Sottile on the shape of space. It dealt with the proof of the Poincare Conjecture on the characterization of the three-dimensional sphere. Dr. Sottile asked more than half the audience to produce belts to twist into loops!

This past summer, we had ten students in our Research Experiences for Undergraduates (REU) program. They each worked with one professor for the summer, though projects often generate longer interaction. The topics range from number theory, topology and differential geometry to graph theory, random matrices, and analysis of tutoring support systems at Tech. For many students, the REU program is a path to graduate study. As in the past, it will generate both presentations and research papers. Our Junior Prize co-winner, **Ross Granowski**, is one beneficiary of this program. He has worked in the past with Professor **Michael Lacey** and is now working with Professor **Wilfrid Gangbo**.

To ensure that we continue producing high-quality graduates, the undergraduate program is in the process of an extensive review. We are examining our curriculum, consistency of grades, and the use of technology and online homework. In this process, we have to take account of the needs of engineers and scientists, architects, and business majors. We have a very large reach—we teach more undergraduate students each year than does any other school at Tech. In any one year, nearly half of all students at Tech take at least one mathematics course, and most of those are at the undergraduate level. It is heartening that other departments/colleges are happy with the services we provide, and this was borne out by comments during our recent five-year review.

One perennial problem is the "leap to proof": how to introduce sophomore and junior students to techniques of rigorous proof as opposed to just following proofs, manipulating formulae, and implementing algorithms. Traditionally our majors have seen this in a course called Abstract Vector Spaces, but it has often fallen short of its goals. Professor **Christine Heitsch** will be running Foundations of Mathematical Proof as a special topics course this fall that will focus on proofs and underlying mathematical principles and might ultimately serve as a replacement for Abstract Vector Spaces. Other courses are also being overhauled.

Online homework is playing an increasing role in our teaching. It offers the option of individualized questions so that different students answer similar problems but with different numbers. In addition, there is instant assessment and immediate feedback to students. **Klara Grodzinsky**, who has extensive experience with several such systems, has found that they encourage students to do homework and improved the grade point average of her classes. Professor **Jeff Geronimo**, who last year ran a careful statistical study of one homework platform, also found evidence of benefits. Of course it takes time for instructors to learn the procedures—students are much more tech-savvy, and quickly master them. The software has occasional glitches, and there is a shortage of suitable problems for some topics. Our faculty is helping build up the question sets. More faculty members are also using the new personal response systems ("clickers") in class.

From a student's point of view, online homework is more affordable: Publishers provide online textbooks together with a homework package that are cheaper than a bound copy of the textbook. This fall, Professors **Xu Yan Chen** and **Yingjie Liu**, and **Klara Grodzinsky** will pilot a new calculus textbook because of its linkage to a high-quality homework platform. Klara's dedication was rewarded with a *Class of 1934 Course Survey Teaching Effectiveness Award* this year.

In many high schools across Georgia, it is our distance calculus program that brings Tech to mind. It was initiated, and has been nurtured, by Professor **Tom Morley** (nicknamed "Dr. Calculus"), in cooperation with the Center for Education Integrating Science, Mathematics, and Computing (CEISMC), and the offices of Professional Education and Admissions. (See page 35) High school students successfully completing the courses can obtain credit for Calculus II and III. It involves some 300 students this year creating positive publicity and serving as an important recruiting tool. This is separate from our important distance learning courses for higher levels, such as differential equations.

Clearly there is a lot going in the School's undergraduate program!

Obituaries

We note with sadness the passing of two of our emeritus faculty members, Frank Stallard and Bill Smythe. *—The Editors*

Frank Stallard passed away on November 11, 2011, at the age of 88 and is survived by his wife of 56 years, Mary, sons Michael, Kent, and Frank Jr., nine grandchildren, and one great granddaughter. Prior to joining our faculty in 1955, he worked as a mathematician at the Oak Ridge National Laboratory, where he and his wife met, and at the University of Iowa. His hobbies included painting and gardening, and he was an active supporter of his sons' sporting, musical, and scouting activities and an active member of Embry Hills Methodist Church. He was a thoughtful and generous person. Jim Osborn recalls how Frank helped him when he arrived in Atlanta in 1957—the evening before Jim had registration duty—how Frank introduced him to the Buckhead Men's Garden Club, and how they shared plants. One of his TAs, Rena Brakebill, remembers him serving his wife's homemade pizza to his TAs during exam week. Frank taught a wide variety of mathematics courses, largely at the undergraduate level, and retired in 1983. Students and fellow faculty members alike remember his ever-present and sometimes dry sense of humor.

Bill Smythe died on February 14, 2012, at the age of 84. He met his wife of 60 years, Jackie, when they were undergraduates at Rollins College, and he joined our faculty in 1955. He is survived by Jackie, daughters Brenda and Nancy, sons Bryan and Rodger, their spouses, and nine grandchildren. He taught a wide variety of courses in pure and applied mathematics and coauthored a linear programming text with Lynwood Johnson. Former student Willie Ho recalls Bill's "calm and gentle demeanor," "his care and concern for students," and how he was always available to meet with students after class. Bill had a lifelong interest in early music, was an accomplished recorder player, and built a harpsichord from a kit. Kevin Culver, founder of the Atlanta Singers and choirmaster at the Cathedral of Christ the King, said, "In his prime, Bill Smythe was the best recorder player in Atlanta" and that Bill "brought centuries-old music to the point where it could be performed locally with regularity and at a high level." Bill also liked to write puzzles and in retirement wrote nearly 400 doublecrossticks, published online at www.doublecrosstick.com. We remember Bill as being modest, quiet, and a real gentleman.

Undergraduate Alumni News June 2011–June 2012

Alumnus **Brian Benson** (BS Applied Mathematics 2008) earned first place for his summer research project work in the Research Experiences for Graduate Students (REGS) program at the University of Illinois, where he is a mathematics PhD student. He was featured in an article in the University of Illinois at Urbana-Champaign Department of Mathematics', fall/winter 2011 news magazine.

Chris de Castro (BS Math 1989) wrote that he is presently a high school mathematics teacher in Gwinnett County, where he teaches mathematics and computer science. His congratulatory note to his undergraduate advisor, Fred Andrew, who retired in December 2011, said, "I wish you a long, healthy, and enjoyable retirement. Please know how appreciative I am of the support and encouragement you gave me during my time at Georgia Tech."

Our newest alumni again garnered three National Science Foundation Graduate Research Fellowships and an Honorable Mention. They are:

Antonio Blanca, a Math/CS major in 2011, received an NSF graduate fellowship. He is in graduate school at the University of California, Berkeley.

David Lowry received an NSF Award. He is in graduate school at Brown University.

Jonathan Poproki, a current mathematics major, received an NSF Honorable Mention and has been admitted to UCLA.

Graduate Alumni News

July 2011–June 2012

José Arrieta (PhD 1991), was one of Jack Hale's first doctoral students at Georgia Tech. After graduation he traveled and held positions around the world at several universities, including UNAM in Mexico City, the University of Texas in Austin, and the University of Sao Paolo in Sao Paulo, Brazil. In 1997 he returned to his native Spain and is currently a Professor in the Applied Mathematics Department at the Complutense University in Madrid. He writes, "I continue enjoying teaching and doing research in differential equations and dynamical systems. I still maintain contact with many of the good friends I found during my stay at GT and still have very active joint research with them."

James King (PhD 1991) is the Assistant Vice President at The Hartford Insurance Group in Connecticut, where he has been for the past seven years.

Tsvetan Stoyanov and Shobhana Murali (PhDs 2001) are happily living the suburban life in Moraga, California (a little town in the San Frrancisco Bay area). Tsvetan works for Morgan Stanley Capital International as a researcher in their valuation group and focuses on energy assets and derivatives. Shobhana is a lecturer in the Department of Statistics at the University of California, Berkeley. She is having a wonderful time teaching upper- and lower-division stat courses, even though some of the lower-division classes are rather large. They have two sons, Hari (9 years) and Milan (5 years), and a yellow Labrador Retriever, Bella. (They got a female because Shobhana was feeling overwhelmed by the general male rowdiness, but the dog is the rowdiest of the lot.) They report that "life is packed, what with work and the kids' extracurricular activities, but quite fun."

Martial Agueh (PhD 2002) is currently an Associate Professor at the University of Victoria, Canada. After completing his PhD, he spent two years (2002-2004) at the University of British Columbia, Canada, as a postdoc and another postdoc year (2004-2005) at Carnegie Mellon University. His research interests include nonlinear partial differential equations, geometric inequalities, kinetic theory, and optimal transport theory. He supervises two graduate students (MSc and PhD) and is funded by the Natural Science and Engineering Research Council of Canada. Martial was a co-organizer of a Nonlinear Analysis summer school program and a conference held in his home country of Benin in 2010 as well as a satellite meeting on Applied Analysis and Applied PDEs at the 2011 ICIAM conference held in Vancouver, Canada. He concludes, "I very much valued the times I spent at Georgia Tech during my graduate studies, and I consider that to be one of the most precious learning periods of my life."

Erik Boczho (PhD 2002, PhD Biology 1995 Carnegie Mellon) is currently an Assistant Professor of Biomedical Informatics at Vanderbilt University School of Medicine in Nashville, Tennessee.

Hamed Maroofi (PhD 2002) has a very successful career with the Bank of America and was recently promoted from Vice President to Director at the Bank of America in New York. Hamed writes, "Following my PhD in April 2002 under Professor Wilfrid Gangbo, I spent two postdoctoral years at the University of Toronto before making the transition to industry (the financial sector) in 2004, first working out of Charlotte until 2007 and then out of New York since 2007. I look back at my time at Tech with fond memories both from social and intellectual perspectives. I particularly miss thinking math. You still think about interesting stuff in industry, but it is not quite the same, and it is difficult to find free time in order to prevent the things that you learned at some point from disappearing. I guess in return you have more financial security. Aged 40, and 10 years past my PhD defense, there are two things I would like to stress: 1) Enjoy your time as a graduate student. 2) Use the time in school to learn as much as you can. You won't have that time again. Greetings to the School of Math!"

Jorge Rebaza (PhD 2002), Associate Professor at Missouri State University, published his first book, *A First Course in Applied Mathematics*, J. Wiley, 2012.

Jose Figueroa-Lopez (PhD 2004) has been promoted to Associate Professor with tenure in the Department of Statistics at Purdue University. He received a National Science Foundation CAREER grant to be funded from July 2012 through July 2017. Figueroa-Lopez's project is titled "Bridging High-Frequency Data Analysis and Continuous-Time Features of Levy Models."

Paul Wollan (PhD ACO 2005) is an Assistant Professor in the Computer Science Department at the Sapienza University of Rome. He was awarded a prestigious European Research Council Starting Independent Researcher Grant. This is the European version of a CAREER Award except much better—a typical award provides 1.5M euro ($2.2M) over five years. Paul, his wife, mathematician Cinzia Elia, and his son have been visiting us during the spring and summer semesters.

Antonia Delgado (PhD 2006) had a research position from May 2007 to September 2008 in the Statistics and Applied Mathematics Department at the University of Almeria in Spain, where she collaborated with Professor Andrei Martinez Finkelshtein on applications of approximation theory to the field of ophthalmology. She now s a tenure-track position as Assistant Professor in the Applied Mathematics Department at the University of Granada in Spain. Antonia both teaches and continues research focused on orthogonal polynomials in two variables. She and her husband, Juanjo Nieto, also a mathematician and Associate Professor at the same university, are the proud parents of Ivan, who was born in 2011.

Rafal Komendarczyk (PhD 2006) joined the Department of Mathematics at Tulane University in 2009 after completing a postdoctoral position at the University of Pennsylvania. His research interests include geometric topology and applied algebraic topology, and he received the 2011 Advanced Research Projects Agency (DARPA) Young Faculty Award. Currently an Assistant Professor, he was awarded a five-year grant from the National Science Foundation in 2011 to study topological structures in the setting of probabilistic models of dust or powder particles, systems of water droplets, and other similar processes. Rafal is married to Aneta (Georgia Tech MSc 2006). They have a three-year-old son, Mateusz.

Graduate Alumni News

July 2011–June 2012

Csaba Biro (PhD 2008) continues in a tenure-track position in the Department of Mathematics at the University of Louisville in Kentucky.

Christina (Teena) Carroll (PhD 2008) accepted a faculty position at Emory and Henry College in Emory, Virginia, after spending four years as a faculty member of St. Norbert College in Wisconsin.

John Pearson (PhD 2008) is a math and science teacher at Pace Academy in Atlanta, Georgia.

Jean Savinien (PhD 2008) is an Assistant Professor in the Department of Mathematics at the University of Metz. Jean writes, "I am in Metz, France. Maybe you've heard of the city, because it's where the Georgia Tech Lorraine (GTL) campus is located! After I graduated in the summer of 2008 (my advisor was Professor Bellissard), I made the rounds of postdocs: a short stay in Bielefeld, Germany, and then two years in Lyon, France. I was hired at the University of Metz last fall for a position with the group of non-commutative geometry. Our department has just merged with the University of Lorraine Nancy to form a larger structure (joint lab), the Institut Elie Cartan de Lorraine. I met Professor Federico Bonetto last spring when he came to our campus and gave a talk while he was on leave at GTL. We could organize more math visits and seminars in Metz and Nancy for faculty on leave, which could be interesting and rewarding for both sides. So I'm looking forward to seeing some more of you here in Metz when you come to GTL for a semester!"

Stephen Young (PhD 2008) has accepted a tenure-track position at in the Department of Mathematics at the University of Louisville in Kentucky, where he joins Csaba Biro.

Alex Grigo (PhD 2009), formerly at the University of Toronto, has accepted a tenure-track position at the University of Oklahoma.

Kun Zhao (PhD 2009), after compleating postdoctoral work at the Mathematical Biosciences Institute of Ohio State University and serving as a Visiting Assistant Professor at the University of Iowa, will join the Department of Mathematics at Tulane University in New Orleans as a tenure-track Assistant Professor in the fall.

David Howard (PhD 2010) accepted a tenure-track position at Colgate University in Hamilton, New York.

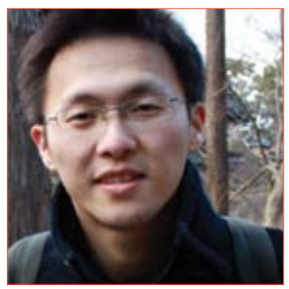
Mitch Keller (PhD 2010) accepted a three-year position at the University of Nebraska–Lincoln, where he will be working on both research and teaching at the university level.

Amit Einav (PhD 2011) is currently in a postdoctoral position as a visiting researcher in the Department of Pure Mathematics and Mathematical Statistics with Clement Mouhot at the University of Cambridge in the UK. He writes that he and his wife, Martha "fell in love with Cambridge very quickly. Besides having a very stimulating and engrossing academic atmosphere, the city itself is gorgeous, cultured, and serene. I am happily researching in the department, expending my knowledge, and delving deeper into topics in kinetic theory, mainly in relation to the Kac model. Academically speaking, the past six months have been very productive: I have attended two conferences so far and am scheduled to attend one more in September. I also hope to come and give a few talks in the US by the end of the year. I have also managed to write a new paper that was accepted into the Journal of Statistical Physics, and have a few other problems I am working on. This fall I am teaching half a course in kinetic equations and a graduate-level course in optimal transportation. While I don't miss Atlanta's weather, I do miss many of my friends and colleagues at Georgia Tech and hope that everyone is doing well."

Sergio Angel Almada (PhD 2011) continues his postdoctoral position in the Mathematics Department of the University of North Carolina at Chapel Hill.

Yun Gong (PhD 2011) joined the Department of Marketing and Sales at Ford Motor Company, where he is building some econometrics models to provide monthly recommendations on production, inventory, pricing, and sales forecasts so as to maximize the company's profit by using techniques from statistics and optimization.

Nan Lu (PhD 2011) is a Visiting Assistant Professor in the Department of Mathematics and Statistics at the University of Massachusetts Amherst.



Jie Ma (PhD 2011) continues as the Hedrick Assistant Adjunct Professor in UCLA's Department of Mathematics.

Maria Carmen Reguera, (PhD 2011) was in a postdoctoral position in Lund, Sweden. In August, she moved to a position at the Universitat Autonoma, in Barcelona, Spain.

Ricardo Restrepo (PhD 2011) is currently a postdoctoral researcher at the University of Toronto in Canada.

Ben Webb (PhD 2011) was a Visiting Assistant Professor at Brigham Young University. He has accepted a postdoc in the Laboratory of Statistical Physics at Rockefeller University, located on the Upper East Side of New York City. He writes, "As a graduate student at Georgia Tech my research focused on the dynamics of large networks. My current research at Rockefeller University is somewhat related, as I am investigating 'determinist dynamics in random environments.' Both deal with the complicated dynamical phenomena that arise through simple interactions of a large number of system elements. My wife and I, along with our four children (Arryana, Hazel, Avery, and Heath), are looking forward to exploring the wall-to-wall historic monuments, museums, etc., that are found in NYC."

Noah Streib (PhD 2011) and wife Amanda Pascoe Streib (PhD 2012) are in postdoctoral positions at the National Institute of Standards and Technology.

2012 PhD Graduates


Nate Chenette

Nate Chenette (PhD 2012) is a visiting assistant professor in the Department of Mathematical Sciences at Clemson University, SC.


Ruoting Gong

Ruoting Gong (PhD 2012) has a postdoctoral position at Rutgers University, NJ.


Huy Huynh

Huy Huynh (PhD 2012) has a postdoctoral position as a faculty member in the Department of Applied and Computational of Mathematics and Statistics (ACMS) at Notre Dame University, IN.


Yao Li

Yao Li (PhD 2012) has a postdoctoral position at New York University's Courant Institute of Mathematical Sciences, New York, NY.


Stanislav Minsker

Stanislav Minsker (PhD 2012) has a postdoctoral position at Duke University, NC.


Luke Postle

Luke Postle (ACO PhD 2012) is an Emory Fellow in the Mathematics & Computer Science Department at Emory University, Atlanta, GA


Marc Sedjro

Marc Sedjro (PhD 2012) has a postdoctoral position with our former faculty member, Michael Westdickenberg, at the University of Aachen, Germany.

Bulent Tosun (PhD 2012) has a position as a CRM (Centre de Recherches Mathématiques) postdoctoral fellow at UQAM (Université du Québec à Montréal) in Montreal, Canada to be followed by a postdoctoral position at the Max Planck Institute in Bonn, Germany.

Anh Tran (PhD 2012) has a postdoctoral position at Ohio State University in Columbus, OH.

Ruodu Wang (PhD 2012) accepted a tenure-track position as assistant professor in the Department of Statistics and Actuarial Science at the University of Waterloo in Ontario, Canada.

Jialiang Wu (PhD BINF 2012) is a researcher at Georgia Tech.

Tianjun Ye (PhD 2012) has begun her software engineer position at the Oracle Corporation in Los Angeles, CA.

Friends of the School of Mathematics News

On April 20, 2012, the School hosted a presentation on "Technology and Undergraduate Education" for the Friends of the School of Mathematics (FoSoM). After a brief overview by Doug Ulmer, there were presentations by several faculty members on how technology is helping us improve the quality and efficiency of several of our academic programs.

Doron Lubinsky, Professor and Undergraduate Coordinator, led off with a presentation on personal response systems, more commonly known as "clickers." These devices are used to collect live responses from students during classes. Input from students can be yes/no, multiple choice, and even full numeric or text responses. Clickers are most often used to check on students' understanding of complicated concepts "on the fly" so that the lecturer can add details or correct the course as needed. They can also be used to take attendance and conduct polls. Many lower-division science courses use these devices, so most students buy one and use it throughout their first two years at Tech.

Klara Grodzinsky, Instructor and Teaching Assistant (TA) Coordinator, followed up with a presentation about online homework. Using digital media, students do exercises on their computers, and then a machine grades the responses and provides instant feedback. The questions are typically modified (by changing the numbers) for each student, and the required answers range from single numbers to complicated expressions. The instructor may specify a limited or unlimited number of attempts. Our experience has been that students will keep doing a problem until they get it right. This and the immediate feedback contribute greatly to their motivation to learn and ultimately to their understanding. Online homework does not fully replace traditional written homework, which is still essential for complicated problems and proofs. It does, however, offload routine work, freeing the TAs and instructors to concentrate on areas where they can add more to the students' learning.

Finally, Professor **Tom "Dr. Calculus" Morley** discussed the video calculus initiative. Each semester, hundreds of high school students from across the state take calculus here at Tech with Dr. Morley via a video link. They can see and hear the lecture in real time and are able to ask questions through the video link. They do the same homework as Tech students and take the same exams. Typically these are top high school students who have exhausted the math offerings at their school and are hungry for more. Needless to say, once they experience a real Tech course, they are more likely to want to enroll here, and this is one of the key attractions of the program to the Institute. There is huge demand for this service—more than we can currently meet, and we are exploring ways of expanding the program.

Both during and after the presentations, there were lots of questions and a lively back-and-forth discussion. We welcome suggestions for topics for future events of this type.

Friends of SoM Bar-B-Que 2011

On behalf of the School of Mathematics faculty, staff, students, friends, and alumni, we'd like to say thanks to our alumni chefs, Gary Robinson and Bill Wise, who provided and prepared the delicious barbecue meats and sauces for our annual Homecoming Bar-B-Que. This annual event is a delicious way to reconnect in Skiles, and to learn about current undergraduate work in the poster sessions of the REU (Research Experiences for Undergraduates) participants. We hope to see you next year! Here are some photos from the 2011 event.

Notes from the ProofWriters

Dear Readers,

Better late than never! The explanation for the ProofReader's tardy appearance can be found in the ProofReader itself. We have been experimenting with a number of features in the hope that you will find something that piques your interest.

The use of computers has had a tremendous impact on the way we do mathematics. Not only did it affect computational mathematics, but it also affected the way in which we all collaborate. It really tied the worldwide mathematical community together. Ron Shonkwiler's piece about computing's early days in the SoM gives you some perspective on how things were before the PC revolution, just in case you have forgotten.

Most of the mathematics that we learn as undergraduates dates from before the 19th century. With the article about Wilfrid Gangbo's research, we have tried to correct that by giving you a glimpse of current mathematics.

The reach of mathematics across national and cultural borders is not widely appreciated. You will find a world map with a listing of some (be assured, not all) national and international collaborations involving the SoM faculty. Mathematics is one of the few universal languages we have; it enables people with vastly different cultural backgrounds to agree on what is good and beautiful in our field.

Most important, we have tried to include all the latest news from our alumni. It shows that our community is much more than just what is going on at the SoM, although it is the nucleus from which all these wonderful careers grow.

There are numerous people who have contributed to the ProofReader content; so many, in fact, that we cannot list them all. Our heartfelt thanks go to all of you who sent in letters and who told us stories about yourselves and others. Thanks to team members Chris Heil, who collected much of the material, and to Michael Loss, who creatively shaped multiple articles. For the writing style of the ProofReader you have to thank Cathy Jacobson as editor-in-chief. What Cathy was able to create out of garbled manuscripts is just short of miraculous. The dazzling look of the ProofReader is the work of Janet Ziebell, who is giving the ProofReader its distinctive style.

As always, if you want to give us feedback on the content of the ProofReader, please do so at editor@math.gatech.edu. We certainly love hearing from you.

—The Editorial Team

Letter to the Editor

We enjoy hearing from you, our readers, and from time to time think that others would also enjoy reading about some of your collective memories. To that end, here is the first offering!

—The Editors

Dear Editors,

Professor Richard Duke kept the School of Mathematics (SoM) graduate students (1977-1980) under lock and key in the D.M. Smith Building, well before its renovation, to prevent the graduate students' sheer brilliance from infecting the faculty.

Contrary to the faculty's belief at that time, the SoM graduate students did not spend their every waking hour on never-ending, raucous card games (hearts was a favorite) while constructing elaborate floor-to-ceiling pyramids of empty soda cans.

When they were not "shooting the moon," they conducted an exhaustive due diligence of the essential mathematics books that were not available in the math library. They prepared the list of suggested book acquisitions and presented it to the Chair of the School of Mathematics—postponing two rounds of 'hearts" to do this.

The attached list of recommended book acquisitions for the SoM library has been transcribed into an MS Word document from a handwritten list discovered in the graduate students' archives.

Bruce J. Lynskey (MS Applied Math 1980)

Suggested Additions to the Reading Room Math Library from the D.M. Smith Building (former home of the School of Mathematics graduate students) circa 1978:

(1) The Jacobians and Their Struggle for Independence
(2) A 10-Day Diet to Improve Indeterminate Forms
(3) Dental Care for Decaying Exponentials
(4) Cheaper by the Googal
(5) How to Discipline Improper Integrals
(6) 1001 Best Loved Double Integrals
(7) A Gardener's Handbook for the Extraction of Roots
(8) The Torus and I
(9) The Vatican's View of Transfinite Cardinals
(10) A Short Table of Even Primes (Abridged)
(11) Picard's Method—Reiterated
(12) Will Success Spoil Runge Kutta?
(13) I Was a Member of the Empty Set
(14) Dining Out in Hilbert Space
(15) The Traffic Problem at Finite Intersections
(16) 100 Tasty Fillings for Empty Sets
(17) Life Begins at eix
(18) The AFL-CIO: An Infinite Union of Dense Sets
(19) How to Keep Condensation Points from Dripping into Empty Sets
(20) Marketing of Scalar Products
(21) A Child's Garden of Chebycheff Polynomials
(22) How I Solved My Imaginary Problems
(23) A Treasury of Matrices—Upright and Inverted
(24) My Neighborhood Is Open—A Study in Integration
(25) Improving Lipschitz Conditions in the Slums of New York
(26) The Decline and Fall of e(-x)
(27) How to Prevent Corrosion on Riemann Surfaces
(28) The Peano Postulates Transcribed for Violin and Cello
(29) First Aid for Dedekind Cuts
(30) A Collection of Happy Endings for Incomplete Beta Functions
(31) The LaPlace Transform—Before and After
(32) Why the Base 10, or If We Had e Fingers?
(33) A One-Line Proof of Fermat's Last Theorem
(34) Was George Cantor's Mind Well-Ordered?
(35) The True Story Behind 2+2=4
(36) Federal Aid for Retarded Potentials

Why Make a Gift?

The short answer is this: Your gift can have a large impact on the education and research efforts of the School of Mathematics. Below are some of the many ways this can happen.

The High School Mathematics Competition is an inspiring event where students gather with others interested in mathematics and compete for scholarships. It is run entirely by undergraduate and graduate student volunteers, with scholarships supported by corporate and private donations as well as a federal grant. Contributions toward prize money or operating expenses would help continue this event and inspire the next generation.

(See http://www.math.gatech.edu/outreach/hsmc/georgia-tech-high-school-mathematics-competition)

Everyone knows that tuition and fees are increasing dramatically at a time when the HOPE Scholarship has become less generous. Funds for undergraduate scholarships would support talented and needy students as they work toward a very valuable degree.

Teaching is a central part of the mission of the School of Mathematics, and we have a very talented and dedicated teaching staff. Recognizing the best of our staff through prizes for excellent teaching and mentoring would underline the importance of these efforts and encourage even more excellence. A named prize would be a great way to remember an alumnus or former faculty member who had a big impact on your life.

Our graduate students are integral to all the efforts of the School—from teaching to research to outreach. They are also the future of the discipline. Supporting them with scholarships, thesis prizes, travel and professional expense funds, or other small gifts would have a large impact on the School and the discipline.

Finally, a long-standing goal of the School is to have a program of named postdoctoral fellows. These positions are the route to a permanent appointment at a top department (such as Georgia Tech) and are the one major element lacking in our current program. Establishing a postdoc program is a long-term effort requiring significant funds but also promising the opportunity to continue the School's progress into the top ranks worldwide.

We're very grateful for all help, both large and small, from our friends. If you would like to contribute to any of the efforts mentioned above or discuss other possibilities, please contact us.

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Postage

Return Service Requested

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