Welcome

Welcome to the Duke Mathematics Department. I would especially like to welcome all of our newcomers and visitors - faculty, staff, and students alike - as well as returning faculty, staff and students.

Dick Hain finished a two year term of service as Department Chair on June 30, and I took over as the new Chair on July 1. Bill Allard is continuing as Director of Undergraduate Studies, Bill Pardon as Associate Chair, and Paul Aspinwall as Director of Graduate Studies. We all look forward to working with you.

The department is excited by the arrival of two new assistant professors this fall, Mauro Maggioni and Lenny Ng. Mauro received his doctorate from Washington University, and comes to us from Yale. He works in harmonic analysis and its applications. Lenny received his doctorate at MIT and comes to us from Stanford. He works in symplectic geometry and low dimensional topology.

The office staff has also seen much change this summer. Shannon Holder has replaced Georgia Barnes who moved over to the Institute for Genome Sciences and Policy. We anticipate hiring a replacement for Anna Harris, who has left us for warmer climes, and adding a sixth staff member to ease the burden on Shannon, Bonnie Farrell, Sunny Oakley and Carolyn Sessoms.

Congratulations to Jonathan Mattingly who won the Presidential Early Career Award for Scientists and Engineers (PECASE) this summer. This is one of the most prestigious awards to honor investigators in the early stages of research and education careers. The award is the highest honor bestowed by the United States government on scientists and engineers beginning independent careers. Jonathan was the only recipient this year in mathematics.

Best wishes for an excellent year for all.

—Mark Stern, Chair

Events

The Mathematics Department is sponsoring a conference in mathematical biology–"Applications of Analysis to Mathematical Biology"—to be held on May 21-23, 2007, at the Searle Conference Center. The central theme of the conference is the application of mathematical analysis, broadly construed, to the modeling of biological systems. The conference is held in conjunction with a dinner to celebrate the 65th birthday of Michael C. Reed, to honor his role in recognizing early the importance of mathematical biology as a legitimate and important area of applied mathematics, and to honor his contributions to mathematics, especially in the application of mathematics to medicine and physiology.

Professor Reed joined the Mathematics Department at Duke in 1974, and was named the Bishop-MacDermott Family Professor in 2003. He has served in a number of official positions, including departmental chair (1982-85, 1986-89), vice chair (2001-03), and director of graduate studies (1980-82). He has mentored 7 postdocs, a number of graduate students, 18 of which have graduated with doctoral degrees, and many undergraduate students. The four-volume textbook that he co-authored with Barry Simon (Caltech), Methods of Modern Mathematical Physics, was named the "Best book in mathematical physics in the 20th Century" at the XIII International Congress on Mathematical Physics in 2000.

Alumni Lectures

For this series of math lectures, DUMU invites distinguished alumni to give an elementary lecture related to their research interests. This series was inaugurated last spring with the visit of Alex Hartemink '94, now an assistant professor of computer science at Duke. The series continues with two visits in October. All those interested are encouraged to attend.

Jeanne Clelland, University of Colorado, Boulder "The Poincare Conjecture or why topologists can't tell their donuts from their cups of coffee" 8PM on Wednesday, October 4th, Math Physics 128.

Jeanne Nielsen Clelland graduated *summa cum laude* from Duke in 1991 and continued here as a graduate student in mathematics. She received her doctorate in 1996 under the direction of Robert Bryant. As an undergraduate here, Jeanne was an AB Duke Scholar and Goldwater Scholar. Jeanne was awarded Honorable Mention on the 1990 Putnam team that placed second in the nation and received the first prize in the Alice T. Schafer Award in 1992. Jeanne is currently an Assistant Professor at University of Colorado at Boulder. Her research interests include the Geometry of Partial Differential Equations. Jeanne will talk about Poincare Conjecture in 3 and other dimensions: "If it looks like an n-sphere, then it is a n-sphere."

Jeff Vanderkam, Center for Communications Research, Princeton "Why the Riemann Hypothesis is True" 4:30 PM on Wednesday, October 18th, Math Physics 119.

Jeffrey VanderKam graduated *summa cum laude* from Duke in 1994 and received his Ph.D. from Princeton University. As an undergraduate here, Jeff was a NC Math Scholar, Goldwater Scholar and Faculty Scholar. Jeff was the first Putnam Fellow at Duke and the first to have his Duke math shirt, with number 4/3, "retired".Jeff now does research for the Center for Communications Research which unfortunately prohibits him from talking about his actual research. Instead, he will present the "real" reason that leads us to believe that the Riemann Hypothesis true, a subject of personal interest to him.This evidence touches on a variety of fields of mathematics and will illustrate the power and depth of the Riemann Hypothesis.

Please send names of alunmi whom you would like to have participate in this series to David Kraines dkrain@math.duke.edu.

Undergraduate News

DUMU
The Duke University Math Union sponsors social events, gaming sessions and an occasional sports competition with the Society of Physics Students.

All Duke students are welcome to participate. Contact Brandon Levin `bwl3@duke.edu` or Keigo Kawaji `keigo.k@duke.edu` to get on the DUMU mailing list.

High School Math Meet
This annual ARML style competition attracts up to 200 high school students from throughout the southeast.Student volunteers areneeded to compose contest problems and to act as guides for the many teams that will be coming to Duke for this day-long event on Saturday, November 11.Encourage your high school math teacher to bring a team.Get a chance to introduce your former classmates to a taste of the Duke experience.For more information, contact Tyler Huffman tbh7@duke.edu or Dr. David Kraines dkrain@math.duke.edu.For more information, see http://www.math.duke.edu/dumu/.

Faculty Scholar
Congratulations to math physics major James Zou who has been named Duke Faculty Scholar.James has taken a rigorous 6 course load in nearly each of his terms at Duke including 8 math, 7 physics and 4 other courses at the 200 and 300 level. He has worked on several research projects in mathematics, helped with physics experiments at CERN, served as an intern with a financial firm, facilitated micro loans in rural China, and designed and taught a house course on Patterns.

James Zou is the twelfth math major since 1992 to be accorded this honor.

MacArthur Award
We are happy to report that former math major Luis von Ahn '00 received a MacArthur "Genius" Award recently.He is currently an assistant professor of computer science at Carnegie Mellon University working at the intersection of cryptography and artificial and natural intelligence.

Competitions
Undergraduates who enjoy solving problems are encouraged to participate in the Virginia Tech Math Contest from 9 to 11:30 on Saturday, October 28, and the W.L.Putnam Math Competition from 10 to 1 and 3 to 6 on Saturday, December 2. Those who want to practice their skills may sit in on the

Problem Solving Seminar that meets Wednesday evenings from 8 to 9:30 in Math-Physics 119.Duke students have excelled in these competitions for many years.Help continue the tradition.For more information, see `www.math.duke.edu/news/awards/ competitions.html` or contact David Kraines at dkrain@math.duke.edu.

Summer research opportunities

In each of the past 7 years, up to 8 undergraduates have received summer stipends from the National Science Foundation for mentored mathematical research. Thanks to a grant from Trinity College, the program will continue indefinitely.

Students in this program are expected to write a senior thesis that qualifies for Graduation with Distinction.In past years, several PRUV Fellows have given talks on their work at mathematics conferences and in a few cases their research has been published in research journals.

Current PRUV Fellows, Michael Bauer, Nikifor Bliznashki, Tirasan Khandhawit, Brandon Levin, Ibraheem Mohammed, Stepan Paul, Charles Staats III, and Lingren Zhang will be giving short talks on their research projects during September and again in April. Those interested in applying to the program are especially encouraged to attend these sessions. See David Kraines and www.math.duke.edu/vigre/pruv/ for more information.

The Center for Computational Science, Engineering, and Medicine with funding from the Duke office of undergrad research provided stipends for six math students last summer to work on problems related to mathematical and computational biology.

CSEM director John Harer was the mentor of four of these students.Math and CS major Kshipra Bhawalkar '08 and math and physics major Morgan Brown '07 studied topological methods for examining large datasets. Russell Posner '08 studied interface surfaces for protein-protein complexes.Tyler Huffman '09 studied models for gene regulatory networks.

In addition, Ryan Link '08 has been working with Professor Marty Woldorff in the center for cognitive neuroscience and Aalok Shah '08 worked with Professors Mike Reed, Fred Nijhout, and Dr. Dave Anderson on a project related to cellular metabolism.

It is expected that the program will continue next summer. For more information, see csem.duke.edu or email csem@duke.edu.

Through its Research Experiences for Undergraduates program, the National Science Foundation supports research by several hundred math undergraduates at locations around the country.Lists of REU and other programs and activities for math undergraduates may be found at www.ams.org/outreach/undergrad.html.

Several Duke students have participated in the Director's Summer Program of the NSA over the past decade. The deadline for applications to this program is in mid October. See www.nsa.gov./careers/students_1.cfm

Links to some of these and to other programs can be found at www.math.duke.edu/news/undergradnews.html

Graduate Program News

New Graduate Students

Nine graduate students join our program this fall. Wth their undergraduate institution, they are:

- **Prakash Balachandran,** Cornell University

- **Graham Cox,** University of Victoria

- **Kate Herbig,** Macalester College

- **Aaron Jackson,** Northern Arizona University

- **Anna Little,** Samford University

- **Michael Pruitt,** University of Maryland at Baltimore

- **Sarah Schott,** University of Florida

- **Timothy Stallmann,** UNC Chapel Hill

- **Tiffany Tasky,** Johns Hopkins University

Herbig, Pruitt, Stallman and Tasky are J.B. Duke Scholars.

Graduating Ph.D. Student

Timothy Lucas received his doctorate this August under the direction of William Allard. His thesis is titled "Numerical Solutions of an Immunology Model Using Reaction-diffusion Equations with Stochastic Source Terms". He has accepted a postdoctoral position with the Center of Computational Immunology at Duke and will be an Instructor in the Math Department.

Thomas Laurent, who received his doctorate last spring, has accepted a postdoctoral position at UCLA.

Teaching Award

The mathematics department has honored graduate students Joseph Spivey and Michael Nicholas with the L.P. and Barbara Smith Teaching Award. This teaching award was made possible by a generous donation from Captain L. P. and Barbara Smith, who established a fund in 1981 for this purpose.

Following his retirement from the U.S.Navy in 1966, Captain Smith earned a masters degree in math education at Duke and was kept on as an instructor in the department.He became Supervisor of First-year Instruction in 1973, and continued until his (second) retirement in 1982.

Since his retirement from Duke and until his death earlier this year at the age of 87, Captain Smith and Barbara had kept active in traveling, outdoor sports, and cultural activities while living in New Mexico and Seattle. His contributions to the Duke mathematics department are fondly remembered and greatly appreciated.

Joseph Spivey, a fifth year graduate student, is studying the topology of moduli spaces of Riemann surfaces under the direction of professor Richard Hain. He enjoys reading suspense and fantasy novels. Mike Nicholas, a sixth year graduate student, is studying singular integrals and electromagnetic scattering. He enjoys hiking, cycling, canoeing, camping, and x-country skiing.

Joseph and Mike have both been praised by their students for their excellent teaching and for the time they spend helping their students outside of the classroom.Joseph has served on the Department's calculus committee and has contributed to course development and course supervision. Mike has frequently provided good ideas and constructive suggestions to help the department to improve the introductory courses.

Because of the generosity of L.P. and Barbara Smith, the math department is pleased to be able to recognize their fine teaching and contributions to our program with a $2500 fellowship each. We congratulate Joseph and Mike on their teaching success, thank them again for their contributions to the department and wish them continued success.

Faculty News

New Faculty

The following professors and research associates have joined the department this fall.

- Instructor **Timothy Lucas** received his doctorate from Duke. Timothy works in biomathematics.

- Assistant Professor **Mauro Maggioni** received his Ph.D. from Washington University and comes to us from Yale. He works in Harmonic Analysis.

- Assistant Research Professor **Scott McKinley** received his doctorate from Ohio State. He works in Stochastic Partial Differential Equations.

- Assistant Professor **Lenhard Ng** received his doctorate from MIT and comes to us from Stanford Univeristy. He works in Symplectic Geometry.

- Assistant Research Professor **Bianca Santoro** received her doctorate from MIT. She works in Riemannian Geometry and Geometric Analysis.

We welcome the following visiting professors:

- **Emma Carberry** works in Differential Geometry. She is visiting Duke from the Univerity of Sydney.

- **Shrawan Kumar** works in Representation Thoery. He is visiting from UNC.

- **Leonardo Mihalcea** works in Algebraic Geometry and Algebraic Combinatorics. He is visiting from Florida Sate University.

Coming Home

After a 13 year absence Lenhard Ng has returned to the Research Triangle as a regular faculty member in our department.While growing up here, Lenny made quite an impact. At the age of 10, he scored a perfect 800 on the math SAT.At Chapel Hill High School, he had four perfect scores on the American High School Math Exam, captured a silver and two gold medals at the International Mathematical Olympiads and placed third in the Westinghouse Science Talent Search all before his 17th birthday.

Lenny Ng graduated from Harvard *summa cum laude* in three years, a Putnam Fellow each year. (The Duke Putnam team likely would not have come in first in 1993 and 1996 had Harvard allowed freshmen on their team or had Lenny spent four years there.) After receiving his Ph.D.from MIT, Ng was awarded the five-year postdoctoral fellowship from the American Institute of Mathematics (only one given per year), spending one year at the Institute for Advanced Study and then four at Stanford. He is delighted to be back in North Carolina and looks forward to working with the students and his colleagues here.

Ng works in differential geometry, specifically symplectic geometry, low dimensional topology, and knot theory. In recent years techniques from symplectic geometry have been applied to study knots and manifolds in low dimensions with spectacular applications to topology. Ng has introduced a new knot invariant derived through these means. His current research involves applying this invariant to explore the topology of knots and 3- and 4-dimensional manifolds with potential links to algebraic geometry and string theory.

Duke Math News

The *Duke Math News* is published several times a year and is distributed to those in the Duke mathematics community by campus mail. For previous editions and other news, see `www.math.duke.edu/news/`. We welcome items of interest for our next issue. Send them to `jones@math.duke.edu` or `dkrain@duke.edu`

To read about other news, honors and events concerning mathematics at Duke, visit `www.math.duke.edu/news/`. The on-line calendar at `www.math.duke.edu/mcal` lists both regular and special seminars and colloquia for the upcoming weeks. The department maintains video archives of talks, lecture series and special conferences at Duke, many of which are available, on-line. See `www.math.duke.edu/computing/broadcast.html` for more information.

—David Kraines, DMN Faculty Sponsor