fsumath
FLORIDA STATE UNIVERSITY
Spring 2006

A Historical Perspective of Topology at FSU

Topology: the mathematical study of those properties of geometric forms that remain invariant under certain transformations, as bending or stretching (as defined by Random House Webster's College Dictionary)

For those who may be unfamiliar (or a little rusty) with the specifics of the field, topology is an elastic, very flexible form of geometry. The main areas of study include: algebraic topology, which uses abstract algebra to encode and analyze properties of spaces and objects; differential topology, which draws on more analytical tools for similar purposes; and geometric topology, which is the study of those geometric characteristics of objects that are not rigid as size or shape.

For the most part, the study of topology at FSU throughout its history can be classified as geometric, though there have been topologists who focused in other areas. The department and its faculty have a rich history rooted in the field, and their reputation of being a leading institution in research and study dates back to the late 1950s and early 1960s, which is where one must venture to understand fully the impact the field has had on the department and vice-versa.

The mathematics department began development in topology under the mentorship of Morton Curtis and then-chair Thomas Wade. As its status grew, it became engrossed in a positive cycle of progress, attracting some notable topologists, thereby strengthening its potential in the field.

In the early years, FSU attracted names such as John Hempel (now at Rice), Robert Williams (now with University of Texas at Austin), and Russ McMillan (retired from Wisconsin) for relatively brief but productive stays. James Andrews also joined the faculty and spent his career at FSU. Around the same time, Curtis was responsible for the hiring of Orville G. Harrold, a well-known figure in the field who would become known by some as the "father of topology" at FSU. With his hiring, the department began the climb to the upper rungs on the ladder of topology research.

In the mid to late 1960s the number of topologists in the department grew significantly. John Bryant, De Witt Sumners, Perrin Wright, and Chris Lacher (who later moved to computer science) started their careers at FSU at that time and were joined by Wolfgang Heil a few years later. They all made significant contributions to the department and the study of topology. At one time, 11 faculty members were supported in their research by a single grant from the National Science Foundation (NSF). Some of them have recently retired, but Heil and Sumners are still with FSU today.

"I'm sure most of those hired — this especially includes me — were attracted to FSU for its reputation in topology," Bryant said. "It was certainly among the strongest groups in the department, and with the present faculty in topology, it continues to be so."

Generally speaking, geometric topology has been categorized through the years as an abstract branch of mathematics, as opposed to applied areas. As often happens when researchers begin to collaborate and study with those from other areas, the boundaries have become blurred during the last 20 years. Funding agencies such as NSF and the Office of Naval Research (ONR) support faculty endeavors to further interdisci-

(Continued on page 6)

A View From the Chair...

It has been an eventful year in the department. De Witt Sumners stepped down after six years as Chair to enjoy a well-deserved sabbatical in the 2005-06 academic year (as I write he is in Japan!). I was appointed Chair in August 2005 in De Witt's stead and confess to a certain satisfaction with the job, though I admit I have much to learn before I am able to fill De Witt's shoes. Steve Bellenot has taken to the Associate Chair position with great energy and enthusiasm. He, from the outset, has demonstrated a certain flair for making appropriate adjustments to the logistics of the day-to-day running of the department.

De Witt Sumners was elected a fellow of the American Association for the Advancement of Science (AAAS) in 2005. In January this year, the American Institute of Aeronautics and Astronautics (AIAA) awarded Chris Tam their highest honor, the 2006 AIAA Pendray Aerospace Award. You may read more about these two honors in this newsletter.

Other honors within the department follow. Max Gunzburger is an invited speaker in the Numerical Analysis and Scientific Computing Section at the 2006 International Congress of Mathematicians coming up in Madrid in August. Karen Everage was named the University Distinguished Teacher in 2004, the University's highest teaching honor, and Linda Rogers received a University Teaching Award in 2005.

In September 2005 the department honored retiree Steve Blumsack for his 30 plus years of faculty service with a dinner at the Silver Slipper. In October the department honored the department chairs of the past 25 years with a wine and cheese reception at the Brokow-McDougall House, a beautiful antebellum mansion in Tallahassee.

Those honored were John Bryant (1980-84), Ralph McWilliams (1984-90), Fred Kreimer (1990-93), Chris Hunter (1993-99), and De Witt Sumners (1999-2005).

The past year has been the busiest hiring year in memory. More information appears on page 3, but I'll mention the names of our new faculty and staff: Associate Professor Giray Okten (Financial Math), Assistant Professors Amod Agashe (Pure Math), Nicholas Cogan (Biomedical Math), Rudy Horne (Applied Math), Ziyad Muslimani (Applied Math), Raul Tempone (Computational Math) , Post Doctoral Scholars Leonardo Mihalcea (Pure Math), Peter Roper (Biomedical Math), Ashwin Vaidya (Applied Math), Yan Zeng (Financial Math), Assistant in Mathematics Kristina Bowers, Office Assistant Margaret Hall, Program Assistant Dena McDaniel, and Grants Specialist Scott Wimberly.

The department looks forward to a busy summer of research and teaching and another productive and eventful academic year in 2006-07.

Dr. Philip Bowers

Our Congratulations!

Alumni Recognition

Congratulations to alumna Natasha Berloff (PhD, FSU, 1996)! She has been awarded a Pilkington Teaching Prize by the University of Cambridge for "making this difficult lecture course (fluid dynamics and dynamics) accessible and interesting to students." Natasha is a lecturer in applied mathematics at Cambridge and was one of only 11 recipients of the award — and the only mathematician. She learned her craft as a teacher at FSU through the TA training program, and is a fine testament to its effectiveness.

Recent PhDs

The Math Department takes great pride in our graduates and in knowing that they are elsewhere, carrying on our tradition of success. Recent PhD recipients are as follows.

- Zhenlu Cui, a student of Dr. Qi Wang, graduated in summer 2005 with a focus in applied and computational mathematics and is currently a postdoctoral associate in the math department at the University of North Carolina-Chapel Hill.
- Mack Galloway, supervised by Craig Nolder
- Anand Ganesan is currently employed with General Electric Energy in Greeneville, South Carolina, after receiving his PhD in summer 2005. While at FSU, Anand was a student of Dr. Christopher Tam and studied computational mathematics and aeroacoustics.
- Becky Goforth received her PhD posthumously in April 2005 under the supervision of Dr. Sam Huckaba. Becky was a faculty member at Stephen F. Austin State University on Nacagdoches, Texas. Her fields of study were commutative algebra and cryptography.
- Samet Kadioglu, supervised by Mark Sussman
- Partha Srinivasan, supervised by Jack Quine

Retirement

The Department recognizes long-time professor Dr. Steve Blumsack in his retirement. We will not say farewell, as he will remain a part of the department, its legacy and contributions, and atmosphere. Dr. Blumsack joined the faculty in September 1969 and retired from FSU in June 2005. Although he is officially retired, he continues to work on grants — currently on two of his own and consulting for another.

Welcome to our newest members!

Amod Agashe
Assistant Professor, Mathematics
With us since fall 2005
Research interests: Number theory
Degree: PhD, University of California at Berkeley, 2000

Kristina Bowers
Assistant in Mathematics
Office: 208 LOV

Nicholas Cogan
Assistant Professor, Mathematics
With us since spring 2006
Research interests: Mathematical biology; bio-fluids; biofilms
Degree: PhD, University of Utah, 2003

Margaret Hall
Office Assistant
205D LOV

Rudy Horne
Assistant Professor, Mathematics
With us since fall 2005
Research interests: Pulse interaction effects in fiber optics communications systems; random dispersion in fiber systems; mathematical models and numerics concerning randomness in physical systems, asymptomatic and perturbation methods for solving linear and nonlinear partial differential equations
Degree: PhD, University of Colorado at Boulder, 2001

Dena McDaniel
Program Assistant, Mathematics
Office: 225 LOV
Duties: Corresponds with both U.S. and international students to ensure a smooth departmental application process

Beverly McNeil
Program Assistant
Office: 225 LOV

Leonardo C. Mihalcea
Instructor, Mathematics
With us since fall 2005
Research interests: Algebraic geometry; Combinatorics
Degree: PhD, University of Michigan, 2005

Ziyad Muslimani
Assistant Professor, Mathematics
Degree: PhD, Technion-Israel Institute of Technology, 2000

Giray Ökten
Associate Professor, Mathematics
With us since fall 2005
Research interests: Monte Carlo Methods; Mathematical Finance
Degree: PhD, Claremont Graduate University, 1997

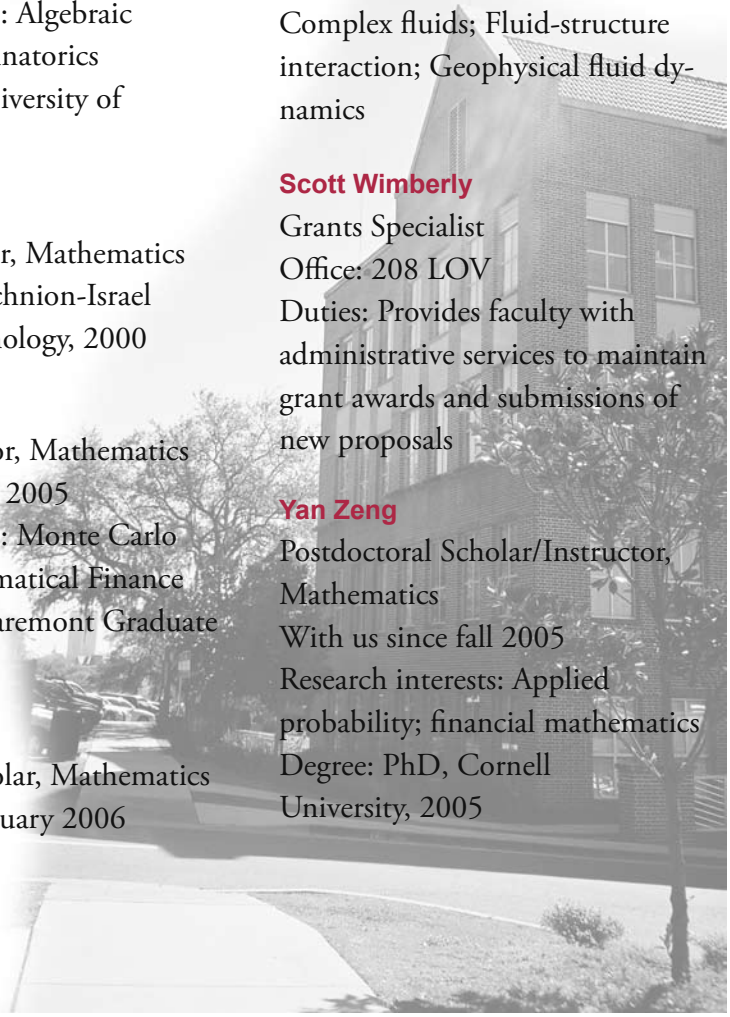
Peter Roper
Postdoctoral Scholar, Mathematics
With us since January 2006

Raul Tempone
Assistant Professor, School of Computational Science
Research interests: Posteriori error approximation and related adaptive algorithms for numerical solutions of various differential equations
Degree: PhD, Royal Institute of Technology, Stockholm, Sweden, 2002

Ashwin Vaidya
Postdoctoral Scholar, Mathematics
Research interests: Partial differential equations; Fluid mechanics, Complex fluids; Fluid-structure interaction; Geophysical fluid dynamics

Scott Wimberly
Grants Specialist
Office: 208 LOV
Duties: Provides faculty with administrative services to maintain grant awards and submissions of new proposals

Yan Zeng
Postdoctoral Scholar/Instructor, Mathematics
With us since fall 2005
Research interests: Applied probability; financial mathematics
Degree: PhD, Cornell University, 2005



Alumni Spotlight:

Success stories—from students to faculty, we have them and we love them. They are indicators that we are what we desire to be: a program that supports and nurtures and one that is progressive in nature. We also love to see those successes beyond our program in our alumni. Perhaps those stories are the ones that we are proudest to pass on. Not only do they motivate and inspire current and future students, they also show our strength as a program and the investment our faculty members make in our students, as teachers and colleagues.

The only PhD in the history of FSU's Math Department to receive a National Science Foundation postdoctoral fellowship, Eddie Qian's mathematical story begins as an award-winning high school student who knew at an early age the direction he would take would include mathematics in a big way. It continues today with Eddie's current position as a successful associate with a global investment management firm. The role of our department fits securely somewhere in between as the preparation, guidance, and knowledge Eddie needed to make his mark.

Eddie attributes his interest and ultimate success in mathematics to a number of factors both in his native China and here at FSU. He became interested in math at an early age, mostly because of exposure to the subject by his parents, who were high school and college math teachers. His talent in the field was soon apparent, as he was dominant in local and regional math competitions as a high school student. His competitive successes only strengthened his love for the area.

Naturally for Eddie, he continued on the mathematical path in college, choosing to study at Peking University and eventually earning a master's degree in computational mathematics at Academia Sinica, China's national research institute. For his PhD study, Eddie wanted to attend a university with a strong emphasis in applied mathematics. While researching his options, he discovered FSU, decided it was the best fit for him, and accepted a much-needed teaching assistantship. He flew from Beijing to Tallahassee — his first-ever trip on a plane — with $100 of borrowed cash in his pocket.

"Although we now see Edward Qian as the analyst in a very sharp suit, headed for his office at a top address in Boston's financial district, some of us remember him fondly as a tall, lanky, basketball-playing, just-past-20 year old," said Bettye Anne Case, a math department faculty member who remembers Eddie's first visit to FSU.

As he settled in to life at FSU and in the U.S., Eddie began working with Dr. Chris Hunter as a research assistant, with study focusing on galactic dynamic. Their topics included building analytic equilibrium models for galaxies and constructing potential density pairs for galaxy models.

"[The research] suited me well because I liked deriving analytical results as well as performing numerical simulations," Eddie says. Dr. Hunter's teaching and working styles also suited Eddie well. Of Hunter, Eddie says he is "meticulous, persistent, and helpful in a quiet way."

The relationship formed with Hunter isn't the only thing at FSU that influenced and encouraged Eddie. He also found that the individual attention provided by the department in general was

Qian Successes, Contributions Continue

beneficial in ways that may not have been obvious to him as a student.

"While I enjoyed doing research, I also liked teaching, though not initially," Eddie says. "A lot of credit goes to Bettye Anne (Case) for developing and guiding the TA program, paying attention to the individual TAs. Now that I am working in the financial industry, some of the presentation skills I learned as a TA are so crucial. It's hard to imagine what I would do without them.

"Also, it helps to break the ice whenever you can tell people that you used to teach certain NFL players when they were FSU students."

Direct faculty involvement in other areas of Eddie's study served as another important "ice breaker." He credits the encouragement provided by FSU faculty for his NSF fellowship. "They put me in a position to apply for the fellowship."

Eddie feels that the fellowship, which allowed him to study at the Massachusetts Institute of Technology with Dr. Alar Toomre, has greatly influenced his career. Not only did it provide him with the funding to explore other research interests, but it also instilled in him a new sense of self-confidence and, undoubtedly to Eddie, opened professional opportunities that would not have otherwise been available.

Not only have Eddie's accomplishments made things possible for him, but his FSU legacy has helped improve the opportunities for students that have followed, and will follow, him through the department. He was an initial adviser to the Financial Mathematics Advisory Group and continues to support the program, serving as a guest speaker and leading a short course during the annual Financial Mathematics Festival, hosted by the Math Department for students in Computer Science, Economics, Finance, Risk Management, and Statistics.

"The Financial Mathematics program provides students with rigorous mathematical training and financial and market knowledge so that they have the tools to tackle real-life problems, either in industry or academia. I advised an emphasis on the program's mathematical content and also teaching students about portfolio management. Too many programs focus too much on option pricing theory…where many quantitative investment firms like ourselves seek candidates who understand the mathematics of portfolio management." Eddie is currently employed with PanAgora Asset Management.

After presenting a short course on these topics and speaking with several FSU faculty members who agreed with his analysis, Eddie realized that there was not one good, comprehensive textbook on the topic. So, a year ago, he and a colleague at PanAgora began work on one. They hope the book will be available by year's end, continuing the influence his success will have on students of mathematics.

While our focus throughout this article has been Eddie's story as a successful mathematician, this is only a part of his life. "In 2000 Eddie and his delightful wife Amy announced their first child... and their first mortgage. They are happy that son Garrison has since been joined by brother Bryan and sister Katie," Case said.

Having lived in Boston since he and his wife Amy moved there for his fellowship at MIT, he will forever have an affinity for Tallahassee. He stills visits often and hopes to bring his children—Garrison, Bryan, and Katie — for a visit sometime soon.

Teaching and Other Awards

Every year the Department recognizes outstanding achievement among its students at Math Honors Day. The 2005 event was held April 1 and saw a number of students rewarded for their accomplishments. The day also marks the induction of our outstanding students into the Florida Beta Chapter of Pi Mu Epsilon, a national scholarly society in mathematics consisting of chapters at various colleges and universities. The FSU chapter was established in 1956. Members are able to add their names to a ledger that has been signed by each member since the chapter's founding. Both undergraduate and graduate mathematics students are eligible for membership, and undergraduates in other majors may be eligible if they satisfy the national organization's criteria for membership. These include a specified overall class ranking, as well as sufficient credits and grades in mathematics courses. Members of Pi Mu Epsilon also participate in one or more of the student activities in the department: Florida State Student Mathematical Society, Florida State Student Actuarial Society, Putnam Competition Team, or Graduate Student Seminar.

Dwight B. Goodner Mathematics TA Teaching Awards:

Advanced: Srisairam Achuthan

Beginning: Gabriel Bouch

D.W.Simpson Actuarial Scholarship:

First Place: (tie)

R.J. Egnor

Kelsey O'Brien (tie)

Runners-up:

Suzanne Ferrell-Locke

Anthony Lencioni

Amelia Powers

Kenneth G. Boback Award:

Candace M. Massey

Robert Schoen

Tamera Scholtz

Lee Singleton

Lyndsey Skelton

Benjamin Thayer

Bedford West

Spring 2005 inductees are:

Christopher Androne

Katherine Casula

Ana-Marie Croicu

Gregory Dungan II

Robert Egnor

Cameron Jones

Yong Jung

Dea Kondi

Courtney McCabe

Kelsey O'Brien

Jackson Pickett

Dmitri Pisarev

Kyle Reed

Topology (from page 1)

plinary studies, and many research topics cross the academic boundaries to create unusual "lab-fellows."

In the mid 1980s, a group of mathematics researchers including Bryant, Sumners, Lacher, and applied mathematician Louis Howard were awarded an ONR grant to study the applications of topology to polymer chemistry. Later in his FSU career, Sumners became renowned for his study of topology and its relation to biology, most notably knot theory and the structure of DNA.

A new group of topologists came to FSU in the late 1980s and early 1990s. Phil Bowers, Eric Klassen, and Washington Mio introduced several new lines of research in topology and geometry at FSU and participated in many new developments. Bowers' work on geometry was later applied to conformal mappings of the brain, Klassen made many contributions to gauge theory and the topology 4-manifolds, and Mio collaborated with Bryant for many years in work that led to the exciting discovery of exotic higher dimensional manifolds.

Currently, topologists at FSU continue to move toward exciting discoveries with unprecedented lines of research that will certainly maintain the long tradition of topology. Sergio Fenley works with laminations and foliations of 3-manifolds using flows, in which objects move with time just like wind and fluids. Eko Hironaka investigates several aspects of low-dimensional topology, emphasizing knot theory. Mio and Klassen are conducting interdisciplinary research in the areas of image analysis and pattern recognition — how can a machine recognize an object, a face, or interpret a scene? Monica Hurdal, Sumners, and Bowers use mathematics to develop maps of the anatomy and functionality of the brain, and Heil continues to carry out his research program on the topology of 3-manifolds.

The caliber of research throughout FSU's history and the faculty who consistently meet the standard set so many years ago have secured a place in topology for FSU. Not bad for a group of people said to not have the ability to tell a donut from a coffee cup — topologically speaking, anyway.

De Witt Sumners Elected Fellow of Prestigious Science Council

A Florida State University mathematics professor who has built an international reputation as a pioneer in finding real-world applications of mathematics to the sciences has been elected a fellow of the American Association for the Advancement of Science.

De Witt Sumners is being honored for sustained, outstanding work in topology and knot theory and for research and leadership in using mathematics in molecular biology and computational chemistry. Sumners is believed to be the first person from FSU's math department ever to be elected a fellow of the AAAS.

"It's a great honor and recognition of my career, which has included national service on committees focusing on combining math and biology," Sumners said. "The discovery of DNA and, more recently, the sequencing of the human genome has revolutionized the field of biology. To understand this data, you need mathematical models. So while biology is the science of the 21st century, there are great opportunities for mathematicians."

Each year the AAAS Council elects members whose "efforts on behalf of science or its applications are scientifically or socially distinguished." A certificate and pin will be presented to Sumners during the AAAS Fellows Forum, part of the association's annual meeting in February.

Sumners, a Robert O. Lawton Distinguished Professor and chair of the math department, joined the FSU faculty in 1967 as an assistant professor and was promoted to associate professor in 1970 and to full professor in 1975. He earned a bachelor's degree in physics from Louisiana State University in 1963 and a doctoral degree in mathematics from the University of Cambridge, England, in 1967.

The AAAS is an international, non-profit organization dedicated to advancing science around the world. In addition to organizing membership activities, AAAS publishes the journal *Science* as well as many scientific newsletters, books and reports.

~FSU Media Relations Press Release

Tam Receives AIAA Award

The American Institute of Aeronautics and Astronautics (AIAA) awarded FSU Robert O. Lawton Distinguished Professor of Mathematics Christopher K. W. Tam the 2006 AIAA Pendray Aerospace Literature Award in January.

Tam is being honored "for outstanding contributions to the mathematical foundation and algorithms for computational aeroacoustics, the understanding of jet noise generation mechanisms and prediction methods, turbulence modeling and hydrodynamic instability through numerous publications."

A pioneer and leading authority in computational aeroacoustics, Tam has published hundreds of papers in the areas of aeroacoustics, fluid mechanics and computational methods, and has contributed significantly to the advancement of the aeroacoustics science through his research, teaching and leadership to the scientific community.

Tam obtained his bachelor's degree at McGill University and his MS and PhD degrees at Caltech. He was a Ford Foundation post-doctoral fellow/ assistant professor at the Massachusetts Institute of Technology before joining Florida State University where he is now a Robert O. Lawton Distinguished Professor. Tam is a Fellow of AIAA, the American Physical Society and the Acoustical Society of America.

The AIAA advances the state of aerospace science, engineering, and technological leadership. Membership is drawn from all levels of industry, academia, private research organizations, and government.

~AIAA Press Release

Spring 2006

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*The **fsumath** newsletter is available in alternative format by contacting the Department of Mathematics or the University ADA director, campus mail code 2410. For people who are hearing or speech impaired, contact the phone number through the Florida Relay Service at 1-800-935-8770 (voice) or 1-800-955-8771 (TDD).*

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Many of our graduates have kept in touch with the Department and we invite all other alumni to do the same. In fact, we would like to add your name and contact information to our alumni database and include your information on our website. To be included, email alumni@math.fsu.edu.

Keep Us Posted!

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Address _____

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You can support the students and faculty of FSU's Department of Mathematics with a tax-deductible gift to enhance our teaching and research efforts.

Checks payable to **FSU Foundation Mathematics Fund No. 0223** may be sent to Dr. Philip Bowers, Chair, FSU Department of Mathematics, Tallahassee, FL, 32306-4510 or FSU Foundation, Tallahassee, FL 32306-2660.

Questions may be directed to Dr. Bowers by phone (850.644.7405) or email (bowers@math.fsu.edu). *Please help us support the students who hope to follow in your footsteps.*