FSUmath
THE FLORIDA STATE UNIVERSITY COLLEGE OF ARTS AND SCIENCES

Letter from the Mathematics Department Chair

Dear Friends of FSU Department of Mathematics,

It has been a fantastic year for the Florida State Department of Mathematics! There have been numerous positive changes and additions to the department along with a plethora of honors that have been awarded. Also, we have strengthened our outreach efforts in order to better serve our community. I thank you for your continuing support which is crucial to our success.

Following last year's inauguration of the FSU High School Math Contest, we initiated FSU Math Fun Day. It was a huge achievement thanks to our volunteers and the overall community's participation. Eko Hironaka and Steve Blumsack deserve much credit for leading this effort and the great positive response to this event is leading us to plan more events like this in the future.

Two new graduate faculty members, Richard Oberlin and Arash Fahim joined the department in August. Richard is an analyst and an alumnus of the department. Arash works in the area of financial mathematics. This is the first time in many years that we have two tenure-track faculty members joining the department, and we are hiring two more this academic year. Moreover, David Ekrut joined us as a teaching faculty enhancing our basic math teaching group. We also hired a new academic advisor, Pamela Andrews. She serves as a key staff member and a liaison of all students in the Department of Mathematics.

Three long-time faculty members Bettye Anne Case, Warren Nichols, and Jack Quine retired this year. Each of them contributed significantly to the department. I wish them the best during retirement.

Additionally, there have been changes to some existing faculty. Eko Hironaka is the new Director for Pure Mathematics. We thank the previous director, Mark van Hoeij, for his dedication and service to the department. Brian Ewald has taken on the new role of Coordinator for the Professional Master Degree Program in Financial Mathematics.

Recently, the department went through a once-every-seven-year quality enhancement review process. We learned a great deal about ourselves in the process and are very much amazed by our productivity despite the very limited resources that we have. The committee, especially the committee chair Paolo Aluffi, deserves a round of applause for a job superbly done.

Our students, faculty and staff continue to excel in teaching and research. The number of undergraduate

In This Issue

majors has exceeded 400 for the first time. We have awarded 18 doctoral degrees, another historical high! Two faculty members, Eric Klassen and Jim Wooland, have been awarded University Teaching awards. Faculty members continue to succeed in attracting external research grants despite the sequester. These external grants illustrate the recognition among the peers enjoyed by our fine faculty, and bring in much needed additional resources to the individual faculty, graduate students, and the department.

The department has also taken on several new initiatives. We have launched the FSU Math Fellow's Program to provide recognition to faculty members who exemplify excellence in research. The first awardee is Washington Mio who also delivered a beautiful Fellow's talk.

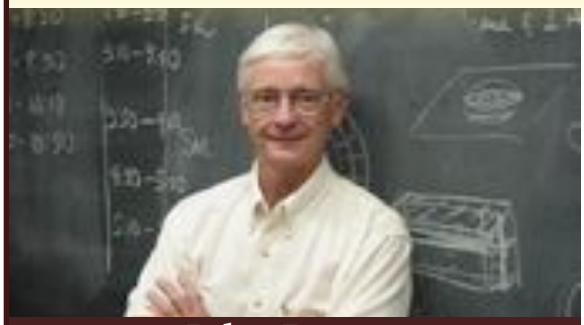
It has been a real pleasure serving as the Department of Mathematics Chair. I am extremely proud of our faculty, staff, students and alumni's accomplishments. I am sure you will enjoy reading some of the success stories highlighted in this newsletter. Also, please feel free to send any comments or suggestions that you may have for our department at chair@math.fsu.edu as we value our community's input.

I wish you and your family a great holiday season and a happy new year!

Xiaoming Wang, Chair

FSU's Inaugural American Mathematical Society Fellows

Reflecting on Honor and Looking to the Future of Math



John Bryant

Robert Gilmer

De Witt Sumners

In November 2012, The American Mathematical Society honored 1119 mathematicians in their first class of Fellows. Three FSU math department professors John Bryant, Robert Gilmer, and De Witt Sumners numbered among them. Looking back on their long careers and substantial contributions to the field, they've been kind enough to offer their reflections and advice on the field of mathematics, at FSU and beyond.

Regarding the new AMS program, Dr. Bryant explained, "As an AMS officer, I was in favor of the program." He was able to contribute to the process and criteria for the honor, and called the Fellows program an "opportunity for our department to get international recognition, an opportunity they didn't have before," as well as "a way to highlight faculty." Meanwhile, Dr. Sumners said, "I was surprised and pleased. It is a big honor to be recognized by your peers, other mathematicians." Dr. Gilmer, retired for ten years, remarked "It was very gratifying ... to have the contribution you've made to the subject recognized. And when you look at the group, it's humbling." Indeed, the AMS Fellows, including mathematicians from more than 600 institutions, is humbling bunch.

While it is clear that these three professors have accomplished multiple successes in teaching and research, each of them reflected on specific achievements they consider their greatest contributions to the field. Dr. Sumners spoke of his "shift from pure mathematics to applications of mathematics in biology. Lots of scientists are interested in looking at mathematics to elucidate what's happening in the cell... the mathematicians are interested as well." Dr. Bryant mentioned his work with colleagues, citing "The paper I wrote with Dr. Mio and two others, Topology of the Homology Manifolds, published in Annals of Mathematics. That solved a problem that had been circulating for about 20 years...in a way that people didn't expect." Finally, Dr. Gilmer talked about both his teaching and research success. He re-

membered his first group of "motivated, talented" PhD students, all of whom went on to contribute significantly to the field, saying "I feel that I was influential in that." As far as his research pursuits, he identified his book, Multiplicative Ideal Theory, adding "It was basically the first book that gave a comprehensive treatment of the subject. It stimulated a lot of research in the area."

As these prestigious men look back on their work, they also had much to say about the future of the math department at FSU, the direction of the field, and advice for burgeoning mathematicians. Dr. Gilmer praised the department's diversity "in terms of gender and race, but also in terms of the interests of the department", comparing his early years at FSU, when the focus was on pure and applied mathematics, to the current offerings in four areas. Dr. Bryant and Dr. Sumners made a point of highlighting the departmental support they'd received throughout their research endeavors. Dr. Bryant remembered "being allowed to travel, to take sabbatical... I always felt appreciated," while Dr. Sumners remains excited about the Biomedical Mathematics degree program.

Perhaps most powerful were the words of advice each Fellow had for the next generation of mathematicians. From Dr. Sumners: "Pursue you own interests. Keep apprised of what's happening in the world. Talk to a lot of people. Look at lots of opportunities." Dr. Gilmer offered: "Two-thirds to three-fourths of what you do goes in the wastebasket. It's important to find out what doesn't work because it gets you to the path of what DOES work. Be tenacious, willing to work hard." Dr. Bryant added: "To be successful at mathematics, keep an interest in it. It's a creative process. You have to want to do it."

But all three agreed on this:

"You have to love what you do."

Alumni News

Javier Arsuaga (PhD 2000 with Major Professor De Witt Sumners) recently received a large NIH grant (http://news.sfsu.edu/mathematician-receives-grant-create-3d-genome-models).

P. Beaumont, Y. Guan (FSU PhD 2011), and **A. Kercheval**, Complex Dynamics in Equilibrium Asset Pricing Models with Boundedly Rational, Heterogeneous Agents, to appear in Complexity.

Ivo D. Dinov (PhD 1998 with Major Professor De Witt Sumners) recently moved from the UCLA Laboratory of Neuro Imaging (LONI), to the University of Michigan, where he is an Associate Professor of Nursing, and Director of the Statistics Online Resource Division of Nursing Business and Health Systems (http://nursing.umich.edu/faculty-staff/ivo-d-dinov).

Rana D. Parshad (PhD 2009 with Major Professor Xiaoming Wang) accepted a tenure track offer at Clarkson University in upstate New York starting in Fall 2013. Previous to this appointment, he had postdoctoral positions at Clarkson Universitiy and at King Abdullah University of Science and Technology.

Daniel Robinson (PhD 2011 with Major Professor Eric Klassen) writes about his work at amazon.com: "I'm a software development engineer for Amazon Web Services. My team builds systems that automatically configure Amazon's network so that customers with special equipment or special latency requirements can connect to the cloud. It's kind of like FSU, in that I'm surrounded by very smart people and I'm always learning."

Florida State University Undergraduate Mathematical Society

The Math Society at Florida State University's reemergence in the Spring semester of 2012 was spearheaded by Jaclyn Adelson and Johnny Petit after having been dormant for many years. They collaborated with Ryan Ehresman and Lawrence Dunn and several other undergraduates to draft plans and a mission statement for the Society. The first elections were held during the 2012-2013 school year, and Dr. Eric Klassen of the Math Department was selected as the Society's faculty mentor and sponsor. Shortly thereafter, the Society became a Registered Student Organization and a second round of elections took place bringing in the current wave of officers.

Simon Burhoe is the current president of the Society and Daniel Fuentes-Keuthan is the vice president. The other officers are Michael Ayoub, Officer of Public Relations; Thomas Frey, Society Treasurer; Courtney Marie Grazzini, Society Historian; and Constanza Miguel, Society Secretary.

These new officers share the same goal as those students who founded the new Society: inspire a sense of community among those FSU undergraduates who study mathematics or are interested in mathematics by holding bi-weekly meetings, study groups, and hosting academic lectures by faculty both from within the Math Department at FSU and elsewhere.

The Society has been successful at estalishing a social network for interested undergraduates, both on Facebook and at the open meetings. Members come from diverse backgrounds, including the Physics Department and the FAMU-FSU College of Engineering. In addition to the meetings and lectures, Society members aim to participate in mathematics-related expeditions; for example, this semester seven members of the Society attended the Third Annual Kennesaw Mountain Undergraduate Mathematics Conference (KMUMC 2013), where Lawrence Dunn presented his research on intuitionistic intensional type theory.

If you are interested in learning more about the FSU Undergraduate Mathemtical Society, visit the Facebook group at: www.facebook.com/groups/fsumathsociety/

In the near future, the Undergraduate Mathematical Society will establish more of an online presence by creating a blog that will cover details of past events and contain a schedule for future events and activities.

Student Profile: Kelly Pawlak

Physics student unleashes her curiosity in research

Majors: Physics and Applied & Computational Mathematics
Graduation: Spring 2014

When it comes to conducting undergraduate research, Kelly Pawlak has shown herself to be ready for the most intellectual of challenges.

"I encourage my friends and classmates to get into research because I've had such a wonderful experience," said Pawlak, who has been investigating a concept in condensed matter physics known as Bose-Einstein condensation, which relates to a particular type of particle called a boson. Because some atoms have even numbers of constituent particles — protons, neutrons and electrons, which all carry ½ spin and thus have integer spin — they are considered bosons. But not all bosons are atoms; some do not have protons, neutrons and electrons.

"Because bosons, under the correct conditions, tend to exist in the same state, Bose-Einstein condensation is a really counter-intuitive phenomena," Pawlak said. "As an example, we can imagine a set of 100 ordinary/classical two-state particles to be a set of 100 typical coins. You could flip the set of 'normal particle' coins repeatedly, for an astronomical length of time — say the age of the universe — and very probably never have all of them come up as heads. However, if the 100 coins represent bosons, the chance that all of them would come up heads would be about one in a hundred."

Because of this bizarre statistical property and other strange behaviors that arise from the nonlinearity of the system, the Bose-Einstein condensate can be useful to science and warrants study, according to Pawlak.

As evidence of the outstanding research she has conducted so far, Pawlak was one of four undergraduates who attended the Eighth IMACS Interational Conference on Nonlinear Evolution Equations and Wave Phenomena, a large gathering of leading mathematicians and physicists. She made a presentation on her research, "Random Stability in Nonlinear Media: An Investigation of Bose-Einstein Condensates."

"My talk was during the first day and the entire time leading up to it was absurdly nerve-racking," she said. "After a few minutes went by, I forgot that I was even giving a talk, and the rest went smoothly. At the end, a few professors approached me and complimented me on the presentation, which really set the tone for the rest of the conference for me."

Pawlak called her experience at the IMACS conference "great."

"I learned a lot about current topics in applied mathematics," she said. "I think every undergrad interested in academia should attend a conference."

Ziyad Muslimani, an associate professor of mathematics who has been supervising Pawlak's research, described her as "bright, creative and hard working."

"The first thing that caught my attention while working with her was her strong drive for success and passion for research and discovery," Muslimani said. "She invests tremendous amount of energy in thinking about the problem she is trying to solve and never gives up!"

Based on the strength of her research, Pawlak received a 2013 Undergraduate Research and Creative Activity Award from Florida State. The award consists of a $4,000 stipend.

"The URCAA money freed me from the obligation of working over the summer, which led to a lot more time for me to concentrate on my research," she said. "Also, some of this money has gone towards equipment and software for the computational part of my project."

In addition to the URCAA, Pawlak is the recipient of an Honors Thesis Award.

"My thesis project is very broad in scope at the moment, and encompasses both the above project and another man-

uscript being worked on," she said. "They are both related to Bose-Einstein condensates and are both investigations into the field of nonlinear dynamics."

During her final year of high school, Pawlak was talked out of pursuing physics in college. She began her college career at Florida State as an engineering major, but the coursework didn't click with her interests. After flip-flopping around the sciences, came back to physics full force.

"Since changing majors, school has been a lot less stressful. I'm finally doing what I really want," she said. "I am actually surprised that my GPA has increased since switching!"

"Scientists spend their lives climbing mountains. We may never make it to the top — we may never find a complete description of the universe — but the climb gives us a new perspective on the world."

- Kelly Pawlak

After graduation, Pawlak plans to pursue a doctorate in physics and become a tenured faculty member at a strong STEM school, conducting original research in condensed-matter physics and mathematical physics.

Undergraduate Research and Awards

Kelly Ann Pawlak, who works with Ziyad Muslimani, was awarded funding to present a paper at the NSF sponsorred "The Eighth IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory" in Athens, GA, USA, March 25-28, 2013.

FSU Undergraduate Research and Creativity Award: Kelly Ann Pawlak received this award of $4K to support her research project this summer under the direction of Prof. Ziyad Muslimani.

Graduate Student Research and Awards

Two graduate students from the polytechnic university of Madrid visiting Professor David Kopriva this summer to study spectral element methods. One student is part of the EU ANADE project (http://www.anade-itn.eu).

Kerr Ballenger collaborated with Craig Nolder on talks at Workshop on Results in Mathematics and Physics obtained by Methods of Hypercomplex Analysis, November 7-11, 2013 and at a Joint AMS and MAA Mathematics Meeting. Dates: Friday, January 17, 2014. Title: Boundary Values of Components of Monogenic Functions.

Vijay Kunwar received a student travel award for 2013 SIAM Conference in Applied Algebraic Geometry (AG13), to be held August 1-4, 2013 at Colorado State University in Fort Collins, Colorado where he will give a talk on ''Computing Hypergeometric Solutions of Second Order Differential Equations with Five Singularities". He also has a paper (joint work with Mark van Hoeij) accepted in ISSAC 2013 titled "Second Order Differential Equations with Hypergeometric Solutions of Degree Three."

Matt Jemison was awarded a SIAM travel grant in order to give a presentation on The Moment of Fluid Interface Reconstruction with Filaments: Increasing Sub-Gridcell Resolution" in the minisymposium Microscopic to Macroscopic Fluid-Structure Interactions, at the SIAM annual meeting in July, 2013.

L. Mander, M. Li, W. Mio, C. Fowlkes, S. Punyasena, "Identification of Grass Pollen Through the Quantitative Analysis of Surface Ornamentation and Texture, Proc. Royal Soc. B (2013) 280: 20131905.

D. D. Martinez, F. Memoli, W. Mio, "Multiscale Covariance Fields, Local Scales, and Shape Transforms", in F. Nielsen and F. Barbaresco (Eds.): Geometric Science of Information 2013, Lecture Notes in Computer Science 8085, 794-801, Springer, Heidelberg, 2013.

Yunyi Shen received a Dissertation Research Grant from the Florida State University Graduate School.

Alumnus Profile: Kurt Vinhage

Kurt Vinhage, who got his Bachelor's in Mathematics at FSU and is now a graduate student at Pennsylvania State University, may joke about missing the Quizno's near the Love Building, but what he really misses about his time at FSU is the people. As a PhD student in his third year at Penn State, Kurt is using what he learned in FSU's math department to teach students and pursue his research interests. His advisor, Anatole Katok, with whom Kurt works, focuses on rigidity of higher-ranked dynamical systems and rigidity of Weyl chamber flows. As he explained, "In a classical dynamical system, time can be a discrete or real parameter, but in both cases it's one-dimensional. In a higher-ranked system, it's multi-dimensional. The work I do is classifying, showing rigidity phenomena that occur -- measurable rigidity, differentiable rigidity, structural stability." And he's doing what he loves, drawing on his undergraduate studies: "I really like the subject because it has a unifying element to it. To prove what I want to prove you have to use tools from algebra, geometry, and measure theory, and there are very few subjects where you use such a variety of tools."

For Kurt, a precocious curiosity towards mathematics predates his time at FSU. It goes all the way back to his childhood. He said, "I always liked math and was always fascinated by geometry -- so much so that in middle school, I started keeping a notebook with formulas for approximations for pi. In high school I asked my father for his calculus textbook and started reading that." FSU provided an environment for Kurt to foster those ambitions. Dr. Hurdal, his Calculus 3 professor, encouraged him to consider graduate school, and he had the opportunity to take part in a pre-graduate program called MASS (Mathematics Advanced Study Semester) at Penn State.

After working through most of the math courses offered at the undergraduate level, Kurt was able to work closely with faculty to keep digging. He explained: "The FSU department did a really good job of making sure I always had a new course to take and new material to work on. There was a lot of personal attention. I did an honors in the major under Dr. Mesterton-Gibbins, and I also had the opportunity to do a minor research project with Dr. Hironaka." Kurt made it clear that the faculty's investment in his success and support of his curiosity did much to prepare him for his current undertaking. He discussed his research projects at FSU, saying, "I got a feel for how to think about problems that have never been solved before. When you take a course, you look at problems with solutions. But when you start a new project, you don't know what tools you'll need. It's a new way of thinking, and being exposed to that at FSU was a great help."

Kurt has had the chance to add teaching to his skills, as both a teaching assistant and a lead instructor. While teaching Introduction to Linear Algebra, he was glad to see "the material was accessible to students who hadn't yet taken Calculus 1." He's clearly enjoyed his teaching time, and looks forward to more. Whereas research can be solitary or abstract, teaching provides an opportunity to make connections between the field and the rest of the university. Kurt explained, "Communication between disciplines is important in establishing the growth of knowledge, and being able to teach at any level is a good quality in any mathematician."

Kurt had advice for those students considering graduate work in mathematics. He emphasized the benefits of a personal investment in one's studies, saying "You can get a degree by going to the courses. But there's so much more to be gained from the FSU experience. If you don't take advantage you're really cheating yourself." How? He recommended sitting in on graduate courses, to get an idea of what's coming, and getting to know faculty -- "Don't be shy about it." When asked about his thoughts concerning the future of the FSU math department, Kurt was glad to know that a greater variety of courses are being offered at the undergraduate level. He was also excited about new faculty and new research projects going on. But the future of the field in a broader way? He'd like to see more people finding a balance among research, the historical appreciation for scholarship, and the new work being done. He loves what he's doing, considers himself lucky, and hopes others will follow in his footsteps.

He said it best: ***"To get to think about the problems you want to and work on the problems you want to is a great luxury."***

Faculty Research Profile: Richard Bertram

People are often confused about what Richard Bertram, a professor in the FSU Mathematics department and the director of the Biomathematics program, does for a living. At mathematics conferences he encounters people who thought he was a biologist, while at biology conferences he is known as â€œthe math guyâ€. This is to be expected when you work at the interface of two disciplines, as Bertram has done since his days as a graduate student at Florida State University. Bertram became interested in the field after reading elegant work by John Rinzel that used a sophisticated mathematical technique called fast-slow decomposition to understand the nonlinear dynamics underlying bursting patterns in the electrical activity of neurons. After completing a dissertation on bursting oscillations under the supervision of Jerry Magnan (FSU Mathematics), Bertram moved to the National Institutes of Health as a postdoctoral fellow at the Mathematical Research Branch, where Rinzel was the lab chief. It was at the NIH that two of the most important events in Bertram's career took place: he began working with Arthur Sherman and he began working on pancreatic islets. Today, after many years and moves from Washington D.C., to Pennsylvania, and then back to Tallahassee, Bertram still works with Sherman on pancreatic islets, and other biological and mathematical topics. Along the way, he has picked up many other collaborators (98 co-authors so far), and even an experimental lab of his own at the Biomedical Research Facility at FSU. He has also branched out to several other topics in biology, chemistry, and dynamical systems theory.

The application areas of Bertram's current research focus are neuroscience, endocrinology, and the intersection of the two called neuroendocrinology. He develops mathematical models of the various systems, uses mathematical and computational techniques to analyze the models, develops predictions that will help support the model (or overturn it if the predictions fail), and then works with others to test the predictions in the laboratory. Within neuroscience, he collaborates with a team of scientists at FSU to understand how the neural circuitry in the bird brain develops so as to produce a highly stereotyped song, as occurs in the male zebra finch. This may seem to be a strange topic, and always gets the eye-rolling response when he mentions it at parties, but there is method to this madness. There are no primates that learn to vocalize by listening to adults, as humans do when learning to speak. The closest you can get to human vocalization is the male zebra finch, which learns

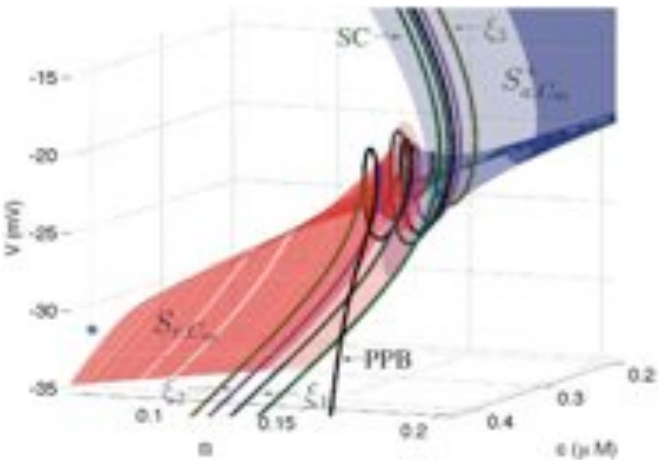
its song by listening to and mimicking its father. So one good way to understand how humans acquire speech is to study the zebra finch. Bertram started working on this in 2006, when he was approached by Frank Johnson (FSU Psychology) to help solve a problem that came up when doing an acoustic analysis of the notes of the bird song. It turned out to be a statistics problem, so Bertram asked Wei Wu (FSU Statistics), who he had recently met during Wu's job interview, to join the group. The team has recently grown to include Rick Hyson (FSU Psychology), who is an expert at making electrical recordings from neurons in a brain slice. Bertram's role is to help in the development of analysis techniques for the bird song, and to develop mathematical models of the neural circuitry that underlies the vocalization. The team is funded by the National Science Foundation, and includes graduate students from Neuroscience and Mathematics.

Within the area of endocrinology, Bertram studies the biophysical mechanism of pulsatile insulin secretion from cells in the pancreas called Î²-cells. Malfunction in insulin secretion leads to type II diabetes, which is by far the most prevalent form of the disease. One sign of type II diabetes is the loss of insulin oscillations in

the blood. Since his days as a postdoc at the NIH Bertram has studied how islets produce oscillations, and how the oscillations from ~1 million islets synchronize to give coherent insulin oscillations in the blood. This involves development of models and use of the fast-slow analysis technique to understand them. Much of that work has been with his long-time theoretical collaborator Arthur Sherman (NIH) and experimental collaborator Les Satin (Univ. Michigan). More recently, Bertram has begun collaborating with Mike Roper (FSU Chemistry) to design a very small device (called a microfluidic device) that can be used to test a theory on islet synchronization that can't be tested in the whole animal. Bertram has worked with students from Physics, Mathematics, and Chemistry on the islet research, which has been funded by the NSF, the American Heart Association, and most recently the NIH (with Roper as the lead investigator).

An area of the brain called the hypothalamus, and the nearby pituitary gland, work together to orchestrate hormone release from all the endocrine glands of the body, such as the adrenal gland, ovaries, testes, pineal gland, and others. In 2005 Bertram began a collaboration with Marc Freeman (FSU Biological Science, retired) to study rhythms that occur in pituitary hormone release. This research is funded by the NIH, which provides sufficient financial support for a fairly large group of mathematicians, physicists, and biologists to study the problem from many angles. When Freeman retired Bertram became the principal investigator of the lab, which he now runs in collaboration with two FSU research professors, Joel Tabak and Arturo Gonzalez-Iglesias (both FSU Mathematics). This is the only neuroendocrine lab in the world that combines in vivo (whole animal) studies, in vitro (dispersed pituitary cells and brain slice) studies, and mathematical modeling. Since Bertram has been part of the lab, they have worked with students from Mathematics, Biology, and Neuroscience, as well as several postdoctoral fellows.

While Bertram's research is driven mostly by biologi-



cal questions, these often lead to some very interesting mathematical questions. Most recently, Bertram has been studying mixed-mode oscillations, which consist of small and fast oscillations interrupted periodically by large excursions. Oscillations of this type occur in many pituitary cells and in single pancreatic Î²-cells, but although models developed by Bertram's lab easily reproduce the oscillations, understanding the dynamics that underly them is not so easy. A chance meeting with Martin Wechselberger (Univ. Sydney) at a conference in England in 2009, one of the leading theorists on mixed-mode oscillations, led to a collaboration that has revolved around abstract structures such as canard trajectories, folded-node singularities, and singular funnels. Bertram's team is now applying what they have learned from this mathematical analysis to laboratory experiments, using software that allows them to inject ionic currents described by mathematical models into real pituitary cells. These models are calibrated to the cell's behavior using the parallel processing capabilities of a programmable Graphics Processing Unit in a desktop computer, and then predictions are tested on the same cell used to calibrate the model. The mathematics again returns to the biology...

Penelope Kirby, Coordinator of Graduate Teaching Assistants:

Dr. Kirby Teaches Others How to Teach, Learn Along the Way

Teaching assistants help get the work done on campuses across the country, but who helps the TAs? In FSU's math department, Dr. Pene Kirby is one of those people. As Coordinator of Graduate Teaching Assistants, Dr. Kirby leads the TA Training Program, working closely with incoming students through a series of courses to provide support as students seek to maintain their own studies alongside their newfound instructional role. Dr. Kirby understands that challenge, and explained: "They have a fairly hard job. They have to explain mathematics in very low language. They need to be flip-flopping in their mind, as a student and as a TA. Graduate students are trying to manage, trying to be everything and balance it all out." That's where she comes in.

The TA Training Program, designed around three courses and rife with faculty and peer mentorship, offers support to students who are, indeed, trying to do it all. Whether or not they've taught before, this training provides the tools and encouragement necessary for successful instruction. Dr. Kirby's goal through the program, she reflected, is "to feel like they've grown from the time they walk in the door as a first semester TA to when they leave. I want them to have grown it that time." As a teacher of teaching, she gets to see firsthand, across many levels, just how that growth comes about.

Before classes begin, incoming TAs take a lab class to learn the ropes of proctoring exams. They start off with lab classes. While they're doing lab classes they also work with a lecturer. For the first year, they observe an experienced lecturer. In their first two semesters, they participate in the solo class and the presentation workshop, both of which prepare them for more independent instruction down the road. Dr. Kirby is pleased that she's able to offer such a comprehensive guide to teaching: "We have a very robust training for TAs. They're never just thrown into a class and told, 'Just go do it.' They get a lot of feedback, a lot of help. I've had a number of TAs progress from no experience at all to being able to take on anything." That progress comes in the form of the solo class and presentation workshop.
The solo class serves as a conduit for university and departmental policy, procedure, and course materials, building a foundation for solo teaching opportunites, such as teaching pre-calculus. While a student may lead his or her own class, Kirby sees these courses as more of a guided solo, since "everybody's teaching the same class, taking the same tests. They have all the departmental materials. They are following some real structure; they get oversight. Somebody visits their class; they turn in gradebooks."

The presentation workshop is the next step. It's a space where a small group of students, led by Dr. Kirby, perform their presentations while being recorded and then have the chance to review, analyze, and learn from the experience. Their classmates have a chance to offer constructive criticism, there's ample time in the six-week course for students to present multiple times, building their confidence in a teaching and learning environment. This semester, for example, finds Dr. Kirby with 20 students, and the workshops are broken into four workshops with five students each. Without a doubt, students benefit from this individual attention.

As students move through their training, they're also given the opportunity to be involved in the classroom in a variety of ways. Other than the lab classes and guided solos, students can also lead recitations, where they work closely with faculty, learning the tricks of the trade, while also dipping their toes in the water.

Kirby explained, "The TA and the instructor are going to work together. I'm doing calculus, and I ask them to

"The most rewarding moment is when a student who has been struggling starts to do better, starts to get it, and they get excited."

- Dr. Kirby

contribute questions for the exams, and they grade at least half of the exams." It's a good opportunity that leads them to the most daunting - and rewarding - level of work: teaching their own course.

After a graduate student has passed candidacy, and they've done fine teaching pre-calc, then they can move on to calculus, or even higher. They make their own tests. They have a department outline, but they still get a faculty mentor, someone who's taught the course, so that they can bring the tests to the faculty member, ask questions. I like it when I can see that somebody else has taught the course, and I can pull a new faculty member in. I think some of the faculty have got a lot out of being a mentor. I think sometimes the faculty enjoy it too.

In 1140 and in calculus, I pair TAs up for peer mentors. And the minimum requirement is that they have to observe each other at least one time. It is helpful not only to get feedback but also to see someone else teaching the same course. It encourages them to talk to each other about teaching the class. When you study with a friend, and you answer a question, you learn as much by answering a question as you do by asking.

I think that no matter what you go into the ability to talk to a group of people clearly, communicate with a group of people that are non-specialists in a way that everyone can understand, is a benefit of the program. It doesn't matter whether they're going in to education or not.

Advice to Teachers

That first day you walk into the room, fake it. Become an actor. The first day is the scariest. I learned that while there are people that are naturally gifted, teaching can be learned. And you can learn to teach well. And I think that's something that I didn't really know until I stated teaching. I just thought it happened. And I think as you progress, you learn there are some techniques. Walking into that first 1140 class, it's probably as frightening as I felt. It's not easy, but you get better, and you learn.

Why Teaching?

There's a lot to love about it. I think my favorite moment is when a student who's been struggling just gets it. I had one like that this week. The most rewarding moment is when a student whos's been struggling starts to do better, starts to get it, and they get excited.

Department News 2013

Recent PhDs

PhD Fall 2012

Tingting Fang (Pure Mathematics, Major Professor: Mark van Hoeij) Thesis title: Solving Linear Differential Equations in Terms of Hypergeometric Functions by 2-Descent. Employment: Assistant Professor, Salem State University.

Dan Li (Pure Mathematics, Major Professor: Matilde Marcolli and Paolo Aluffi) Employment: Institute des Hautes Etudes Scientifiques, Bures-sur-Yvette, France. Publications: The algebraic geometry of Harper operators, J. Phys. A: Math. Theor. 44 (2011), 405204.

Daniel Robinson (Pure Mathematics, Major Professor: Eric Klassen) Thesis Title: Functional Data Analysis and Partial Shape Matching in the Square Root Velocity Framework, Employment: Amazon.com.

PhD Spring 2013

Jonathan Bates (Biomathematics, Major Professor: Washington Mio) Thesis Title: Spectral methods for morphometry.
Publications: Bates, J., Pafundi, D., Kanel, P., Liu, X., Mio, W. From Nano to Macro, 2011 IEEE International Symposium on Biomedical Imaging, pp.1851--1854
Bates, J., Liu, X., Mio, W. 2010 20th International Conference on Pattern Recognition, pp.2648--2651.
Bates, J., Wang, Y., Liu, X., Mio, W. IEEE International Symposium on Biomedical Imaging: From Nano to Macro, 2009. ISBI '09. pp.943--946.

Motoi Namihira (Financial Mathematics, Major Professor: David Kopriva) Thesis Title: Probabilistic uncertainty analysis Employment: Southern Company in Atlanta.

Gregory Toole (Biomathematics, Major Professor: Monica Hurdal) Employment: Assistant Professor in Mathematics at Polk State College in Winter Haven, FL.

Linda (Crystal) Wells (Pure Mathematics, Major Professor: Eric Klassen) Thesis Title: Shape Analysis of Curves in Higher Dimensions. Employment: Florida Gateway College, Associate Professor.

PhD Summer 2013:

Arij Daou (Biomathematics, Major Professor: Richard Bertram) Thesis title: From Songs to Ion Channels and Mathematical Modeling. Employment:

Math Department Newsletter Fall 2013

Department News 2013

Recent PhDs

Postdoc at University of Chicago, Neuroscience Department. Publications:
Arij Daou, Matthew Ross, Frank Johnson, Richard Hyson, Richard Bertram (2013), Electrophysiological Characterization and Computational Models of HVC Neurons of the Zebra Finch, Journal of Neurophysiology 110: 1227-1245, 2013.
Arij Daou, Frank Johnson, Wei Wu, Richard Bertram (2012), A Computational Tool for Automated Large-Scale Analysis and Measurement of Birdsong Syntax, Journal of Neuroscience Methods, vol. 210, pp. 147-160.
Xinyu Zhang, Arij Daou, Tuan Truong, Richard Bertram, Michael Roper (2011), Synchronization of Mouse Islets of Langerhans by Glucose Waveforms, American Journal of Physiology, 301: E742-E747.

Jian Geng (Financial Mathematics, Major Professor: Michael Navon) Thesis title: Calibration of local volatility models and proper orthogonal decomposition (POD) reduced order modeling for stochastic volatility models. Employment: Wells-Fargo, Charlotte, NC.
Publications: Joint paper with M. Navon to appear in the Journal of Quantitative Finance.

Wanwan Huang (Financial Mathematics, Giray Okten and Brian Ewald) Thesis Title: Stochastic Modeling of Financial Derivatives. Employtment: Tenure track assistant professor, Roosevelt University.

Xia Liao (Pure Mathematics, Major Professor: Paolo Aluffi) Thesis title: "Chern classes of sheaves of logarithmic vector fields for free divisors", Employment: Kaiserslautern University of Technology, Visiting Scholar. Publications: "Chern classes of logarithmic vector fields," J. of Singularities, and "Stable birational equivalence and geometric Chevalley-Warning" to appear in Proceedings of the American Mathematical Society.

Dongxu Wang (Pure Mathematics, Major Professor: Wolfgang Heil) Title: 3-manifolds of S^1 category 3.

PhD Fall 2013:

Pierre Garreau (Financial Mathematics, Major Professor: Alec Kercheval) Title: Jump Dependence and Default Risk: a new class of structural models of default risk.

Yanyan He (Applied and Computational Mathematics, Major Professor: Yousuff Hussaini) Title: Uncertainty quantification and data fusion based on Dempster-Shafer theory.

Wen Huang (Applied and Computational Mathematics, Major Professor: Kyle Gallivan) Title: Optimization Algorithms on Riemannian Manifolds with Applications.

Yaning Liu (Applied and Computational Mathematics, Major Professors: Giray Okten and Yousuff Hussaini) Title: Non-intrusive methods for probabilistic uncertainty quantification and global sensitivity analysis in nonlinear stochastic phenomena.

Candace Ohm (Pure Mathematics, Major Professor: Mike Mesterton-Gibbons) Title: The Evolution of Deception in Signaling Systems.

Mark Whidden (Biomathematics, Major Professor: Nick Cogan) Title: Numerical Methods for Multiphase Systems with Applications to Biology. Publications: Cogan, N. G., Donahue, M.R., and Whidden, M.E. "Marginal stability and traveling fronts in two-phase mixtures." Physical Review E 86.5 (2012): 056204.
Cogan, N. G., Donahue, M.R., Whidden, M.E., and De La Fuente, L. "Pattern Formation Exhibited by Biofilm Formation within Microfluidic Chambers." Biophysical journal 104.9 (2013): 1867-1874.

Yuan Zhang (Financial Mathematics, Major Professor: Alec Kercheval) Title: Modeling high-frequency order book dynamics with support vector machines.

Annual Honors Day

Dwight B. Goodner Mathematics Fellowship:
Gregory Ivan Dungan and Yuanting Lu

Kenneth G. Boback Award:
Yaineli Valdes

Bettina Zoeller Richmond Award:
Mehmet Aktas and Pierre Garreau

Betty Anne Case Actuarial Science Award: Brian Stein

De Witt Sumners Fellow:
Jeremy Anthony

Financial Math Festival Poster Competition Winners:
1st place: Nguyet Nguyen
2nd place: Pierre Garreau
3rd place: Stan Lewkow

Distinguished Teaching Assistants Ibukun Amusan, Arij Daou, John Geng, Ahmed Derar Islim, Yaning, Liu, Dane Mayhook, Tony Wills, Celes Woodruff and Qiuping Xu.

Faculty Honors and Awards

Paolo Aluffi received an FSU COFRS summer grant for a project entitled "Potts models, graph hypersurfaces, and Chern class identities in string theory."

Richard Bertram and **Mike Roper** (FSU Chemistry) have been awarded a 4-year grant from the National Institutes of Health for "Microfluidic Devices for Determining Dynamics of Islets of Langerhans". Richard Bertram chairs a symposium on Insulin Pulsatility Matters at the 2013 Endocrine society Meeting in San Francisco in June, 2013.

Bettye Anne Case is giving an invited talk for the AWM Careers Session, at the annual SIAM in San Diego July 8, 2013. Title: "Your Career Trajectory."

Nick Cogan is giving a keynote presentation at BIOMATH 2013 with a talk entitled: Pattern Formation of the Causative Agent of Pierce's Disease within Microfluidic Chambers, in Sofia Bulgaria June 16-21, 2013 http://www.biomath.bg/2013/index.php.

Sergio Fenley received a Collaboration Grant for Mathematicians from the Simons Fou ndation with a project entitled "Foliations and flows in 3-manifolds."

Kyle A. Gallivan (Co-PI) Collaborative Research: ABI. Innovation: Quantifying and Exploiting The Structure Of Phylogenetic Tree Space Through Network Analyses.

Eriko Hironaka, Washington Mio and **Kate Petersen** co-organized the FSU Topology Week and FSU-UF Topology **Meeting in February 2013.**

Eriko Hironaka is co-organizing a meeting at the Mittag-Leffler Institute in Sweden, July 1-5, 2013 with R. Kellerhals (U. of Fribourg). The title of the conference is Growth and Mahler Measure in Geometry and Topology.

Mark van Hoeij received an NSF grant for work on "Linear Differential Equations with a Convergent Integer Series Solution" Grant period: Sept 2013 - Aug 2016.

Monica Hurdal is a plenary speaker at the conference "Conformal Geometry in Mapping, Imaging and Sensing" being held at the Royal Imperial College of London, June 20 and 21. She is organizing the Spring 2014 theme semester on Frontiers in Imaging, Mathematics and the Life Sciences at the Mathematical Biosciences Institute (MBI). As part of the theme semester, she is also an organizer of a workshop during the theme semester March 17-21. The workshop is Integrating Modalities and Scales in Life Science Imaging.

Harsh Jain received a Collaboration Grant for Mathematicians from the Simons Foundation with a project entitled "Mathematical Models of Cancer Growth and Treatment."

Alec Kercheval, with the help of financial math faculty and department staff, organized the 15th annual Financial Math Festival in March 2013.

David Kopriva gave a Plenary Talk on "Spectral Element Methods in Motion" at HONOM 2013: EUROPEAN WORKSHOP on High Order Nonlinear Numerical Methods for Evolutionary PDEs (HONOM 2013) , March 18-22, 2013.

Mike Mesterton-Gibbons received a Collaboration Grant for Mathematicians from the Simons Fou ndation with a project entitled "Game-theoretic models of animal behavior."

Washington Mio was awarded an NSF Collaborative Research Grant on "ABI Innovation: Breaking Through the Taxonomic Barrier of Fossil Pollen Identification Using Bioimage Informatics," for the years (2013-2016).

Craig Nolder is visiting Harbin Institute of Technology May 8-May18, 2013, where he will give a series of lectures.

Kate Petersen received an FSU COFRS summer grant for a project entitled "Geometric Structures of Knot Complements." She will also participate in the Research in Pairs (RiP) program at Mathematisches Forschungsinstitut Oberwolfach (MFO) from June 9 - 22, 2013 with Chris Sinclair (U. of Oregon) on a project entitled `Analytic Properties of Norm Power L-series,'

Mika K. Seppala is PI on a subcontract from NSF. His project is entitled: "Organizing Multi-Disciplinary Communities to Conduct Data-Intensive Research on Education and Learning."

Mark Sussman won the "Outstanding paper award of 2012" Journal of Chemical Engineering of Japan. Authors: Ohta, Kimura, Furukawa, Yoshida, Sussman "Numerical Simulations of a bubble rising through a shear-thickening fluid."

Christopher K. Tam (PI) Modeling And Simulating the Generation, Propagation, and Radiation on Indirect Combustion Noise of a Simple Engine - Ohio Aerospace Institute.

Xiaoming Wang is PI for an NSF Grant. His project is entitled "Two phase flows in Karstic Geometry."

Math Department Newsletter Fall 2013

The First Annual

FSU MATH FUN DAY

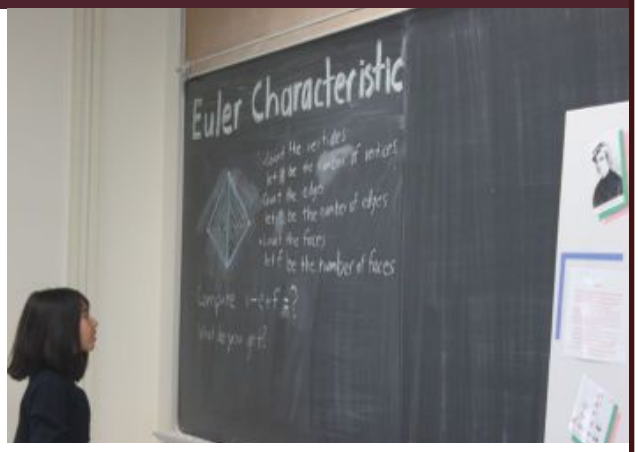
A Celebration of Mathematics

Saturday, October 12th 2013
12:30 p.m. to 3:00 p.m.

"It was great to see the kids being exposed to math and science in a way that really made them think. Great hands-on activities! Please have more of these events."

- Paige Forshay, Parent

Learn more about
FSU Math Outreach at:
www.math.fsu.edu/CommunityOutreach



What exactly is Math Fun Day?
It is a day to celebrate the beauty, utility, and connections of mathematics in our every day lives.

Where did the idea for this event come from? In the past few years, the department has stepped up its activities aimed at connecting with the community, and showing people new ways to think about mathematics. Last year, Dr. Alec Kercheval and Dr. Steve Blumsack conceived of a high school mathematics competition that emphasizes insight, inspiration and creativity over speed and memorization. After the success and popularity of last year's endeavor, the department has decided to add this math fun day to follow the competition.

How was this event put together? The Mathematics Department and College of Arts and Sciences provided both encouragement and financial support for this event. Additionally, roughly 50 undergraduate math majors, graduate students, faculty and staff members volunteered their time, effort and ideas to make this event possible.

What types of events took place? Throughout the event there were faculty presentations, special programs for elementary school students, rooms designated for fractals and geometric construction, short videos, mathematical games, tricks and so much more!

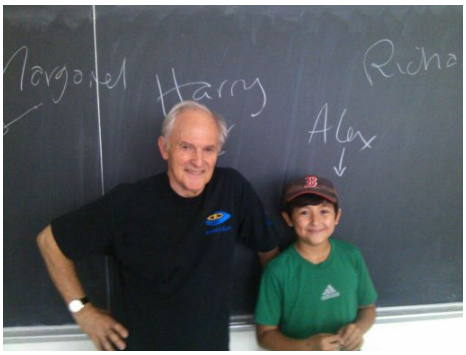
Why should the community support activities like Math Fun Day? Humans are born curious. Many in our community have a thirst for learning. All in our community need to be informed regarding important concepts in order to participate in a democracy. Issues that relate to mathematics are commonplace in our lives. Students need to understand the nature of mathematics in order to make informed decisions regarding courses, programs, and careers.

If you are interested in being on our mailing list for future outreach events, send an email to chair@math.fsu.edu

Math Department Newsletter Fall 2013

Math Fun Day

Thanks to parents, teachers, fun-loving children and our wonderful volunteers, the Department's first Math Fun Day was a roaring success! During an intense 3 hour period on a Saturday afternoon in October roughly 400 visitors took part in a Department open house, free to the public, featuring faculty lectures, three activity rooms,a media room, poster presentations by undergraduate and graduate students, and two interactive presentations (including one by Nobel Prize Chemist Harry Kroto!).



The event was made possible by over 40 undergraduate, graduate, faculty and staff volunteers who freely gave their time in the middle of a busy semester to brain storm ideas, prepare posters, plan activities, and to engage the public with their energy and enthusiasm for mathematics. In addition to being able to connect with the public, one unexpected and important outcome of Math Fun Day for the Department was the chance for our diverse members to work together on a common project that we all care about.

The enthusiastic public response and comments by parents and teachers showed us unequivocally that the community is aware of the importance of mathematics in society and are thirsty for more access to its myriad facets and entry ways to far-reaching ideas. Most of all, the curiosity and absorption in the faces of the younger participants assured us that most if not all participants did indeed come away with the notion that mathematics can be a lot of fun. Our human captivation with cool patterns, symmetries and constructions is all part of what draws us, young and old, to mathematics whether or not we are aware of the process. Through hands-on activities, videos, and presentations participants were exposed to mathematics in an immediate and personal way, germinating food for thought and understanding that will grow with each additional exposure to mathematics, whether in school, at work, or in more free form activities.

> ***"We loved this event and look forward to attending all future ones. My daughter loved all the hands on rooms and loved winning stickers every time she figured out a pattern on the board."***
>
> - Adriana Killingsworth, Parent

The Department of Mathematics expresses its deep gratitude to all student and staff volunteers who shared their time, energy and enthusiasm on Math Fun Day. Many thanks to parents and teachers who spread the word, and helped us draw a larger attendance than we could have anticipated. We are also grateful for those visitors who left us their email addresses and responded to our brief exit survey about math fun day. Your comments and requests are important to us, and we will take them into account as we plan future Math Fun Day events.

"One thing that really, really pleased me was that this event involved the whole community of the department working together: faculty, graduate students, undergraduate students, staff. This event showed that we can work together and very efficiently. I was extremely pleased to see how warm, caring and receptive the students were in this event - beyond the technical preparation for the event. I think an event like this helps our sense of community within the department." - Dr. Sergio Fenley, FSU Faculty Member

Meet Dr. Harry Kroto

During the Math Fun Day festivities, we had the honor of having one of our presentations conducted by Dr. Harry Kroto.

Dr. Kroto has been deemed a "modern Renaissance man." Besides discovering the Buckminsterfullerene (Buckyball) with U.S. colleagues and winning the Nobel Prize for Chemistry in 1996, he is also an accomplished graphic artist and long-term advocate for science education.

In an interview with *Asian Scientist Magazine*, Dr. Kroto remarked: "We should be teaching children not to accept any information without assessing the evidence very carefully. I want children to ask questions, to be curious, to ask 'Why?'"

Kroto runs learning workshops for children, and most recently (at Math Fun Day at Florida State) ran one on buckyballs for about 50 children and their parents.

Thank You to All of Our Volunteers

Faculty:
Dr. Alec Kercheval
Dr. David Kopriva
Dr. Eriko Hironaka
Dr. Giray Okten
Dr. Kate Petersen
Dr. Monica Hurdal
Dr. Paolo Aluffi
Dr. Sergio Fenley
Dr. Steven Blumsack

Staff:
Pamela Andrews
Priscilla Travis

Graduate Students:
Andrew Winters
Calvin Gilmartin
Candace Ohm
Carolyn Drobak
Chris Stover
Daniel Weingard
Danielle Ireton
Erdal Imamoglu
Joe McKenna
John Anthony Emanuello
Kerr Ballenger
Leona Sparaco
Lydia Eldredge
Matt Donohue
Matthew Villemarette
Max Wyse
Nguyet Nguyen
Robert Billet
Tony Wills
Yi Ji
Yuan Bing
Yunyi Shen
Zhang Xiping

Undergraduates:
Aimee Maltby
Alyssa Larson
Caitlin Henderson
Daniel Fuentes-Keuthen
Emily Nunez
Gabriela Metallides
Israel Felhandler
Kelly Ann Pawlak
Lawrence Dunn
Mitchell Schmidt
Olivia Dugan
Omar Kamal
Patricia Yoho
Samuel Bacaner
Shana Rhodes
Simon Burhoe
Stefani Brilley

We thank the Dean of the College of Arts and Sciences, the Brennan Professor of Mathematics at the Florida State University, and friends of the Mathematics Department for their financial support, without which the FSU High School Mathematics Contest and the Math Fun Day event would not be possible.

Math Department Newsletter Fall 2013

Meet Our New Graduate Faculty Members

Arash Fahim

Arash Fahim earned his PhD in Applied Mathematics in 2010 at the Centre de Mathématiques Appliquées Ecole Polytechnique, France, under the direction of Nizar Touzi. Prior to joining FSU he held a postdoctoral position at the University of Michigan in Ann Arbor. His primary research interest is "probabilistic numerical methods (Monte Carlo) for nonlinear partial differential equations with applications in finance".

Richard Oberlin

After receiving his B.S. from Florida State in 2002, Richard Oberlin spent five years studying harmonic analysis with Andreas Seeger at the University of Wisconsin. He then went on to the postdoctoral program at UCLA where he was mentored by Christoph Thiele and Terence Tao, and was on the LSU faculty from 2010 until returning to his hometown in May.

Washington Mio, FSU Math Fellow 2013

Mio always had an interest in the applied sciences and engineering. As an undergraduate he started out in engineering; however, Mio thought that it would be good to first learn some mathematics, a little beyond calculus, differential equations, and linear algebra in the engineering curriculum. But the detour took a bit longer than expected...it became a career!

Unpredictable paths led him to investigation of problems in pure mathematics that address foundational questions in the theory of high dimensional manifolds. His favorite piece produced during that phase resulted from joint work with Bryant, Ferry, and Weinberger in the early 90's, a paper in the Annals of Mathematics that reports discovery of exotic manifolds, spaces long regarded as the "lost tribes" in the theory of manifolds. Study of these exotic spaces occupied much of his time until a radical shift in direction about a decade ago took him into research in pattern analysis and biomathematics.

As Mio says, "This is an exciting time to be involved in research in biomathematics as technology is enabling scientists to map new frontiers in biology and medicine that are posing challenging problems that demand development of new methods of mathematical and statistical data analysis to advance these disciplines."

Mio's current work deals primarily with computational modeling and analysis of morphological and imaging data that arise in areas such as developmental and evolutionary biology, and computational anatomy. The research activities are highly interdisciplinary and involve collaboration with evolutionary biologists, geneticists, clinicians, paleoecologists, and earth scientists in projects supported by the National Science Foundation and the National Institutes of Health.

FSU High School Mathematics Competition Winners

52 students from Chiles, Leon, Lincoln, Rickards, FSUS participated in the FSU High School Mathematics Competition this year. Each contest is a 3-hour written exam that tests problem solving skills and mathematical ingenuity rather than the content of a specific course. The exams consist of 6-10 problems requiring clearly written solutions.

Junior Division (9-10th grade)

Jamie Gao	Chiles	1st place
Nilay Patel	Chiles	2nd place
Arya Okten	Chiles	HM
Justin Chen	Chiles	HM
Kevin Jiang	Chiles	HM
Ian Bernander	Rickards	HM

Senior Division (11-12th grade)

Brian Ahn	Chiles	1st place
Nicholas Yang	Chiles	2nd place
Seonghwa Min	Lincoln	HM
Sean Deyo	Leon	HM
Jeewoo Kang	Rickards	HM
Siddarth Kethireddy	Rickards	HM

HM = honorable mention

Become a "Friend of FSU Math" in 2013-2014!

FSU Math community members are invited to become a **"Friend of FSU Math"** by donating to the Florida State University Foundation. Any amount will be truly appreciated, and will help us achieve our department goals in teaching and service to the community.

Your past gifts have been used in a variety of ways to support FSU Math. These include alumni networking efforts, such as the newsletter and social media, awards for excellence in teaching and service for graduate students and faculty, research training and support, distinguished visitors and guest lectures, and community outreach programs like Math Fun Day and the high school mathematics competition. Your generosity will help us continue to offer a strong academic program, foster connections to the community, and create opportunities for life and career after graduation for our students.

For information about donations with special targets like outreach, named awards or lecture series, please contact **chair@math.fsu.edu.**

You can send your tax deductible gift to:
FSU Foundation Mathematics Fund No. 0223 208 Love
1017 Academic Way
Tallahassee, FL 32306-4510

If you prefer to give online, please follow the links from **www.math.fsu.edu/donate** and choose '**Mathematics**' from the Designation drop-down box.

Thank you!

Editorial Information

Editor: Eriko Hironaka
Contributing Writers and Copy Editors: Ariel Backer & Julie Dow
Design & Photography: Ariel Backer & Yunyi Shen

Florida State University Department of Mathematics
(850) 644 2202 www.math.fsu.edu

FSUmath

SEASON'S GREETINGS

From our family to yours,
we wish you a happy holiday
and a great new year!

2013-2014