DEPARTMENT OF
MATHEMATICS
AT FLORIDA STATE UNIVERSITY

MAY 2020 • WWW.MATH.FSU.EDU

FSU Alumna Named AMS Fellow

Former FSU Biomathematics student **Mariel Vazquez** has been selected to the 2020 Class of Fellows of the American Mathematical Society (AMS). She received her Ph.D. in 2000 under Prof. De Witt Sumners and is now a Professor in the departments of Mathematics and of Microbiology and Molecular Genetics at the University of California, Davis. The Fellows of the AMS program recognizes members who have made outstanding contributions to the creation, exposition, advancement, communication, and utilization of mathematics. The AMS selected Prof. Vazquez "For contributions in research and outreach at the interface of topology and molecular biology, and for service to the mathematical community in particular to underrepresented groups". Vazquez's research lies at the interface of mathematics, polymer physics, and molecular biology and she specializes in the application of topological tools to study DNA.

Mariel Vazquez

After graduating from FSU, Vazquez was a postdoctoral fellow at the University of California, Berkeley from 2000 to 2005, then a faculty member in the mathematics department at San Francisco State University from 2005 to 2014, before joining the faculty at the University of California, Davis. Prior to being selected as an AMS fellow, Vazquez received several awards, including the prestigious NSF Early Career Award in 2011 and, in 2012, the Presidential Early Career Award for Scientists and Engineers (PECASE), the nation's highest honor for researchers in the early stages of their career.

A Message from the Chair

Washington Mio

Greetings! As we near the end of the academic year, it is very rewarding to see how much the Department of Mathematics has accomplished in all spheres of academic activity as a result of the hard work and dedication of our faculty, students, and staff members, and the support from our donors, alumni and the larger community. Over the last few years, we have welcomed many new faculty members to a vibrant and collegial environment, where groundbreaking research in mathematics – both pure and applied – goes hand in hand with undergraduate and graduate education.

The cutting-edge research of our faculty and students cover a vast mathematical landscape, frequently transcending disciplinary boundaries, with many projects funded by external contracts and grants. The teaching and scholarly accomplishments of our faculty and students have been recognized by many awards, and the recently implemented Dean's Postdoctoral Program enriches the atmosphere of the department with the

CHAIR Continued on page 2

Nick Cogan Becomes the Fourth Brennan Professor of Mathematics

Nick Cogan

The Marion Bradley Brennan Professorship in Mathematics was established through a generous gift from Ms. Carol Brennan, in honor of her mother. Carol completed her Bachelor's degree in 1976 and Master's degree in 1978, both in applied mathematics at FSU. Upon graduation, she took a position at Bell Laboratories, and later at Telcordia Technologies where she became the Corporate Vice President of Quality Operations before retiring. She regularly returns to the math department to attend the Brennan Professor talks given by new recipients.

The Brennan endowed professorship is awarded every three years or so to an FSU mathematics professor who is an "internationally known scholar in the field of mathematics, with a proven track record in research, teaching, and mentoring of undergraduate and graduate students". The first recipient of the award was Paolo Aluffi, who held the chair from 2012 until 2014. This was followed by Eriko Hironaka, who held the position from 2014 until 2015, when she left the department to become a senior editor at the American Mathematical Society. The third recipient of the chair was Richard Bertram, who held the position from 2015 until 2018. The most recent recipient, Nick Cogan, was selected to hold the endowed chair position until 2021.

Dr. Cogan is a biomathematician who builds and analyzes models describing fluid/solid interactions, chemical transport, and bacterial physiology. He has published roughly 50 papers in journals such as Biophysical Journal, the SIAM Journal on Applied Mathematics, the Bulletin of Mathematical Biology, the Journal of Theoretical Biology, and the Journal of Membrane Science. His publications typically are aimed at answering biological questions, and often employ sophisticated mathematical tools and computational analysis. This work is often done in collaboration with experimental scientists. His research has been supported over a number of years by the National Science Foundation, and one of his publications was awarded a Best Paper Prize from the journal Mathematical Medicine and Biology. The lead author on this prize-winning paper was Angela Jarrett, a former biomathematics graduate student who is now a postdoctoral fellow at the University of Texas, Austin.

Angela is not the only student fortunate enough to work with Dr. Cogan. In fact, he has mentored eight doctoral students who, after receiving their PhD degrees, went on to postdoctoral work at the University of Michigan, University of Texas, University of Cincinnati, and North Carolina State University, as well as to industry. Dr. Cogan regularly teaches the graduate-level class Spatial and Temporal Methods in Biology, as well as special topics classes such as Sensitivity Analysis. His extensive work with students has been recognized with an FSU Graduate Mentor Award in 2016 and an Honors Thesis Mentor Award in 2018. It is only fitting, then, that Dr. Cogan should become the fourth recipient of the Marion Bradley Brennan Professorship.

Chair, *from pg. 1*

contributions, energy and vigor of many junior scholars and educators. Our students graduate to successful careers in academia and diverse sectors of industry or government, attesting to the quality of our programs. It also has been very refreshing to see a renewed commitment from our faculty to offering richer academic experiences to our undergraduates to enhance learning outcomes, especially in basic mathematics that influences the academic trajectories of so many students, campus wide. Through our outreach activities, the Department engages with the local community, catalyzing interest and inspiring K-12 students to learn mathematics. All of our activities are supported by a wonderful, dedicated staff that ensure that our operations run smoothly, always ready for the next challenge.

As I sketched this message, reflecting on the collective achievements of the Mathematics Department over the years was very inspiring. Over three quarters of a century, our research and graduate programs have come a long way and attained national prominence. Our undergraduate and graduate programs are in a healthy state and are responsive to the needs of our students, supporting many career paths. I have every reason to believe that we are on a strong, positive trajectory and the future is bright. Looking forward, we will continue to build on our strengths and expand in new directions. One of the current plans is to unveil a new master's program in data science in the fall of 2021.

I invite you to continue to read this Newsletter to learn more about the department and the people making things happen. I wholeheartedly thank all members of the Mathematics Department for all of their contributions, our alumni for continuing to project a great image of the department, and our donors for endowing professorships, funding scholarships, supporting the professional development of our students, and making a real difference in so many ways.

DEPARTMENT OF
MATHEMATICS
AT FLORIDA STATE UNIVERSITY

MAY 2020
www.math.fsu.edu/newsletter

Washington Mio
Chair, Department of Mathematics
chair@math.fsu.edu

Amod Agashe & Richard Oberlin
Editors

Richard Bertram
Reagan Creamer
Nick Cogan
Lydia Eldredge
Brian Ewald
Arash Fahim
Nina Fernandez
Shelby Fintak
Monica Hurdal
Steve Paris
Julia Ream
Contributing Writers

University Communications
Creative Services
Layout and Design

Newsletter Submissions
newsletter@math.fsu.edu

FSUmath is a newsletter produced by the Department of Mathematics at Florida State University

Department of Mathematics
Florida State University
208 Love Building
1017 Academic Way
Tallahassee, FL 32306-4510
Phone: 850-644-2202
Fax: 850-644-4053
Web: www.math.fsu.edu

Hunter Professorship

Christopher Hunter (1934-2008) was recruited by FSU from MIT in 1970 to found and direct the applied mathematics program. He was the department chair from 1993 - 1999 and had a profound impact on mathematics at FSU. In 2018, his estate established the Christopher Hunter Endowed Professor of Mathematics. The endowment is used to support a faculty member whose scholarly activity is focused on, but not limited to applied mathematics. The inaugural faculty member was Mark Sussman. Monica Hurdal and Kyle Gallivan were also nominated. Dr. Sussman joined FSU in 1999 with a PhD. from UCLA under Stanley Osher followed by several years at Sandia National Labs. Dr. Sussman answered a few questions:

Mark Sussman

What was your reaction to finding out you would be the inaugural Hunter Professor?

I was very happy, and I became a little emotional at the time, upon hearing I was chosen as the inaugural Christopher Hunter Professor because I was picked by my colleagues whom I hold in high regard, and I value my colleagues' opinion. Also, Christopher Hunter was a scholar with high integrity and I am especially humbled that it is his name that is attached to the Professorship.

How did you decide to become an applied mathematician? Can you tell me something about your pre-graduate school experiences?

From an early age, I excelled in math and science classes and did comparatively very poorly in other subjects. In other-words, I had a lot of positive reinforcement regarding my achievements in math and science, but not so much encouragement in other fields. I was on my high school math team. I benefited from the fact that my father has a Master's degree in Mathematics and my older brother has a PhD in the UCSD AMES program (now the UCSD MAE (Mechanical and Aerospace Engineering) program). Although my dad was a professional programmer and my older brother did a lot of computer programming (we owned a radio shack TRS80 computer and then we owned the first IBM PC computer), I was intimidated by the prospect of having to write computer programs until I got to San Diego State University (SDSU). My teachers at SDSU made math and computer programming very accessible and I quickly started to enjoy the computer programming aspect of my education too. I ended up with a Bachelors in Math at SDSU with minors in both Physics and Computer Science.

I note that in undergraduate school, through my father's connections, I got 2 part time computer programming jobs (business programming, relational databases) which were also very motivating for me to pursue Applied Math. It was working as a professional programmer (more business programming and relational databases) that enabled me to support myself through graduate school. I note that one special talent that I possessed when working as a programmer is the ability to take someone else's code, and find their bugs.

How would you describe your area of expertise? How has your area of research changed in the past 10 years or so?

My area of expertise is (i) Numerical Analysis and (ii) Computational Science and Engineering. In Numerical Analysis, my collaborators and I analyze numerical algorithms for their benefits and

drawbacks. Numerical Analysis is an exciting field for me these days because it seems like there has been an exponentially growing number of new applications for computer algorithms in order to help solve problems in industry, medicine, and national security. I look at glassdoor.com, indeed.com, and monster.com and I see exciting opportunities for Numerical Analysts. Also, I look at the many Government Grant opportunities online and I am always encountering new applications listed.

In Computational Science and Engineering, we apply cutting edge numerical methods in order to solve problems with Aerospace, Navy, Automotive, and Medical applications. Our research has been funded through the National Science Foundation (NSF), Office of Naval Research (ONR), Sandia Labs, SAIC (now Leidos), UTRC, Weidlinger Associates, and National Aeronautics and Space Administration (NASA).

In the past ten years, I have noticed that the following fields have grown rapidly: Data Science, statistical learning, distributed computing systems, self-driving vehicles, robotics, space exploration, and scientific discovery at atomistic scales.

How do you find collaborators? What is your favorite part of research? What is your least favorite aspect of research?

In the process of carrying out my research, I am non-stop curious about what other researchers are doing. I am constantly searching the web looking for information. If one knows where to look, the web is full of links to articles, journals, researcher websites, computer programs, and presentation files. The amazing thing is that I very rarely spot misinformation on the web in my fields. I try a lot of algorithms that I find on the web for example, and they almost always work! In many cases, I only "communicate" with collaborators through the sharing of computer algorithms and other related research ideas. I use a lot of other peoples' research, so I cite many people in our articles, and, thankfully, other people cite our research too.

It is hard for me to select my most favorite part of research since research to me is a whole process that cannot be broken up into pieces. As a research professor, my official duties are research, teaching, and service, and I have been very lucky in that all of these activities, without exception, contribute as a whole to my continued growth in understanding of the world around us, as well as contribute to continued awareness of what I don't know.

I feel like that I am constantly growing. I am always reading, whether it be math, physics, engineering, computer science, agriculture, history, etc.

How many projects do you keep moving at one time?

As many as humanly possible.

Faculty Promotions

Congratulations to Arash Fahim, Ettore Aldrovandi, Nick Cogan, and Pennington LeNoir on their recent promotions

Arash Fahim joined the department in 2013 after graduating from Ecole Polytechnique in 2010 and Postdoctoral positions at the Fields institute and the University of Michigan from 2010-2013. He was promoted to Associate Professor in August 2019.

Ettore Aldrovandi joined the department in 2001 after Postdoctoral and Scientific positions at Aarhus Universitet, SUNY Stony Brook, Trieste International School for Advanced Studies, and the FSU physics department. He graduated from the Trieste ISAS in 1992 and was promoted to Full Professor at FSU in August 2018.

Nick Cogan joined the department in 2005 after a Postdoctoral position at Tulane and graduating from the University of Utah in 2003. He was promoted to Full Professor in August 2017.

Pennington LeNoir joined the department in 1987. She taught in the Alabama K-12 system from 1972-1980, at colleges in North Carolina from 1980-1987, and received her PhD from North Carolina State University in 1989. She was promoted to Teaching Faculty III in August 2017.

Arash Fahim

Ettore Aldrovandi

Nick Cogan

Pennington LeNoir

New Faces in the Graduate Faculty

by Reagan Creamer and Shelby Fintak

Tom Needham

Tom Needham

In January of 2019, Dr. Tom Needham walked into the Love Building to give a talk on topology in data science at FSU's Mathematics Colloquium. Less than nine months later, he walked into the same building to teach his first full day of classes as an Assistant Professor. As the newest professor within the Department of Mathematics, Dr. Needham brings a background of data science research and signal processing applications to the university.

Journey to Florida State

Before coming to Tallahassee, Tom started his undergraduate studies in mathematics at the University of Wisconsin-Milwaukee, graduating twice from the school: once in 2007 for a Bachelor of Science in Applied Math and Physics, and again, in 2009, for a Master of Science in Mathematics. Following his time in Wisconsin, Tom traveled south to attend the University of Georgia. Here, he earned his PhD in Mathematics, and wrote his thesis titled, "Grassmannian geometry of framed curve spaces." While working on his PhD, Tom also began his teaching career by serving as a Teaching Assistant for six years.

Following his graduation, Tom was hired by The Ohio State University as a Ross Assistant Professor. At Ohio State, he taught courses such as General Topology and Knot Theory and Calculus. Additionally, he created and established Introduction to Applied Algebraic Topology, an undergraduate course focused on persistence homology.

In the Fall of 2019, Tom joined the Department of Mathematics at Florida State University as an Assistant Professor. During his first semester, he enjoyed being able to work with FSU students for the first time through his Calculus III course. "The class went smoothly and I had some very bright students," he said. "My teaching experience in the first semester was great."

A Focus on Data Science

Outside of the classroom, Tom is a part of the budding data science research taking place at FSU. As stated in the 2018 "Data Never Sleeps" report by Domo, a cloud-based business management platform, it was estimated that "1.7 megabytes of data will be created every second for every person on earth" in the year 2020. With 2.5 quintillion bytes of data being created every day, data science has become essential to understand for researchers. For Tom, this understanding will come from mathematics and statistics. "Data science is a vital area in mathematics because methods of data science have been very successful from a practical viewpoint, but the theory of why they work is still not well understood," he said. "In order for advanced methods of data science to be more widely adopted in, say, medical diagnostics, we need a better theoretical understanding of them."

> *"Data science is a vital area in mathematics"*

With new programs and projects starting up, Tom and a number of his peers are working to explain the theory of data science through mathematics. "FSU has strong groups working in the theory of data science from many perspectives," he said. In addition to their research, Tom and his peers are teaming up with the Department of Computer Science and Department of Statistics, to develop a Master's Degree Program in Data Science.

Tom has also worked on using data science for specific applications outside of FSU. Last summer, he joined a group of mathematicians at The Institute for Computational and Experimental Research in Mathematics at Brown University, to look into gun violence through a mathematical lens. "We are currently working on developing a mathematical model to explain the increase in mass shooting incidents in recent years." This is just one example of how Tom's research provides data science applications.

Aside from data science, Tom has been focusing his attention on a number of research projects. For example, he is looking into Network Analysis through Optimal Transport with his collaborator, Samir Chowdhury, of Stanford University. This area of mathematics examines the most effective way to allocate resources. "The goal of this project is to use ideas from OT to compare networks, such as social networks or neural networks," Tom said. "It turns out that the Optimal Transport formulation of network analysis has many convenient properties, allowing us to define statistical quantities for collection of networks. For example, given a collection of social networks, how should one define

the 'average' social network?" Tom and his collaborator answer this question through their work. Furthermore, he is studying Symplectic Geometry and Signal Processing. "It turns out that symplectic geometry has surprising applications to problems in signal processing," he said. "My collaborator, Clayton Shonkwiler [of Colorado State University], and I discovered that problems in signal processing can frequently be reformulated in the language of symplectic geometry, which gives a new set of tools for tackling them."

Looking Ahead

In addition to his research, Tom is currently organizing an international workshop to take place this summer. The workshop, set to take place at the Mathematical Biosciences Institute at The Ohio State University, will focus on bringing researchers together "from the disciplines of optimal transport and topological data analysis to discuss application domains which are commonly studied in both fields." During the summer, he will also speak at the 2020 SIAM Conference on Mathematics of Data Science.

Despite only being in Tallahassee for a semester so far, Tom is already beginning to leave several lasting impacts within the math department. With new programs, courses, conferences, and research projects in the works, he is looking forward to what his first year at FSU will hold. For Tom, FSU's Department of Mathematics is set apart from others across the country because it provides students and faculty alike with inclusivity and a friendly atmosphere. "In many math departments, there is not very much interaction between different research groups or between senior and junior faculty," he said. "At FSU, there are frequent events where faculty from several disciplines and seniority levels get together. At larger events, there is also a lot of interaction with postdocs and graduate students." Feeling welcomed in his new environment, Tom is grateful to call Florida State home and is excited for what his time within the math department will bring.

New Faces: **Feng Bao**

Starting his studies in science, one FSU professor is working to find applications for today's pressing issues. Now a mathematician focused in applied and computational math, he is working with chemists and physicists to create solutions based in mathematics. Working on projects supported by the Department of Energy and collaborating with some of the country's top scientists, Dr. Feng Bao says mathematics is about solving real world problems.

Feng Bao

Background

For his undergraduate studies, Dr. Bao was a student in the Chu Kochen Honors College at Zhejiang University. Studying in Hangzhou, China, he says his first major was not math. Instead he studied all types of science ranging from chemistry to psychology. Soon, he switched to applied mathematics, adding that he knows it's useful and can be used in many different fields.

After graduating from the elite honors college with a Bachelor of Science in Mathematics, in 2006, he started attending Shandong University. Based in Shandong, China, he worked with advisor, Dr. Peng Shige, who he describes as one of the most well-known mathematicians in financial math. Working with one of the founders of financial math, Dr. Bao says that Dr. Shige hugely influenced his research interests. "He is very important in my research career," he shared. "He's probably one of the best people in probability, especially control theory."

By 2009, Dr. Bao earned his Master of Science in Mathematics, and moved to the United States. Attending Auburn University in Georgia, he began focusing on computational math. There, he wrote a thesis based on optimal filtering. "The goal of the optimal filtering problem is to make the best estimate of the hidden state that is not directly observable based on your partial noisy measurements or observations," he said. By 2014, he graduated from Auburn with his PhD in Mathematics.

Following his graduation, he served as a postdoc at the Oak Ridge National Laboratory. Working in the Division of Computational Science and Mathematics, he started to develop his vision as a mathematician. "At Oak Ridge, I rarely saw applications," he said. "That established my vision of why I should use math to solve real world problems." After completing his two-year postdoctoral fellowship, he became an Assistant Professor at the University of Tennessee at Chattanooga, where he stayed for two years.

Teaching

In 2018, Dr. Bao started his career at Florida State University as an Assistant Professor within the Department of Mathematics. Since arriving at FSU, he has taught Calculus III, along with a graduate course in Stochastic Computing and Data Assimilation. In that special topics course, he is able to share his research field with students. "Another way to describe optimal filtering, in general, is as data assimilation," he explained. "In the class, I still say, 'this is an optimal filtering problem,' because this is a state that is random, stochastic, and not directly observable. So, we use partial noisy measurements on these hidden states. We filter out the uncertainties and the noise to make the best estimation."

Looking to the future, Dr. Bao hopes to continue to teach courses in stochastic computing and optimal filtering. "I do feel stochastic computing is a very important direction in computational math, especially now with the supercomputers and the high-performance computing facilities that are focused on parallel computing," he said. "I think that it's a very important direction in computational math, and I hope I could teach more students in this area."

Research
When considering universities to work at, FSU was of great interest to Dr. Bao in regards to research. "With the research environment, especially in applied and computational math, there's a very good reputation at FSU," he said. "I know many students who graduated from FSU and became very successful. There are very strong programs and good students."

His own research interests include stochastic optimization, data assimilation, and stochastic inferences, uncertainty quantification. His overall goal in his research is to solve real-world problems. Starting at Oak Ridge National Laboratory, he began working with scientists to use mathematics as a solution to pressing issues. "I feel I have to work with various scientists, like chemists and physicists," he said of his research field. "They really care about real problems. So, the manner that evaluates how well we do this is how many real problems can be solved. Could they [the solutions] improve other people's lives?"

Currently, Dr. Bao is working on a number of problems. One project he has taken on is studying the computational framework of unbiased studies of correlated electron systems. In another research area, he is working on finding adaptive backward SDE methods for nonlinear filtering projects. He is also giving new meaning to a subject he studied in his graduate years. "Another direction that I'm trying to explore started since I came here is optimal control," he said. With a background in the subject from his graduate advisor, Dr. Shige, he is looking to expand the uses of that area. "My master's advisor worked in traditional optimal control. So, I learned a lot of things actually in preparation for optimal control. Now, I think, if we have lots of data, and we can make a good estimation based on the data, what do we do next? We take actions to try to take optimal control of the system based on the data."

Overall, Dr. Bao is focused on providing solutions to today's pressing, science problems via mathematical research. For him, being able to use "mathematical methods created by real mathematicians to solve real scientific problems" is what is most exciting in his career. On looking towards the future he said: "I hope I can be the bridge between math and science."

New Faces: **Ibrahim Ekren**

How do we measure our time here on Earth? By the amount of money we can make in a year? By our perfect score on a difficult exam? Or is it the people we meet that are more important and their advice more life-changing than any number we can compute? For Ibrahim Ekren, Ph.D., it is the latter. He can pinpoint the three biggest influences in his career and even remains in contact with some of them to this day. Though his skill and life-long interest in mathematics guides his daily life, it is the people he meets along the way that truly leave an impression.

Ekren was born in Turkey and moved to France when he was 15 years old. "I didn't speak the language, and I realized that I could never compete with the other people academically in anything that would require knowledge about the language." This led him in the direction of math and physics, subjects at which he naturally excelled, in the universal language of numbers and logic. After high school, it was his math teacher, Michel London, that encouraged him to continue his studies in math. "He wrote my recommendation letter, I was accepted [at Preparatory Classes in mathematics], and everything followed after that. I think that was one of the biggest impacts in my life in terms of this choice."

The force of this impact lead to a trend that would continue throughout Ekren's education. After reading an article about an accomplished math finance professor, he knew that attending the university at which she taught was the next step for him. Towards the end of his master's program there, it was her and his advisor's influence that sent him even further into academia. They suggested he go work under a strong researcher in math finance, Dr. Jianfeng Zhang who would later become his doctoral advisor, at the University of Southern California. With this, Ekren moved across the globe to obtain his Ph.D. in mathematics.

After conducting postdoctoral research at ETH Zurich and completing one year as a Post-Doctoral Assistant Professor with the University of Michigan's Department of Mathematics, Ekren accepted a faculty position at Florida State University. Our strong math finance department is one of the biggest in the U.S. - a main factor that attracted Ekren to our university in the first place - and provides plenty of opportunities for collaboration and discussion. "Mathematicians have the image of self-centered, reserved individuals. This is not how things work. People do not just do math in their corner, they collaborate." Without the empowering relationships

Ibrahim Ekren

Ekren experienced with his professors, he might not have ended up here with us today.

As a professor, connecting with others remains a potent theme for Ekren. "I used to have undergrad professors who were proud of the number of students who would drop out of the class, because it would show rigor in the class, and it is not the same thing in the U.S." The transition from France's abstract way of thinking and teaching, to the concrete and 'down-to-Earth' way of working in the United States challenged Ekren to adapt his method of teaching from what he's always known. "I realized that I needed

to take into account the differences in the expectations of the students and the university. It's not about how I want to teach, but it's also how the university and students expect me to teach." Coming from the education system in France, where an average and acceptable grade is less than 10 out of 20, cultural differences obviously played a huge part in his transition to professorship in the states. It took him some time to adjust to American undergrads' mentality, but his compassion for his students and personal understanding of cultural differences made the transition one he was willing to work towards.

For Ekren, the importance of absorbing wisdom from one's academic surroundings isn't limited to the people he works with alone. Understanding the philosophy of a subject is just as important as learning the material itself. "The fact that some people say we don't use [math] after [schooling] is completely wrong, because it creates logical thinking." When you understand logic, you're more structured in your way of thinking and can easily spot false ideas. It would greatly benefit humanity if more people realize these implications, especially before raising their hand to ask 'when will we ever use this?' in one of Dr. Ekren's classes.

At the end of a long day, after working on pricing models and teaching calculus three to his undergraduate students, Dr. Ekren tries to squeeze in some relaxation time before it's his turn to look after his one-and-a-half year old daughter. "In the past, I used to play soccer, I used to run a lot, I used to ski. But that is all 'used to.'" Luckily, the academic life provides numerous opportunities to travel and add to the list of more than 20 countries Ekren has already visited. "I have never been to the south of the world, so that's the next objective." The fact he enjoys traveling is no surprise. Collaborating with researchers and experiencing cultures around the world is just another way this math finance and probability professor deepens his understanding of the way this pale blue dot in space tends to operate.

New Faces: **Aseel Farhat**

Becoming a Mathematician

As if unwilling to lose a brilliant mind, mathematics serendipitously reclaimed the focus of Dr. Aseel Farhat's career. In high school, math and physics played on equal ground. Farhat excelled in both, but ultimately chose physics for her first undergraduate degree. During this time, Farhat completed a minor in mathematics. She took all the major classes and even returned for a second B.S. in the subject.

After receiving her masters in computer science, Farhat began the grueling process of applying for PhD fellowships in physics. She could certainly calculate the odds, but after two years of sending out international applications for physics, the one applied mathematics program she applied to granted her the fellowship. The University of California, Irvine.

Aseel Farhat

This turned out to be one of those times when the universe knows exactly what we need before we do. Farhat enjoyed the theoretical side of physics more than the experimental side graduate schools tend to focus on. "I realized that I actually liked mathematics more," she said. "I got a program that was math with some applications from physics. It was a perfect fit." Proving theorems, pure mathematics, and analysis.

Trained for Academia

If you surveyed a library full of students, say Strozier during finals week, you'd see that most of them can't wait for graduation. Enticed by the promise of smooth sailing and no more exams, the mirage of ease and only doing things you want to do. But in reality, life after graduation is much harder, especially for those seeking a career in academia. It takes a great piece of advice, delivered just when you're ready to hear it, self determination, and the right mentor to push you to that higher potential.

During her time at UCI, Farhat trained rigorously with her doctoral advisor, Professor Edriss S. Titi. She attributes her success and ability to work under pressure to her advisor's high expectations. "I was trained to accept how hard [researching] can get."

While working her second postdoc, Farhat explored a new direction. The gears shifted towards applied physics problems, the Navier Stokes equations, which required mathematical analysis and solutions.

Farhat recalls advice from a former professor that put this all into perspective: "She used to tell me all the time, 'make sure you have two lines of research, because with one line, you can only go in one direction.' With two lines, you can make a plane of directions." Farhat has done exactly that, focusing on a blend of Navier Stokes equations and fluid dynamics in her current research. "I can find a problem that's interesting, that has significance, and link it to [my] research and get nice results. When you're a young assistant professor, it takes time to find your own path, but I have two paths that I can make a plane of problems with in the meantime. [I'll] find my own path somewhere in the middle."

Amid her multiple projects, Dr. Farhat focuses on continuous data assimilation and proving criteria related to the 3D Navier-Stokes equations. Along one line, she analyzes algorithms related to weather forecast problems to determine which ones work and under what conditions. Along the other, she does a sort of mathematical backtracking to find conditions that will prevent the Navier Stokes solutions from blowing up.

New Faces: **Tyler Foster**

Tyler Foster

This is my novice, and quite frankly, embarrassing attempt at high concept art. Hopefully, at least one person will sharply exhale through their nose because of it. Quite serious about art himself, a high school-aged Tyler Foster listens to his math teacher go on a tangent about the projective plane. No one really follows because this isn't an undergraduate level math class, but it shows Tyler that math might have something more interesting to say than what a high school curriculum could show him. He does well in math, but doesn't particularly care for it at this time.

After high school, he attends Art Center College of Design to study fine art, which he calls 'west coast conceptual art.' It's the intention behind a piece, and its ability to evoke connections and provoke discussion that becomes the focus on his education, putting him and his peers in a pretty cerebral state of mind. Around the same time, Foster picks up the practice of browsing the math section at a local Barnes and Noble. He dives into books that pique his interest, sometimes in spite of their difficulty. The selection here is pretty good thanks to the store's close proximity to CalTech. It's a good place to be if you suddenly become interested in math.

In the aisles of Barnes and Noble, Foster introduces himself to Susan Blackmore and W.D. Hamilton. Before long, pure mathematics supersedes his interest in making conceptual art. He heads to community college with the intention of pursuing math, an intention strongly reified by his acceptance to the University of California, Berkeley. Foster continues to find and read the latest books on mathematics, eventually realizing that academic papers would have served his purpose better. He blames the lack of distinction on his youth.

At Berkeley, Foster favors algebraic geometry. It seems impenetrable, but the difficulty is what intrigues him. He reads about Alexander Grothendieck on the web and sits tirelessly with Hartshorne's algebraic geometry book, trying to read and understand it in little bits. In retrospect, he admits he barely understood anything in that book, but each small piece conquered was an exciting accomplishment.

In graduate school at Yale University, the concepts keep growing. Luckily, Foster's advisor, Mikhail Kapranov, is a walking textbook, with pages from other textbooks stapled in. Foster and the other graduate students marvel at the guy's wealth of knowledge, prodding each other to go ask a question and see for themselves. Each random question is not only met with an answer, but a full-blown lecture aided by the nearest blackboard. It's a minor detail in many years of graduate school, but sticks with Foster as an ideal to aspire towards.

Without so little as a master's degree in mathematics, I realize I'm not the ideal person with which to discuss highly specialized research. But I'm still so curious as to how this work gets done. So I asked. "There's two different days I have. One happens when I really understand something. I can tell that I understand it, and all I need to do is sit down and write all the words and show myself that I know it. Then another day is: I know what I want to happen mathematically, and for like five hours, every single thing I think of just

Faculty Retirements

Thank you and congratulations to recent retirees Ken Dodaro, Mike Mesterton-Gibbons, and David Kopriva!

Ken Dodaro joined the department in 1985 after graduating with a Master's degree from Rensselaer Polytechnic Institute. Following 33 years of service, he retired as Teaching Faculty III.

Mike Mesterton-Gibbons received his PhD from Oxford in 1977 and settled at FSU in 1982 after several research and teaching fellowships in the UK. He joined the ranks of the Emeriti in 2017.

David Kopriva received his PhD from the University of Arizona in 1982. After working at many observatories, national labs, institutes, and foundations, he landed at FSU until his 2017 retirement. His (Bruce) Lee number is 3.

Ken Dodaro

Mike Mesterton-Gibbons

David Kopriva

doesn't work. Nothing's making sense. I feel like every idea I have is wrong. That's a frustrating day." At that point, Dr. Foster may go read something to understand or just sit down and think about it really hard. Every day he conquers a new piece of the theorem he wants to prove, he adds a notecard or strip of paper to the pair of whiteboards on his office floor. Parts one and two, he says, keeping in mind that part one must be built with part two in mind. As we sit in his office he recognizes a hole in the problem from across the room. Of course, I only see ink on paper held in place by circular pink magnets.

In math and in art, it only takes the thought of an idea to inspire interest. The concept could completely fail, but you're eager to find out if you can make it work. Somewhere along the line, things stop making sense, new problems arise faster than you can solve old ones, and the whole thing no longer resembles what you had in mind. In art, maybe you give up on the piece with a vague intention of trying again later, next time with more foresight. But in math, it's not a matter of finding a new approach to a bad idea, as much as your idea being literally false. "That's a kind of finality that doesn't exist in a lot of other disciplines. It makes it really fun, like higher stakes, but also when that happens it's just super depressing. Congratulations, you spent three months on a bad idea." But then you read another paper with a cool result and spark a new idea to pursue.

After surviving Michigan and Connecticut winters as a lifelong Californian, Dr. Foster enjoys the pseudo-freeze of Florida winters. The local bugs fascinate him almost as much as Tallahassee's proclivity for hiding weird adventures at every turn. From biking around St. Marks, to less conventional things like floating down Wakulla after dark, or eating really good fried chicken from a gas station car wash, there's never a dull moment in the capital city if you know where to look. "There's something that's just kind of mad about it." Since reminiscing his way back into an old hobby, Dr. Foster spends most of his free time skateboarding and wouldn't have it any other way. As he puts it: when he isn't skating, he just wants to be skating.

New Faces: **Alexander Reznikov**

Serving as one of the newer members of Florida State University's Department of Mathematics, Assistant Professor Alexander Reznikov offers the program a fresh perspective.

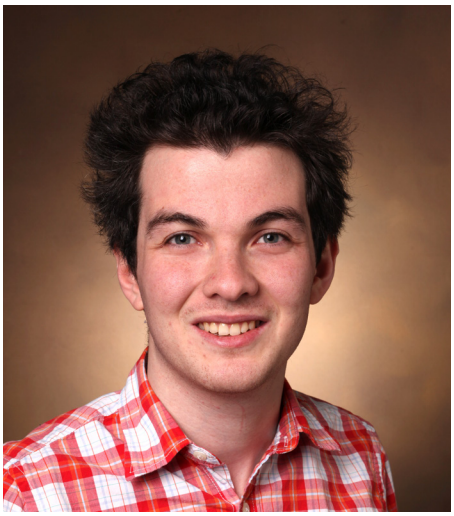
Growing up in Saint Petersburg, Russia, young Alexander excelled in mathematics. During his grade school years, he completed an intensive mathematics program. One of the reasons Alexander became interested in pursuing mathematics was the long line of mathematicians in his family. With his mother, grandmother, grandfather, and great-grandfather all serving as mathematicians themselves, Alexander continues the tradition. After graduating high school, he attended a university in his hometown to receive his Bachelor of Science degree in pure mathematics. With his grandfather having had experience in America, Alexander began to explore American graduate school opportunities himself.

In 2009, Alexander moved from Saint Petersburg, Russia to East Lansing, Michigan, to attend Michigan State University. While at MSU, he was not only able to conduct research and become an expert in his field, but he was also able to experience the United States for the first time. While living on his own, something very uncommon for graduate students in Russia, he was able to travel and explore America, frequently venturing to Chicago, Ann Arbor, and occasionally California, on the weekends. He also made a point to travel home to Russia and spend time with his family.

Three qualifying exams, plenty of rigorous research, and five years later, he graduated from MSU in 2014, earning his PhD in pure mathematics. After graduation, he moved to Nashville, Tennessee, and spent three years at Vanderbilt University for a postdoctoral research opportunity.

Journey to Florida State

In 2017, he began applying for assistant professor positions at universities across the nation. After catching the eye of Florida State University's mathematics department, Alexander traveled to campus after being invited to interview. Shortly thereafter, he accepted an assistant professor position and began teaching the same year.



Alexander Reznikov

During the fall 2017 semester, he started teaching a calculus course, which he continued to do for the next two semesters to follow. As of spring 2019, he began instructing a graduate course for the first time.

Research Interests and their Applications to the Classroom

As for his research, Alexander explores many topics, such as harmonic analysis, potential theory, and complex analysis. Through the department, he is able to conduct his own research and then relay it back to students, in an effort to get them interested in upper level topics.

"Harmonic analysis is a very fun topic to talk to students about," he comments. "It's why you hear sound when you pull the string on a guitar. It oscillates, becomes a lot of waves, and when these waves reach your ear, you hear the sound."

Using lighthearted, accessible examples like these, Alexander is able to make difficult concepts attainable to his students. When discussing potential theory, he uses examples involving bagels and gas stations to help his students understand the problem setting. He also finds it helpful to draw connections between his research areas.

In his Measure and Integration course, he is able to show first-year graduate students his own research, in an effort to expand their knowledge of mathematics and help them choose an area of focus themselves. While in graduate school, students have two years to pass qualifying exams and discover what aspects of research interest them.

"These are my two years to make a difference," he remarks. "I feel that I am teaching them real stuff. After this course, they can start reading modern papers. "Overall, I am trying to shape a mathematician."

Aside from teaching his course and conducting research, Alexander continues to focus on encouraging the success of graduate students.

"Outside of class, I meet with prospective graduate students," he explains. "We are bringing a lot of prospective graduate students here and I'm trying to meet with all of them, to show off FSU."

"To me, complex analysis is also part of harmonic analysis, although I'm sure this is different for others in the department" he suggests. "Complex analysis appears everywhere. In some sense, it is one of the more established parts of mathematics."

In 2018, he specifically focused part of his research on fractals.

"It is somewhat surprising to me that a lot of things are false in this set because they are so symmetric," he observes. "I am very excited to be able to prove that something is actually true."

Currently, Alexander is focusing his attention on problems related to discrete potential energy.

Teaching Graduate Students

As of spring 2019, Alexander began teaching his first graduate level course at FSU.

"A first-year grad student has some preferences but they are still pretty undecided about the direction of their research," he explains. "This is why I wanted to teach a graduate course so badly."

In the future, Alexander hopes to facilitate a program-wide conference and has reached out to the Conference Board of the Mathematical Sciences to do so. The conference would host ten lectures from a widely respected mathematician, while simultaneously providing graduate students with an opportunity to share their research.

In 2018, Alexander received a grant from the National Science Foundation to further his research. He continues to apply for such grants to continue his research and sponsor graduate students.

He also works to host analysis seminars to make reading papers more accessible to students and completes yearly classroom visits to explain his research.

Outside of the Classroom

Alexander and his wife, Natalia, revolve their weekends around their four-year-old daughter, Victoria. They love to travel, venturing to countries such as Russia and Brazil. In Tallahassee, they love going to community events such as productions by the Children's Theater, local concerts, and FSU's very own circus. Alexander also enjoys gardening, grilling out on the weekends, and participating in outreach to local elementary schools.

New Faces: **Sanghyun Lee**

Sanghyun Lee

On a sunny Sunday morning, you decide to bust out some suds and clean up a bit. Wash your car, do the dishes, give your hair the shampooing it deserves. When you go to pour dish soap in that oil-covered bowl or stream shampoo straight into your palm, you might be lucky enough to see something truly intriguing: a self-propelling, soap-shooting fountain! This mesmerizing phenomenon is caused by the Kaye effect, a property of certain fluids that inspired Sanghyun Lee, Ph.D. to embark on a career solving real world problems. "Not only [do] I think math professors were influencing me, kind of telling me how the fundamental science is important, but also, [seeing] how these studies could be applied to real applications in computer science was fascinating." This understanding would ground Lee in research solving problems related to numerical methods for partial differential equations (PDEs), especially those PDEs coupled with multiphysics and multiscale phenomenons. Lee is constantly looking for a 'good problem' to dedicate himself to, including hydraulic fracturing, sinkholes, and seawater intrusion, now focusing on the problems in the state of Florida.

During his undergraduate at Sogang University, Lee began searching for ways to take his studies away from the desk and into real world equations. "To apply math to the real world, we need to have some simulation techniques, which means it's based on all the computing techniques." After double majoring in mathematics and computer science, Lee moved to Texas A&M, where he received his Ph.D. from the Department of Mathematics. His postdoctoral studies put him in collaboration with Mary Wheeler, modeling the propagation of fractures in porous media to improve the techniques of oil and gas production. Penetrating deep into the subsurface with lots of water and high pressure leads to seemingly unpredictable results. One initial cut could spur numerous spidering fractures with no way to predict, observe or study their growth. This lead the researchers at the Center for Subsurface Modeling to develop a simulation. Scan data, such as the toughness of the ground material, allowed Lee and associates to study fractures, how they propagated, and predict how and where they were likely to form. "The gas price is really cheap now, right? This is one of the main reasons. We have new technology."

Collaboration is Key

Lee admits he's no experimentalist, so his research is predicated upon collaboration with chemists, mechanical engineers and even hydrologists. "Otherwise I'm just sitting down and making up the problem," he says. At every level, creative researchers find the most compelling topics and innovative solutions by engaging with reality. What problems can I solve in the world around me? Who has searched for a solution already? What did they find? "Researching is often re searching. It's not always finding something very new but I can try to research what people already did and tweak a little idea and see what happens next."

Researchers, like Lee, gather throughout the year at symposiums and workshops to meet friends, exchange new ideas, find collaborators and most importantly, good problems. To help facilitate productive conversations pertaining to his research, Dr. Lee organized two mini-symposiums at the upcoming SIAM GS conference in Houston, Texas. One on the fracture work, and another on seawater intrusion. "A big portion of research is going to workshops and conferences for researchers. This is a good opportunity to get all these method people together and see their recent advances so we can try to improve them together, if we can." The tricky task of finding interesting problems with feasible solutions couldn't be accomplished without this open dialogue of research and ideas.

Since Coming to Florida

Lee has adjusted the focus of his research towards local problems since accepting the faculty position at FSU. "I want to find a really good problem in Florida. I think sinkholes and the seawater control might be some of the good problems here." With all the groundwater pockets, springs and sinkholes spotting Florida, the thread of geophysical fluid dynamics and subterranean phenomena continues throughout Lee's research. "We cannot really prevent [sinkholes], but ...what I'm trying to do now is find how we can model the sinkhole so we can use this as a forecast tool... We still don't know the dominating factor, so we have to figure that out first." He remains active in the geophysics community, giving talks, organizing mini-symposiums, and even collaborating with UCF's sinkhole institute to find new solutions.

When Dr. Lee isn't modeling sinkholes and fractures, he enjoys fishing off the panhandle and camping with his wife and two kids. "We are adjusting to the life in Florida." Luckily, our beautiful swampy state offers plenty of research-worthy problems and peaceful places to cast a line.

FSUMS general body meeting. (center left: President, Anna Wuest; center right: President Emeritus, Sofia Medina)

Society of Undergraduate Math Studies

When most people hear the term "math club", they think of students gathering to practice challenging problems, usually for a competition. But SUMS – the Society of Undergraduate Mathematics Students – provides a relaxed environment for students to further the mathematical community here at FSU.

Michael Madar (left) & Connor Doherty (right) demonstrating the unraveling of DNA

SUMS meetings typically take place once a month on a Thursday, at 5 pm. The club usually has about 30 people in attendance, but over 100 people officially on the roster. All students in the math department are emailed the time and topic of the meeting in advance and can drop by if the subject is of interest to them. After an icebreaker riddle to get everyone in a mathematical state of mind, a club officer or guest speaker will give a presentation. Past topics have included research opportunities in STEM, how to navigate the math department as a transfer student, and grad school tips. In addition to general body meetings, SUMS also helps coordinate students to attend the Troy Undergraduate Mathematics Conference in early April.

SUMS sponsors and fields speakers for the Undergraduate Math Seminars, in which faculty members (or even students) give talks about an area of their expertise. On January 28th, SUMS officer Sam Glickman gave a talk about the subject of his undergraduate thesis, KPZ universality. SUMS also worked directly with Dr. Monica Hurdal to coordinate the

Sofia Medina (right) talking about tessellations in bees

'Math in Nature' room at Math Fun Day. These activities included showing how the condensed structure of DNA is actually long enough to stretch to the moon and back (pictured). We also showed how different animals, like bees, exhibit patterns that follow the Fibonacci sequence!

2020 Board Members (left to right): Regan Cotton, Vice President; Sarah Downing, Secretary; Dr. Monica Hurdal, Faculty Sponsor; Angie Davenport, Treasurer; Julia Ream, President

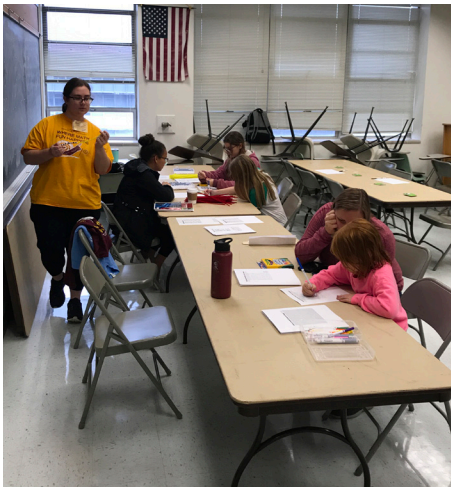
Association for Women in Mathematics

The Association for Women in Mathematics (AWM) is a professional society whose mission is to encourage women and girls to study and to have active careers in the mathematical sciences, and to promote equal opportunity for and the equal treatment of women and girls in the mathematical sciences. The AWM FSU student chapter was founded in 2016 and soon after officially became a Recognized Student Organization (RSO) through the university. With that, the chapter has now grown to well over the 34 members it was founded with, hosting men and women undergraduate and graduate students from a variety of STEM degree tracks!

This past year, the FSU AWM student chapter has implemented specialized programming in order to focus efforts toward realizing the greater AWM goal via three overarching themes: personal development, community, and engagement. This programming is broken up into three branches in order to actively target these areas. General Meetings create space for a variety of seminars and workshops aimed toward the professional and personal development of organization members. In the Fall 2019 semester, some of these included a special seminar on Imposter Syndrome and a Resume Workshop hosted by the department's career liaison Krystle Graham. Social Meetings allow for members to bond and build a sense of community within the greater STEM family, creating a space and atmosphere for underrepresented demographics in the organization that historically has not always been present in the mathematical sciences. Finally, the chapter's monthly study sessions are aimed at encouraging healthy study habits and exploring different study environments across FSU to help members explore the study strategies that work best for them so that they can better succeed in school. Through these main three avenues, the AWM FSU student chapter hopes to encourage and promote its members to continue their pursuit and enjoyment of the mathematical sciences here at FSU and beyond.

The AWM FSU student chapter has also recently started the AWM Mentoring Network. The AWM Mentoring Network pairs graduate and upper division undergraduate student mentors with undergraduate student mentees. The goal of this pairing is for mentors to serve as an academic big sibling to their mentee, guiding them through the upcoming school year. Mentor-mentee discussions can cover a variety of topics such as: concerns about one's major, advice for applying to graduate school, as well as more general conversations about what different areas of math look like and how to learn more about them. The program kicked off to a great start in the Fall of 2019 and will continue on in the Spring.

Other upcoming events for the organization include volunteering with The Big Event to give back to the Tallahassee community, sponsorship of a room at Math Fun Day to introduce a younger audience to women in math, and a special Pi Day Fundraiser. General meetings for the Spring will include opportunities for undergraduate members to practice their presentation skills and a graduate student panel. Next year, the AWM FSU student chapter hopes to initialize an invited lecturer series highlighting women in math in order to further expose FSU's student body to the work of women mathematicians and encourage students of all underrepresented demographics to continue their pursuit of the mathematical sciences.



Volunteers help the public make Binary Bracelets to learn more about coding at Math Fun Day

Panel Discussion

Quant Symposium

The twenty-first Quant Symposium at the Florida State University was funded by the College of Arts and Sciences and the Department of Mathematics. The event, which was aimed toward career enhancement for graduates in financial mathematics, was held on February 22-23, 2019 at the Department of Mathematics. In attendance were 94 students, faculty members, alumni, and professionals, 21 females and 73 males, among them 31 non-FSU affiliated.

Two well-established non-FSU professionals, Dan Pirjol (VP at J.P. Morgan) and Hamed Firouzi (founder of Alphabist L.L.C.), presented new trends in research and practice in financial mathematics, including the role of data science in algorithmic trading, applications of machine learning in the retail credit market, cryptocurrency, and scaling limit of GARCH model to a tail risk model.

A new feature of the twenty-first Quant Symposium was the presence of Andrew Fan and Jon Yeatman, two of our most successful M.S. alumni. Andrew is now at the Citi Bank in Tampa, where he is working on a new area where mathematical science has left its mark, the counterparty risk. Jon worked for many years in the Florida State Board of Administration, where the public funds of the state of Florida including the employees' pension fund is managed.

As always, we invited two of our Ph.D. alumni, David Mandel from J. P. Morgan and Ming Zhu from Bank of America and Merrill Lynch. David, one of our recent alumni, talked about his path toward a career in financial industry as well as the geometry of statistical hedging in the fixed-income security market. Ming laid out the shortcomings of the traditional LIBOR interest rate and the reasons behind the recent move in the market toward SOFR interest rate. A panel of nine professionals, including our six guests and three recruiters, answered students' questions about issues related to the job market. The recruiters came from the Citi Bank in Tampa and the Florida State Board of Administration and interviewed several of our students on the premises.

Discussions over lunch

Math Puzzler

In this issue we present a Math Puzzler. The question comes from the FSU High School Math Contest. A prize* will be awarded for the best solution with the clearest explanation submitted by **September 1, 2020**. Solutions can be submitted to **newsletter@math.fsu.edu**. We hope you are challenged by this Puzzler!

In parallelogram ABCD, the point P on the long diagonal AC is the same distance, x, from the 3 vertices A, B, and D; and twice that distance, 2x, from the other vertex, C. Determine the internal angle α at the vertex A.

**FSU Mathematics faculty and their families, and those affiliated with the FSU High School Math Contest (sponsors, participants, math club members, etc.) are not eligible for the prize. The newsletter editor and staff will determine prize eligibility.*

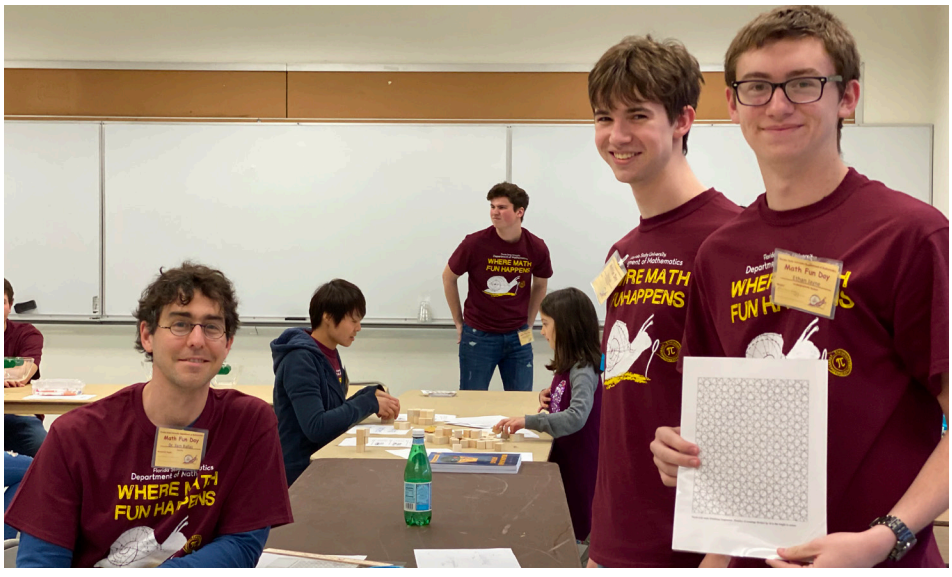
Math Fun Day Volunteers

Math Fun Day A Great Success!

On February 1, 2020 the Mathematics Department held its seventh annual FSU Math Fun Day and it was another amazing success! We had over 600 people from the community visit us during Math Fun Day. Over 120 graduate and undergraduate students, faculty and staff volunteered their time and effort with Math Fun Day. This event continues to do a wonderful job of cultivating and stimulating mathematics among K-12 school students through engaging and hands-on activities.

This year we had our classic activity rooms and we added a few new themes. The Fractal Room was filled with beautiful images of fractals and had several fractal-building activities. Fractals are infinitely repeating patterns and visitors learned where they occur around us. Many kids were seen walking around with their own 3D Sierpinski Tetrahedron Fractal or they created a fractal using a computer.

The Mathematical Games Room had many great games like SET, 3D tic-tac-toe, Tower of Hanoi, and logic puzzles. Learning the mathematical strategies for playing various games can give you a winning edge! Those interested in computers were able to play in the Scratch programming environment and enhance their critical thinking skills In the Polygons Through Programming activity room.



Faculty & Student Volunteers

The Symmetries and Patterns Room had volunteers adorned with origami crowns who taught children how to make their own crowns. Visitors explored geometries and patterns with easy to make origami models and discovering the wonders of the hexahexaflexagon was another popular activity. Kids continued exploring geometry and shapes in the Geometric Constructions Room, which had a large table where everyone could build shapes and patterns and models with the Zome construction tool.

The FSU Student Chapter of the Association of Women in Mathematics organized the Women in Math Room where children could engage with activities that related to accomplishments women have made in the fields of mathematics and computing. Colored beads introduced children to binary code so they could make bracelets of their name in binary.

Older kids were introduced to ghosts from FSU's past in the Math Escape Room. Participants had to use their mathematical knowledge to unlock clues to the ghosts' past, break the curse, and escape! As usual, this room was a big hit!

The Math in Nature room was organized by the FSU Student Undergraduate Mathematics Society (SUMS). This room was a huge success with many new and interesting activities, including the complexity of DNA, the numerous ways you can find the Fibonacci sequence in nature, and even a real lizard that was used to demonstrate body proportion and game theory!

A number of faculty also participated in various workshop rooms including Secret Codes and Easy as Pi. Participants were able to interact with faculty – they were able to break secret codes with Dr. Giray Okten, or engage in hands-on activities and demonstrations with Dr. Arash Fahim, Dr. Sam Ballas, Dr. Aseel Farhat, and Dr. Jon Ahlquist. We also had the new Pi-endulum activity, where participants could obtain pi by swinging a pie on the end of a pendulum! And of course, we still had the Sea-to-See touch tanks which had an activity about the mathematical intricacies of the snail shell.

We have received many wonderful comments from our visitors.

Great interactive educational activities for all ages. Students, staff, volunteers, etc. were very energetic, helpful and welcoming.

The posters were fantastic! The staff/volunteers were super nice and helpful! THANK YOU! What a gift for Tallahassee!

A Mathematical Lizard

FSU Math Fun Day reached hundreds of children and it helps to inspire a love of math. It continues to be a great service from our Department to our community. A special thank you goes out to Dr. Monica Hurdal for being the Director of this event and Lydia Eldredge for assisting. Financial contributions from the Department of Mathematics and the College of Arts and Sciences are gratefully acknowledged. Plans are already underway for an even better event next year! We hope to see you there!

Math Games Room

High School Math Competition

We are pleased to announce the winners of the FSU High School Math Contest. This contest, held each fall, requires the competitors to give detailed written answers to 10 questions over three hours. We congratulate all the participants from our high schools spread out around Leon county, and thank the undergraduate math club for their invaluable assistance in proctoring and grading the exam.

8TH ANNUAL MATH CONTEST FALL 2019

Lower Division | Grades 9-10

1st Place
Filippo Aldrovandi-Reina (Chiles)

2nd Place
Wesley Chen (Chiles)

Honorable Mention:
Cyrus Nadiazdeh (Chiles),
Bruce Yang (Chiles)

Upper Division | Grades 11-12

1st Place
Alex Hu (Chiles)

2nd Place
Elise Farr (Chiles)

Honorable Mention:
Jessica Cao (Chiles)
April Le (Chiles)

7TH ANNUAL MATH CONTEST FALL 2018

Lower Division | Grades 9-10

1st Place
Alex Hu (Chiles)

2nd Place
Brighten Jiang (Chiles)

Honorable Mention: Akash Bhat, (Rickards), Rahul Iyer (Chiles), Kaitlyn Wen (Chiles)

Upper Division | Grades 11-12

1st Place
Andrew Yuan (Chiles)

2nd Place
Jennifer Wen (Chiles)

Honorable Mention:
Brandon Chyi (Chiles),
Townsend Porcher (Chiles),
Jason Zhang (Chiles)

More information about the exam is available at
www.math.fsu.edu/~ewald/outreach/contest.math.

Department News

The "Actuarial Ambassador Program", a joint effort between FSU Actuarial Science and the International Association of Black Actuaries, established to raise awareness of the actuarial profession among mathematically talented black students, was awarded the **2018 Affiliate of the Year Award** at the IABA Annual Meeting in Atlanta last summer. There were about a dozen past and present FSU actuarial science students in attendance.

FSU Mathematics will host an **NSF-CBMS Regional Research Conference** in August 2020 titled "Analysis, Geometry, and Partial Differential Equations in a Lower-Dimensional World". It is being organized by Aleksandr Reznikov.

Alumni News

Serdar Cellat (PhD 2018, Okten and Mio) works at Liberty Mutual, Boston.

Yuanda Chen (PhD 2017, Kercheval) works for Goldman Sachs, NY.

Zailei Cheng (PhD 2018, Zhu) is working in Citi, Tampa, Florida.

Chun-Yuan Chiu (PhD 2016, Kercheval) works at Bank of America NY.

Justin Eilertsen (PhD 2016, Magnan) is a postdoctoral fellow in nonlinear dynamical systems at the University of Michigan (Ann Arbor) in the Department of Molecular and Integrative Physiology.

Matthew Hancock (PhD 2018, Magnan) works at Enthought (Austin, Texas) in machine learning and scientific software development.

Andrey Manakov (PhD 2019, Magnan) works for Citigroup (Tampa) as a lead quantitative researcher.

David Mandel (PhD 2017, Hussaini and Okten) joined J.P. Morgan, NYC.

Navid Salehy (PhD 2019, Kercheval) is Assistant Professor, University of New Orleans.

Nima Salehy (PhD 2019, Okten) is Adjunct faculty, Louisiana Tech University.

Yu-Ying Tzeng (PhD 2017, Okten) is Assistant Professor, Department of Risk Management and Insurance, National Cheng-Chi University, Taiwan (co-directed with Dr. Paul Beaumont).

Jian Wang (PhD 2017, Okten) is at Byton, Santa Clara. (co-directed with Dr. Jinfeng Zhang).

Chechen Zhou (PhD 2017, Kercheval) works at Wells Fargo, NC.

Graduate Student News

Orhan Akal published two journal articles and three conference papers at ICMLA 2018, ICIP 2019, and SPIE 2020. He collaborated with NIH, and interned for Air Force Research Lab, Intelligent Robotics Inc., and Siemens Healthineers. A patent application for the work done at Siemens is in progress.

Yiran Chen gave a talk in the 2019 SIAM Conference on Computational Science and Engineering, titled "Goodness-of-fit Testing of Copulas using Quasi-Monte Carlo Methods".

Antigoni Georgiadou received a DAAD grant to fund her internship at the European Space Agency (ESA) in Darmstadt, Germany, and received the URA Visiting Scholarship three times (2017, 2018, 2019) to travel and work at Fermilab, in Batavia Illinois, as a research assistant.

Josh Kimrey gave an invited minisymposium talk at SIAM Applications of Dynamical Systems 2019.

Faculty Awards

Martin Bauer is a co-PI on an NSF grant (Collaborative Research) on "The Space of Riemannian Metrics for the Statistical Analysis of the Human Connectome" and a grant from the Erwin-Schrödinger Institute, Vienna, on "Geodesic Equations on Mapping Spaces".

Richard Bertram received an Outstanding Paper Prize from the Society for Industrial and Applied Mathematics in 2017, with co-authors Theodore Vo and Martin Wechselberger. Bertram also received an FSU Graduate Faculty Mentor Award in 2017, and a Distinguished Research Professor Award in 2019. In 2019 he was selected as the inaugural Tam Family Professor of Mathematics (there is an article about the professorship planned for the next newsletter). In 2017, 2018, and 2019 he received grants from the NSF and the NIH.

Kyle Gallivan, Yousuff Hussaini, and Giray Okten, along with Bahri Uzunoglu of Uppsala University received a grant from the Swedish Foundation for International Cooperation in Research and Higher Education (STINT), on "Renewable energy conversion scenarios for Florida power system disaster relief and resiliency".

Ishkan Grigorian was inducted by Phi Eta Sigma National Honor Society for a Service Excellence Award in 2018.

Monica Hurdal was designated a Woman of Distinction in Science, Technology, Engineering and Mathematics in 2017, and as a Trailblazer in 2019, both by the Oasis Center for Women and Children, Tallahassee.

Sanghyun Lee was awarded an NSF grant titled "Fluid-filled Fracture Propagation with a Phase Field Approach in Subsurface by Employing Nonlinear Strain Limiting Models and Enriched Galerkin Methods".

Washington Mio received an NSF grant (Collaborative Research) on "The Topology of Functional Data on Random Metric Spaces, Graphs and Graphons".

Ziad Musslimani received a Fulbright Fellowship in 2019 and the Marie Curie Fellowship, from the European Research Council in 2018.

Giray Okten received a Graduate Faculty Mentor Award in 2019 from FSU.

Mark Sussman was awarded a NASA grant as a co-PI with Kourosh Shoele (PI), and Wei Guo (Co-PI) on "Fast multilevel multi-phase CFD-nodal model for cryogenic applications".

Faculty News

Martin Bauer was co-organizer for an NSF-Workshop on "Applications-Driven Geometric Functional Data Analysis" held at FSU in 2017 and "Shape Analysis, Stochastic Geometric Mechanics and Applied Optimal Transport" held at Banff, Canada in 2018.

Sanghyun Lee organized mini-symposia at the SIAM Conference on Mathematical and Computational Issues in the Geosciences Houston, Texas, and at the 20th Annual Conference of the International Association for Mathematical Geosciences (IAMG), State College, Pennsylvania.

Nick Moore's recent work on rogue waves with Tyler Bolles (then an undergraduate at FSU) and Kevin Speer of GFDI has been featured on Physics Central, which can be found at *http://physicsbuzz.physicscentral.com/2019/01/scientists-may-have-solved-mystery-of.html*

Craig Nolder organized a special session at the AMS sectional meeting in Gainesville, Florida.

Giray Okten gave a plenary talk titled "Randomized quasi-Monte Carlo methods in global sensitivity analysis", at the Ninth International Conference on Sensitivity Analysis of Model Output, Barcelona, Spain, in 2019, and wrote a textbook titled "First Semester in Numerical Analysis with Julia", which is an open access textbook, published by the Florida State University Libraries. He also co-organized, with Sergei Kucherenko, a special session at the Monte Carlo and quasi-Monte Carlo Methods in Scientific Computing Conference, Rennes, France, in 2018.

FSU Mathematics PhD Recipients

Fall 2018

NAME	AREA	ADVISOR	THESIS TITLE
Zailei Cheng	Applies & Computational Math	Lingjiong Zhu	Diffusion Approximation of a Risk Model

Summer 2018

NAME	AREA	ADVISOR	THESIS TITLE
Nihan Acar	Biomath	Nick Cogan	Exploration of the Role of Disinfection Timing, Duration, and Other Control Parameters on Bacterial Populations Using a Mathematical Model
Gitesh Dawer	Applied & Computational Math	Adrian Barbu	Neural Rule Ensembles: Encoding Feature Interactions into Neural Networks
Yaqing You	Applied & Computational Math	Kyle Gallivan	A Riemannian approach for computing geodesics in elastic shape space and its applications
Xinru Yuan	Applied & Computational Math	Kyle Gallivan & Pierre-Antoine Absil	Riemannian Optimization Methods for Averaging Symmetric Positive Definite Matrices

FSU Mathematics PhD Recipients

Spring 2018

NAME	AREA	ADVISOR	THESIS TITLE
Serdar Cellat	Biomath	Washington Mio & Giray Okten	Metric Learning for Shape Classification: A Fast and Efficient Approach with Monte Carlo Methods
Atanaska Zapry-anova Dobreva	Biomath	Nick Cogan	Using Mathematical Tools to Investigate the Autoimmune Hair Loss Disease Alopecia Areata
Sepideh Ebadi	Biomath	Nick Cogan	Evolutionary Dynamics of Bacterial Persistence Under Nutrient/ Antibiotic Actions
Daniel Eduardo Galvis	Biomath	Richard Bertram	Distributed Neural Network Models for Birdsong Production
Matthew Charles Hancock	Applied & Computational Math	Jerry Magnan	Algorithmic Lung Nodule Analysis in Chest Tomography Images: Lung Nodule Malignancy Likelihood Prediction and A Statistical Extension of the Level Set Image Segmentation Method
Hua-Yi Lin	Financial Math	Arash Fahim	Optimal Portfolio Execution Under Time-Varying Liquidity Constraints
Yaineli Valdes	Pure Math	Ettore Aldrovandi	The 1-Type of K-Theory for a Waldhausen Category as a Multifunctor
Ethan Randy Wil-liams	Pure Math	Richard Oberlin	Affine Dimension of Smooth Curves and Surfaces
Xiping Zhang	Pure Math	Paolo Aluffi	Characteristic Classes and Local Invariants on Determinantal Varieties (Temperate)

Fall 2017

NAME	AREA	ADVISOR	THESIS TITLE
Jian Li	Biomath	Nick Cogan	Modeling of Biofilms with Implementations
Wan-Yu Tsai	Financial Math	Arash Fahim	Monte Carlo Scheme For A Singular Control Problem: Investment-Consumption Under Proportional Transaction Costs
Sergiusz Jan Wesolowski	Biomath	Richard Bertram & Wei Wu	Developing SRSF Shape Analysis Techniques for Applications in Neuroscience and Genomics
Wen Xu	Pure Math	Mark van Hoeij	Third Order A-Hypergeometric Functions
Melissa Sue Marchand	Applied & Computational Math	Kyle Gallivan & Paul Van Dooren	Low-rank Riemannian Optimization Approach to the Role Extraction Problem

FSU Mathematics PhD Recipients

Summer 2017

NAME	AREA	ADVISOR	THESIS TITLE
Chaoxu Pei	Applied & Computational Math	Mark Sussman & M. Yousuff Hussaini	Space-Time Spectral Element Methods in Fluid Dynamics and Materials Science
Erdal Imamoglu	Pure Math	Mark van Hoeij	Algorithms for Solving Linear Differential Equations with Rational Function Coefficients
Chenchen Zhou	Financial Math	Alec Kercheval	On the Multidimensional Default Threshold Model for Credit Risk Model
Diana Lissett Flores-Diaz	Biomath	Richard Bertram	An Electrophysiological and Mathematical Modeling Study of Developmental and Sex Effects on Neurons of the Zebra Finch Song System
Omid Khanmoha-madi	Applied & Computational Math	Mark Sussman	High-Order, Efficient, Numerical Algorithms For Integration In Manifolds Implicitly Defined By Level Sets
Yahya Ahmed Almalki	Pure Math	Craig Nolder	Sorvali Dilatation and Spin Divisors on Riemann and Klein Surfaces
Jian Wang	Financial Math	Jinfeng Zhang & Giray Okten	Ensemble Methods for Capturing Dynamics of Limit Order Books
Yunyi Shen	Pure Math	Matilde Marcoll & Paolo Aluffi	Arithmetic Aspects of Noncommutative Geometry: Motives of Noncommutative Tori and Phase Transitions on GL(n) and Shimura Varieties Systems
Yu-Ying Tzeng	Financial Math	Giray Okten & Paul Beaumont	Quasi-Monte Carlo and Markov Chain Quasi-Monte Carlo Methods in Estimation and Prediction of Time Series Models
Leona H. Sparaco	Pure Math	Kathleen Petersen	Character Varieties of Knots and Links with Symmetries

FSU Mathematics PhD Recipients

Spring 2017

NAME	AREA	ADVISOR	THESIS TITLE
Vehpi Yildirim	Biomath	Richard Bertram	Mathematical Modeling and Analysis of Gene Knockout Compensation in Pancreatic Beta-Cells
Yao Dai	Biomath	Mike Mesterton-Gibbons	Game-Theoretic Models of Animal Behavior Observed in Some Recent Experiments
Jian Li	Biomath	Nick Cogan	Mathematical Modeling of Biofilms and Implementations
Liang-Hsuan Tai	Applied & Computational Math	Kyle Gallivan & Anuj Srivastava	Trend and Variable-Phase Seasonality Estimation from Functional Data
David Mandel	Financial Math	Giray Okten	Random Sobol - Sensitivity Analysis and Model Robustness
Mehmet Emin Aktas	Pure Math	Eriko Hironaka	Topology of N-gonal Curves
Daniel Weingard	Biomath	Richard Bertram	Scroll Waves: And How They Interact with Non-Reactive Knots, Tori, And Spheres
Yuanda Chen	Financial Math	Alec Kercheval	Modeling Limit Order Book Dynamics using Hawkes Processes
John Max Wyse	Biomath	Mike Mesterton-Gibbons	The Impact of Competition on Temporal Musth Strategies: A Game-Theoretic Approach
Joseph Patrick McKenna	Biomath	Richard Bertram	Insulin Secretion Rhythms: Calcium Regulation of Beta-Cell Metabolism and Rescue of Islet Oscillations

Mathematics Honors Day 2019

Every year in the spring, the Department of Mathematics recognizes graduate and undergraduate students for their teaching, academic, or service achievements. The following are the award winners from the Annual Honors Day event in Spring 2019:

Dwight B. Goodner Mathematics Fellowship

Millie and Dwight Goodner established this award to recognize teaching excellence in mathematics by graduate students.

Johnna Barnaby
Carolyn Eady
Lydia Eldredge
Inmaculada Sorribes Rodriguez

Kenneth G. Boback Award

This award is presented to an outstanding senior undergraduate majoring in Mathematics.

Jacob Spainhour

Betty Anne Case Actuarial Science Award

This award is presented to an outstanding undergraduate student majoring in Actuarial Science. This award was established by Courtney and Shari White.

Kristen Swinski

Bettina Zoeller Richmond Award

This award is presented to two graduate students for outstanding service to the Department.

Johnna Barnaby
Angelica Davenport

Charles and Anna Uhrhan Endowed Scholarship

This award is presented to a deserving math major exemplifying excellence in scholarship and moral character.

Sofia Medina

Clara Kibler Davis Scholarship

Nicole Bruce
Yiran Chen
Carolyn Eady
Opal Graham
Thanittha Kowan
Inmaculada Sorribes Rodriguez
Xiaoya Wang

Distinguished Teaching Assistants

The Department recognizes graduate students who have demonstrated several semesters as successful teaching assistants and are in good standing in the Mathematics Department.

John Bergschneider
Jamie Fox
Opal Graham
Grayson Jorgenson
Yang Liu
Michael Niemeier
Nima Salehy
Kangwei Xing

Financial Math Quant Symposium Poster Competition Winners

1st Place: **Navid Salehy and Arun Polala**
3rd Place: **Jamie Fox**

Graduate Research Week Award Winners

Flash Talk Competition
1st Place: **Patrick Eastham**
2nd Place: **Yiran Chen**

Poster Competition
1st Place: **Opal Graham**
2nd Place: **Inmaculada Sorribes Rodriguez**
3rd Place: **John Bergschneider**

Evelyn and John Baugh Undergraduate Scholarship

Aaron Putriment
Adam Tatun
Anthony Maiello
Brooke Dyer
Catherine Williams
Christopher Tobar
Danielle Marino
Daniela Lemus
Jared Giotta
Jonathan Justice
Kayla Davis
Kristen Swinski
Kyle Putriment
Luke Dilworth
Madison Flick
Michael Deveikis
Michael Madar
Michael Ramsey
Mukund Viswanathan
Paige Graber
Reagan Huet
Rebecca Glesser
Regan Cotton
Samir Iskandarani
Travis Bolger
Tristan Waterbury
William Shparberg

Other Honors

- **16 students** were inducted into the Florida Beta Chapter of Pi Mu Epsilon, an academic, national scholarly society in mathematics
- **15 students** received SOA/CAS exam reimbursements for Exam P/1
- **38 students** received SOA/CAS exam reimbursements for Exam FM/2
- **7 students** received SOA/CAS exam reimbursements for Exam IFM/3F
- **1 student** received an SOA exam reimbursements for Exam C
- **1 student** received an SOA exam reimbursements for Exam L-TAM

DEPARTMENT OF MATHEMATICS

AT FLORIDA STATE UNIVERSITY

Become a friend of **FSU Math** in 2020!

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 FSU High School Mathematics Contest. 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 Building
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!