

The Quaternion

Volume 34: Number 1; Spring 2021

The Newsletter of the Department of Mathematics and Statistics



**UNIVERSITY OF
SOUTH FLORIDA**
A PREEMINENT RESEARCH UNIVERSITY

Contents

Pandemic Stories	1
Faculty News	6
Student News	8
Transitions	10

Pandemic Stories

When the semester started, the pandemic was merely a whisper on the other side of the world. But something ominous was in the air. A large branch fell from one of the laurel oaks that had long towered in front of the building, and it turned out that the trees were compromised. Down they came, and the building looked bare without them...



The grounds people planted some magnolias in front, and some day they will tower over passersby. But for now, the building towers over them.

By the time the magnolias were planted, the campus was closed, and most faculty, staff, and students had left — although groundskeepers stayed, keeping the grass at bay and planting the occasional magnolia.



The Morsani Center continued to have patients, but with precautions in place.



Meanwhile, with students gone, the squirrels had to make do without nachos or butter brickle. Back to acorns (sigh).

But on campus or off, classes must continue. Here are a few of our stories...

Story I

Joel Rosenfeld is an assistant professor. This is his story.

When the quarantine hit during spring break, I was teaching Introductory Differential Equations. Like everyone else, I had Spring Break to put a plan together and run with it. I had no previous experience with Teams or Zoom, and I had only a passing familiarity with Discord.

I was reluctant to require any attendance, or to do anything synchronously, since everyone's schedule was upended (including mine). If a college student has a job, it's likely in the service industry, and it was obviously about to crash. That means my students would have to turn to more flexible employment options, such as Uber, Doordash, etc. to make ends meet. They likely would have little time for my class, and it's very unlikely that they'll be able to meet at the previously scheduled time.

In the meantime, my home situation was a bit of a mess. My wife, my children (twin toddlers), and I were all really sick. I had a nasty cough, a fever, and I couldn't cough enough to clear my lungs. My wife's ribs hurt from all the coughing she was doing. My children dealt with it better, but were still sick. Does this all sound familiar? We don't know if it was the novel coronavirus or not, since no one was doing testing at the time.

Under these constraints and conditions, I had to put together a class. My wife was expected to maintain the schedule she had before the quarantine, and I did my best to squeeze what I could around that. This meant that we had to give up our weekends to make sure everyone was getting their work done, and to make sure that we actually fed our children.

While Teams, Zoom, and the other options seemed interesting, I didn't want to subject my students to a new system, when they didn't actually sign up for an online class to begin with. I had a YouTube channel that I posted to occasionally, [Th@MathThing](#), and every student would be familiar with and have access to YouTube, if they had access to the internet. If they didn't have access, well there was no helping them. (Here's my latest video, be sure to check out the [MATLAB at Midnight](#) segment in the middle.

Before becoming a mathematician, I spent six years as a graphic designer for an educational technology company, The Athena Group. I worked together with a team composed of professors of education (Drs. Richard Ledbetter and Sebastian Foti) and programmers to develop digital content for middle school and high school teachers. I also helped develop a graduate course at the University of North Florida [?] on Education Technology together with the late Dr. Sebastian Foti. Most of our products were fun little science experiments, educational videos, websites, etc, that could all be accessed either online or from a CD (remember those?). During that time, I developed skills using PhotoShop, Premiere, and 3DS Max.

Turns out that the entire Adobe suite can be leased for \$20/mo with an academic account. So I brushed the dust off my decade old graphic design skills and set to work putting together my first lecture. It took me all day, but as I kept working, I got much faster. I can now put together an entire edited lecture in about 3 hours (if I don't want to do anything fancy). I used a combination of a camera on a tripod to give face time to a problem, then transitioned to me working in GoodNotes on my iPad, and then back to a closing blip with the camera on the tripod. Basically, I took the model of "Tell them what you are going to tell them, tell them, and tell them what you told them".

My students responded very well to my efforts. One student told me that it helped keep her son's attention, who would otherwise be a big distraction. As I went on, I found new ways to introduce content in my videos. I added some music from a colleague that did covers for my favorite video game, Marathon. This colleague is Dr. Craig Hardgrove, who is an Assistant Professor of Geology at ASU, who was also transitioning to online teaching. He graciously gave me permission to use the music on my YouTube channel, and I feel that his contribution really improved my videos. The outro to every video is now his cover of "Guardians".

My students ended up doing fairly well in my course. I don't know if this was because of rather liberal examination policies on my part, or if they actually learned from my videos. Looking at the free response questions I had them photograph and upload to the Canvas quiz program, I see that many of them got the basic mechanics of the problems down, and given the circumstances, that's all that I could ask for. If they want to refresh that content, well my YouTube videos will always be up there.

I signed up to teach differential equations again this summer. That way, I can provide a complete class on my YouTube channel for all of my students (and anyone else) that might want to refer to them in the future.

I'm just glad that my students were able to weather the class and move on with their academic careers. No need for this Pandemic to become a barrier to their educational and career goals.

Story II

Greg McColm is an associate professor. This is his story.

In Spring, I was teaching Symbolic Computations, which consists of using programs to solve computational problems — including differential equations. Then we all went online.

Most students stayed at home in the Tampa Bay area, but some were in other states or even in other countries. The pandemic was on everyone's mind, and it seemed appropriate to look at where models of pandemics come from. And most models of the pandemic are constructed of differential equations.

About a century ago, epidemiologists started modeling epidemics using systems of differential equations. The basic one was the SIR model (for Susceptible / Infectious / Recovered), which consisted of three differential equations, all three with time as the independent variable. $S(t)$ is the number of susceptible people at time t , $I(t)$ is the number of infectious people at time t , and $R(t)$ is the number of recovered people.

Susceptible people become infectious when exposed to infectious people, so the first differential equation is

$$S'(t) = -bS(t)I(t), S'(t) = -bS(t)I(t),$$

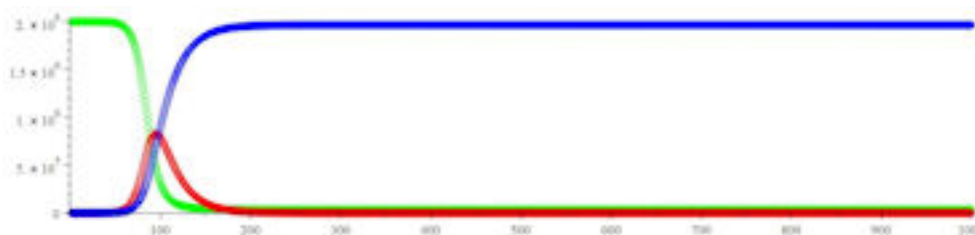
for some parameter b , which depends on social distancing and other measures to slow the epidemic. Meanwhile, at any given time, a certain proportion of infectious people recover, so the third differential equation is

$$R'(t) = gI(t), R'(t) = gI(t),$$

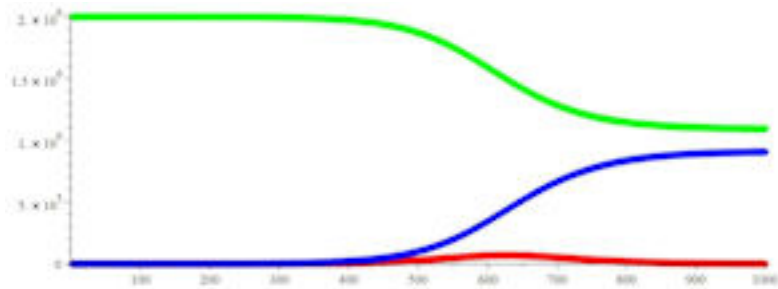
for some parameter g , which depends on available treatment. That means that the second differential equation is

$$I'(t) = bS(t)I(t) - gI(t), I'(t) = bS(t)I(t) - gI(t).$$

Here was a new homework assignment. Assuming that a city of 2 million susceptible people has a few infectious people; graph the solution. Here, the horizontal axis is time, and the susceptible people are green, the infectious people are red, and the recovered are blue.

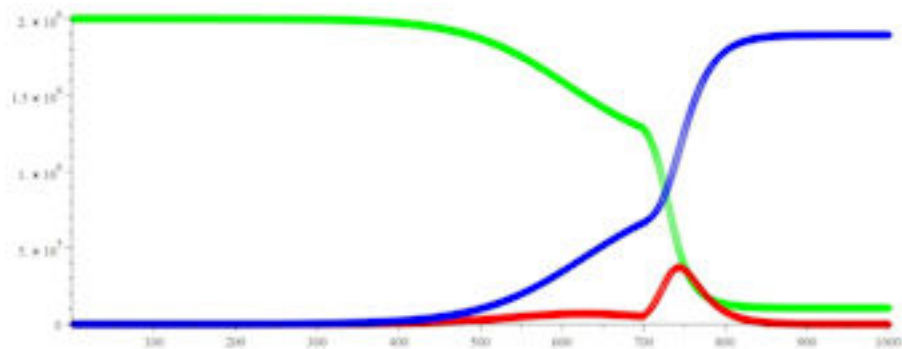


Now, assume social distancing (which reduces b). What happens then?



The red curve flattens, and fewer people get the disease, but it takes longer to get through the epidemic.

Finally, I asked an extra credit question: suppose that people practiced social distancing until the number of infectious people went down. What would happen then?



An argument for waiting for a vaccine.

This is a very simple model, focused on a single city with a homogeneous and well-mixed population exhibiting simple behavior, with no improvements in medical treatment. The “compartmental models” used by experts are much more sophisticated and project much more complex outcomes.

Faculty News

Jean-François Biasse Honored — and Rapidly Responds



Jean-François Biasse received the 2020 USF Outstanding Research Achievement Award and the 2020 USF Outstanding Faculty Award. He also received an Innovation & Partnership award for the Florida High Tech Corridor. And he received two USF Pandemic Rapid Response Network grants: one (with Computer Science Engineering Professor Sriram Chellappan, Infectious Disease & International Medicine Professor Lynette Menezes, Infectious Disease & International Medicine Professor Charurit Professor Somboonwit, Computer Science Engineering Professor Attila Yavuz) for secure contact tracing apps for mobile phones, and one (with Information Systems & Management Professor Shivendu

Shivendu, MUMA Dean of Business Moez Limayem, D. Davis, MUMA Marketing & Innovation Professor Robert Hooker, Information Professor Loni Hagen, Computer Science Engineering Professor Attila Yavuz, Public Health Practice Professor Marissa Levine, and Mental Health Law & Policy Professor Kyaien Conner) for a blockchain-based decentralized Digital ID system to provide essential services during the pandemic such as secure and anonymous proof of tests and vaccination.

A Center for Cryptographic Research



Professors **Jean-François Biasse** and **Giacomo Micheli**, along with USF Computer Science & Engineering professors Mehran Kermani and Attila Yavuz, have created a Center for Cryptographic Research at USF. It was launched with a grant from the USF Strategic Investment Pool and will have a particular interest in cybersecurity. Professor Biasse is the first director.

Mohamed Elhamdadi Receives a Simons Grant



Professor **Mohamed Elhamdadi** was awarded a \$ 42,000 Simons Grant over five years for a project on *Algebraic Structures in Knot Theory*. These algebraic structures, called “Quandles,” are fundamental in distinguishing knots (one of the main problems of knot theory) and have been used recently to study protein folding properties.

Wen-Xiu Ma Chosen to Lead New Journal



Professor **Wen-Xiu Ma** was appointed by Elsevier in March 2020 to serve as the first editor-in-chief of the journal [Partial Differential Equations in Applied Mathematics](#). This new journal seeks to provide a platform for the rapid circulation of original research in applied mathematics and science that utilizes partial differential equations and related techniques.

Professor Ma is also on the Clarivate Analytics list of Highly Cited Researchers for the sixth consecutive year.

Abdulmelik Mohammed Awarded AMS-Simons Travel Grant



Abdulmelik Mohammed is a postdoctoral scholar at USF, and he was awarded an [AMS-Simons Travel Grant](#). These grants are administered by the American Mathematical Society with support from the [Simons Foundation](#). Each grant provides an early-career mathematician with \$2,500 per year for two years to be used for research-related travel. The grants program acknowledges the importance of research interaction and collaboration in mathematics, and aims to facilitate this for recent Ph.D. recipients.

Joel Rosenfeld Wins Three Grants



In his first year here, Joel A. Rosenfeld has been awarded three grants; two from the Air Force Office of Scientific Research (AFOSR) and one from the National Science Foundation (NSF). His work focuses on connecting function theoretic operator theory with that of data driven approaches to learning in dynamical systems. One reviewer wrote that "Not only is the approach novel but the topic is an ambitious attempt in this segment..." The grants are:

1. From the AFOSR Young Investigator Research Program (YIP) of \$450,000 on Hilbert Spaces from Occupation Kernels and Learning in Nonlinear and Nonlocal Dynamical Systems.
2. From the NSF, with Rushikesh Kamalapurkar at Oklahoma State University and Taylor T. Johnson at Vanderbilt University, Collaborative Research: Operator theoretic methods for identification and verification of dynamical systems. Professor Rosenfeld is the principal investigator, and USF's share of the \$688,856 award is \$229,350.
3. From the AFOSR, with Rushikesh Kamalapurkar at Oklahoma State University, Operator theoretic methods for data-driven control synthesis. Professor Rosenfeld is a co-principal investigator, and USF's share of the \$455,222 award is \$221,468.

Professor Rosenfeld has been posting videos on his research and teaching on his You-Tube channel, [ThatMathThing](#).

Student News

Florida Epsilon Chapter of Pi Mu Epsilon: Inductions, Awards, Elections, and Events

USF Math students selected to Pi Mu Epsilon membership this year included James Harbour, Lara Lahey, Jessica Newman, Shani Nuyts, Gitte Ost, and Chien Truong. However, the 2020 Induction Banquet for new PME members had to be cancelled due to the Corona-virus pandemic.

Winners of the 2020 PME Outstanding Scholar Award were Patrick Collard, and Boyoon Lee. This award is given every year to USF graduating math students representing academic excellence and dedication to mathematics.

PME officers for the 2019-2020 academic year were Jaeden Ayala (President), Deanna Ramnarine (Vice-president), and Alexa Scott (Treasurer). They helped organize and host the Fall/2019 Hillsborough County Math Bowl, a half-day of mathematics competitions for Hillsborough County High Schools students, hosted by PME and the USF Dept of Mathematics & Statistics.

USF Student Chapter of the Mathematical Association of America (MAA)

The USF Student Chapter of the Mathematical Association of America (MAA) held one-hour math problem-solving sessions every Thursday afternoon of the academic year. Math Club officers Alexander Mercier (President), and Keller Blackwell (Vice-president) hosted these meetings with the help of Math Dept visiting scholar Dr. Anamaria Iezzi.

The MAA math club co-hosted a well-attended fall semester Math Picnic at the USF Riverfront Park.

Math Club Vice-president Keller Blackwell continued his impressive run of academic awards by winning in March a Stanford University Knight-Hennessy Scholarship, and an NSF Graduate Research Fellowship to help fund his graduate studies in Computer Science at Stanford University starting in fall of 2020. Last year he had won the PME Outstanding Scholar Award, and a Barry Goldwater Scholarship to help him in his math undergraduate studies at USF.

The Graduate Mathematics Seminar

The [Graduate Mathematics Seminar Series](#) was organized by and for graduate students. They meet weekly, and a typical meeting consists of a talk by a graduate student on their current area of research. The talks are meant to be accessible to graduate students, and to serve as a means to promote discussion.

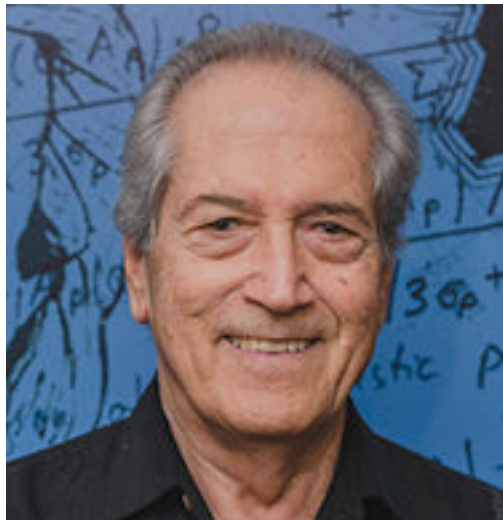
For first and second year graduate students, the seminar serves as an introduction to the kinds of research the department has to offer, provided by fellow graduate students. Since the seminar is student-led, the environment better facilitates questions and discussions from students, and is a good opportunity for newer graduate students to interact with other students in the department.

For more advanced graduate students, the seminar provides a forum for students to practice their communication skills and prepare for upcoming conferences or talks in a more relaxed environment. And it provides a place for students to discuss their research with their peers and exchange ideas or collaborate.

Transitions

Departures

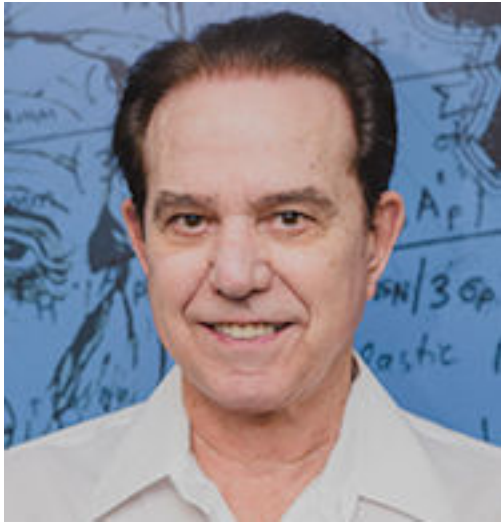
Six of our permanent faculty are departing USF, and we wish them well on their further adventures.



Manoug Manougian arrived at USF in 1968 with a fresh Ph.D. from the University of Texas. He served as chair from 1974 to 1984. He was active in science education, becoming the director of the USF STEM Education Center, which offers a summer program for high school students, and the faculty advisor for the Society of Aeronautics and Rocketry (SOAR), which has won several NASA-sponsored awards (he had been the founding director of the Haigazian College Rocket Society from 1960 to 1966). He is also active in social issues, being a co-author and associate producer of a documentary on "The Genocide Factor," and being active in the Center for the Study of Family Violence.



Rumiya Masagutova arrived at USF in 2012 after a decade in the USA. Originally from the USSR, she received her Ph.D. in physics and mathematical sciences from the Abram Ioffe Physical-Technical Institute of the Russian Academy of Sciences in 1981 and served as a professor at the Tashkent University of Economics; when she arrived, Tashkent was in the USSR, and when she left, it was the capital of Uzbekistan. After getting a Master's in mathematics from New Mexico State University, she worked in several positions across the USA before arriving at USF, where she became a visiting instructor in 2013 and an Instructor I in 2018.



Marcus McWaters joined the USF faculty in 1966, and for many years has been one of the two most longest-serving faculty at USF. He had received his Ph.D. from the University of Florida, and he was a topologist by training, but later he got involved in computer-aided instruction and computational video. He also co-authored a series of lower division textbooks with the late Jogindar Ratti. In addition, he served as associate chair during the mid-1990s, and was elected chair in 1998, and he served as chair until 2014.



Scott Rimbey joined the USF faculty in 2000 after serving, among other things, as an assessment specialist at the Educational Testing Service and on the technical staff of Rockwell Corporation. A USF alumnus (Magna Cum Laude) in math and physics, he received his Ph.D. in applied math from UCLA in 1984. He served USF in many ways, notably as departmental associate chair for eleven years.



USF shared **Vilmos Totik** with the University of Szeged since 1989. While at USF he was very active; until his retirement in 2020 he served on six editorial boards, wrote six monographs, a research problem book, and over 200 papers on a variety of topics. He received numerous awards for his research and writings; in particular, he is a member of the Hungarian Academy of Sciences. From now on he is one of our emeritus professors.



Yuncheng You joined the USF faculty in 1990. He received the B.S. degree in Mathematics in 1968 from Fudan University in Shanghai and then worked in a metallurgical company until 1977. He received the M.S. degree from the Institute of Mathematics of Fudan University in 1982. He came to the United States in 1986, received his Ph.D. from the University of Minnesota in 1988, followed by two years in Purdue University as a Research Assistant Professor. Since his arrival in USF, Dr. You has had a distinguished career in the research on partial differential equations, infinite-dimensional and stochastic dynamical systems, mathematical biology, and recently on complex neural networks.

Promotions



Jean-François Biasse has been promoted to Associate Professor with tenure. Professor Biasse came to USF in 2015 as part of Florida's cybersecurity initiative. He had received his doctorate from the Ecole Polytechnique after receiving two baccalaureate and two masters' degrees from the University of Paris, the École des Mines de Paris, and the École Normale Supérieure. He is a very active researcher in cybersecurity (see the account in the [2016 Quaternion](#)) as recognized by his bringing \$1.3 million in external funding to USF (including an NSF CAREER Award). He has performed many services to the mathematical community, in particular, he is an associate editor of the [International Journal of](#)

[Computer Mathematics: Computer Systems Theory](#) and is a co-founder and Director of the Center for Cryptographic Research at USF. He also co-founded the CodeBreakHERS cybersecurity camp for young girls, which runs annually at USF.



Mohamed Elhamdadi has been promoted to full Professor. An alumnus of the University of al-Qarawiyyin (the oldest institute of higher education in the world, in Fez, Morocco) and the University of Nice-Sophia Antipolis, Professor Elhamdadi came to USF in 1999 as an adjunct and gradually rose through the ranks. His research has focused on low-dimensional topology, especially knot theory, with applications in biology, physics, and other areas of mathematics. His service to the community includes being an editor of [Open Mathematics](#). And he is fluent in Arabic, English, French, and Spanish.



Lu Lu has been promoted to Associate Professor with tenure. Professor Lu received her Ph.D. from Iowa State University in 2009. Then she was a postdoctoral research associate at Los Alamos National Laboratory. She arrived at USF in 2013 as a visiting professor and was hired as an assistant professor in 2016. She is a prolific researcher in statistics with 50+ publications and a co-authored book titled "Statistical Roundtables: Insights and Best Practices". She has received several awards and also serves on the editorial board of *Quality Engineering*.

The *Quaternion* is an annual publication of the Department of Mathematics & Statistics at the University of South Florida-Tampa.

The department serves the community by teaching students, conducting research that will help build the future of Florida, and providing outreach services.

We'd Like to Hear from YOU!

The Department of Mathematics & Statistics would like to hear from alumni, friends, collaborators, members of the community, and fellow explorers of and guides to the world of mathematics and statistics.

Department of Mathematics & Statistics
University of South Florida
4202 E. Fowler Ave., CMC342
Tampa, FL 33620

Phone: (813) 974-2643
Fax: (813) 974-2700

Web page: <http://www.math.usf.edu>