The Quaternion

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The Newsletter of the Department of Mathematics and Statistics

Mathematics and Cybersecurity at USF

The Internet may have been a curiosity in the

economy. According to the McKinsey Global Institute, in 2009 the Internet accounted for 3.4 % ctivity, more than education or agriculture. According to the Boston Consulting Group, in 2010 the Internet accounted for 4.7 % of the US economy, more than the federal government. The Internet is growing about 10 % a year, and that attracts a wide variety of entrepreneurs. That includes criminals.

As the old line goes, Willie Sutton robbed banks

And spies, saboteurs, and vandals. In 2014, McAffee estimated
world economy about half a trillion dollars a year.

The Florida state government responded by creating the *Florida Center for Cybersecurity* (fc^2), based at the University of South Florida, with supporting programs throughout the State University System. The USF program is a *National Center for Academic Excellence in Cyber Defense*,

by the National Security Agency. It includes a program for preparation for *the Certified Information Systems Security Professional* (CISSP) certificate.

This is an interdisciplinary program, spanning the colleges of Arts & Sciences, Behavioral & Community Sciences, Business, Education, and Engineering.
two hundred thousand positions that will go
[2] Managing Director **Sri Sridharan**, who anticipates one to two million new

Contents

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Mathematics and Cybersecurity at USF

Continued from page 1

computer, or even hold it for ransom. There is no absolute test to check if an email contains a Trojan: in 1989, William Dowling observed that from

can exist. We are stuck in a perpetual arms race with the hackers.

Professor Xiong works on the question: upon receipt of a message allegedly sent by goodmachine.org, what does one do with it? Servers handling messages need increasingly sophisticated tests to detect increasingly sophisticated hacks, while not blocking legitimate messages needed to keep the network running.

legitimate messages are accepted while illegitimate messages are not.

Encryption is part of cryptography, the mathematical foundation for engineering secure computing and communications systems and protecting them from hacks. The underlying model of encryption is to allow two people to

Mathematics and Cybersecurity at USF
Continued from page 2

has to communicate with robots billions of miles from Earth.) Meanwhile, they are developing the foundations for securing keys and keeping ahead in the arms race with the hackers.

The demand for cybersecurity is only going to increase, and USF will be at the forefront of meeting this demand.

Transition

Xiang-dong Hou has stepped down as Graduate Program Director after five years. He is succeeded by **Brian Curtin**. We thank Professor Hou for his service.

Lu Lu has been reassigned as a tenure-track assistant professor. She received her Ph.D. in statistics from Iowa State in 2009, and a post doc at Los Alamos, USF hired her as a visiting assistant professor in 2013.

Dima Savchuk was awarded tenure and promoted to associate professor.

Stephen Suen has retired after 23 years at USF. A student of Geoffrey Grimmett at the University of Bristol, he applied probabilistic methods to solve problems in combinatorics and algorithms, particularly in graph theory. In 2014, he became Associate Chair. We wish him well on his future adventures.

Meanwhile, **Scott Rimbey** is returning to the

This August was the golden (fiftieth) anniversary for **Marcus McWaters**, who came to USF in 1966. He is one of two USF faculty who have served half a century at USF.

Rebecca Wooten has left the University of South Florida after 25 years, first as a tutor for Project Thrust and a graduate student, later as an adjunct and then an assistant professor. A student of **Chris Tsokos**, she continued her work in applied statistics at USF while helping out in the Urban Scholars Outreach Program and many other efforts. We wish her well on her further adventures.

Departmental News

The Department is the home for a new interdisciplinary **Center for Complex Data Systems** (CCDS), under the direction of **Les** [illegible] departments of Chemistry, Economics, Geosciences, and Physics, as well as Research Computing. It has started a new Distinguished Scholar Lecture Series, and this spring invit Lecture 324.07

Departmental News
Continued from page 3

The Department and the Pi Mu Epsilon honor society hosted the two Hillsborough County Math Bowls during the last academic year. **Fernando Burgos** and **Paul Thorne** (for the high schools), assisted by Fred Zerla, oversaw the bowls. Both times, King High School took first place.

Ken Ono, the Asa Griggs Candler Professor of Mathematics at Emory University, delivered the Kent Nagle Lecture last March. He spoke on the life and work of Srinivasa Ramanujan, an amateur mathematician who developed some of the deepest mathematics of the 20th century. Ono was an associate producer for the 2016 biographical film *The Man Who Knew Infinity*, starring Dev Patel as Ramanujan.

L to R: Jeffrey Nagle, Ken Ono, and Sandra Nagle.

The Nagle Lecture Series was established in honor of the late R. Kent Nagle, who was deeply interested in mathematics in scholarship, education and society.

Faculty News

Jean-François Biasse was awarded a five-year $ 35,000 grant from the Simons Foundation for project in *Algorithms in Number Theory, Quantum Information, and Cryptography*.

Arthur Danielyan, **Seung Yeop Lee**, **Razvan Teodorescu**, and **Sherwin Kouchekian** received a $ 25,000 NSF grant to host 32nd Southeastern Analysis Meeting at USF.

Dima Khavinson and **Catherine Beneteau** received a $ 25,000 NSF grant to organize an international summer school on *Spectral Theory and its Applications* that was held at the University of Laval in Canada.

Wen-Xiu Ma
Highly Cited Researchers list.

Manoug Manougian was invited to the *Global Aerospace Summit* in March at Abu Dhabi.

Vilmos Totik was elected a fellow of the American Mathematical Society
to classical analysis and approximation theory and for exposition.

Kaiqi Xiong received $ 750,000 from BBN Technologies and the National Science Foundation for cybersecurity research and education.

We also have a picnic every fall. From left to right, Alan Sola (now at Stockholm University), Mile Krajcevski, Fernando Burgos, and Dulce Garcia.

Student News

The USF Chapters of the Mathematical Association of America and Pi Mu Epsilon honor society met biweekly over pizza this last year, where they heard presentations by faculty and students. Math club members attended the 2015 MAA Suncoast Meeting at Florida Polytechnic University on December 4 and the 2016 MAA Florida Section Meeting on February 26 & 27 at St. Leo University.

Continued on page 5

Student News

Continued from page 4

Lukas Nabergall made a presentation on *Patterns and Distances for Double Occurrence Words* at the Section Meeting. During that year, **Nicole Hudson** served as President of the Math Clubs, and **Anjanet Loon** as Vice President.

Sixteen students were inducted into Pi Mu Epsilon in April: **Corinne Barnes**, **Nathan Callihan**, **Anthony Cilluffo**, **Jennifer Cuartas**, **Kevin Dennis**,

Student News

Continued from page 5

Laude; and **Bruce Wong**.

Twelve students received MAs: **A. K. M. Bashar**; **Wei Chen**, *Analysis of Rheumatoid Arthritis Data Using Logistic Regression and Penalized Approach* under **Dan Shen**; **Gregory Churchill**; **Jeremy Kerr**, *On the Number of Colors in Quandle Knot Colorings* under **Mohamed Elhamdadi**; **Shanna Lindemeyer**; **Josiah Park**, *Generalized Phase Retrieval: Isometries in Vector Spaces* under **Boris Shekhtman**; **Jonathan Spiewak**, *Leonard Systems and their Friends* under **Brian Curtin**; **Yue Sun**, *Resonant Solutions to (3+1)-Dimensional Bilinear Differential Equations* under **Wen-Xiu Ma**; **Hongliang Wang**; **Tae Hyon Whang**; **Yun Yun**; **Xiaochuang Zhao**, *Ensemble Learning Method on Machine Maintenance Data* under **Dan Shen**.

And three students received PhDs: **Joy DôAndrea**, *A Statistical Analysis of Hurricanes in the Atlantic Basin and Sinkholes in Florida* under **Rebecca Wooten**; **Venkateswara Mudunuru**, *Modeling and Survival Analysis of Breast Cancer: A Statistical, Artificial Neural Network, and Decision Tree Approach* under **Lesȝaw A. Skrzypek**; and **Vindya Pathirana Arachchilage**, *Nearest Neighbor Foreign Exchange Rate Forecasting with Mahalanobis Distance* under **Kandethody Ramachandran**.