C(c) News

The Newsletter of the Mathematics Department at the College of Charleston

"Changing of the Guard"

The College has recently hired Andrew Hsu as its new president. We are also seeking new deans and a new provost. There are big changes happening in the math department's administration, too!

Bob Mignone is stepping down from his position as department chair after 12 years at the helm. He looks forward to returning to being "just a professor" so that he has time to dedicate to his research area, mathematical logic. And, **Debby Jeter**, who has been the associate chair for 7 years, is retiring from academia with plans to spend more time traveling with her husband and playing music with her band.

Taking over are new chair **Liz Jurisich** and new associate chair **Kate Owens**. The department congratulates and heartily thanks all four of these hard working faculty members!
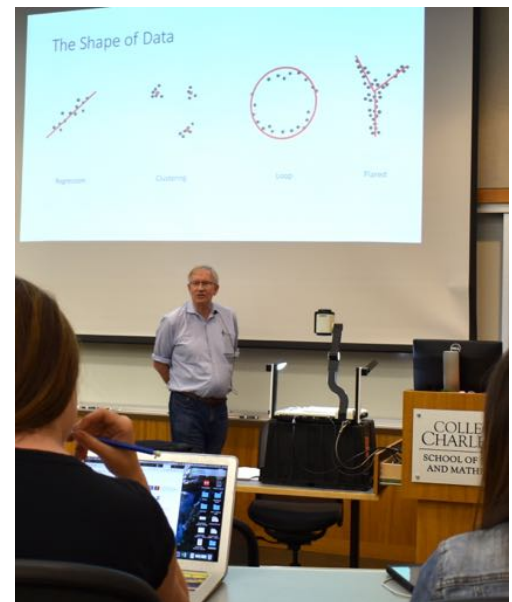
Liz Jurisich and Bob Mignone, the incoming and outgoing chairs of the math department

C of C Math Department Runs Major TDA Conference and Workshop

Two of the biggest challenges facing the fields of statistics, mathematics, and computer science in the 21st Century are trying to make sense out of really huge data sets and teaching computers to recognize patterns or images. *Topological Data Analysis (TDA)* is a new field that applies the very abstract mathematics of *algebraic topology* to these sorts of questions.

Keynote speaker Gunnar Carlsson explains the uses of topology, which studies the connectedness of geometric objects, in data science.

The *NSF-CBMS Conference and Software Day on Topological Methods in Machine Learning and Artificial Intelligence* held at the College of Charleston during May 2019 brought together experts in this hot new area with those wishing to learn it. In this way, the conference, co-organized by math professors **Annalisa Calini**, **Ben Cox**, and **Liz Jurisich** both helped spread familiarity with established TDA techniques and enabled the discovery of new ones. (In addition, this successful conference surely further enhances the CofC Math Department's growing international reputation for excellence!)

Faculty Arrivals and Departures

We are pleased to welcome several new faculty members to the Department of Mathematics.

Mustafa Hajij and **Daniel Maroncelli** have both been hired as assistant professors in our department. Hajij, who comes to us following a postdoctoral position in the Computer Science department at Ohio State University, is an expert in topological data analysis. Maroncelli is a familiar face on campus, as he has been here in a visiting position, and his research applies functional analysis to questions in differential equations.

We also welcome **Rachel Hunter** who holds a master's degree in mathematics from The Citadel and has been hired into our department as an instructor.

And we bid a fond farewell to two retiring faculty members: **Debby Jeter** and **Gil Lauzon**. The CofC math department is *grateful* to them both for their many years of dedicated service to the College and its students.

COLLEGE *of* CHARLESTON

This newsletter is a production of the Department of Mathematics at the College of Charleston. It was edited by Alex Kasman. Write to him with news to include in future issues, questions, or concerns at kasmana@cofc.edu.

The Mathematics of Gravity Waves

Our keynote colloquium speaker for 2018-2019 was University of Michigan mathematician **Lydia Bieri** who spoke to us about her cutting-edge research on gravity waves.

Gravity waves were a hot topic in 2019 because they have were experimentally detected for the first time. But, as theoretical objects, they already have a long history. Albert Einstein conjectured gravity waves might exist and mathematician Yvonne Choquet-Bruhat proved in 1952 that they are a mathematical consequence of General Relativity.

Professor Bieri, who was born a raised in Switzerland before moving to the USA, has continued the theoretical study of gravity waves begun by Einstein and Choquet-Bruhat. Among the more surprising discoveries that she reported to us is that gravity waves leave a lasting impression; even after a wave passes, it leaves things slightly different than they were before.

Kudos
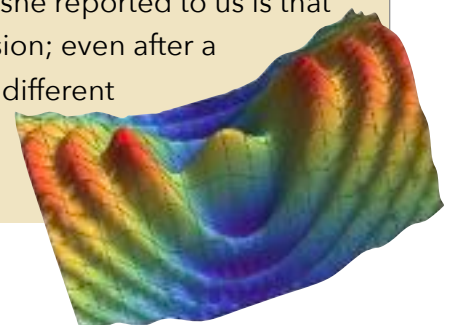
Students:

The Susan Prazak Award for Future Teachers is given annually in honor of Sue Prazak, who taught at CofC from 1972 to 1999. This year's recipient of the Prazak award is **Joe Casagranda**.

The Ewa Wojcicka Award is our departments top award, given in memory of Professor Wojcicka to a recipient showing exceptional ability, creativity and potential in mathematics. This year's recipient of the Wojcicka award is **John Cobb**.

The Scott Ward Award, given each year to a math major displaying outstanding ability in math and a commitment to connect mathematics to another discipline, goes this year to **Blaine Billings**.

The Mathematics Department's 2019 Outstanding Student Awards went to **John Cobb, Jay Van Raalte, Posy Olivetti, Blaine Billings, Caroline Copeland, Bridget Ierace, Shoshana Berkowitz, Michael Lanier, Elaine Todd, Payden Shaw, Choral Linhart, Allyson Lesher,** and **Erin Langenstein**.

Math grad student **Emma Collins** received the Amy T. McCandless Fellowship and **Zach Wirszyla** received the Principal Fellowship from the Graduate School.

Graduating math and chemistry double-major **John Cobb** was awarded the highly competitive National Defense Science and Engineering Fellowship from the U.S. Department of Defense. This fellowship, which provides 3 years of full tuition, a stipend, insurance and $5000 in travel funds, aims to increase the number and quality of our nations scientists and engineers. John will be using this support to attend the University of Wisconsin's math PhD program.

Faculty:

The six plenary speakers at the 11th International Conference on Mathematics and Mathematics Education in Developing Countries was held in Laos included Michael Dorff (president of the Mathematical Association of America), Kenji Ueno (a well-known Japanese algebraic geometer), and the CofC Math Department's combinatoricist **Dinesh Sarvate**. Professor Sarvate is pictured here with the Minister of Education and Sports, Madam Sengdeuane Lachanthaboune.

Congratulations are also due to **Professor Sarvate** for being one of two recipients of the *Michael J. Auerbach Award* from the School of Sciences and Mathematics this year. This prize, named in honor of the recently retired Dean of SSM and awarded this year for the first time, is given to faculty members who excel in conducting and publishing research with undergraduate students.

congratulations, y'all!

Annalisa Calini has been asked by the National Science Foundation to serve as Applied Mathematics Program Director in the Division of Mathematical Sciences for the 2019-2020 academic year. Professors **Tom Ivey**, **Bev Diamond** and Calini herself have all previously served in this important position.

Answer to Math Meet question from Page 5: $\dfrac{x+1}{x^3-1}$

TDA Conference and Workshop (continued from page 1)

The main event for the audience members who came from around the country and around the world to participate in this conference at CofC were a series of lectures by Stanford professor **Gunnar Carlsson** (see photo below).   In addition, after each day's lectures there were working groups on topics like "*Applications of the Mapper Algorithm in Medicine*" and "*Persistence Diagrams in Image Processing*".

The format was completely different for the final day of the conference, advertised as "Software Day".   Key developers and power-users of TDA software, **Henry Adams** (Colorado State University), **Jessi Cisewski-Kehe** (Yale University) and **Jisu Kim** (Inria Saclay, France) began Saturday's schedule with demonstrations of the power of existing software packages that perform these techniques. Then the participants broke down into separate groups to work on what were called "coding sprints".   Like the working groups from earlier in the week, these groups both sought to educate and to advance the cutting edge, but now focusing on the software rather than the theory.   Coding Sprint titles included "*Bug hunt for Scikit-TDA*", "*Ripser applied to cyclo-octane molecule and optical image patches*", and "*Example Generation Hackathon*".

The expenses of the conference were covered by the following generous sponsors: The National Science Foundation, The Conference Board of the Mathematical Sciences, an Anonymous Donor, the Lowcountry Graduate Center, the newly established M.S. Program in Data Science and Analytics, and Hawkes Learning Systems.

The conference, which was held in the atrium and auditorium of the School of Sciences and Mathematics Building, was a huge success. Thanks to the sponsors and for everyone at CofC who contributed to the effort!

Co-organizer Ben Cox with Gunnar Carlsson

One of the Working Groups

Co-organizer Annalisa Calini with Henry Adams

Co-organizer Liz Jurisich with President Hsu

Graduate Program News

CofC has offered Master's Degrees in mathematical sciences for decades. Under the leadership of co-directors **Annalisa Calini** and **Martin Jones,** it also added a statistics concentration and a "4+1" program through which undergraduate students can earn a bachelor's degree *and* a masters degree in mathematics in only 5 years. Now, thanks largely to their hard work, it seems quite likely that the math department will also soon be offering PhDs in mathematics. The very small PhD program, designed to synergistically enhance our undergraduate program, would be the first doctoral degree of any kind offered by the College of Charleston if it is approved at the state level in this coming year. We are hoping to admit our first PhD candidates in Fall 2020.

Professors **Alex Kasman** and **Jiexiang Li** will be taking over as co-directors of the graduate program as of Fall 2019. With assistance from the outgoing directors, who will help with recruitment as well as shepherding the PhD proposal through its final stages, they will ensure that the CofC Math Graduate program continues to provide a phenomenal education in mathematics and statistics to the students it enrolls while also expanding the advanced course offerings available to our undergraduates.

In the 2018–2019 academic year, **Sean Rogan** graduated from with a Certificate in Statistics and **Tristan Aft, John Allen, Colin Alstad, Wallace O'Rear, Daniel Rich, Albert Serna, Vladislav Sytchev,** and **Spencer Wilder** all received Master's Degrees in the Mathematical Sciences.

For more information, please contact the program co-directors at kasmana@cofc.edu and lij@cofc.edu.

C of C Math Meet 2019

Our annual math contest for high school students co-directed by **Garrett Mitchener** and **Kate Owens** was held on February 23, 2019. The t-shirt featured diagrams of powers of real and complex numbers mod 7 (as in the figure shown here). We welcomed a total of 37 teams from South Carolina, North Carolina, and Georgia to campus. The Charlotte Math Club came in first and Charlotte Latin second in *Varsity Team Elimination*. The winning teams for the *Written Test* were Community House Middle School (level 1), Hammond School (level 2), and the Charlotte Math Club (level 3). Thanks to the Departments of Mathematics, Physics, Chemistry, and Computer Science for making the event a success!
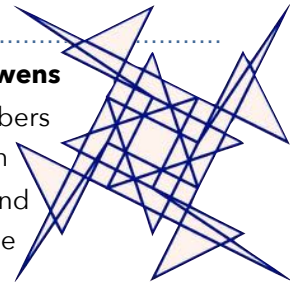
$\{$ *Can you answer this Math Meet question?* On the interval $(-1,1)$ the function $\dfrac{x-1}{x^3+1}$ can be written in the form $f(x)+g(x)$ where f is even and g is odd. Find $f(x)-g(x)$. *(Answer appears at the bottom of page 3.)* $\}$

Student Research Update: Three Prizes for Three Students

If you read the last issue of this newsletter, then you learned about a summer research project conducted by undergraduates **Monique Sparkman** and **John Cobb** along with graduate student **Albert Serna** and Professor **Alex Kasman** which studied quaternion-valued KdV solutions.

In the year since, all three students won separate awards for their presentations of their research! Serna at the "3MT" contest where students must present the idea behind their thesis in only 3 minutes, Sparkman for her presentation at the statewide SCAMP conference, and Cobb for his poster at the Joint Mathematics Meetings. Their results have since been combined into a paper and submitted to the *Journal of Mathematical Physics*.

<u>Mission Statement:</u> Mathematics is an art, a pure reflection of the human mind. Mathematics is the language of science. It provides powerful tools for understanding our world. Mathematical reasoning and the critical thinking skills that develop with the study of mathematics are foundational necessities for an educated workforce and citizenry in the 21st century. In support of these principles the Department of Mathematics will offer a varied curriculum with flexible programs. The Department will recruit a distinguished faculty of dedicated teacher-scholars, who through teaching seek to impart mathematical knowledge, skills, and critical reasoning, as well as a sense for the utility and beauty of mathematics; and through scholarship will seek to fulfill the professional responsibility of expanding mathematical knowledge and applications, while providing students opportunities for original research. All mathematics courses, whether a part of the general education core curriculum; degree requirements in the sciences, social sciences or business; or for mathematics majors, will have as a goal a transformational learning experience. Students majoring in mathematics will benefit from small classes, personal attention, and a curriculum that allows for concentration in several key sub-disciplines and pre- professional tracks, preparing them for a variety of careers, further study at the graduate level, and the pursuit, for its own sake, of learning the oldest of the liberal arts.

A Message from Bob Mignone, Math Department Chair

The College of Charleston, like public institutions throughout the country, are increasingly called upon to rely on non-tax based sources to operate and maintain the levels of quality, value and impact that their students, alumni and communities expect. Now more than ever philanthropic giving is critical for us to continue to achieve our goals of education, research and service to the community. Please consider giving to one of these four funds:

R330 General Math Department Fund   **R520 Math Graduate Program**
R342 Ewa Wojcicka Memorial Math Award Fund   **E373 Prazak Award for Future Math Teachers**

You can make a donation via credit card by visiting http://giving.cofc.edu/math.

Or you can pay by check and mail it to *College of Charleston Foundation / 66 George Street / Charleston, SC 29424.* (Make your check out to "College of Charleston Foundation" and be sure to indicate the fund that you are donating to in the memo and in the cover letter.)