

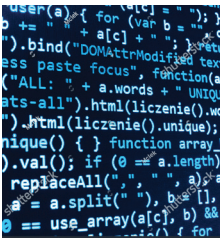
CONTENTS

Department chair contributes to Collision



2

Cresswell-Clay: Grad made good



4

Gannon does community outreach



6

New grad students



Scientific Computing chair Gordon Erlebacher, helped shape Florida State's University's research response to the coronavirus pandemic. Now he has been awarded a grant for a project that studies COVID-19.

Initially, Erlebacher's contribution was at the preliminary stages of the spring Collaborative Collision, as he originally proposed the idea for having a university-wide virtual event exclusively focused on research projects on the novel coronavirus. After that conversation, Mike Mitchell, Program Manager of Strategic Initiatives and Proposal Development in the Office of Research Development, took Erlebacher's idea and created their first Collaborative Collision over Zoom. "It's especially important to thank Dr. Gordon Erlebacher of FSU's Department of Scientific Computing for first suggesting the idea of a Collaborative Collision focused on COVID-19," said Mitchell. A global crisis stimulated the university to pull together and look for cross disciplinary synergies that address the health, social and economic impacts of the COVID-19 pandemic.

Collaborative Collisions were created to bring faculty from across campus into a single location to share their research in a common area, to create partnerships across disciplines to form a creative commons – a place to cross pollinate ideas and conduct research with fresh eyes. Along with faculty from across the research spectrum, Erlebacher attended the collision; this led to a

partnership with Xiuwen Liu, Professor in the Department of Computer Science, and Shuyuan Mary Ho, Associate Professor in the School of Information. Together, the team proposed a research project, Achieving Economic Normality and Public Health via Deep Learning Modeling and Contact Tracing, and have been awarded \$20,000 for a short-term (90 day) research and planning a project for the summer.

The core component of the proposed research is to develop data-driven time-dependent transmission models for COVID-19 using deep neural networks, as these neural networks have solved other challenging problems in the last several years,



Scientific Computing Chair, Gordon Erlebacher

continued, see Erlebacher, page 7

Scientific Computing doctoral grad awarded Fulbright

Cresswell-Clay received doctorate December 2019

A Scientific Computing doctoral graduate has been awarded one of two Fulbright Early Career Awards to carry out postdoctoral studies in Spain. Evan Cresswell-Clay, a December 2019 Ph.D. grad, was notified of the award on February 27th by the J. William Fulbright Foreign Scholarship Board. The Board is responsible for approving the selection of all Fulbright recipients and for supervising the program worldwide.

Cresswell-Clay's award is to carry out postdoctoral studies in Spain. He became aware of and wanted to apply for the prestigious award after hearing a lecture during one of the department's weekly colloquiums. His initial

interest in the Fulbright began as a way to continue a collaboration he had with Dr. Maurizio De Pitta of the Mathematical, Computational & Experimental Neuroscience Group from the Basque Center of Applied Mathematics (BCAM) in Basque, Spain. "First, I really wanted to work with Dr. De Pitta since his models on glial calcium signaling have been at the core of my doctoral work. In addition, I relished the opportunity to work at BCAM because they are conducting exciting research on how the brain represents information. In this regard, I feel that I can leverage my research agenda within BCAM's research culture. As a result, the Fulbright scholarship seemed like a natural fit. As a

young scientist, I am honored by the award of a Fulbright Fellowship. For me it is a unique opportunity to learn about the Basque, Spanish and European cultures, academically and beyond. Not only will I be able to work with premiere researchers in my field at a research institute that I admire, but I look forward to the opportunity to experience life in Europe, especially in a country where I've always wanted to live," said Cresswell-Clay. Because the initial research became part of his dissertation, the Fulbright award project closely mirrors and extends that work.

Cresswell-Clay began his graduate studies at the Department of Scientific Computing in the Fall of 2014, after completing his undergraduate degree in applied mathematics at the University of Pittsburgh. During that time, he actively pursued research and learning opportunities outside the university, landing a summer internship at the Pittsburgh Supercomputing Institute and an eight-week training program at Princeton University. In Pittsburgh, Cresswell-Clay created a Python interface for MCell, software that leverages spatially realistic 3-D models and specialized algorithms to simulate movements and reactions of molecules within and between cells. At Princeton, he took a two-month NAND gate skill enhancement training. He dedicated some of his time in graduate school to volunteer as a youth soccer coach for the City of Tallahassee.

"From the first day I met him in 2014, Evan expressed a desire to study biological systems with a view towards helping the people around him," said

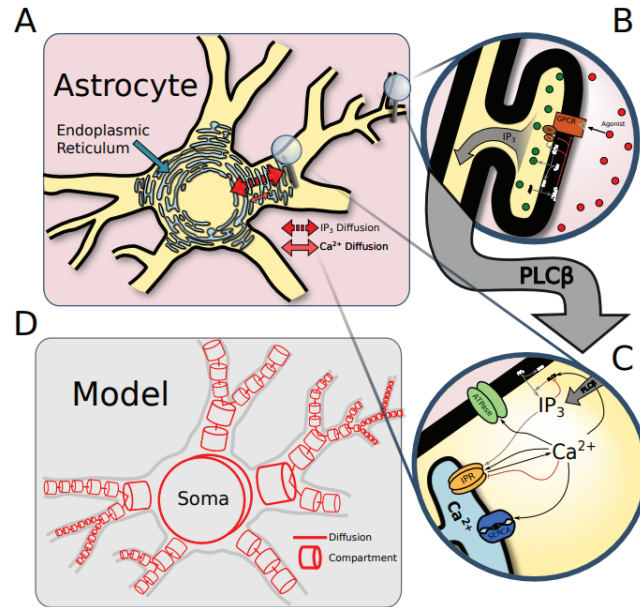


Evan Cresswell-Clay, Ph.D.

Scientific Computing department chair Gordon Erlebacher. “Since then, he has grown as an independent researcher accumulating expertise across disciplines as diverse as biological modeling, computer modeling, and software engineering. Along his path to graduation, he digested an impressive amount of literature on the neurobiology of glia, now a core asset of his competitive professional profile. As a result, Evan is well positioned to contribute to the nascent field of astrocyte modeling. As his advisor, I am very proud of Evan’s achievements, and expect many great contributions in his future.”

Applied mathematics, computational science and computational modeling are natural allies. Cresswell-Clay considered his interest in medicine and its possibilities as an extension of his studies to conduct research into the effects of neural activity on calcium concentration in astrocytes. Astrocytes are cells in the brain and spinal cord that perform many essential complex functions in a healthy central nervous system, such as supporting the blood-brain barrier and assisting with repairing injuries to brain and spinal cord.

The interaction mechanisms between astrocytes and neurons and how they contribute to information processing is an emerging topic among the neuroscience community. These mechanisms focus on the inner workings of the astrocytes, which are a type of non-neuronal cell in the brain. As methods for observing the brain continue to improve, these cells are gaining greater attention and research because of the pivotal role they play in higher level learning and cognition (mental processes). In addition, evidence suggests that astrocytes could act as therapeutic targets in several neurodegenerative



Above: Astrocyte response to neuronal activity.

diseases, such as Alzheimer’s and epilepsy. As a result, the neuroscience community is showing great interest in how these cells work.

“I think the Fulbright organization recognizes this potential and critical importance. The project I put forward will bring several research institutions together, both here in the US and in Spain. Dr. De Pitta and I are collaborating with Drs. James Schummers and Gordon Erlebacher, respectively, from Florida International University in Miami and Florida State University in Tallahassee. Dr. De Pitta will help me incorporate data from Dr. Schummers’ lab to extract statistics of calcium signals in relation with the complex branching anatomy of astroglial cells; Dr. Erlebacher will also lend his expertise to develop the computational framework of the model. This type of international collaboration is why the award exists. I personally find it worthwhile because contributing to an

increased understanding of these cells will have a positive impact on people’s lives,” stated Cresswell-Clay. “This to me is the great thing about mathematical biology. I’ve always enjoyed mathematics but it was important to me to have the potential to help people.”

Immediately following graduation, Cresswell-Clay began working at the National Institutes of Health in Washington, D.C. at the National Institute of Diabetes and Digestive and Kidney Diseases where he applies his medical and computational expertise to protein folding problems in Dr. Vipul Periwal’s Biological Modeling Laboratory. Cresswell-Clay’s work in computational modeling involves developing methods from information theory that infer tertiary protein structure by using protein sequence data from homologous protein families. “Protein structures are important because structural features can shed light on biological functions such as cell signaling and inferring

SC doctoral student creates community program

Back in the fall, SC doctoral student Ashley Gannon had an idea. She became interested in offering a community-based summer programming course to high school students, wondering whether that kind of workshop series – one that focused on teaching 9th – 12th graders how to code - was viable, and whether there would be enough interest and support to get it off the ground. She thought it through, then talked to her professor, Bryan Quaife, department chair Gordon Erlebacher, and Barbara Shoplock, a program director at FSU's Office of STEM Teaching Activities (OSTA). They all advised her to go for it.

"I vocalized the idea of Create with Code! around the beginning of last November with Dr. Quaife and Dr. Erlebacher, then worked with Barbara Shoplock as time allowed to get the camp fundamentals established," Gannon stated.

When Gannon met with Shoplock, they discussed and hammered out operational and administrative matters around the program. The Scientific Computing/OSTA partnership is critical for keeping operational expenses for staff, insurance, and transportation low so the course can be offered for at an absolute minimum cost. Shoplock informed Gannon of opportunities to promote the camp at local STEM events such as the Tallahassee Science Festival and Math Fun Day, cre-



DSC doctoral student, Ashley Gannon

ated and distributed memos to high schools in Leon County, and provided Gannon with a sample application from which to build. "Her wealth of knowledge has been beyond helpful."

Create with Code! (CwC) is envisaged as a weeklong summer initiative for Leon County high school students who are interested in science and programming. This program will

introduce students to Python for data visualization, machine learning, robotics programming, and Unity for game design. During the week, students can explore FSU's computing, entrepreneurship, and science resources, including the Research Computing Center, the Geophysical Fluid Dynamics Institute, and the Center for Intelligent Systems, Control, and Robotics (CISCOR), and the Innovation Hub.



The program is a joint effort between the Department of Scientific Computing and the Office of STEM Teaching Activities.

Students who enroll do not need to have programming experience; just an interest in learning, coding, science, and summer fun.

After meeting with Shoplock, Gannon created an application for the program, then spent time Spring semester working on all the pieces of the program. "I am currently working on curriculum development and setting up the college admissions session. I am also working on finding funding for laptops for the students to use, and on setting up several back-up plans in case funding does not come through for this. I plan to be one of the counselors during the camp."

Once Gannon sent out a call to other graduate students to ascertain interest in helping develop the curriculum for the program, many people signed up to assist. Receiving support from the scientific computing community has been and

remains an important part of developing and implementing the program; Gannon sought advice and counsel from people around the department and the university sciences. Others assisted too. "Bill Burgess has done a wonderful job creating and printing fliers for us to use while canvassing the camp," said Gannon. "Jack Fox, Jake Cherry, Ezra Brooker, Bryan Quaipe and Gordon Erlebacher advised me to do it. None of these people told me I was insane when I pitched them this idea. They all encouraged me to go for it, and so I did. I may not have without their initial support."

Two sessions of Create with Code! will be held online in July; 18 students are enrolled. Currently, Gannon and colleagues plan to cover intro to python, visualizing data, and game design. The camp will be run face-to-face in 2021 if circumstances allow.

If you are interested in joining the curriculum development team or are interested in being involved in other ways please email Gannon at ag12s@my.fsu.edu. For more, go to <https://www.bio.fsu.edu/osta/cwc.php> Facebook: https://m.facebook.com/profile.php?id=106487017489378&ref=content_filter

Create with Code! Participants & Contributors

Daryn Sagel facilitated the Geophysical Fluid Dynamic Institute's involvement in the camp by organizing, with Catherine Hancock's assistance - a tour of the lab and an experiment using the wave machine. Sagel played a significant role in fleshing out the details of the data visualization experiment; next year, the camp plans to incorporate a section on weather modeling. Sagel is the curriculum development lead for both the Data Visualization and Game Design modules. She helped create the camp logo and name.

Barbara Shoplock enabled the partnership between the Department of Scientific Computing and the Office of STEM Teaching Activities (OSTA). She is the Director of the Saturday-at-the-Sea Program (SATS) and Co-Director of the Young Scholars Program (YSP).

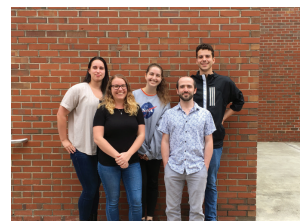
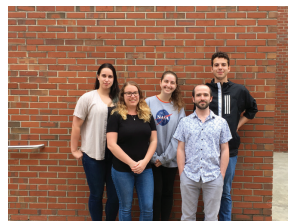
Curriculum Development Team:

Ezra Brooker: Ezra helped canvass at Math Fun Day and the the 2020 Providence Neighborhood STEAM Day and Summer Camp Fair. For the latter, he developed visuals of star explosions to show students, demonstrating the importance of programming for science applications. He is currently a curriculum development lead for the Data Visualization Module.

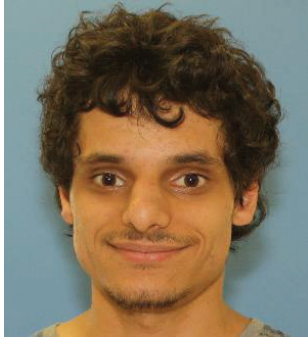
Jake Cherry helped construct a basic camp outline, which had several iterations of ideas and led to the current outline. He also helped Gannon apply for a grant, and attended the first couple meetings with OSTA and CISCOR. Cherry helped canvass the camp at the Tallahassee Science festival and Math Fun Day. He is a curriculum development lead for the Robotics Module.

Pankaj Chouhan canvassed at Math Fun Day. He is helping develop the Data Visualization module.

Alanna Mottesheard helped canvass at Math Fun Day, where she learned about this project, while helping Gannon run a room for a separate project - Computer Science Integrated in Middle School Mathematics (CSIMMs). She is a curriculum development lead for the Machine Learning module.



DSC welcomes new Fire Dynamics grad students



Bryan Azbill



Daniel Rosales Giron



Yang Wang

In concert with the Geophysical Fluid Dynamics Institute, the Department of Scientific Computing holds two new graduate majors – the Ph.D. in Geophysical Fluid Dynamics (GFD) or in Fire Dynamics (FD).

The GFD program is an interdisciplinary field that seeks to improve our basic understanding of fluid flows in nature. Some of the subdisciplines within this program include climate and paleoclimate, biogeochemical processes, hydrology, karst hydrodynamics, air-sea interaction, ocean dynamics, and hurricane dynamics. All have strong links to the Applied Mathematics Program and to Statistics. The Fire Dynamics degree program is about

the study of fire in nature as a fluid dynamical phenomenon, with complex physical, chemical, and turbulent interactions with the environment.

Please join us in welcoming our newest students.



With his move to Florida, Bryan Azbill has lived in eight states, including Utah, Nevada, New Mexico, California, Wyoming, Montana, and Arizona. After spending much of his childhood playing on his computer and exploring the west with the Boy Scouts, he attended the University of Utah in Salt Lake City. In 2016, Azbill received dual bachelors' degrees in pre-professional physics and applied mathematics.

While in Utah, he held teaching and tutoring positions, and did some applied research. Azbill researched wave-optic nanolithography with COMSOL multiphysics. He is interested in many subjects, including blockchain development, cryptocurrency market trading and algorithms, and machine learning. When he graduates with his masters degree, Azbill intends to work as a data

scientist in the Utah Valley. For now, he enjoys music, film, and novelty. "I really love high adventure, studying new and interesting disciplines, which is what drew me to interdisciplinary Computational Science, though after all my travels I'm actually looking forward to settling with something stable." Azbill plays the piano and violin.

Originally from Honduras, Daniel Rosales Giron received his undergraduate degree from the University of the South, in Sewanee, TN where he majored in physics and mathematics. While in Sewanee, he participated in a variety of projects involving Raman spectroscopy, a spectroscopic technique typically used to determine vibrational modes of molecules, and material sciences.

In 2017, Giron joined the newly created Fire Dynamics program at FSU with Dr. Kevin Speer as his advisor, and has worked on instrumentation, and fire spread model development and testing while collaborating with Tall Timbers Research Station. He is currently working on computational models of fire spread with a particular interest in the dynamics of flanking and backing fire, as well as the impact of fuel resolution on fire behavior.

In his free time, he frequents coffee shops and the local rock climbing gym.

Yang Wang grew up in central China, and came to FSU to pursue the Ph.D. after completing his bachelor of science degree at the Ocean University of China in atmospheric science (2010)

and master's work at the Institute of Oceanology in meteorology (2013). His past research includes retrieval of sea ice parameters from satellite data, large scale climate oscillation, model output analysis and field work at the Tibetan Plateau. His current research is on dynamics of the Ross Gyre, a cyclonic circulation system south of the Antarctic Circumpolar Current (ACC) in the southeastern Pacific basin. The Ross Gyre remains one of the least observed regions of the Earth's surface; the regional circulation of the water masses in the gyre and neighboring regions, penetration of deep water to the shelf and return pathways from the shelf to the interior - matters crucial to our climate - are poorly understood.

Wang's specific research project aims to determine the structure and trans-

port of the Ross Gyre and associated sub-gyres and quantify the interactions between the ACC and Ross Gyre.

Not only is Wang pursuing his doctorate in computational science, he is simultaneously pursuing a masters degree in applied mathematics. His supervisor is Kevin Speer.

Wang has a son, William, and enjoys hiking and the sea. "I spent some time on the sea and at the foot and middle of Mount Everest," he said. He also enjoys playing musical instruments [he is practicing the harmonica], programming and coding, and oceanography modelling. "I like coding small but elegant models commonly used in oceanography research. As an oceanography modeler, I like the real ocean more than the model."

continued from Erlebacher, page 1.

surpassing human performance. Thus, Erlebacher, Ho and Liu anticipate breakthroughs in model accuracy and effectiveness. During the project, they plan to analyze the vast amount of publicly available COVID-19 datasets, to further improve the parameter estimation for the COVID-19 pandemic.

The investigators want to enhance individual contact tracing capability with minimal imposition on individual liberty; they plan to develop Android and iOS apps to implement the ideas with a limited and controlled release to quantify their effectiveness. The model will consider potential super-spreader roles and contact-dense sites and events to adopt a distributed approach to reduce the reliance on

individual enrollments. They also plan to evaluate the effectiveness of the privacy-preserving exposure notification framework jointly developed by Google and Apple.

Collaborative Collision grants are intended to allow teams to position themselves to seek external funding for a new research initiative by demonstrating a history of successful collaboration. Erlebacher's project is expected to be completed by the end of summer.

For more on the collision, go to <https://www.research.fsu.edu/research-offices/ord/collaborative-collision/>.

For more on Erlebacher, go to <https://people.sc.fsu>.

continued from Gannon, page 5.

Ethan Peacock is developing a logo for the camp.

Sam Roberti is a curriculum development lead for the Machine Learning module.

Other Collaborators:

Jonathan Clarke (CISCOR), Paul van der Mark, Bin Chen, Ken Baldauf, & Catherine Hancock were receptive to and helped plan lab, supercomputing, and institute tours. Nathan Crock provided an api for an algorithm that crops images of faces to use in our Machine Learning module.

Department of Scientific Computing
400 Dirac Science Library
P. O. Box 3064120
Tallahassee, FL 32306-4120
www.sc.fsu.edu

First Class
US Postage
PAID
Tallahassee FL
Permit 55

The department's mission is to be the focal point of science and computation at Florida State University. Gordon Erlebacher is Chair of the Department of Scientific Computing. He can be reached at 850.644.7024. Newsletters are issued three times each year. Subscriptions and single copies are available by calling 850.644.0196. This publication is available in an alternative format on request.

continued from Fulbright, page 3.

structure can help us in a myriad of ways such as designing site-directed mutations that change a protein function, or simply knowing which molecules a protein will interact with. This has major implications in biological understanding and medicine.” His employer will give him release time to pursue the Fulbright project.



Cresswell-Clay will reside at BCAM in northern Spain from January 2021 – September 2021. As part of the Fulbright award, all software and modeling tools produced by this project will be made freely available on Cresswell-Clay's GitHub repository.

For more about the Basque Center for Applied Mathematics, go to <http://www.bcamath.org/en/>.

To see Cresswell-Clay's GitHub repository, go to <https://tinyurl.com/y3hkd2qk>.

Learn about the Fulbright program at <https://us.fulbrightonline.org/>.

You can view the Department's web site at www.sc.fsu.edu.



sc.fsu.edu