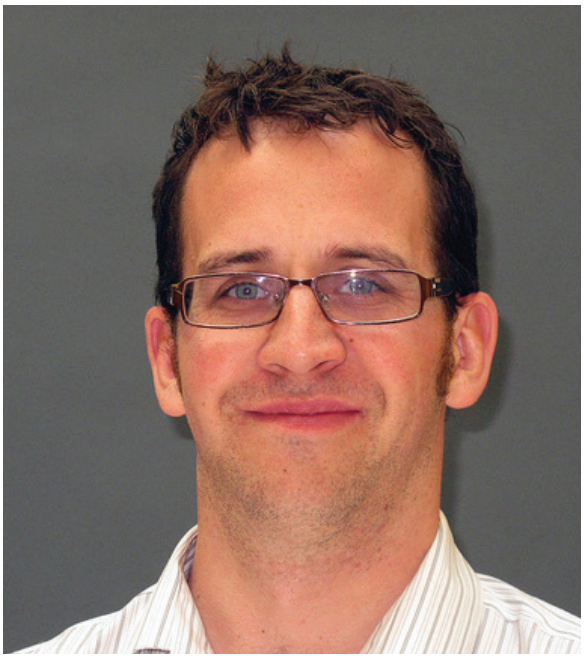
Fall 2022

Department of Scientific Computing

CONTENTS

Fire Resilience Project awarded Collaborative Accelerator Grant



Dr. Bryan Quaife

Associate Professor Bryan Quaife, along with an interdisciplinary team of university faculty, was awarded the first Collaborative Accelerator through FSU's Council on Research & Creativity. The team received a $50,000 award for seed money to generate preliminary data for a larger funding request that will be submitted this year.

The research team will conduct a study to determine the impact of prescribed and controlled fires on the environmental resilience of forests in southeastern U.S. ecosystems. Fires are a major source of air pollution, greenhouse gases, and aerosols, and cause pyrogenic organic matter in soils, which leaches into groundwater. Southeastern ecosystems are among the most species-rich, biodiverse ecosystems outside of the tropics, and are shaped by frequent low-intensity fires that burn fallen pine needles and grasses. Habitat loss and degradation are destroying many species that are only found in longleaf pine forests, and many agencies are focused on restoration of these precious habitats.

Through a prescribed burn study conducted at the Tall Timbers Research Station the research team will catalogue atmospheric emissions and soil organic matter dispersion before and after a prescribed burn, then compare experimental data to historical and simulated data to determine the optimal amount of fire that best serves the ecosystems, people, health, economy, and climate in Florida.

For more, go to research.fsu.edu.

Spotlight on Scientific Computing's New Chair

DSC Chair, Professor Peter Beerli

Peter Beerli serves as a professor and chair of the Department of Scientific Computing at Florida State University's College of Arts and Sciences. Beerli earned his Ph.D. from the University of Zurich in Switzerland and came to the U.S. in the 1990s as a post-doctoral researcher at the University of Washington in Seattle. Beerli's research interests lie in evolutionary biology, specifically population genetics and phylogenetics, which combine math and biology.

Tell us a little about your background and what brought you to FSU.

I grew up in Switzerland with three siblings. Despite no one in my family ever attending university, I pursued higher education in biology. My academic interests began in herpetology, which is the study of reptiles and amphibians. During my undergraduate studies, I was the director of an amphibian survey in the Canton of Thurgau when I learned about computing. However, because it was the 1980s, no formal computing or programming classes were available at my university. Within two years, I became a part-time computer programmer for a Swiss bank. Soon after that, I started an ecological consulting business with a friend while working on my master's and doctoral degree in zoology.

In 1994, my family and I moved to Seattle, Wash. for my post-doctoral position in the Department of Genome Sciences at the University of Washington in Seattle. I stayed there for nine years working on computational methods to infer population

models from genetic data as a research associate and research assistant professor. I then moved to a more permanent position as an assistant professor at FSU in 2003.

Can you break down your areas of academic interest for us?

Population genetics was 'invented' to combine Darwinian evolution and Mendelian genetics. Since then, it has played a key role in shaping biological theory and explains how species are related to each other. Once automatic DNA sequencing became feasible in the late 1980s, evolutionary biologists commonly used phylogenetic analysis to examine species interconnections. My research at the Department of Scientific Computing describes new algorithms and software methods to estimate the evolutionary past of species using present-day genetic data and data simulation. We generate synthetic data and test our models on these data to verify our software. Verification of our computing methods is often done in collaboration with researchers from the Department of Biological Science at FSU.

What makes you passionate about your topics of research?

I consider myself a toolmaker. I create software that allows others to convert their data into statements about evolutionary processes. For example, I distribute MIGRATE, a software that models genomic data according to the potential historical interactions among populations. The outcome of this program estimates the routes of migration and possible sizes of these populations.

What do you want the public to know about your research? Why are your topics important?

My methods help biologists and epidemiologists evaluate the spread of diseases over long periods of time. My work is tied to mutational changes in genomes, so findings in this field are often measured in generations. For example, my methods are used to describe the evolution of SARS-Cov-2, influenza and HIV/AIDS and contribute to an overall understanding of diseases.

You earned your Ph.D. in Switzerland before coming to the states as a postdoc in 1994. What was that transition like and how does your international experience manifest in your professorship at FSU?

Moving to Seattle first allowed me to acclimate to the American cultural climate. However, I prefer the summer heat in Florida over the constant rain in Washington. My own experiences help me understand my international students' struggles, and I try to support them as much as possible.

Who are your role models? Are there certain people who have influenced you most in your life and career?

The most influential people in my career include Joe Felsenstein, my post-doctoral adviser and retired professor emeritus in the Departments of Genome Sciences and Biology at the University of Washington in Seattle, and Thomas Uzzell, my doctoral thesis advisor who is now a retired professor from the Academy of Natural Sciences at Drexel University in Philadelphia.

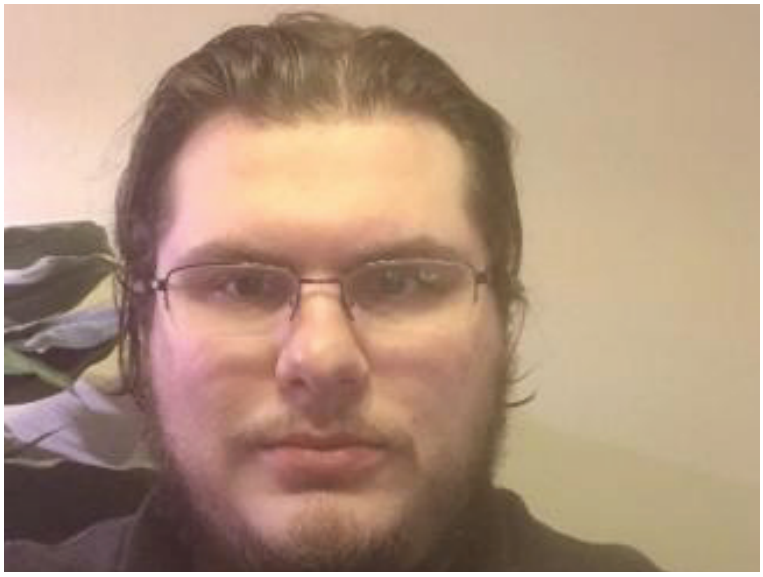
continued on page 7

Townsend Successfully Defends Dissertation

This fall, Alex Townsend successfully defended his dissertation entitled, *Aggregated Pulse Analysis: A New Framework for Shape-Driven Analysis of Bioacoustic Signals in the Time Domain*, research into the study of frog calls and bird song. Townsend recounts his memories of coming to Florida State from St. Augustine, how he got to Scientific Computing, and his time as a student.

On coming to FSU

I'm originally from St. Augustine over on the East Coast of Florida. My parents ran a small medical office there. I spent a lot of my summers helping them with receptionist work and chart filing. I came to FSU because I really liked how compact the campus is compared to other places like UF or Georgia Tech. I liked that I could walk between



classes pretty easily and that the class sizes were often smaller than UF. Also, FSU had a lot of majors I was interested in.

Undergrad Experience/Introduction to Morphometrics

I discovered Scientific Computing almost by accident in my 3rd year of undergraduate. I was getting close to being done with my first major (Environmental Science) and I realized I would need more quantitative skills to better my chances of getting into Graduate School, which was something I really wanted to do. I saw ISC3313 (Intro to Scientific Computing) while browsing the course catalog the summer of my second year while I was looking for courses that would fit the bill of what I was looking for and which could be applied in nature.

ISC3313 looked like a really good applied introductory programming class for science majors. I ended up taking that class; Dr. Plewa was teaching it in Fortran. I discovered I really liked the subject and that the career prospects in computing and computational science were a lot better than Environmental Science at the time. I then signed up for Geometric Morphometrics, which was an ISC4933 course, taught by Dr. Dennis Slice. That class was a lot of fun and we got to work on some really cool applied projects there.

Graduate School

One day out of the blue, Dr. Slice asked me if I wanted to work with him on applying Morphometrics to the study of bird songs. I was looking for some undergraduate research opportunities since I felt I'd need that experience to get into graduate school so I agreed almost instantly. Dr. Slice's contact never got back to him with the bird songs he wanted me to work on, so I went scouring the internet for other options and eventually happened upon frog calls from the MacAulay Library. From there, I just kept working on it. Dr. Slice was a fantastic mentor and he really convinced me to double major in Computational

Science and eventually to stay for graduate school .

Research Interests

My main academic interests right now are High Performance Computing and Software Scalability, Geometric Morphometrics, Data Science and Machine Learning (both methodology development and application), Computational Bioacoustics (the field my Ph.D. research was applied to) and Signal and Image Processing.

The most interesting thing I think about my research is that it's possible to use only time-domain features paired with morphometric techniques to analyze differences in animal vocalizations and likely in other types of signals as well. This way, you don't necessarily need spectrograms or frequency-domain analysis.

My research is about analyzing bioacoustic sounds, like bird songs and frog croaks, using the shape of features in the time-domain rather than the frequency domain. Mainly I look at individual pulses, which roughly correspond to one note in a bird song or one croak from a frog, and compare them using morphometric techniques. This is important because it provides a more transparent, interpretable and simple to use method, especially in the intermediate steps. This allows field researchers to quickly gain an idea of the landscape of sound variation in the species or ecosystems they are studying.

Changing Circumstances

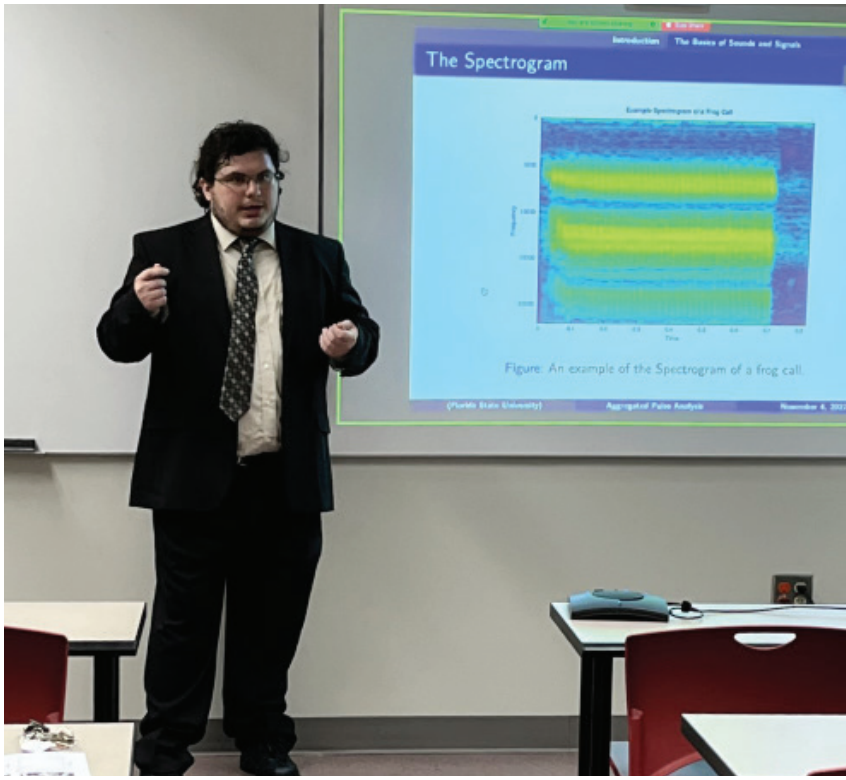
Dr. Slice's death was a sudden shock to me. I got the news from Dr. Erlebacher and Dr. Beerli completely out of the blue one day when I was eating lunch out at a Thai restaurant I liked. Getting new major professors wasn't too rough of a transition; I ended up being taken on by Dr. Beerli and Dr. Meyer-Baese. They were extremely helpful and because of their support, I was able to adjust and get back on track reasonably smoothly.

What's next

Currently, I have a full time job working at the Research Computing Center here at FSU as an Applications Specialist. I've worked there full time for 3 years now and as an intern for 2 years before that. I think I'm going to stay here at RCC for the time being. I really like the job, and it lets me see and help out with a ton of different research going on across campus.

Below: Townsend at his dissertation defense.

Alex Townsend is an Applications Specialist at FSU's Research Computing Center. For more, go to rcc.fsu.edu.



Remembring Chad Sockwell

Kenneth Chad Sockwell, Ph.D.

Chad Sockwell, a Scientific Computing graduate, died suddenly and unexpectedly in Denver, CO in May of this year. Sockwell was awarded dual Bachelor of Science degrees from FSU where he majored in Computational Science and Physics. He went on to study and receive his masters and doctoral degrees in Computational Science under the guidance of Max Gunzburger and Janet Peterson, completing the Doctor of Philosophy degree in 2019.

Sockwell had many research interests, including Climate Modeling, Ocean Modeling and Simulations, Fluid Mechanics. Reduced Order Modeling, Superconductivity, High Performance Computing, Hamiltonian Structure Preserving Schemes, Dynamical Systems, Mimetic Models, Higher Resolution Schemes, and Non-Linear Partial Differential Equations. While a Ph.D. student, Sockwell moved west to accept a research position at Los Alamos National Laboratory in New Mexico. After graduating, Sockwell remained in Los Alamos, having accepted a position which focused on developing physics-preserving reduced order modeling techniques for ocean models. The goal was to produce a reduced order model capable of assisting in uncertainty quantification calculations and data assimilation, and to produce high resolution initializations at a reduced cost.

Always sociable and gregarious, Sockwell was a dear friend and colleague, and we cherish the time we had him in our lives.

Chad Sockwell was 31 years old.

Greenwood awarded McKnight Fellowship

Left: Ph.D. student Jhamieka Greenwood (right) pictured with fellow doctoral student Daryn Sagel at a prescribed burn research site.

Scientific Computing student Jhamieka Greenwood is a recipeint of a McKnight Doctoral Fellowship, one of the most prestigious fellowships available for doctoral study. The fellowship is awarded to African American and Latino students enrolled in crucial disciplines where members of underrepresented groups have not historically enrolled and completed degree programs.

Up to 50 fellowships are awarded annually for study at nine participating Florida universities, including Florida State, University of Miami, University of South Florida and Florida A&M.

For more on Greenwood and the Department of Scientific Computing, go to: http://sc.fsu.edu.

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Beerli, continued from page 3

What is your favorite part of your job?

My favorite part of my job is implementing complex methods into programming code and watching it work. I also enjoy collaborating with graduate students on their research.

If your students only learned one thing from you, what would you hope it to be?

To be curious and stubborn.

For more on Beerli and the Department of Scientific Computing, go to: http://sc.fsu.edu.

This article was written by Hannah Fulk, and first appeared at https://artsandsciences.fsu.edu/article/faculty-spotlight-peter-beerli

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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.

New Staff at DSC

Liston Davis, DSC Administrative Associate

Liston Davis, the department's new Administrative Associate, is originally from Florence, South Carolina. The younger of two siblings, Davis followed his sister to Florida A&M University, where he played for the Marching 100 and, in 2003, received a Bachelor of Science degree in Computer Science.

Before coming to Scientific Computing, Davis worked in FAMU's Human Resources and Admissions offices as a Program Assistant. He also worked at a local television station – WTXL - as Floor Director, organizing events and issues behind the scenes to ensure a smooth broadcast. "I was in charge of everything that was going on behind the camera while the show was going on," said Davis.

Davis is single, and enjoys watching wrestling and football. He has been collecting comic books and action figures since childhood.

For more, go to sc.fsu.edu.

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