Department of Scientific Computing

Scientific Computing Professor named AAAS Fellow

Professor Peter Beerli has been named fellow of the American Association for the Advancement of Science (AAAS), the world's largest general scientific society and publisher of the journal Science. He is among 443 newly elected fellows for 2019, and the sole FSU scholar recognized to receive the distinction this year.

Beerli was elected to the 2019 AAAS Fellows Section on Biological Sciences. He is being honored for his distinguished contributions to the field of population genetics, particularly for theoretical modeling of gene flow, coalescence and population structure in a conservation context.

Beerli is interested in all aspects of population genetics and evolutionary biology that involve single species or groups of closely related species and their distribution in space and time. His research studies have focused on developing new approaches for the inference of parameters relevant to understanding current and past migration patterns, and developing new methods to test genetic populations.

Gordon Erlebacher, Department Chair, states that "Migrate, Peter's signature code, has a worldwide distribution, and remains at the forefront of population genetics research. Its latest advances stem from original research by Peter and his students. Congratulations, Peter, on this deserved recognition."

Beerli and his students have pursued a very diverse set of topics, ranging from epidemiology, disease transmission and social contact, to selection and polymorphism in neutral regions of DNA, to comparisons of population genetic models in a Bayesian context. He is keen that his students develop their own thoughts and theories that they can take with them once they successfully defend their PhD theses; Beerli wants to make sure

Quaife and colleagues receive $2.2m grant award
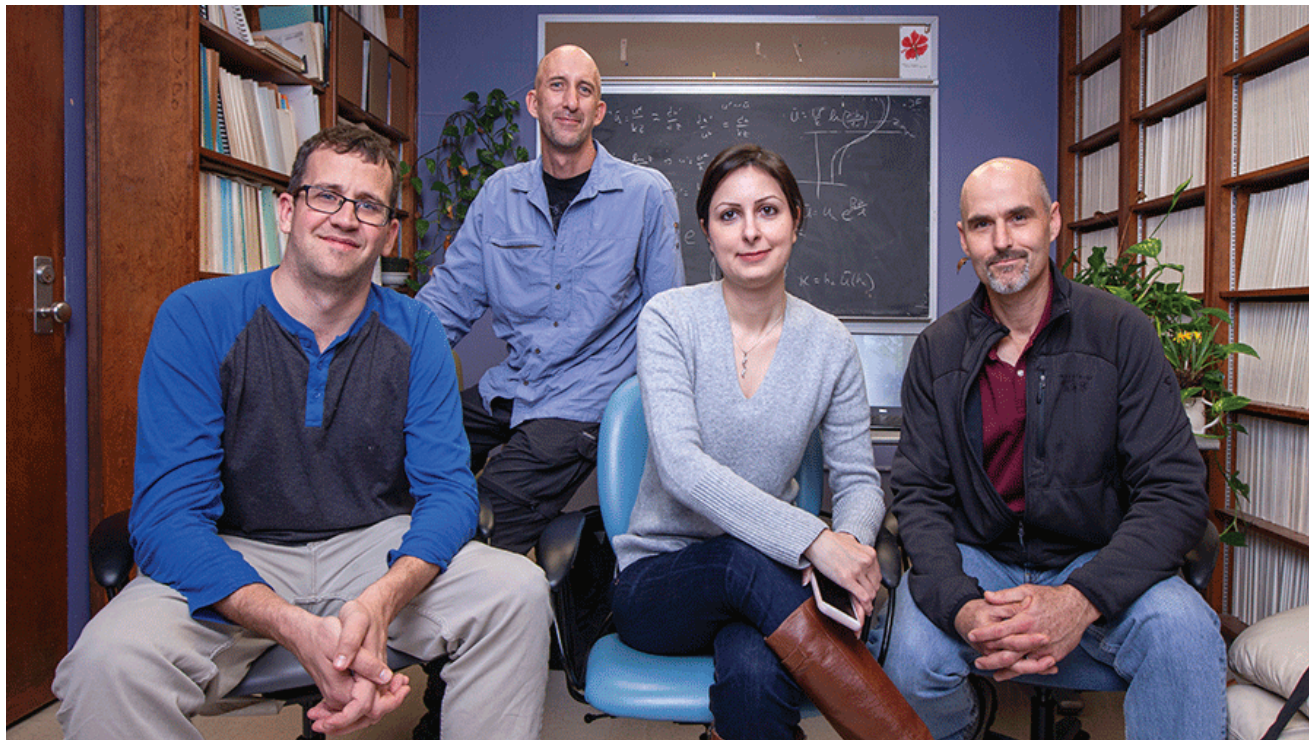
From left: Bryan Quaife, Rod Linn, Neda Yaghoobian, and Kevin Hiers.

Multiple collaborators from different organizations will study prescribed burns

Bryan Quaife, a mathematician and assistant professor of computational science, has received a grant that will help him study fire dynamics, the study of how chemistry, fire science, computational fluid dynamics, heat transfer and engineering interact to influence fire and plume behavior. Quaife is the lead investigator on the $2.2 million grant award.

Managing land resources requires forethought and active administration in urban and rural settings. It is critical that these considerations occur before issues arise to capitalize on habitat conservation, wildlife management, sustainable agriculture, and energy production. Land management also

thwarts undesirable and unsafe conditions – for example, safety can be compromised if land is not routinely burned. Fire studies such as the one Quaife and colleagues will undertake can help predict and prevent this type of circumstance.

"With changes happening at political and environmental levels, the ability for fire managers to use prescribed burns is becoming more challenging. As urban areas approach land managed by prescribed fire, there is an increase in hazards due to air quality and fire escape. We would like to better understand and ultimately engineer plume behavior under given fuel and atmospheric conditions," said Quaife.

To better understand how and why fires spread, Quaife, along with co-lead principal investigator, Neda Yaghoobian, will build simulations to research smoke production and dispersion, plume dynamics, and quantifiable risk of ember-ignited, low intensity, small scale wildland fires on DoD lands. The study seeks to improve our understanding of how plot configuration, ignition pattern, fuel moisture, site-specific vegetation, and meteorological conditions interact to influence fires in prescribed burns. Quaife and company will use multi-scale modeling, new model development, and high resolution measurements for data analysis. Computational fluid dynamics will play a large role in the research.

"A grand challenge is to describe the important physics that occurs at small

scales, and transfer these results to the larger scale dynamics. With current computing power, resolving all scales is not possible, meaning that subgrid models are required. This is particularly challenging for prescribed fire because of the complex geometry, heterogeneous fuels, and uncertainty in the measurements. Part of the work we are doing – hopefully – will help develop better and simplified models that will be transitioned to fire managers who can use the methods in an operational setting."

In practice, the ability to predict the conditions of a given fire is improving; fire managers are faced with a large number of uncontrollable variables (e.g., time of day of the fire, what fuels will grow, where they are distributed, moisture conditions), which makes the research highly complex.

"Once this knowledge is transitioned to fire managers, they will be able to make more informed decisions about how they should run a prescribed fire. This will assist them in burning the plot at an appropriate level, while increasing efficiency and reducing risk."

The grant, *From Fire to Plume: The Role of Vorticity and Fuel Moisture on the Near-Field Plume Structure and Ember Dynamics*, is a collaborative effort between Quaife, Yaghoobian (FSU mechanical engineering), Rod Linn (Los Alamos National Laboratory), Kevin Hiers (Tall Timbers Research Station and Land Conservancy), and Eric Rowell (Tall Timbers). Kevin Speer, Director of the Geophysical Fluid Dynamics Institute is also a co-PI on the grant. The research is funded by the Department of Defense, through SERDP, the Strategic

Environmental Research and Development Program, and ESTCP, the Environmental Security Technology Certification Program. SERDP and ESTCP are the DoD's environmental research programs. These programs strive to improve DoD's environmental performance and enhance mission capabilities by using basic and applied research to identify and implement cost effective technologies in accordance with environmental priorities.

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For more on Quaife, go to http://people.sc.fsu.edu/~bquaife/.

For more on the Department of Scientific Computing, go to sc.fsu.edu.

For more on the grantor, go to SERDP/ESTCP.org.

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they are not a cog in his research machinery, but that they become peers with similar research interests.

Beerli received his doctoral degree from the University of Zurich, Switzerland and taught at the University of Washington before coming to FSU.

All 2019 fellows will be presented with a certificate and the traditional rosette in Seattle, WA on Saturday, February 15, 2020 during the AAAS Fellows Forum, a part of the Association's annual meeting. The Forum will be held at the Washington State Convention Center.

Each year, AAAS elects members whose efforts on behalf of the

advancement of science or its application are scientifically or socially distinguished. To be considered for the award, scholars must be nominated by their peers, then go through a two-step review process for review by a steering committee. Finally, the AAAS Council votes on the ultimate list.

The full list of 2019 Fellows is available on the AAAS website.

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For more on Beerli, go to peterbeerli.com.

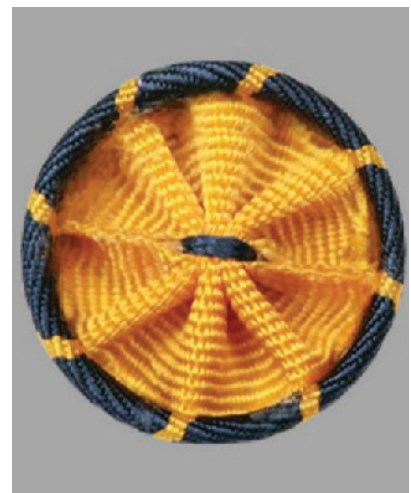For more on Beerli's award, go to news.fsu.edu and AAAS.org.

Image of AAAS rosette.

DSC undergrad enrollment increases

Above: Karey Fowler
Opposite, bottom: Ryan Learn and Karey Fowler pause for a moment at a recruiting event.

This fall, Scientific Computing reached a new milestone with the enrollment of 50 students in our undergraduate program. The department's recruiting efforts have been concerted and extensive, resulting in an opportunity to provide students with knowledge, skills and connections that will help them launch important and meaningful careers. As the department's primary recruiter, Karey Fowler played a pivotal role in the sizeable increase in undergrad students. The official numbers illustrate Fowler's continued efforts to recruit more students and foster their success.

"I've tried to attend not just the most visible recruiting events. For example, I've been to the FSU Resource Fair at the Civic Center. There are many on campus organizations represented – ROTC, religious organizations and the like. I've been the only FSU academic department represented.

"I think I'm the only academic representative there because other departments don't necessarily need to go there; everyone knows what biology is, everybody knows what business is. They don't necessarily know computational science is

the wave of the future and they don't know our grads have excellent job prospects, high satisfaction post-graduation and some the highest salaries right out of the gate," said Fowler.

Before coming to Scientific Computing, Fowler was a recruiting and advising professional, spending a portion of her career as the Advising First advisor in the College of Music. She has adopted and replicated some of the most valuable approaches she's come across. Additionally, she has her own approach to advising, and she enjoys meeting others, talking with them and learning about their interests.

"Rather than using a prescriptive approach to advising – take this, this, and this - I've tried to use a holistic approach to advising by encouraging the students to come talk to me about what they want to accomplish. When they do come, I look at their records and make suggestions to them about what steps to take next. That might include double majoring, pursuing undergraduate research, or talking to a specific professor about a project or collaboration. These meetings help me learn a lot about our students."

Students often approach her with questions about how to proceed when they have academic difficulties or personal issues. "I've had students approach me to say they're having a hard time in a programming class or had family issues. They ask me what to do when they need to drop a class after the posted deadlines. I can use my knowledge of how processes work to help them, or make suggestions based on my experi-ence to help them find something that works. Sometimes kids are hesitant to talk to professors, even when they need to. It helps me when I think back to my 18-year-old self. It's harder to know what to do at that stage."

Now that the department has reached the 50 student mark, Fowler, in conjunction with the department chair, has her sights set higher. She is thinking about ways she can sustain and grow the department, and continue to attract the brightest students by building experiences and staying connected.

"All over the country, there are living-learning communities springing up, for instance -- if students are going into pre-med, they have a group called FIGS, these small student groups have weekly meetings and some classes together, so they get to know each other and form lasting relationships. Depending on where a student is in mathematics is when they can start in our department. That means a student can be in our major for the first two years, but never have a class. By the time the third year rolls around, they haven't had much contact with us, and if a fraternity brother or good friend is majoring in engineering, they may just decide to go that way, because there's no connection. Lower level fun courses might be a bridge to help the students stay engaged."
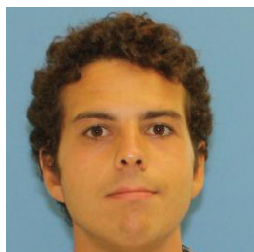
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Karey Fowler is Academic Advisor at the Department of Scientific Computing. She can be contacted at 850.644.0143.
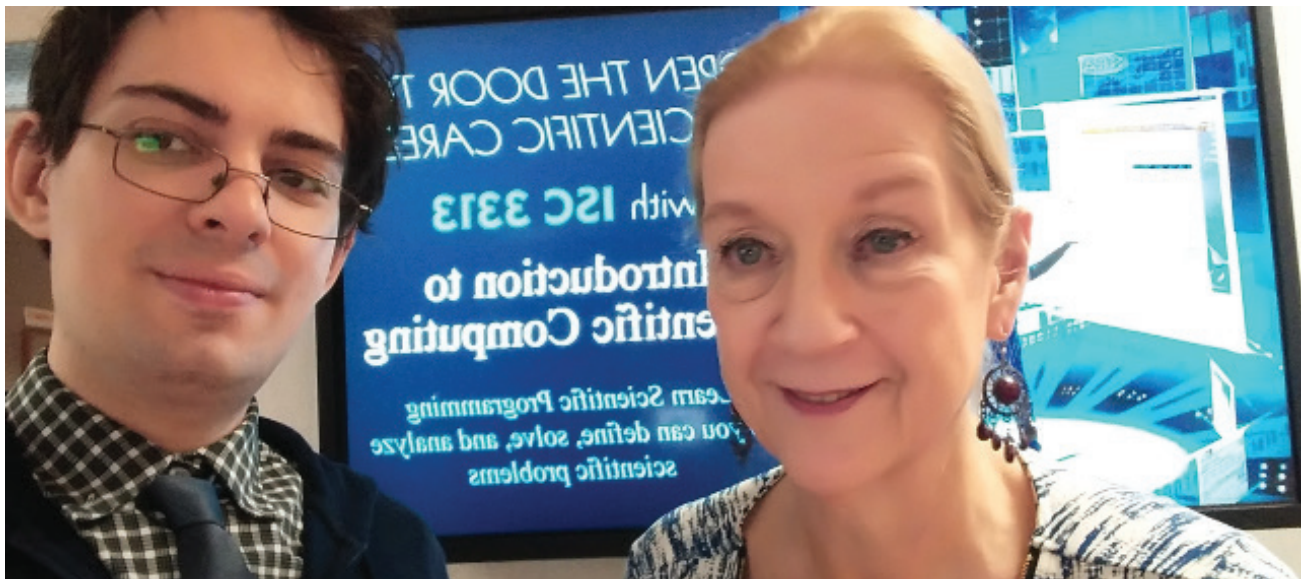
DSC welcomes new staff and grad students

Zehao Chen

Jesse "Jake" Cherry

Pankaj Chouhan

Zehao Chen comes to FSU from Inner Mongolia, China where he studied at Wuhan University. Located in Hubei province, Wuhan is one of the oldest universities in China. There, Chen received an undergraduate degree in engineering with studies in spatial informatics and digitalized information. After completing his bachelor of science, Chen came to the US to pursue graduate studies at the University of Florida. In 2018, Chen was awarded a masters degree in Computer Science, and returned to China to work as a software engineer. Initially, he worked for a start up with students from Tsinghua University on facial recognition software. Later, Chen worked on natural language processing at a company called Xiaomi Technology.

Chen enrolled in the Computational Science Ph.D. program to pursue his interest in machine learning and computational neural science. He oves sports (especially soccer which he plays on the weekends with friends), music and computer games.
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A Tallahassee native, Jake Cherry is a graduate of both Tallahassee Community College and FSU. Cherry graduated with a bachelor of science in Applied Mathematics in May, 2019, and joined the department as a Ph.D. student in August.

As an undergraduate, Cherry studied bioinformatics with Alan Lemmon, with a focus on sequencing technology and evolutionary models learning the ins and outs of working with massive data sets. At present, he is weighing his research options and is looking forward to working with Bryan Quaife on his erosion models.

Cherry is interested in becoming more proficient in teaching and mentoring during his graduate study, and plans to pursue a career in academia long-term. He is a diver, having just received his PADI Advanced Diver certification this summer.

He is also a guitarist and bassist in search of a band, and really enjoys the Tallahassee bluegrass scene.
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SC doctoral student Pankaj Chouhan was born and raised in Delhi, the capital of India. He attended the University of Delhi where he selected physics as an undergrad major, completing the bachelor of science degree in 2016. Chouhan then moved to Rupnagar to pursue the master of science in engineering physics/applied physics at the India Institute of Technology, Ropar. Chouhan completed the degree in 2018.

While at Ropar, he began working on two-dimensional material, then became involved in the computational aspect of his research. Working on computational aspects of the research and taking numerical approximation method courses led him to pursue a doctorate in computational science. He is working with Sachin Shanbhag to create an inverse model that can predict polymer structures by feeding inputs about polymer properties of molecules into the model. The main goal of this problem is to reduce the time complexity as much as possible.

Chouhan is a soccer fanatic, and has recently discovered a talent for cooking. He makes Indian food when his coursework schedule allows. Apart from that, he has a keen interest in the stock market (an outgrowth of having worked at a high-frequency trading firm for 5 months) and machine learning – a topic he plans to explore in his research. In his free time, he enjoys working out and doing things that are outdoorsy.
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Danielle Runtschke, DSC's new Administrative Specialist/Financial Specialist comes to FSU via Valdez, Alaska, having moved to Tallahassee with her family when she was around the age of 10. She has worked for the State of Florida for 11 years in various state agencies, including Florida Fish & Wildlife and Florida Department of Health. Runtschke transitioned to FSU and for the last 3 years worked at Sponsored Research, the Institute for Child Welfare, and now the Department of Scientific Computing.

Runtschke holds a Bachelor of Science and MBA in Business from the University of Phoenix, having earned her degrees online while working full-time. In addition, she is both a licensed real estate agent and notary.

When she has free time, she enjoys cooking, singing, spending time outdoors, traveling, reading and completing puzzles. She is married (Axel), has three children (Austin 22, Allison 20 and Aiden 11), two dogs (Abby and Ace) and a snake (Phoenix).

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Originally from Maryland, Daryn Sagel has lived in Florida throughout high school and college; she earned her undergrad degree here at FSU, double-majoring in Applied & Computational Mathematics and Physical Science with a concentration in physics and fluid dynamics. In addition to this diverse set of interests, Sagel also completed a minor in film.

Since her freshman year, Sagel has worked with Bryan Quaife and the Geophysical Fluid Dynamics Institute (GFDI); she continues those affiliations today as a grad student. Her initial research was in particle image velocimetry, but within the last year, she has become part of the Fire

Dynamics research group. Her current project applies computer vision principles to characterize the behavior of fire spread and plume dynamics. Sagel is working to develop software that will use infrared and visual video to detect and measure the rate of fire spread, obtain and statistically analyze wind data, and characterize plume structure and plume dynamics.
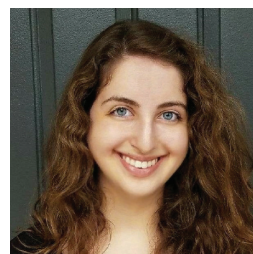
In her leisure time, Sagel loves to read, learn other languages, and work on motion design/animation.

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John Thompson is Scientific Computing's new IT Support Specialist, working in the department's Technical Support Group. A native and long time resident of the Tallahassee area, Thompson graduated from Lawton Chiles High School, received an Associate of Arts in Computer Science from Tallahassee Community College, and was awarded an undergraduate degree in Information and Communication Technologies from FSU. As support specialist, he is responsible for supporting DSC and our affiliate, GFDI.

Thompson enjoys spending time with friends –biking on the local trails, playing video games (things like Dungeons and Dragons or Warhammer 40K) and swimming. He enjoys studying history and computers, and enjoys eating food and trying out new types of food from foreign countries.

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Danielle Runtschke

Daryn Sagel

John Thompson

DSC faculty awarded tenure, promotion

Chen Huang

Xiaoqiang Wang

Two SC faculty have earned tenure and/or promotion. The new status will be effective in August with the start of the 2019-2020 academic year.

Chen Huang joined the department in 2014. His group develops quantum mechanics embedding methods to overcome the length-scale limitation in solving the Schrodinger equation, with the goal of obtaining sufficiently accurate electronic properties in large, heterogenous materials in a parameter free way. Huang teaches Density Functional Theory and Molecular Dynamics: Algorithms and Applications, among other courses. He received tenure and was promoted to associate professor.

Xiaoqiang Wang has been promoted to professor. Wang came to Scientific Computing as assistant professor in 2006, and was promoted to associate professor in 2012. He does scholarly research in numerical analysis and applied partial differential equations; mathematical biology; image processing, scientific visualization and data mining; and high performance scientific computing.

For more, go to sc.fsu.edu.

sc.fsu.edu

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