NEWS BRIEFS

ROD ALFERNESS RETIRES; TRESA POLLOCK NAMED INTERIM DEAN

Materials professor **Tresa Pollock** has been named interim dean of the UC Santa Barbara College of Engineering, following the retirement of **Rod Alferness,** which became effective Sep. 21.

"We are grateful for Professor Pollock's dedication and willingness to assume the responsibilities of this important leadership position," said **Chancellor Henry Yang** in a letter announcing her appointment.

Pollock, the Alcoa Distinguished Professor of Materials and a world-renowned metallurgist known for her creativity as a researcher, has served as the COE's associate dean since 2018 and will lead the college until a new permanent dean is identified following a thorough national search.

"It is an honor to serve the college in the role of interim dean at this critical time," Pollock said, "and I am grateful for the leadership that Rod provided throughout his tenure as dean."

"My association with Tresa goes back quite a number of years, to when she served as chair of the Materials Department, and more recently, as a fellow associate dean," said **Glenn Beltz,** the COE's Associate Dean for Undergraduate Studies and a professor of mechanical engineering. "The diversity of experience she has gained during her distinguished career in both industry and academia gives me tremendous confidence that she will continue to advance the stature of the College of Engineering on both the research and the education fronts. I look forward to working with her."

Tresa Pollock became the COE's interim dean after Rod Alferness retired.

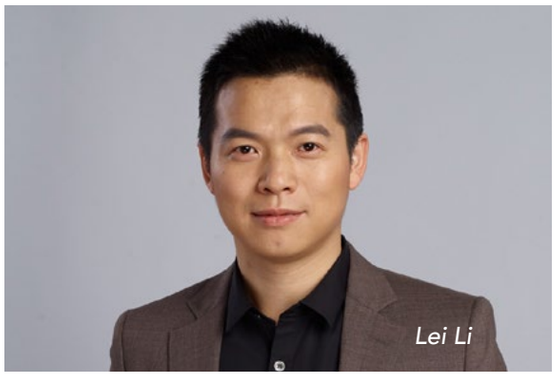
During his ten years as COE dean, Alferness provided steady leadership that led to increased standing and recognition for the college. Under his watch, important new buildings were completed, key faculty members were hired and retained, and the college made the transition to and from remote learning during the COVID pandemic, to mention only a few of many important milestones. While Alferness will be missed by all who know him, he left the college well positioned to move boldly into the future.

Please join us in welcoming Dr. Pollock to her new role, and in wishing her abundant success in the months ahead.

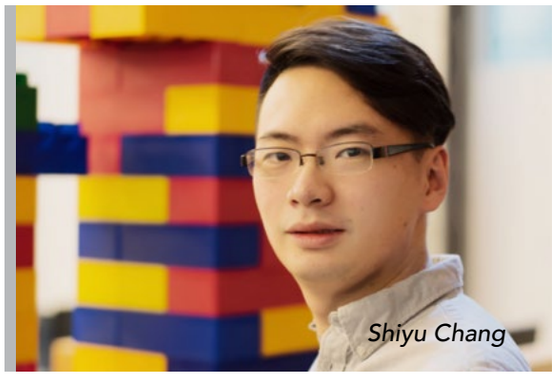
"RISING STARS" JOIN COMPUTER SCIENCE FACULTY

The Computer Science Department in the UC Santa Barbara College of Engineering has earned a solid reputation in many areas, one of them being natural language processing (NLP), a sub-specialty within machine learning (ML) and the greater realm of artificial intelligence (AI).

The department's standing in NLP, especially, will undoubtedly rise further with the addition of two new faculty members: **Lei Li,** formerly of ByteDance AI Lab, the company behind TikTok and other prominent mobile apps, where he was founding director, and **Shiyu Chang,** previously a research scientist at the Massachusetts Institute of Technology's IBM Watson AI Lab. They joined the CS faculty this summer.



Lei Li



Shiyu Chang

Computer science professor and department chair, **Tevfik Bultan,** said of the two hirings, "UCSB CS has become a center of excellence, with stellar students and faculty, and this enables us to attract the best talent in the world, as demonstrated by Lei's and Shiyu's decisions to leave lucrative research positions in industry and join our department. They will further strengthen our leadership in NLP and help us to address the exploding demand for research and education in ML and AI."

"This is excellent news for our program

and very important for our campus," said **William Wang,** computer science associate professor and co-director of UCSB's Natural Language Processing Group and its Center for Responsible Machine Learning. "Both Lei and Shiyu are rising stars in AI and NLP, and their presence here means that our students will be able to take more, and more diverse, AI courses, and allow us to build one of the strongest natural language processing groups in the world."

Li earned his bachelor's degree at China's prestigious Shanghai Jiao Tong University and his PhD in computer science from Carnegie Mellon University in 2011. He then spent three years as a postdoctoral researcher at UC Berkeley before eventually finding his way to ByteDance. Chang received both his BS and his PhD from the University of Illinois at Urbana-Champaign.

The common theme in much of Li's work is a focus on developing new technologies to improve the efficiency and efficacy of how people create, communicate, and consume informational content, mainly in the areas of ML, NLP, and machine translation, as well as in such innovative project areas as intelligent robotics.

A machine-writing system (Xiaomingbot) that Li developed to automatically create news articles from table data was used to generate media reports on some four hundred competitions in the 2016 Rio Olympics, and in August, he and his team won the best paper award, out of more than three thousand submitted, at the Annual International Conference of the Association of Computational Linguistics.

He says that coming to UCSB made sense: "I had a chance to visit Santa Barbara previously and was really impressed by the extraordinary group of scholars and the hospitality of the region. Plus, there are many people here I admire or know very well, such as [CS professors] **Ambuj Singh** and **Xifeng Yan.** I have been reading their papers since my graduate school years. Also, William Wang and I have collaborated on multiple papers." Finally, the vice president of ByteDance, **Dr. Weiying Ma,** is a UCSB alumnus who, Li said, "kept telling me good things about UCSB."

Chang says that his interest in teaching was kindled by his late advisor at the University of Illinois. "A teacher changed my life," he said. "I want to have the same impact on my students, and I would like to use my passion and enthusiasm to encourage young people to devote themselves to this field, just as my school and my advisor did for me. This is why I am committing myself to pursuing an academic career."

Chang's research is focused on advancing the application of deep-learning algorithms, which, he said, "have achieved unprecedented success across many benchmark tasks but see only limited application in mission-critical deployments, such as medical applications, owing to the lack of an efficient communication channel between humans and machine-learning algorithms."

In a conventional ML paradigm, he explains, humans communicate with neural networks primarily by providing them with training and testing data, and the neural networks communicate back with a single, inscrutable neural prediction. There are few opportunities for humans to inject additional intuitions, experience, or other guidance into these "black-box" systems.

Chang's most recent work has focused on "deep rationalization," that is, using a language he calls "rationales" — human-interpretable explanations of neural network predictions — to enable efficient two-way communication between humans and complex neural networks.

Both Li and Chang say that they are looking forward to working with the UCSB NLP group and other scholars in CS.

"I firmly believe in the power of teamwork, and I have benefitted a lot from it," Chang noted. "The UCSB NLP group is one of the most reputable research groups worldwide. I look forward to working closely with all of the talented faculty members and students in the group to develop more impactful research."

"Together with my colleagues, I hope to strengthen and further promote UCSB as a nationally and internationally recognized center on AI, machine learning, and NLP," Li said, "and to cultivate next-generation scientists as leaders in academia and industry."

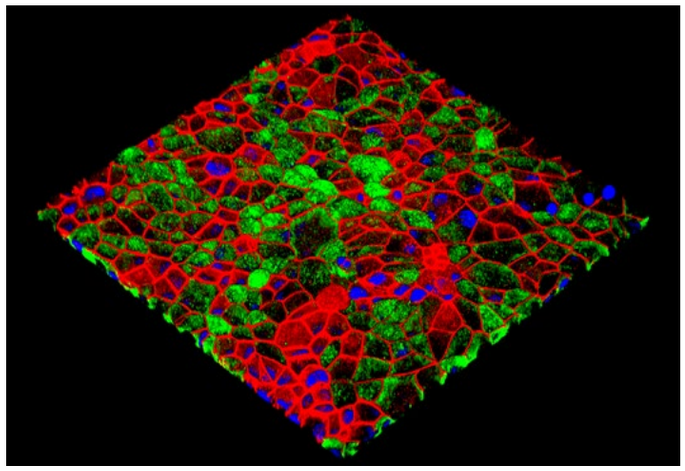


Image of retinal pigment epithelial cells on a scaffold after recovery from cryopreservation, stained for the ZO-1 protein (red), the BEST-1 protein (green) and nuclei (blue). Illustration by Jeff Bailey

FREEZING HEATS UP POSSIBILITIES FOR MACULAR-DEGENERATION THERAPY

In 2016, UC Santa Barbara biochemist **Dennis Clegg** published a paper describing a treatment he had developed for age-related macular degeneration (ARMD), the leading cause of blindness in aging populations. The process involves attaching ocular cells, created from pluripotent stem cells, to a flexible scaffold that is implanted into the eye. Clinical trials of the treatment are currently under way.

Now, Clegg and collaborators at UCSB, the University of Southern California, and the biotechnology company Regenerative Patch Technologies (RPT) have reported a new methodology for preserving RPT's stem cell-based therapy. The results, published in *Scientific Reports,* demonstrate that the implant can be frozen, stored for long periods, and distributed in frozen form to clinical sites, to be thawed and immediately implanted into the eyes of patients experiencing macular degeneration. The technique will extend the shelf life and enable on-demand distribution of the treatment to distant clinical sites, increasing the number of patients able to benefit from it and other cell-based therapeutics.

"This is the first published report that demonstrates high viability and function of adherent ocular cells following cryopreservation, even after long-term frozen storage," said lead author, **Britney Pennington,** who is head of process development at RPT and assistant project scientist at UCSB.

The study demonstrates that cryopreserved implants are comparable to their non-cryopreserved counterparts in appearance, gene expression, and cellular function. "It's a major advance in the development of cell therapies using a sheet, or a monolayer, of cells, because you can freeze them as the final product and ship them all over the world," said Clegg, who is senior author on the paper.

Data Driven Biology Fellows (from left): Gabriella Villalpando Torres, Rebecca Martin, Daniella Walter, and Samuel Rosen.

NEW PROGRAMS IN BIOENGINEERING FOR PHD STUDENTS IN MULTIPLE DISCIPLINES

PhD students in multiple disciplines are taking advantage of two new training programs launched during this fall quarter at UC Santa Barbara: the Interdisciplinary Training Program in Quantitative Mechanobiology, funded by a National Institutes of Health (NIH) T32 institutional training grant, and the Data Driven Biology (DDB) training program, funded by the National Science Foundation's (NSF) National Research Traineeship (NRT) program.

Beth Pruitt, mechanical engineering professor, director of UCSB's Center for BioEngineering, and PI of both training grants, says that the grants provide new opportunities for UCSB graduate students to work collaboratively and become better prepared for careers in academia, industry, national labs, and government.

Both programs accept PhD students from multiple departments and programs at UCSB, including the newly approved Biological Engineering PhD program, which will begin matriculating graduate students in fall 2022. The programs offer participants novel coursework and hands-on research experiences, plus opportunities for internships, externships, professional development, networking, and mentoring.

The NIH-funded Interdisciplinary Training Program in Quantitative Mechanobiology brings together biologists, physicists, and engineers to train predoctoral researchers in mechanobiology, which is focused on the relationships between molecular events and mechanical forces in living systems. The program enhances students' training in quantitative bioscience methods and engineering models and devices, while also offering multidisciplinary training to develop and apply quantitative approaches to problems in mechanobiology.

The program recently welcomed its inaugural cohort of Mechanobiology Fellows, comprising six PhD students representing the Departments of Chemical Engineering, Mechanical Engineering, Physics, Biomolecular Science and Engineering (BMSE), and Molecular, Cellular and Developmental Biology.

The NSF-funded DDB program is intended to train a new generation of biological scientists and engineers who are fluent in data analytics and experimental methods and can work across disciplines to advance fundamental research in quantitative biology and bioengineering. The program enhances students' PhD research by enabling them to integrate machine learning, data science, and quantitative image and bioinformatic analysis into their work.

The program welcomed its first cohort of five Fellows, from the Departments of Mechanical Engineering, BMSE, and Electrical and Computer Engineering.

KNOWLEDGE SHARING BEGINS AT THE BIOPACIFIC MIP

Virtual "summer school" was in session August 2-5 as the BioPolymers, Automated Cellular Infrastructure, Flow, and Integrated Chemistry Materials Innovation Platform (BioPACIFIC MIP), a $23.7 million NSF-funded collaboration between UC Santa Barbara and UC Los Angeles, offered a series of online training and information sessions to potential users.

The week-long summer school gave students, postdocs, faculty, technical staff, and industry researchers the opportunity to learn more about scalable production of bio-derived building blocks and polymers from yeast, fungi, and bacteria. The MIP incorporates automated high-throughput synthesis and characterization of bio-derived polymers with the goal of accelerating discovery and development of new high-performance materials.

The MIP is intended to be used by researchers from across the broad biomaterials community, with a vast network of users sharing knowledge. "Knowledge sharing is one of the key pillars that the NSF expects of MIPs," said UCSB MIP executive director, **Tal Margalith.** "We wanted to leverage the summer school to introduce the biomaterials research community to the MIP and its available equipment [see P. 8 for more on MIP instrumentation] and expertise while also creating a community around BioPACIFIC MIP and providing networking opportunities for students, especially with industry. The industry career panels were particularly well received, and the technical sessions were all well attended."

Outreach of the kind offered at the summer school is key, because half of the available platform time is reserved for external users, who need to be aware of what it offers in order to take advantage of the MIP's vast potential. To that end, said Margalith, UCSB and UCLA MIP faculty and staff reached out to experts in academia whose research is aligned with the MIP's capabilities, including experts in such key areas as high-throughput automated flow chemistry and creating nomenclatures for organizing polymer databases. Industry speakers attended from companies that either make tools used at the MIP or are using automation to develop biomaterials. More than thirty experts presented at the event, including MIP co-directors **Javier Read de Alaniz** (UCSB) and **Heather Maynard** (UCLA).

The summer school focused on introducing attendees to automated high-throughput synthesis and characterization of bio-derived polymers; hierarchical computational tools and theory to enable flexible, inverse design; the Design-Build-Test-Learn (DBTL) experimental design, intended to accelerate discovery of new high-performance materials; and the capabilities of the state-of-the-art equipment available at BioPACIFIC MIP while also providing mentorship and networking for graduate students.

KEEPING UP WITH COVID

With the UC Santa Barbara campus reopened even as variants continue to be a challenge, particularly in areas that have low vaccination rates, we caught up with ***Carolina Arias,*** *an assistant professor in the UCSB Department of Molecular, Cellular and Developmental Biology and an expert in virus-host interactions, to discuss her current focus with respect to the diminished, though continuing, pandemic. Arias recently received the prestigious 2021-'22 Harold J. Plous Award from the College of Letters & Science. The award is given annually to an assistant professor from the humanities, social sciences, or natural sciences who has shown exceptional achievement in research, teaching, and service to the university.*

Convergence: What is keeping you busy these days?

Carolina Arias: Variants. As viruses replicate, they accumulate mutations, and that leads to new variants; it's a normal part of viral replication. Right now, my lab is continuing to support Cottage Hospital and the California Department of Public Health to sequence viral variants, to help them figure out which ones are circulating, and to keep tabs on any that either the CDC or the WHO, or both, refer to as "variants of concern."

At the start of the pandemic, we saw a mix of variants, the majority of which were neither "of concern" nor "of interest." Then, the West Coast variant became dominant throughout California. The Alpha strain, from Great Britain, was then prominent for a while. The next significant variants were Beta from South Africa, Gamma from Brazil, and now, Delta from India. The virus is constantly changing. On the West Coast and across the U.S., it's all Delta now. In Santa Barbara, Delta came in and replaced all the other variants in a couple of weeks.

2021-'22 Harold J. Plous Award winner, Carolina Arias.

> "WHEN YOU ARE VACCINATED, YOUR IMMUNE SYSTEM IS READY TO GO, SO YOU CONTROL THE INFECTION AND YOU CONTROL IT EARLIER."

C: *How do you keep track of the evolving variants?*

CA: We talk to each other a lot. For instance, we have a regular meeting with the people at Cottage Health. There are repositories of information, including good, up-to-date websites where you can go to track the variants and see where we've had outbreaks and whether a certain variant is represented more in the U.S. or California. We get information from WHO, the CDC, and even just the news, like Reuters. And we constantly monitor the archives of research journals.

C: *Are you still involved in testing?*

CA: Yes; even though we have very high vaccination rates among the UCSB population, testing will continue to be important until we can control transmission and see cases dropping around the world. We have to be vigilant, and we have to test to be aware of any new variants that might show up. As long as it's spreading, it will continue to mutate.

C: *What are your thoughts on vaccines, eleven months after the first one came out?*

CA: The vaccines are safe, they work as they should, and side effects are rare. And you are much more likely to become severely sick or to die of COVID if you get infected and are not vaccinated. The evidence is there. Many people think that the vaccines should completely prevent transmission and we should not have breakthrough cases, but that's not the case.

We know that people who are vaccinated are not ending up in the hospital, but it doesn't mean that we are completely immune. The vaccine was not designed to prevent transmission completely. It was proven to prevent severe disease, and it is doing that in normal vaccinated people who do not have other underlying factors, such as a compromised immune system.

When you are vaccinated, your immune system is ready to go, so you control the infection, and you control it earlier. The vast majority — in the upper ninety percent — of people who are severely sick right now and have filled our ICUs recently are unvaccinated. Recent outbreaks have been outbreaks of the unvaccinated.

C: *Why do some vaccinations, such as those for measles and polio, prevent all cases of disease, while others seem to provide less complete protection?*

All vaccines are different, and the type of protection they provide against different pathogens is going to be different, too; it's not one recipe fits all. That's why we don't have a vaccine for every single pathogen out there, because they all behave differently, so how your system responds and how the vaccine targets the virus or the pathogen will be different, too.

We've been working on an HIV vaccine for decades and still don't have it. It gives you a little pride in the community that we were able to develop several vaccines that actually work against this virus. Otherwise, we'd be in more trouble than we are in now.