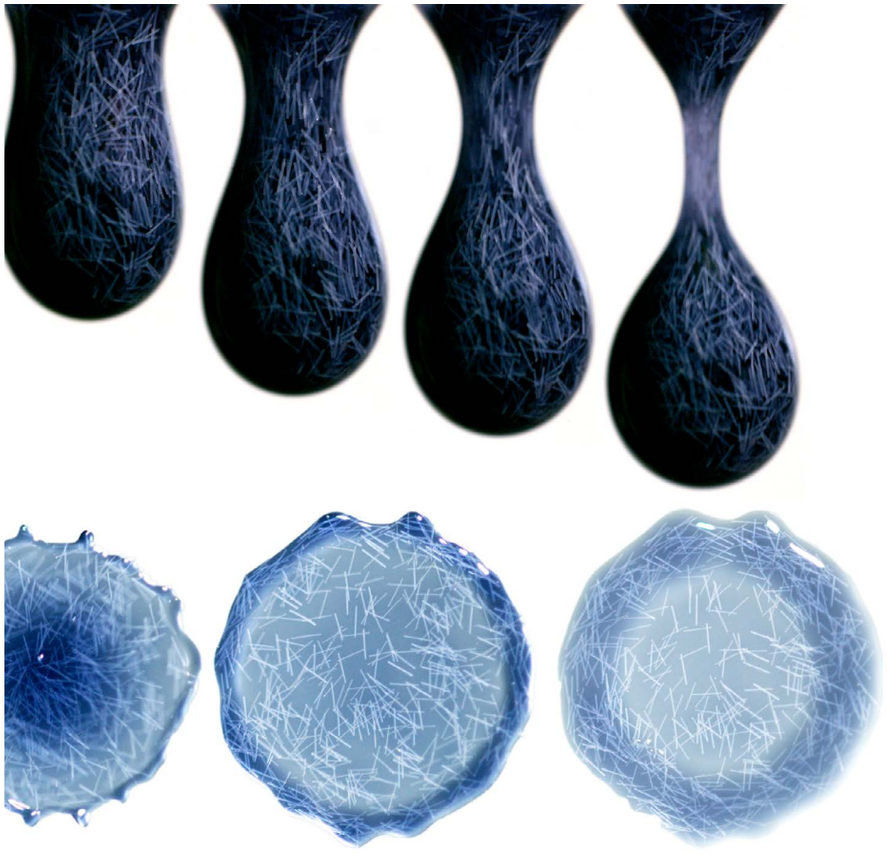
NEWS BRIEFS

PARA-POWER: RORY COOPER KEEPS ROLLING

UC Santa Barbara alumnus **Rory Cooper,** known globally for his pioneering work in researching, conceiving, designing, and building adaptive technology for those who, like him, navigate the world in a wheelchair, returned to the UCSB campus on April 19 for the first time since receiving his PhD in Electrical and Computer Engineering in 1989. He delivered a wide-ranging talk about the seemingly limitless avenues of research and engineering under way at the University of Pittsburgh's Human Engineering Research Labs (HERL), which Cooper directs. A longtime para athlete who has won medals in the Paraympics and the World Para Athletic Championships, Cooper has been instrumental in numerous breakthrough technologies, including adapting the lightweight, ergonomic, injury-reducing designs of racing wheelchairs for everyday use.

Inventor, para athlete, and UC Santa Barbara alumnus Rory Cooper (right) shown during his wide-ranging talk at the College of Engineering.



A DROP OF RECOGNITION AT APS MEETING

A PhD student in the laboratory of **Alban Sauret,** associate professor in the Mechanical Engineering Department at UC Santa Barbara, was one of three presenters to win an award for their posters, which were featured in the Gallery of Soft Matter at the annual meeting of the American Physical Society, held in Minneapolis in March. Third-year student **Sreeram Rajesh**'s poster illustrated the release of suspended droplets containing agglomerations of fibers. Such suspensions could be useful in additive manufacturing (3D printing) by allowing the printing of fiber-reinforced composite materials having desirable mechanical qualities.

The image was made using high-speed photography and optical microscopy to capture the dynamics of a water-glycerol mixture containing nylon fibers of various lengths and at various concentrations. The poster shows images of the droplets dangling from a syringe before they are released (top row at left) and then spreading out on a hydrophilic surface after being released (bottom row at left). In his doctoral research, Rajesh is investigating the factors that influence the final orientations of the fibers in the liquid, which could affect the properties of the printed material.

The award-winning poster produced by Sreeram Rajesh shows the dynamics of fiber-containing droplets for 3D printing.

Photograph by Ram Seshadri

Ram Seshadri (left) and Anthony Cheetham have questions regarding big claims about AI and new materials discovery.

WILL AI IDENTIFY 2 MILLION NEW MATERIALS? OUR FACULTY HAVE QUESTIONS.

Every day we hear new claims about all the amazing things that AI will do for us. Are they valid? UC Santa Barbara faculty members — emeritus materials professor **Sir Anthony Cheetham** and materials professor and Materials Research Laboratory director and College of Engineering associate dean, **Ram Seshadri** — wondered that upon reading a paper by a group of Google DeepMind researchers published in *NATURE* last November.

The paper's authors suggested that AI would "enable the discovery of 2.2 million new stable materials...representing an order-of-magnitude expansion in stable materials known to humanity." Cheetham and Seshadri did some diligence and then followed with a jointly authored perspective piece casting a critical eye on the claims. Their article was published April 8 in *Chemistry Materials.*

Cheetham and Seshadri cite numerous technical questions about the means of classifying materials, but one point stands out. Materials scientists tend to agree, they say, that, in order to be considered new materials, novel compounds should demonstrate three key characteristics: . they should be "experimentally realizable, novel in the sense of being more than a trivial extension of known compounds, and able to display evidence of utility."

In the vast majority of the new materials hypothesized to arise thanks to AI and machine learning, they write, "We find scant evidence for compounds that fulfill the trifecta of novelty, credibility, and utility. "While the methods…hold promise, there is clearly a great need to incorporate domain expertise in materials synthesis and crystallography."

SHELLPHISH HACKERS TAKE $1 MILLION IN DARPA COMPETITION

The Shellphish Support Syndicate, a team comprising UC Santa Barbara computer science faculty and students, as well as UCSB alumni who are now professors at Arizona State University and Purdue University, has earned a $1 million award as one of seven funded teams that will participate in the DARPA Artificial Intelligence Cyber Challenge (AIxCC) Small Business Track Competition.

The prize money will support the team as it prepares for the next AIxCC event. For that competition, Shellphish team members will build a cyber-reasoning system that leverages advanced AI techniques to automatically identify vulnerabilities in software and propose software patches that fix them.

The team, with faculty support from UCSB computer science professors and cyber-defense experts **Christopher Kruegel, Giovanni Vigna,** and **Wenbo Guo,** also includes ASU professors **Adam Doupé, Yan Shoshitaishvili,** and **Fish Wang,** and Purdue professors **Antonio Bianchi** and **Aravind Machiry,** all of whom are UCSB alumni affiliated with the Computer Security Group (SecLab) and also members of Shellphish.

The next step in the AIxCC will be the Semifinal Competition (ASC), which will be held this coming August. Each of the top-seven-finishing teams in that competition will receive an additional $2 million and advance to the Final Competition (AFC), to be held in August 2025, with the top three teams each earning a portion of the $8.5 million in total prize money.

Cyberdefense is familiar terrain for all of the participants, and Kruegel and Vigna are key researchers in the new $20 million UCSB-led, NSF-funded ACTION Institute, which was established with the goal of teaming humans and AI agents in uprecedented ways to protect mission-critical cyberconnected systems and infrastructure, such as banks, hospitals, government organizations, etc.) Vigna is the director of the ACTION Institute, and Kruegel is a co-PI on that project.

Center of Engineering Innovation and Design donors Virgil Elings (left) and Alistair Wynn unveil a plaque to honor them and their fellow donors, as Mechanical Engineering Department chair, Jeff Moehlis, looks on.

EVENT HONORS COE MACHINE SHOP RENOVATION DONORS

Donors joined UC Santa Barbara faculty and staff in March for a ceremonial unveiling of a plaque dedicated to the donors who made possible the renovation of the College of Engineering (COE) Machine Shop, officially called the Center of Engineering Innovation and Design (CEID).

Long the first stop for COE faculty and students needing something built for a lab or an experiment, the shop is especially important to undergraduate students in the Mechanical Engineering (ME) Department. About twenty teams of such students each year use the shop to build and test their senior capstone projects.

On hand for the event were donors **Virgil Elings, Alistair Wynn,** and **Jim Frank.** Elings spent twenty years on the UCSB physics faculty and co-founded Digital Instruments, a pioneer in developing and manufacturing the scanning probe electron microscope.

When Wynn, who founded seven successful companies in the biomedical field, joined the Industrial Advisory Board ten years ago, he said, "We realized that the machine shop was outdated. With this project, I think we've fixed that."

Frank is a longtime COE donor for whose father Harold Frank Hall is named.

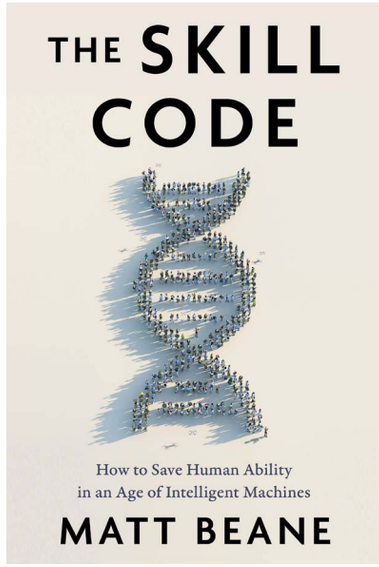
"The most important thing about the machine shop, I believe, is the possibility if offers for developing potential," said COE dean, **Umesh Mishra**. "It's a place for expression that can bring out the genius in a person."

ADDRESSING THE THREAT TO EXPERTISE IN AN AI WORLD

Matt Beane studies how humans build skill at work, and how that's changing with the introduction of intelligent technologies such as AI and robotics. The assistant professor in the Technology Management Department at UC Santa Barbara gave a TED talk on the subject (it has received nearly 2 million views), discussing how using these tools to pursue productivity can weaken the essential bond between expert and learner, with valuable skills being lost in the process. "We are separating junior workers from experts in workplaces around the world," says Beane. "It's a looming multi-trillion-dollar problem that few have been addressing until now."

Beane has written a book on the subject, titled *The Skill Code: How to Save Human Ability in an Age of Intelligent Machines* (Harper Business, 2024). In it, Beane reveals what he calls the "hidden code" that undergirds every successful expert-novice relationship. After spending the past decade examining this unique bond in a variety of settings, from warehouses to surgical suites, he identified the basic components of how we develop our most valuable skill. He calls them "the three C's" — challenge, complexity, and connection.

"When it comes to the three C's and how society is handling advanced automation right now, the novices and trainees have become optional, or have even been removed from the equation," explained Beane. "Raising awareness of that disconnect is an initial step in flipping the script so that technology can help make skill building easier than it was before."



The cover of Matt Beane's book about "the three C's" of human skill building in the age of artificial intelligence.

ECE AND META ALUMNA NAMED VP AT NVIDIA

Last November, **Alexis Black Bjorlin** (PhD '00) was named vice president/general manager of DG/X cloud services at Nvidia. She joined Nvidia from Meta, where she served as VP, Infrastructure, leading the development of compute, network, and storage infrastructure for general compute and AI systems.

"I'm thrilled to be here and to have worked at two of the most impactful companies in the world," she said. "I think it is the result of just focusing on where one can have an impact."

Bjorlin earned her PhD in the lab of electrical and computer engineering professor **John Bowers,** planning to become a professor, but the entrepreneurial activity in the department at the time," she says, "changed the course of my career."

At UCSB, she says, "I learned that you find the most value not when one lab is pitted against another, but when you're working together across disciplines or fields. UCSB had the most collaborative and interdisciplinary program. It's something I've tried to find and foster ever since and have carried with me into building teams and in looking for environments where innovation can thrive."

Bjorlin has hired many Gaucho graduates during her career, and she keeps going back to that well, describing UCSB, and optoelectronics in particular, as "an innovation center where so much of the research is just world-class. It has really helped set an ambitious goal of striving for maximum impact."

Nvidia vice president Alexis Black Bjorlin (PhD '00)

Photograph by Tony Mastres

A new $500,000 NSF grant is aimed at student retention.

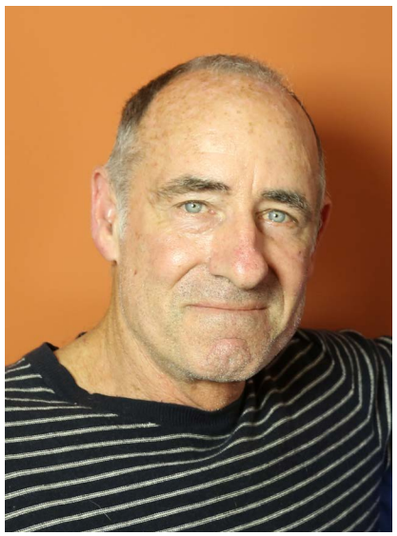
NEW GRANT TO BUILD STUDENT RETENTION

Freshman students in the UC Santa Barbara College of Engineering (COE) who are first-generation college students, are from low-income families or an underrepresented minority, or fit more than one of those descriptions stand to benefit from a $500,000 National Science Foundation (NSF) Hispanic-Serving Institution (HSI) grant. The proposal was written by computer science (CS) professor and Associate Dean of Diversity, Equity and Inclusion, **Elizabeth Belding,** CS associate teaching professor **Diba Mirza,** chemical engineering assistant teaching professor **Joe Chada,** and technology management assistant professor **Jessica Santana.** The new program, which will pilot in fall, is intended to increase retention and graduation rates of students in these communities by better supporting their academic success and sense of belonging in their major. UCSB is an HSI, defined as having at least 25-percent Hispanic full-time-equivalent undergraduate students.

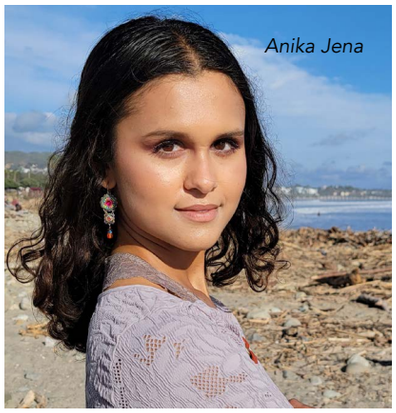
Students from the communities identified above face numerous challenges that can make it disproportionately difficult for them to graduate in engineering majors. The new Integrated Networking, Scholarship, and Peer Interaction for freshmen Engineers (INSPIRE) project is intended to fundamentally transform how such students experience their first year in the COE. By increasing retention and graduation rates of targeted students, INSPIRE is aimed at expanding the pipeline of diverse engineering and CS graduates, who can then pursue graduate degrees, join the workforce, and serve as role models for future engineering and computer science students reflecting the diversity of California and the nation.

ENTREPRENEURIAL FACULTY RECEIVE INNOVATION AWARDS

Two companies co-founded by professors from the UC Santa Barbara College of Engineering received 2024 Central Coast Innovation Awards from the *Pacific Coast Business Times*. Transphorm, a global semiconductor company co-founded by COE dean, **Umesh Mishra,** and **Primit Parikh** ('98), who earned his PhD in electrical and computer engineering from UCSB, received the University Partner Award. C-Zero, a company co-founded by chemical engineering professor **Eric McFarland**, received the Breaking New Ground — Energy Award. C-Zero, which is aimed at "unlocking the zero-emission [hydrogen] energy embedded in natural gas," was also recognized by *TIME*, placing at No. 24 on its list of 250 Top Greentech Companies in America for 2024.



Kudos in green (from left): Pacific Coast Business Times *publisher, Henry Dubroff (left) congratulates Umesh Mishra (blue jacket) and his Transphorm partner, Primit Parikh; C-Zero founder, Eric McFarland; C-Zero senior manager for R&D, Brett Parkinson (left), and senior materials scientist, Andrew Caldwell.*



SOLID GOLD SCHOLARSHIP FOR CHEM-E UNDERGRAD

Second-year UC Santa Barbara chemical engineering student **Anika Jena** is one of 438 students nationwide who received 2024 Goldwater Scholarships, among the most prestigious national scholarships for undergraduate students planning research careers in mathematics, the natural sciences, or engineering. Each scholarship, awarded in honor of the late U.S. senator from Arizona, provides as much as $7,500 per year for up to two years of undergraduate study.

"Research can be tough. There are a lot of setbacks, and you often don't see results even after hours of work," Jena said. "This award reinforces my career aspirations and further motivates me to continue conducting impactful research."

Jena is currently working as an undergraduate student researcher in the lab of **Sho Takatori,** whose research Jena became aware of while still in high school. "Anika will become an exceptional scientist and future researcher," Takatori said. "I look forward to seeing what she will achieve during her undergraduate training, doctoral studies, and beyond."

UNSTICKING TAU TO FIGHT ALZHEIMER'S

UC Santa Barbara researchers continue to unravel the mysteries of folded tau proteins in the brain, the proliferation of which lead to several neurodegenerative diseases, including frontotemporal dementia, progressive supranuclear palsy, and corticobasal degeneration. In an article published in the April 3 issue of the *Proceedings of the National Academy of Sciences*, an interdisciplinary team comprising UCSB neuroscientist **Kenneth S. Kosik,** chemistry professors **Songi Han** and **Joan-Emma Shea,** and chemical engineering professor **M. Scott Shell** describes potential ways to interrupt this process. Their findings demonstrate the possibility of targeting "sticky" sites along the extended form of mutated tau to prevent misfolding of the protein and the ensuing spread of such neurofibrillary tangles. The team's tactic was to induce tau aggregation in a cell culture and use the system to introduce an amino acid that interfered with aggregation of misfolded tau.

The study presents molecular-level insights into how pathological tau spreads, a hopeful advance toward what the researchers describe as "a therapeutic intervention potentially capable of disaggregating tau or preventing its aggregation" in the long form. Any such therapy is still a long way off, but the findings present exciting potential pathways in that direction.