



- Amazon Web Services arrives on campus
- Meet CCID's Yazmin Gonzalez
- Trapping flies in the Mojave
- Save the date

In All Its Complexity

Natalie Klco is a Sherman Fairchild Postdoctoral Scholar Research Associate in Theoretical Physics who is interested in discovering how quantum computers can help efficiently simulate the subatomic world. She is also a percussionist and marimba performer and, recently, a nature photographer. Klco, who joined Caltech last fall and has been living in Seattle during the pandemic, became interested in music at an early age. Her love of the marimba led her to double major in music and physics at Ohio University, where she was lured by the percussion studio's "array of beautiful marimbas" and the university's support for pursuing both passions. On forced musical hiatus due to repetitive motion injuries, Klco has been focusing predominantly on her physics and a new artistic outlet: photographing the trees, flowers, and other natural wonders on walks around her neighborhood.

"This is a COVID project. It is a way to get my body away from the computer and intentionally notice the nature around me. I'm not a serious nature photographer; I was simply taking my family on walks with me from afar, sharing with them the small details of nature that I find fascinating.

"To me, these different aspects of my life—my music, my science, and now my photography—are all expressions of one underlying interest. They are three complementary ways to explore complexity.

"Science is a great language for describing complex systems. When things occur on time or distance scales significantly different than those of our everyday human experiences, it can be difficult to understand their importance. Through experimental data, analysis, and theoretical synthesis of events occurring in fractions of seconds to billions of years and on scales smaller than the size of a proton to those of colliding black holes, we gain a deeper ability to connect with our world.

continued on page 6 ▶

In All Its Complexity

► continued from page 5

“Music is a different language for understanding emotional and neurobiological complexity. Through intricate compositions of sound, from solo performances to symphonies, emotional trajectories that have developed over decades can be captured, processed, and holistically reflected upon.

“Photography is becoming, to me, a language for capturing, admiring, and exalting details of the world that I would have normally ignored. As another way to connect with nature’s complexity, this meditative process has made me more attentive, more curious, and more thoughtful about my place on the earth.

“Humans tend to reduce complexity, whether it is ecological, sociological, or computational, before truly understanding the importance of that complex structure. In nature, this has culminated with species being on the brink of extinction before humans realize how exquisitely evolution has embedded them into the elaborate networks that characterize healthy ecosystems. In computation, this has involved realizing that the quantum world is an essential part of a computational framework capable of representing the complexity of nature.

“So, the photography has also been a small attempt to encourage, mainly in myself, an appreciation for the complexity and diversity of nature in the hope of finding a way to motivate humans to celebrate it rather than cause its destruction.”



See more of Klco's work at nkico.yolasite.com

Four Questions for: Assistant Director, Center for Inclusion and Diversity Yazmin Gonzalez

Yazmin Gonzalez, who joined Caltech earlier this year, will focus on advancing the mission of Caltech's Center for Inclusion and Diversity (CCID) through programming that supports advocacy and education, allyship, and advising. She held previous roles at Loyola Marymount University and UCLA, and brings a particular depth of experience in equity programming directed toward women. She is excited, she says, "to get to work primarily with this constituency at Caltech ... and to be able to team up with the community as a whole to address some of their needs."



1. Describe your vision for addressing the needs of women at Caltech.

I think we have an opportunity to put Caltech on the map when it comes to equity programming that is very targeted to women—professional development resources, salary negotiation seminars, and a wide variety of workshops. The infrastructure is already there. The 'women-in' advocacy groups are already established. There is collaboration among undergraduates, graduates, staff, and faculty. There's a lot of momentum that we can harness to really catapult this type of advocacy and visibility.

I'm also going to be working with Latinx communities, recognizing that there are overlaps. Native American, First Nation folks are a constituency that is also chronically underserved across all institutions of higher learning. So that's another area where I'm hoping to focus.

2. What is one short-term priority you are working on?

The first one that comes to mind is relaunching the Women Mentoring Women program. That program went on hiatus because of COVID, but students definitely want it, and we're going to bring it back in the fall. My goal is also to expand it, to use mentorship to create pipelines that connect undergraduates to industry and then graduate students to industry. So, whether students go into academia or industry, they'll have access to the perspectives of women who have gone before them and who can support them on their journey.

3. What have you learned from talking with the students so far?

We really do have some of the most amazing individuals. I'm proud to be part of this community because the students

are not only leaders in their research and science, but they bring so much nuance to the ways they are expressing themselves. They're bringing into the conversation not just the work they're doing in the labs but the other things they care about: issues around gender, equity, social justice, racial justice. I'm impressed by how much depth and perspective they bring. And it makes me really hopeful for the future.

4. What other areas of programming are you excited about?

We've started conversations at the CCID highlighting the crossover between Latinx and Black communities in the United States, and likewise the overlap and collaboration between Black and Asian American Pacific Islander communities. I'm hoping that I can continue to highlight specific points in history where individuals of different identities or different gender expressions and lived experiences have come together and coalesced around an issue.

To really create social change we need to go back to those chapters of history and hopefully learn from them. I think for a lot of us, even here in Los Angeles, we're accustomed to living in little clusters. So, yes, we might be neighbors, but we're not quite interacting, interfacing, and learning from each other to the depth that we can. Being able to broker and initiate those conversations is something that I'm really committed to and excited about.

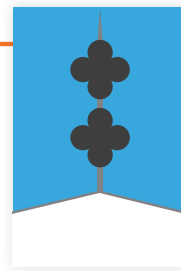
Nora Griffith (BS '21)

#SoCaltech is an occasional series celebrating the diverse individuals who give Caltech its spirit of excellence, ambition, and ingenuity. Know someone we should profile? Send nominations to magazine@caltech.edu.

Nora Griffith graduated from Caltech this spring with a BS in biology. She took over as president of the Caltech Muslim Student Association in her senior year (having served as secretary since her first year at Caltech). She was also co-editor of Totem, Caltech's literary and visual arts magazine, and captain of the women's track team. She holds the Caltech track records for the 200-meter and 400-meter hurdles.

"When I came to Caltech, I knew the campus was only going to have a small number of Muslim students and I would have to make that community for myself. My freshman year, I reached out to then-president of the Caltech Muslim Student Association Hamza Raniwala [BS '20], who had already established Friday prayers on campus, and we worked together to organize a car-pool to the mosque for Ramadan, set up our own room at Caltech where people who are on campus during the day can pray, and host a speaker event open to everyone in the Caltech community. I have to say, though, it was challenging to maintain the community and find new people, and it was a challenge for me to not have the support of many other Muslim students. In my senior year, I realized I wanted future students to feel more supported, so I reached out and did everything I could to make it feel like more of an active community. I found new first years to join, and we utilized our connection with the greater MSA West organization so we could collaborate and pool our resources to have better [virtual] events, such as guest speakers, which also helped us meet more people [online for now]. We recently had a fundraiser, a livestream with three other MSAs, to help the Uyghur Muslims in China who are being detained in 're-education camps.' Just knowing that there are other Muslims on campus here and at other universities doing the same things you are and with a similar worldview is really nice."

For more #SoCaltech, go to magazine.caltech.edu/post/socaltech



Save the Date!

All 2020 and 2021 graduates, along with their families and friends, are invited back to campus on **Saturday, October 16, 2021**, for an in-person celebration that will include a PhD hooding ceremony and other Caltech commencement traditions. Updates will be shared on commencement.caltech.edu.

“When I think about my campus life, what impressed me most was about learning capability. Because today, yes, I have some finance background, but now I’m leading such a big organization, such a huge business covering many sectors. It’s not about what you learn from a specific major at university. It’s about what you learn about learning capability. So, when you come across new things—new business, new opportunities—you can identify the opportunity and hit the pain point of the customers.”

— **Daniel Zhang**, chairman and CEO of Alibaba, in conversation with Caltech president Thomas Rosenbaum at a May 19 Break Through Insight virtual event.



Did you know?

The Jet Propulsion Laboratory, which Caltech manages for NASA, offers a virtual tour of the facility online, including the Space Flight Operations Facility, which has been in continuous operation 24 hours a day, seven days a week since 1964. Go to jpl.nasa.gov/virtual-tour.



Fruit Fly FIELDWORK

Caltech scientists in the lab of Michael Dickinson, the Esther M. and Abe M. Zarem Professor of Bioengineering and Aeronautics, recently demonstrated that fruit flies (*Drosophila melanogaster*) can travel up to 15 kilometers in a single journey. The researchers' discovery was made through a series of experiments at Coyote Lake, a dry lake bed 140 miles from Caltech in the Mojave Desert, where they released hundreds of thousands of fruit flies, luring them into traps, in different experimental runs that aimed to determine their top speeds and measure how they disperse and interact in the wind. The research team was led by former postdoctoral scholar Kate Leitch, who was new to this type of research in the field.

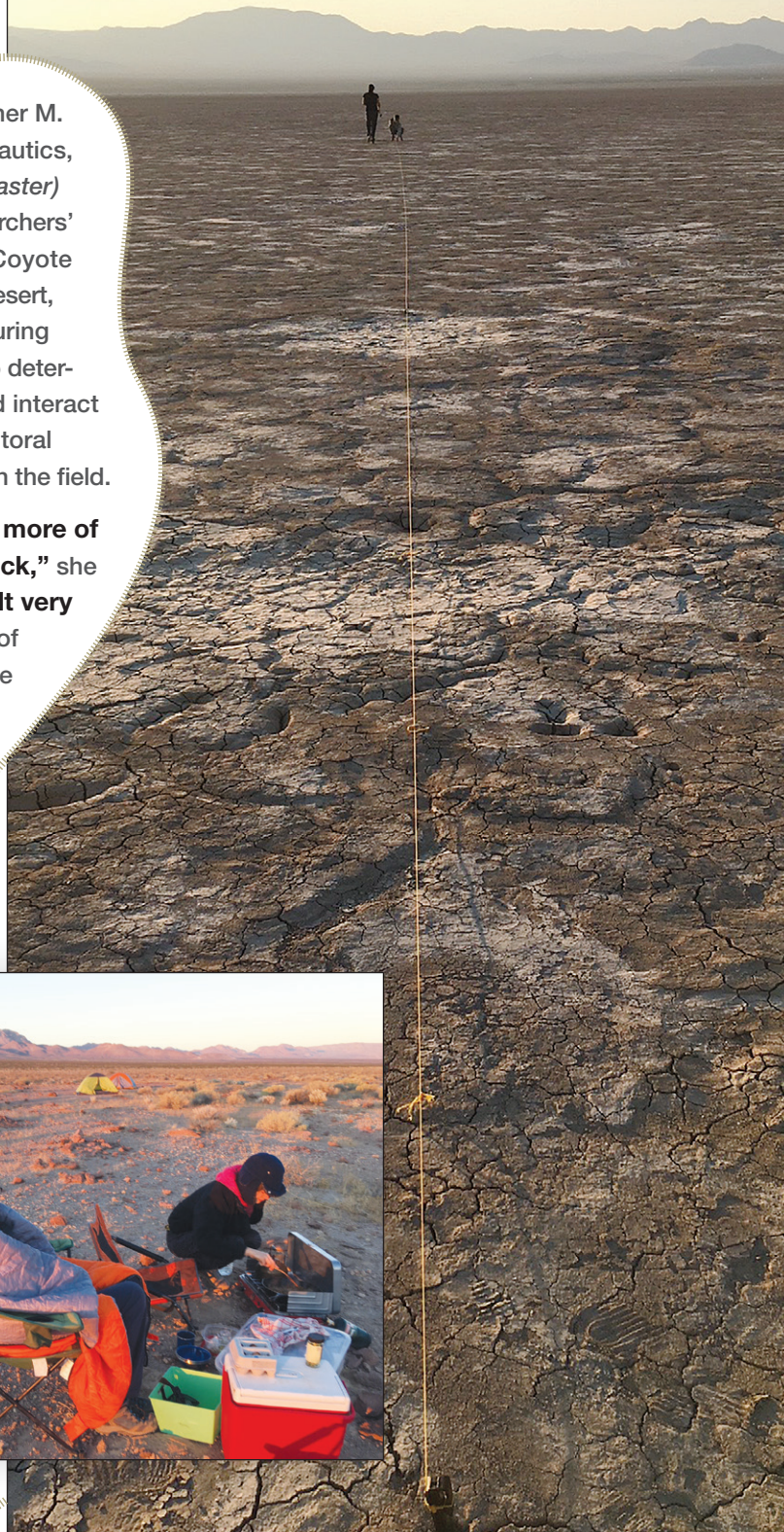
"I think people in the geology department might have more of a feeling of what it's like to drive around in a dusty truck," she says, **"but as a biologist accustomed to lab work, it felt very special."** She especially appreciated the low-tech nature of the endeavor, which took the research team to the field site around a dozen times over three years. **"It was like, 'Is there gas in the truck? Are there flies in the truck? Yes, let's go.'"**

Here, Leitch describes a typical excursion.

"Camping and cooking outside played into this romantic notion I have of fieldwork. We just felt very self-sufficient, and we had all the things we needed to have a cozy good time and get some data. In this photo, we're getting ready for a morning fly release. I'm frying hash browns and eggs for Francesca (wrapped in a sleeping bag) and Román [Corfas], a postdoc in the Dickinson lab. Our tents are in the background, and the Calico Mountains are in the distance."

1

"In the last hours of sunlight, we prepared our experimental layout so that we could get a quick start on a dawn release. In this photo, Francesca Ponce, a graduate student in Michael's lab, and I are measuring out a 50-meter distance from what will be our release site and marking the location for the placement of an upward-facing camera to monitor flies zooming overhead. The light is so gorgeous, and we look so tiny on the vast lake bed."



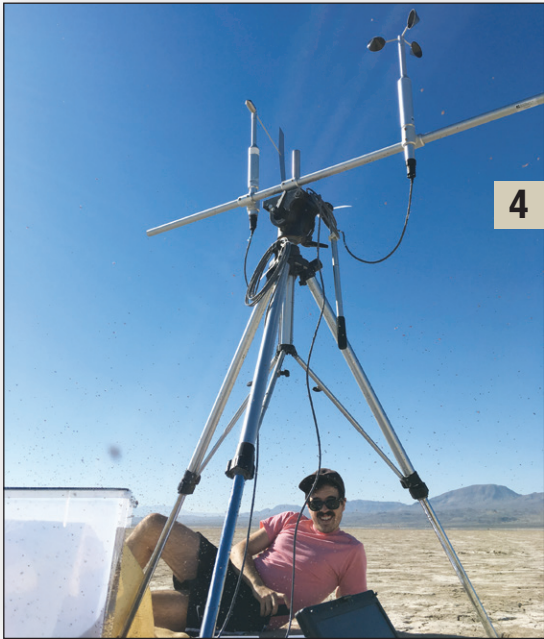
2



“In this photo, Michael Dickinson and I are rushing to set up the anemometer, a device that measures wind speed, at the release site before the temperatures become too sweltering. The photo shows the vastness of the lake bed. In the background are Michael’s Subaru and my 4Runner. There is something beautiful about those vehicles, knowing that they’re full of snacks, Sharpie markers, notebooks, and all the gooey mess of fly collection.”



3



4

“Here is Román at the release site just seconds after releasing approximately 80,000 flies. We had a ring of traps at a 1-kilometer radius that were evenly spaced around the release site. We baited the traps with an apple ferment to attract the flies. The key innovation of our work was having a simple camera that looked down at the traps so that we basically had a time stamp of when the flies entered.”

“This is a photo of me [on the right] and [Ainul] Ainne Huda [former Dickinson lab manager] driving off the lake bed after the windiest experiment we’d ever conducted, which we considered a total failure at the time. Other days, with milder winds, there would be hundreds of flies in a trap, and it just felt like we were rich with data. This photo reminds me how Ainne—with her pragmatism and kindness—always managed to cheer me up.”



5

“One of the earliest hurdles was figuring out how to trap the flies. I talked to my mom, who is a seamstress, and decided to try sewing the trap tops myself. I had a sewing machine in the lab for months, and I felt proud that this side of myself could be useful in biological research. Each trap top was a flat surface of polyester mesh, pulled taut, from which 60 mesh funnels projected downward into the bait below.”



6

Read more about this research on [page 30](#).



amazon on campus

This summer, the new Amazon Web Services Center for Quantum Computing will open on South Holliston Avenue, adjacent to the Pasadena Fire Department station at Del Mar Boulevard.

The center will be led by Oskar Painter (MS '95, PhD '01), the John G Braun Professor of Applied Physics and Physics, along with Fernando Brandão, Bren Professor of Theoretical Physics. Painter and Brandão are on leave from Caltech and working full time for Amazon Web Services (AWS) to establish the center, which will bring together researchers from Caltech, other universities, and industry to develop more powerful quantum computing hardware and software, and to identify new applications for quantum technologies.

Painter says that the center will support a more seamless exchange of ideas and technologies from a university research setting to a commercial enterprise. The strong connection between cutting-edge research and development of commercially viable quantum technologies will help to nurture and develop innovative ideas in the area of quantum computing. “Ultimately,” says Painter, “we foresee a cycle in which we will work on quantum technologies that may play a role in new directions of scientific exploration on campus, such as in materials development, quantum chemistry, and precision sensors at the quantum limit.”

The new building will be occupied primarily by scientists, engineers, technicians, and administrative staff from AWS. There will also be several Amazon Scholars, says Painter, who will be faculty

from Caltech and other institutions, as well as a small cohort of undergraduate and graduate student interns.

The 21,000-square-foot building presented a design challenge to architects Brooks + Scarpa, of Hawthorne, California, since the ground floor, dedicated to laboratories that call for the most quiet and controlled environment possible, has no windows beyond the main entrance lobby. A windowless box-like building would not have integrated well into the surrounding neighborhood, so the architects broke the structure into smaller components, with generous windows and landscaped terraces on the second floor.

The façade bricks shift from a regular brick pattern into a more complex pattern, rotating and twisting to create subtle shadows, depth, and a refined sense of scale—a look inspired by quantum computing, say the architects. Changing sunlight conditions, they say, will also “make the façade go soft and silver in just a few seconds, a quick-moving phenomenon that bends light and casts shadows.”

Interior work spaces are open and reconfigurable to facilitate a variety of collaborations.



“I do think an important part of talking about science is educating the public about how our level of uncertainty decreases as time passes, as we get more information and more studies are performed. So, being forthright and honest about the level of uncertainty, at the same time as emphasizing that this will change and we will at some point get to the truth ... I think that’s the key to it.”

—Kip Thorne (BS '62) at the February 2021 American Physical Society webinar “Communicating Science to Nonscientists in Post-Election & Post-Pandemic America”