Spring 2021 Newsletter
Earth Sciences Department
City College of San Francisco

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NOTE FROM THE CHAIR: Ian Duncan

It has been a challenging year all around. However, when I reflect on the achievements and hard work of the Earth Sciences students and faculty over the past 12 months, there is much to appreciate and there are many reasons to look forward with optimism to next fall. The department has continued to flourish in terms of student interest and enrollment despite the college's troubles.

First and foremost, I would also like to congratulate our 2021 Jim Court Scholarship recipient, Carmen Ramos. The faculty were impressed with her accomplishments and excited to provide her with well-earned recognition as she pursues her educational and career goals.

In faculty news, welcome back Prof. Chris Lewis from your sabbatical! It is unfortunate that he had to return amidst remote instruction, especially for his colleagues as we have not been able to get together, but I am glad Chris is back, and I know he cannot wait to get back into the classroom.

I would like to add a special thank you to Professor Wiese for her service as Vice President of the Academic Senate and member of Senate Executive Committee. Katryn has been an extraordinary advocate for the department and an important ally. She has aided me countless times as we managed the department's response to the pandemic and helped mitigate the impact of the college's fiscal crisis on our classes, students, and programs. I am also grateful for her assistance and guidance in expanding the department's online course offerings, as we have now added Geology 10, 10L, and GIS 111 to our growing online presence.

Finally, I would like to acknowledge Professor Darrel Hess, who will be retiring at the end of this semester. I am particularly sad that my colleague and mentor in geography will be stepping away from City College and the department. His contributions to the field and his presence in the classroom have inspired me and led numerous students to pursue studies in geography and the earth sciences. He has regularly been considered one of the college's finest instructors. Before Darrel started teaching here, with his energy and leadership, geography at CCSF languished due to lack of attention and imagination. The department has so much to be grateful for that cannot described in simple terms, and it will be impossible to replace his hard work, passion, collegiality, and enthusiasm for geography and his students. All of us sincerely hope that he will continue to play a prominent role in the department, hopefully teaching again as soon as next spring. I hope also that when we are eventually able to gather in person, the department and the college will be able to more meaningfully celebrate Darrel's career and express our gratitude.

THANKS and CONGRATULATIONS!

Spring 2021 winner of the Jim Court Earth Sciences Scholarship

Congratulations to Carmen Ramos!

Thank you to all our department assistants this year!

Where as tutors, mentors, lab aides, or on special projects, the faculty and students of the Earth Sciences are deeply grateful for the time and effort of all these individuals:

- **Leslie Bogen** -- Oceanography
- **Cort Benningfield** -- Special projects
- **Sonja Feinberg** -- Oceanography

STUDENTS

Bradley Feucht—Geology

Late in 2020 I made the very difficult decision to put my life in San Francisco on hold and sojourn in my home state of Michigan to assist with my parents during the pandemic; they're both in the high risk category as far as SARS-CoV-2 is concerned, and between that and the expenses of staying in the City, it felt like the right decision. I had enrolled in CCSF years ago, pursuing a degree in Fire Science. It was my dream to be a firefighter with the SFFD, but a knee injury took me out of that race. I spent years trying to find a future for myself anywhere outside of the bottom of a bottle, but doubted my ability to pursue an actual passion of mine, one of endless curiosity. I felt like I couldn't be smart enough to pursue the scientific vocations, and had relegated my ego to the level of the service industry, bartending, stocking shelves, furniture delivery, and the like.

On my breaks at whatever job I held, I would be reading science articles in journals and online magazines, looking up and learning everything that my mind was curious about. I was predisposed to think of myself as incapable, having started my adult life as a teenage runaway without a lot of chances at opportunity in rural Michigan. It didn't stop me from reading encyclopedia entries on whatever piqued my interest. I beat myself up a lot, too, always reminding myself that I can achieve a lot more, but then talking myself out of it with the endless stream of "what-ifs". I had buried myself in what-ifs for decades, and now I'm in my 40th year. Now don't get me wrong; I have lived an interesting life, done things worth retelling from a rocking chair on a porch one day, but I've always known I could do more... except for those what-ifs.

Driving east on I-80, without the distractions with which I had nested my cozy rut of a life, I had a lot of time with my thoughts. The only thing holding me back was myself and my preoccupation with potential futures. Those things that could happen, those what-ifs that stream endlessly through our minds as we weigh out the risks involved in beginning to start thinking about maybe some major changes to our life's trajectory. As it turns out, our species is risk-averse, we stay where it's predictable and safe, but this safe-thinking keeps us in our ruts and what the world needs now is people to break out of these safe ruts and dare to achieve more! I decided to focus on the first step. The first step, the next step we're about to take, is the only one we can be confident about. I told myself over and over again that I can't worry about the future, it's uncertain, and my risk-averse mind will consider only the most trauma-inducing possibilities to keep me safe. To break from this rut, I vowed to focus only on my next step and, for now, on only that.

The fall semester had already started by the time I finally arrived at my mom's house. I found some classes that were remotely taught and enrolled in them, emailing the teachers and hoping to get accepted. I was suddenly a student again! Scared, overwhelmed, elated, excited... you know, the first terrifying/thrilling week of a semester where you're inundated with everything all at once. That semester went both quickly and slowly, like everything during the pandemic. I relied on my math-astute friends and online resources until I had breakthroughs in my precalculus class, and trudged through my English class. Like any worthwhile semester, I was left exhausted afterwards, but was shocked at how well I did.

Completing this step was all I focused on: I worked hard, studied, and got proactive about shoring up where I felt less competent. This whole time, the only thing holding me back was myself. Excited about the next semester after my success with the previous, I took a full load of classes. Sequestered at home still and for the foreseeable future, I decided to take a full load of six Earth Science classes. I'm now in this last few weeks of that semester, and while it has been incredibly challenging at times, it has been among the most fulfilling few months of my life. Keeping myself focused on only my next step has kept me moving forward without the what-ifs holding me back. Having gone from someone who doubts their potential to someone who accepts their potential as an inevitability, I look forward to my career in science. It's no longer a concept apart from my identity, but allowed now to find its expression through my person.

Doubting yourself is a disservice not only to yourself but to society as a whole, I've learned. I'm still staying focused on my next step, but the path is becoming clearer. I started my journey accepting that I don't know the breadth of opportunity available to me, the possibilities of which, in these nascent steps, I am yet unaware. We have the benefit of passionate professors who spend endless hours of their own time helping and guiding us; every week, I get emails providing access to internships and projects in this field where I can get my hands dirty counting frogs or planting trees. Every week, I learn more of what can be done, like bioremediation or habitat conservation, that I wasn't aware of before this semester! There is so much that can be done and there is so much to do, I wake up excited now every day about what new thing I will be learning about in class.

I will be transferring next semester to Lansing Community College here in Michigan, after qualifying for a full-ride grant program for two-year STEM degrees. Completing my AS there, I then plan on transferring to Michigan State University. My steps are getting bigger now as my confidence grows; my dreams, too, are getting grander. Through the support from my start at CCSF, I am considering pursuing a PhD further down the road! I started my 40th year of life hesitant and wary, and in June I start my 41st year full of hope and inspiration. Being a gay, youth-runaway restarting their life at forty, I realize that in most ways I have a nontraditional path through life. But I am here to tell you that no matter who you are, where you are in your life, or how you got here, you can achieve beyond your dreams.

Esther Muñoz—Geology

My name is Esther Caridad Muñoz, and I am working on becoming an astrobiologist. Currently, I am a Ph.D. candidate in the Geosciences Department at Pennsylvania State University studying Biogeochemistry. My research is focused on differentiating biosignatures from abiosignatures when looking for origins of life on early Earth and exo-planets/moons. I am working on studying the intramolecular stable carbon isotope composition of biotic uracil. Why uracil? Uracil is a molecule found in all living organisms and in specific meteorites called carbonaceous chondrites. Researchers measured the stable carbon isotope value of uracil from the Murchison meteorite, yet we have not measured biotic uracil as a comparison. However, to dig deeper, we want to measure each individual carbon of this molecule in order to determine if there is a specific pattern that can be used to distinguish biotic from abiotic processes. We believe that there is a difference given what we know about the carbon sources for each; biotic uracil sources its carbon from bicarbonate/carbon-dioxide, oxaloacetate, and pyruvate, while abiotic uracil sources its carbon from hydrogen-cyanide pools. My project involves growing methanogens, extracting the uracil, measuring the stable carbon isotope composition of the whole molecule, then degrading the uracil to isolate the CO_2 component to determine site-specific carbon composition of that carbon (also known as carbon-2, which is the carbon at position two in the molecule). If successful, then we can move on to study the other 3 carbons that make up uracil and cross-reference our work with new mass spectrometry instrumentation.

While all of that sounds fancy, the road here was not linear nor easy. I began my science career at City College of San Francisco (CCSF) in spring 2011, exactly 10 years ago. I had officially graduated from Mission High School in San Francisco in 2005 and had a long hiatus before returning to school. I did not know what I wanted to do and up until then, I had been discouraged from pursuing science by people telling me that it was not for me. So, who am I? I am a trilingual Mexican-Nicaraguan-American, I am the youngest of 7 and the only one to graduate from high school and pursue a higher education career. While it took me 6 years to transfer from CCSF to the University of California, Santa Cruz (UCSC), those years at CCSF were my foundation.

I graduated from CCSF with an associate degree in Math & Science, and a transfer-degree in Geology. While at UCSC, I began working with arsenic consuming microorganisms and relating that to the geology of their environment to try to understand their evolution, as well as their possible ties to early Earth conditions. I graduated from UCSC with a bachelor degree in Earth Science with an emphasis on

Planetary Science. While I applied to several schools, I was only admitted into Penn State to work with Dr. Chris House. My path has now shifted towards integrating all the sciences together under one umbrella, biogeochemistry.

Amongst the many gains I attained at CCSF, one of the main connections that has followed me since I left has been the organization SACNAS. SACNAS stands for the Society for the Advancement of Chican@s & Native Americans in STEM. I have been a member of each SACNAS chapter throughout my college career and am currently the recurring president of Penn State's chapter. SACNAS is a large network that is focused on bringing our authentic selves to the forefront of science. The greatest aspect of SACNAS is not just the focus of ethnic diversity but also to STEM diversity. Since its conception, it has grown and diversified in many different aspects. I am thankful that I was introduced to this organization because it has helped me find community and friendships that are outside of my department. It is a membership that I recommend everyone to take part in as its networking and programs have helped thousands of students for the last 48 years.

Sonja Feinberg—Oceanography, Environmental Studies

Alaska Whale Foundation Summer Internship

After months of interning locally, studying oceanography at CCSF, and reading as many scholarly articles on whales I could get my hands on, I am thrilled to share I have been selected to participate in the internship of my dreams – humpback whale research in Alaska! Every summer a handful of marine science researchers and graduate students travel to the Alaska Whale Foundation research station in Warm Springs Bay to collect a variety of data that will aid in the understanding and the conservation of marine mammals. I think the Alaska Whale Foundation website describes it best:

> "AWF's broad research program ranges from interest-driven studies on the social structure and foraging ecology of Southeast Alaska's whales, to increasingly timely research on ocean health and human-whale conflicts. Drones, hydrophones, sonars, plankton nets, biochemical analyses, suction-cup tags - all factor into AWF's research toolkit and provide unprecedented views into the lives of these incredible animals" - https://www.alaskawhalefoundation.org/research-1

As an intern, I will get to spend hours on a small research boat aiding the students and scientists with whale identification and data collection. Warm Springs Bay is about a four-hour boat ride from Sitka and

is home only to the research station and a handful of houses – all of which rely on the local hot springs for heat and bathing. I will be living at the station for two months, hopefully getting glimpses of brown bears as well as humpbacks, grey whales, blue whales, and many more marine creatures!

I received my B.A. in Environmental Studies with a concentration in Sustainable Design from Pacific University back in 2017, with the intention of pursuing a career in sustainable architecture. I was lucky enough to study abroad in the Galápagos Islands for my last semester of undergrad, and was completely enchanted by the many ocean creatures I encountered there. After my time in the Galápagos, I declined my offers from Masters of Architecture programs and redirected my work towards entering the field of Marine Biology. I accepted every internship and job opportunity I could that allowed me ample time in the field, including teaching marine science to 5th and 6th graders in Oregon, completing fish dissections for a lab in the San Juan Islands, and swimming with whale sharks in Mexico. I took the Oceanography course at CCSF with Katryn Wiese in 2020 and I highly recommend it to anyone considering a career in marine science, or anyone who loves the ocean! It was scary changing my career plans right as I received my B.A., but every step on my path to a career in marine biology has been fulfilling, rewarding, and an adventure! I am hopeful that my work and time spent with the AWF researchers will be the bridge to my acceptance into a Masters of Marine Biology program.

Anita Engelstad—Oceanography

In 2006 I took my first class at CCSF. I didn't intend to pursue a degree; instead I was thinking it would be fun to learn something new. So I took Katryn Wiese's Geology class, which was a great class to begin with. The next semester I took her oceanography class – and I was hooked. I was so inspired that I decided to do what many people might find insane: starting a bachelor's degree in oceanography at the age of 40. From CCSF I transferred to San Francisco State University (SFSU) in 2007 where I graduated in 2009 in Atmospheric and Oceanic Sciences. I was offered a Master thesis project by my physical oceanography professor and decided to continue my journey at SFSU for another two years. The project investigated the damping effect that a muddy seafloor has on waves, and most of the work was in numerical modeling. Like the Earth Science Department at CCSF, the Department of Earth & Climate Science at SFSU has dedicated faculty and staff, and I received lots of support from my supervisor and professors.

After holding a couple of different jobs, I went to the Netherlands in 2014 for a PhD, which I completed in 2019. The Netherlands have a lot of experience in coastal engineering and oceanography, since part

of the country is situated below sea level, and most of the coastline is protected by dikes and artificial dunes. People there are now looking into innovative approaches to protect the coastline against sea level rise. Our project wanted to answer the question of whether the inundation of Dutch barrier islands (something that happens only during strong winter storms and is currently prevented by dikes) would deliver enough sediment onto the islands that they would be able to grow in height with the rising sea levels. To answer this question we measured waves and sediment transport during two winters on a remote part of the island of Schiermonnikoog and also applied a numerical model. Our results suggested that our study area indeed gained sediment, so that project now moves into the next phase in which researchers are going to remove part of a dike on another island to study the affects of inundation there.

Today, I am now back in San Francisco, and happily employed by the USGS as an oceanographer.

Picture 1: Anchoring the instruments in the sand was hard work. The poles needed to be driven into the sand at least 2 m to prevent them from falling during the inundation of the island.

Picture 2: The frame was equipped with instruments measuring waves and currents

Picture 3: Anita Engelstad on a hike in the High Sierras.

Pierre Churukian—Oceanography

As an Egyptian diver, I already had a strong connection to the Red Sea when I decided to leave my corporate career of 10 years, return to school and start a new life as marine scientist. My undergraduate degree in maths and computer science had shown me how much I enjoy the STEM fields but that I'd still need training in the sciences before I could start graduate school. It scared me more than a little bit, the road forward was uncertain and there were so many practicalities that I couldn't plan ahead for. Overall, I realized none of the jobs I had until that point had been at all fulfilling and none would ever contribute to the Red Sea coral reefs which I cared for deeply.

Deciding to take the leap, I moved to San Francisco and enrolled in CCSF to work towards an Associate degree in biological sciences. I loved it, all of it, the city, CCSF, the students, the faculty, the volunteer opportunities and especially the feeling of getting closer to a goal that had seemed so far away. A couple of years later, it was time to apply to grad school and that turned out to be the most difficult step yet. Choosing a school, choosing a lab, looking for funding, it was hard to even get a simple reply from most labs. This period was probably the most frustrating and more than once I almost gave up thinking that it would never work and I'd return home unable to be a scientist, unable to work in the Red Sea and would have to start looking for a job all over again. Thankfully I persevered, deciding to stop wasting my attention and energy applying to multiple schools, I put all my efforts into my first choice, Scripps Institute of Oceanography at UCSD. To be more effective, I moved to San Diego and enrolled in their Continuing Education program where I could take undergrad courses, attend seminars, meet students and faculty. Doing all that, a guest speaker in a course I was taking was a "quantitative coral reef ecologist", so after his lecture I introduced myself and said I wanted to join his lab, as it turned out he was looking for grad students with maths skills. It seemed perfect. I volunteered in the lab for a few months, then applied and was accepted.

Finally in grad school, in Scripps, in a coral reef lab, doing ecology, I felt as if all the pieces had fallen into place. However earning a graduate degree is a lot of work, mostly independent, lonely work. Choosing a thesis topic is hard enough, especially with the endless reading that comes with it, but then you start collecting data and analyzing your data and you remember this is what you came here for, it's actually a lot of fun, much more so than any corporate job I ever had. Focusing on the positive side of the work, defending my masters thesis came quickly and I graduated feeling on top of the world.

Returning to Egypt to finally apply what I had learnt, there were still more hurdles to clear. All the scientific work I could find in the Red Sea is aimed at conservation, and while it is important and urgent work, I feel its only part of the issue, the other part, ecological research, is also important. We need to understand how coral reefs "work" as much as we need to save the reefs. But I couldn't find any scientists focusing on that part of it, so now I'm trying to start my own ecological research, find my own grants to fund it, and set up my own team to staff the projects. This might be the most ambitious phase of my journey but it will be the most rewarding once completed. I've already started a pilot study collecting a time series of data from Egypt's healthiest, most biodiverse reefs, hoping that having something concrete to start with will facilitate the funding process, and best of all, it gets me in back in the water, diving in the Red Sea I feel so strongly about, learning to identify the corals, the fish and the invertebrates again. This is, after all, much more rewarding than my previous corporate career ever was.

The thing I'd most like to share through this newsletter is how positive my career change process has been, and what a great resource CCSF and its faculty were along the way. It would make me happy if my experience might encourage someone else to take the leap they may be hesitating about, to step forward into a more fulfilling and rewarding life they may be dreaming of. There are many people and resources to help you overcome the costs or problems you might face.

Cort Benningfield—Earth Sciences

I don't have much to report on this year other than to find creative ways to combine mask making and paleontology.

But since I did not get around to submitting an entry last year, I thought I would share some interesting Earth Science related things from the year before. For example, I took the Mineral-Petrology class at SF State that is taught by Professor Mary Leech, in the Fall of 2019. One of the few advantages of being over 50 years old is that I qualify for taking classes through through the ElderCollege program which allows me to sit in on any regular university course on a space available basis for only $55 a class. You do not receive a grade in classes taken through ElderCollege, but Professor Leech was willing to take me on and let me participate as a regular student, grading my assignments and tests.

We spent a lot of time looking at thin sections of various rocks and minerals through polarized microscopes, but the best part of the class was a 3-day field trip to the Mono Lake and Mammoth Mountain area. Most of the side trips were things that I had done before, like the Mono Lake tufa columns, the pumice and obsidian outcrops at Mono Craters, and the basalt columns at Devils Postpile. It was still pretty cool to see them again, this time as a geology student as opposed to a tourist.

There were side trips to places that I had never been to that I found pretty fascinating. One was to the Horseshoe Lake area near Mammoth that has a major tree die-off due to CO_2 seeping up through the ground from faults that extend down to the magma chamber below Mammoth Mountain. Apparently, trees are fine getting CO_2 through their leaves, but cannot tolerate it in their roots. There were warning signs around the lake, advising people to avoid low lying areas where the relatively dense CO_2 can accumulate.

After seeing the columnar jointing in basalt at Devils Postpile, I did not expect to see columnar jointing in welded tuff, but there it was. As opposed to the Devils Postpile where the posts are usually 2 to 3 feet in diameter, the columns in the Bishops Tuff were 6 to 9 feet in diameter and much more irregular.

The other feature in the tuff were these radiating fractures that were 50 cm or more in diameter, some of which had gaping holes in the middle. The fractures are called fumaroles and are cause by rapid release of volcanic gasses. The picture below has a hole big enough to stick my fist in.

Devils Postpile Basalt Columns

Owens Gorge Tuff Columns

Radiating fractures in tuff from fumarole gas expansion

I am looking forward to maybe resuming the cataloging of the CCSF fossil collection and display case in the lab room as well as working with the students in the Geology labs at some point.

FACULTY

Ian Duncan—Geography

I am honored that my colleagues elected me to serve a full term as department chair after my interim stint during Professor Lewis's sabbatical. I have had another great year teaching Human and Physical Geography courses and GIS.

Besides the typical complications of pandemic life, my family and I were able to get out and go on a couple trips in the Bay Area. We went camping at Napa-Bothe State Park and got to wander near some of the back burn from the 2020 Glass Fire. We also went to see the nearby "Other Old Faithful", north of Calistoga, a surface geothermal feature related to the more famous nearby mineral hot springs and The Geysers geothermal power plant farther north. It was also an excellent cultural geography excursion to an increasingly elusive American artifact – the roadside attraction. They had goats, lawn chairs, and a fairly informative exhibit on geothermal activity!

Finally, we did a lot of gardening. It was a great opportunity to get out of a stuffy apartment, stretch our legs, and dig in the dirt. We enjoyed going around to some of the farms and plant shops of Oakland, like Boxcar Flower Farms near the old 16th St. train station, and The East Bay Wilds Native Plant Nursery in Fruitvale, on the hunt for some good drought resistant native plants.

Napa Bothe SP campground, back burn area from 2020 Glass Fire

Boxcar flower farm and the old West Oakland 16th Street train station

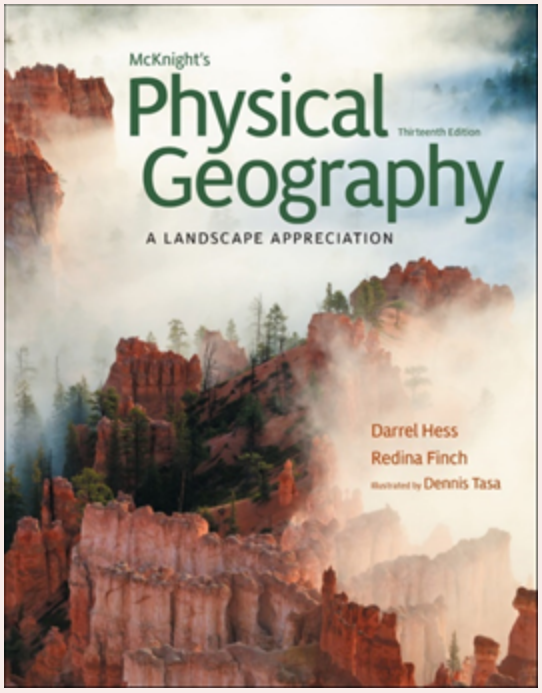
Old Faithful Geyser of Napa Valley, Roadside Attraction with Student Learning Outcomes.

Darrel Hess—Geography

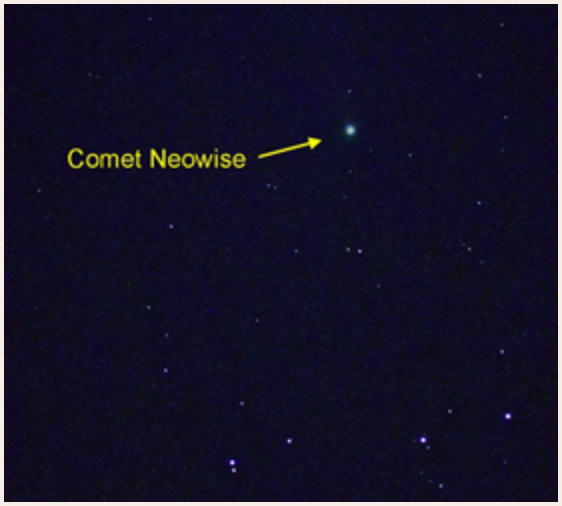
After 31 years at City College of San Francisco, I'm retiring. I'll probably look back on the 2020-2021 academic year as the least fulfilling, but in many ways the most memorable, of my career. I'm very disappointed that my last year of teaching had to be done remotely, without any direct interaction with students in a classroom or with my colleagues on campus. That said, I know that I was luckier than most. I was lucky to have stayed employed and safe and healthy throughout the COVID-19 pandemic, and I'm lucky to be able to retire with more security than many Americans these days.

This last year also turned out to be among the busiest I've ever had. Beginning in spring 2020, when our campus shut down because of the pandemic, like most teachers in the country, I started the process of transforming my face-to-face classes into remote instruction courses. I worked nonstop through the summer and fall, trying to learn the basic skills of effective online teaching.

At the same time, I completed writing the 13th edition of my textbook, McKnight's Physical Geography: A Landscape Appreciation. Working with my Pearson editors and my new coauthor, Redina Finch of Western Illinois University, we integrated an exciting National Parks focus into the entire book. During the winter, I finished production of a new edition of my Physical Geography Laboratory Manual.



Cover of McKnight's Physical Geography, 13th edition. Bryce Canyon National Park cover photograph by Seth K. Hughes/Getty Images.



Comet Neowise. July 31, 2020. 105mm f/2.5, 1 sec., ISO 3200.

As was true for most people during the pandemic, all of my usual trips were cancelled this last year. Instead of camping, scuba diving, and attending conferences, Nora and I stayed home. Because I couldn't travel to dark locations to stargaze with my telescopes, I recorded the year's two landmark astronomical events from the front yard of our East Bay house. At the end of July, Comet Neowise finished its pass around the Sun. I recorded little more than a small fuzzy ball in the light-polluted night sky of the Bay Area; it must have looked amazing under truly dark skies where I wish I could have been! On the other hand, the conjunction of Jupiter and Saturn in late December provided the spectacular sight of both planets in the same telescope field—a once in a lifetime occurrence.

Conjunction of Jupiter and Saturn. December 20-21, 2020.
500mm f/5.6, ISO 6400 (Jupiter & Saturn 1/500 sec.;
Galilean Satellites 1/125 sec.).

Juvenile Great Horned Owl (Bubo virginianus).

Like many people largely stuck inside and close to home this year, my appreciation for birds grew during the pandemic. Nora and I gradually progressed from being casual bird watchers to become serious novice "birders." Our greatest thrill was watching a family of Great Horned Owls in our neighborhood. Beginning in May, we followed them through the summer as the young owlets lost their juvenile feathers and learned to fly (actually, they flew quite well early on, but they needed a lot of practice learning how to land in a tree without crashing!). By the end of summer, the three young owls were gone. We're hoping the parents stay around to raise another brood this year.

During the winter, we watched a lone male Merlin take up temporary residence in our area, looking for his next meal from high atop his favorite trees. Now in the spring, the Western Bluebirds, Northern Flickers, Yellow-Rumped Warblers—and dozens of other birds—are singing and nesting near us. In our retirement, Nora and I look forward to the time we can do more birding, hiking, diving, and camping without the constraints of the school year calendar or the pandemic.

Merlin (Falco columbarius) and the moon.

Western Bluebird (Sialia mexicana).

It has been an honor to teach at City College of San Francisco. I have nothing but the deepest appreciation for the thousands of students who've passed through my classroom these last three decades. And I have enormous gratitude for the colleagues I've worked with over the years—many of whom are now my lifetime friends.

Thanks to all of you.

Have a healthy and happy year. Be safe everyone.

Chris Lewis—Geology and Physical Science

Last fall, I returned from a year sabbatical, taking classes at Cal and developing new materials for our historical geology lecture and lab. I took a digital mapping class that focused on web-based mapping platforms and open-source data, a paleontology class taught by the director of the UC Museum of Paleontology, Dr. Charles Marshal, and an Earth history and stratigraphy class in my old home department, Earth and Planetary Sciences. In addition to the rich subject matter, I learned to use Jupyter notebooks, and to code in HTML, Java and Python. I also had the opportunity to work with Lisa White, director of education at the UC Museum of Paleontology, and Christine Garcia from the California Academy of Sciences to develop research opportunities for undergraduates. The Pandemic limited progress on that project, but we were still able to offer at least one of our CCSF students a paid internship this summer doing paleontology in Canada.

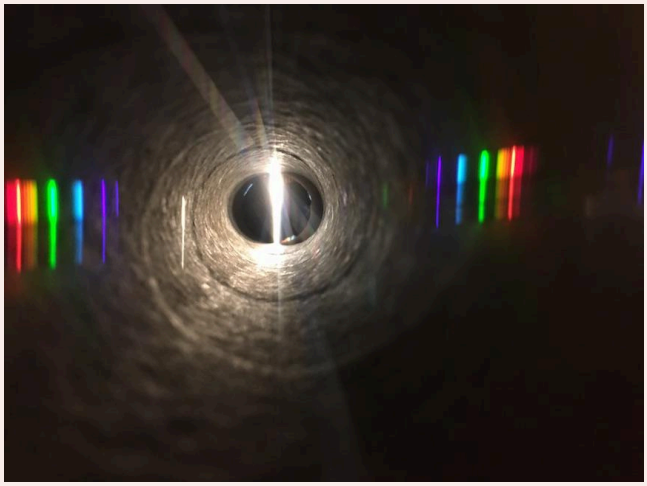
Classes this year were a challenge for all of us, but I was impressed at the resilience and engagement our students showed. Even in remote learning mode, I made great connections with students, and was able to share in their sense of discovery. Labs were especially challenging to develop, but there were some amazing successes, including a lab where students made their own

spectroscopes from an old CD and a cardboard tube. Imagine seeing quantum mechanical phenomena through a toilet paper tube! In March, I was invited by CCSF earth sciences alum, Esther Muñoz to give a talk to the Pennsylvania State chapter of the Society for the Advancement of Chicano and Native Americans in Science (SACNAS) — a both humbling and inspiring experience. Our students are great, and they go on to do greater things.

This summer is shaping up to be fantastic — In June, I will spend two weeks in Montana mapping Cu-Ag mineralization in upper Paleozoic sediments and late Cretaceous plutons with my former thesis advisor at Cal, George Brimhall. Field work is why I became a geologist, and Montana is a great place to see world-class ore deposits and the effects of the Sevier and Laramie orogenies on the once passive margin of North America. In early August I travel to Corvallis Oregon, to attend the School of Ice. Through this program, I will work with top notch paleoclimatologists, learning about their science while studying ice cores form the Ice Drilling Project. This experience will expand and enrich the climate change activities in my classes — a topic we all should be learning more about. I am also planning some camping and hiking trips with my wife, poet Judy Halebsky, and our soon-to-be three daughter, who already collects rocks and loves maps. I hope to see you out on a trail somewhere this summer, if not in-person sometime.

“With their four-dimensional minds, and their interdisciplinary ultra-verbal way, geologists can wriggle out of almost anything.” — John McPhee

Stay healthy and get outside!
Chris



Discrete spectra from an Hg-fluorecent light. Physical Science Lab (P SC 11)

Georgina hits the trail in the Oakland-Berkeley Hills

Katryn Wiese—Oceanography and Geology

I am so grateful to have been able to work with all the student contributors to this year's newsletter. I met **Esther Muñoz** briefly on a field trip before she headed off to continue her studies. **Anita Engelstad** migrated from student to friend and has been an inspiration as well as a hiking companion for over a decade. **Pierre Churukian** was a top student over a decade ago who has continued to stay in contact and inspire me in his dedication to pursuing his career dream. **Bradley Feucht** and **Sonja Feinberg** were students I met through my online classes this last year. Both **Bradley** and **Sonja** stood out to me primarily because of their great questions and thoughtful, engaging, informative, and instructive posts in the online discussions. All these students are stellar examples of intelligence and perseverance and grit. They have inspired me, and I hope they will inspire others. I wish them all well and hope we will continue to hear of their adventures and share in their successes.

I am also deeply grateful for my department colleagues. Thank you in particular for all the assistance and support I've received over my career at CCSF from **Darrel Hess**, who was department chair when I was hired. For over two decades, we have collaborated to build our programs and support our students. I wish him the best in his retirement and am hopeful that he will choose to return in a year to teach again for us as a part-timer. He will be missed! Thank you as well to **Ian Duncan**, our current chair, for gracefully leading us through difficult times, to **Chris Lewis** for his commitment to bringing the highest quality educational experiences to our students in all our programs, to **Gordon Ye** and **Elizabeth Proctor**, our GIS part-timers, who bring their wisdom, expertise, and patience to their classes, and to **Cort Benningfield,** our department volunteer aide, who has taken all our courses and continues to support us and our students through tutoring and equipment and collection maintenance.

This year of 100% remote or online teaching has provided a myriad of new challenges, one of which was finding ways to teach field and lab experiences online. I have now developed fully online versions of our Oceanography and Physical Geology courses -- both lectures and labs. I was always skeptical about the ability to have a science lab experience online, but necessity breeds innovation, and I love solving puzzles. My online students are not getting the same experience as in-person -- for some topics and skills there's less that can be investigated -- but I was also surprised to discover that in other cases the digital and at-home efforts are better, and the learning has been much deeper. My final evaluation is that on balance, online earth science classes can be as valuable, as rigorous, and as successful as an in-person class, albeit with differences, including my needing to put in a lot more time as a professor supporting the students through the process. Having online options is great for students, so it's worth the effort. Want some examples of what I'm talking about?

Field trips -- these are surely best done in person, right? A well done virtual field trip can provide opportunities for self-directed observations and exploration yet also allow me to point out and describe important elements students might not see -- even drawing over the images or videos to outline things like cross-bedding in a sand layer in a cliff or zooming in on very small objects like a nudibranch hiding in the algae in the tidpools. Instead of what typically happens in the field -- only the students who are close enough to hear me or patient enough to listen get the information -- every online student gets a chance to click on a link and hear and see my description. These have been great benefits that my in-person students don't get. Of course there's a loss when you can't feel the rocks or touch the tidepool creatures yourself. That's an important experience too, and yet it turns out that my online students are giving themselves that experience as well. After the virtual field trip, many end up so

excited that they go out to the field site themselves and then report back with photos and stories from their experience, describing how it felt to take their friends or family out to the field locations and show them what they learned. In fact, I can even consider making that a required additional assignment. I am leaning towards believing this model might be a good one for all students -- a combination of virtual field trip followed by in-the-field experiences. Our understanding of concepts and skills deepens as we describe and share those with others -- and self-guided exploration (without a hovering instructor in the background) can spur future discoveries.

Chemistry labs -- these are impossible to do at home, right? The detailed chemistry labs I ran in person in the lab room never really seemed to connect with students: they completed the experiment like a cookbook recipe and despite some group analysis didn't come away with the outcomes I'd hoped for and barely remembered the experience afterwards. Online, students interact with the chemicals in their kitchen -- using tools and materials readily available there, including baking soda, salt, ice, straws, microwaves, and their own breath. Making your own pH indicator out of cabbage creates much deeper connection to the process than simply using pH indicator tape in a classroom. And it has become a favorite lab and the one the most remembered at the end of the semester.

On the personal front, despite the pandemic, Jeremy and I spent a total of 8 weeks on the Big Island of Hawaii this past year. Snorkeling showed us healthier reefs than previous visits (the break from tourists really helps) -- and for the first time I saw cushion stars. On the hiking front, we explored the volcanoes of Hualalai, Mauna Kea, Mauna Loa, and Kilauea. Kilauea is much quieter these days -- no active flows for the first time in 50 years -- but still a thrill to see the evidence of past eruptions, especially the 2018 eruption that built still-smoldering cinder cones across the southeast portion of the island, in the backyards of people's homes.

Meanwhile, there IS an active and very exciting eruption going on in Iceland right now, an area whose volcanism I've studied for years, and we already have our tickets and plans for visiting as soon as the semester is over. I'll be taking lots of video footage and images for my teaching materials and just gawking at the pure splendor of the natural world.

Best wishes for summer 2021 and hope to see you in the fall