# AMHERST STEM NETWORK

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# Editors Note

Welcome to The Amherst STEM Network!  We are a student-run online platform dedicated to showcasing scientific advancements (especially those made by the Amherst College community) in an accessible way.

Science is inspired by the questions we have about our own everyday lives, but the overarching messages of these scientific endeavors are too often masked by technical terminology, equations, and code. By interviewing the students, professors, and speakers who conduct this research, we hope to make complex topics accessible to anyone who stumbles upon our publication. Relaying findings in everyday terms, we hope everyone (yes, that includes you!) can use science to inform their decisions and actions. In this issue specifically, we also navigate through the resources (offered by the Loeb Center and Writing Center) and opportunities (such as SURF) available to students so they too can meaningfully contribute to research.

As the bridge between Amherst STEM and the everyday lives of our readers, we understand that our platform serves a different purpose for different members of the Amherst STEM Network community. For our reporters, ASN is a platform to hone science writing skills and ease into research. For our interviewees, ASN is a way to communicate their work so their findings extend beyond academia and into reality. For our readers, ASN is a resource to help make sense of the world around us all. At the heart of these functions is a desire to understand science and for science to be understood, which is at the core of what we do.

Here's to hoping we can foster more scientific understanding in the world.

*Aditi Nayak*
Editor-in-Chief

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## Remote Learning

On September 7th, 2019, the Amherst family grew one building larger. The 230,000 square foot Science Center has become the hub for research and innovation in the sciences, housing 6 academic departments, 47 research labs, and 87 offices. The building is a part of the college's Greenway Project, a plan designed to pave the way towards a more sustainable campus.

More than 100 companies assisted with the development of the new science center, and 87% of the construction waste (1600 tons or the weight of 267 mammoths) was recycled.

A multitude of factors contribute to the Science Center's biophilic design. The contemporary exterior of the building boasts a triple glazed glass curtain wall, a roof generously layered with solar panels, and rainwater capture. The rust colored panels covering some windows help with cooling or heating the building, and light that passes through the slots on these panels' mimic light passing through trees. The window curtains, made from recycled water bottles, automatically adjust depending on the temperature of the building. This feature tremendously adds to the efficiency of the building's ventilation and heat retention system.

# SCIENCE CENTER

## Sustainability

**Amritha Anup**

Tucked under the main staircase on the first floor is a reflecting pool that contains water that is filtered through the campus gardens. This water is recycled back to plants all around campus. Overall, the rainwater harvesting system reduces potable water consumption by 1 million gallons each year.

Most of the classrooms, laboratories, and meeting spaces in the science center are behind glass walls. State of the art laboratories are grouped based on specialization and include collaborative workspaces. The color scheme of the building consists of earth tones; scattered across the three different floors are sets of green furniture, plants, picturesque landscape views, and ample access to natural light - all of these features tie together to further emphasize connections to nature.

The Science Center is 70% more efficient than average science buildings of the same size and uses only 30% of the amount of energy per square foot used by Merrill, the old science center. The science center's solar array had the highest levels of energy production in July 2019, with a total production of 17.4 MWh. Additional statistical energy contribution data from the solar array can be tracked here.

# SCIENCE
# Under the Sun

## Jonah Horowitz

Every summer, Amherst College hosts the Summer Undergraduate Research Fellowship, or SURF. The program aims to provide a strong first research opportunity to Amherst students who are interested in STEM but lack much formal experience in the lab. To apply, students must submit an unofficial transcript, brief personal statement, and their mentor preferences before the March 2 deadline. SURF researchers receive a weekly stipend of about $500, free on-campus housing, and a full meal plan. In 2019, there were 180 SURF applicants seeking to fill just 56 positions.

Jess Martin, the program's Administrative Director, reported that 60 positions would be offered this summer. To better their chances, Director Martin strongly encouraged students to reach out to mentors whose work they find interesting, whether that entails stopping by during office hours or even asking to sit in on a lab meeting to better understand their field of study.Ruminating on the skills that she believed SURF students develop, Director Martin emphasized personal progress. "There's this idea of creating a full-research-scientist experience," she said, noting that students can learn to collaborate with others and fully pursue a research question, on top of lab techniques. With these experiences under their belts, she hoped that students would have a much stronger grasp on what aspects of a research career best suit them. Last summer, Mayesha Ahmed '22 worked in Professor Christopher Durr's lab, studying polymer chemistry.

She reflected on how participating in SURF helped strengthen her self-confidence in her potential for a career in science. "I felt like I wasn't good enough to be part of a research lab when I first got in," she said, noting how she, like many others, struggled at first in her introductory Chemistry classes. After successes in the lab, however, she overcame any self-doubt and developed a true sense of belonging. Sam Schulz '22 was another SURF researcher in the summer of 2019. He worked in Professor David Hall's physics lab, building an optical device that would help to trap Bose-Einstein condensates. Unlike other student researchers, who occasionally found themselves working into the evenings, Sam found his schedule more relaxed. However, he discovered that he could not spend his free time as he might have during the school year. "It was a little weird just being here with a tenth of the school," he said, "because it's the same place, but it has a very different feeling." Nevertheless, Sam appreciated SURF for enabling him to get directly involved in research and work closely with a professor, an advantage that he credits to Amherst's undergraduate focus. In regards to the social scene over the summer, Director Martin pointed to a number of activities dedicated to community-building. She believes these group events, which include frequent outings, distinguish SURF from similar programs elsewhere. She said, "I think it's nice to be able to provide the opportunities to get off campus, just enjoy the Valley in the summer, and hopefully deepen friendships."


*Above: Jesmyda Viyano '22 presenting her SURF research with Professor Sheila Jaswal*

# Geology Department Field Trip to Hawai'i

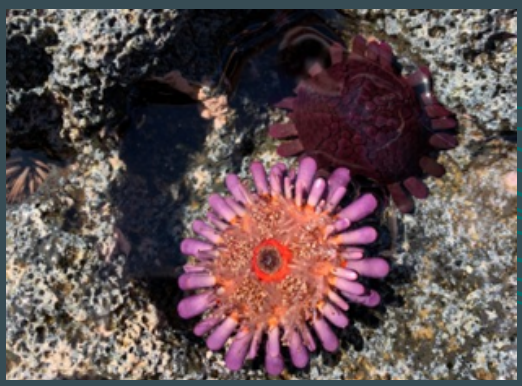
**Anna Makar-Limanov**

What do you get when you mix twenty-four students, two geology professors, and one volcanic island? A once-in-a-lifetime educational experience! Over interterm, the geology department sponsored a field trip to the Big Island of Hawai'i. I, along with various other students--from first years who had chosen to take Intro to Geology their first semester, to seniors writing geology theses--learned firsthand about how volcanic islands like Hawai'i form and various features that are unique to these environments. For instance, we got to visit one of only four green sand beaches in the world, which are made of grains of olivine. During the trip, we hiked down the steepest road in the U.S. into Waipi'o Valley, visited the southernmost point of the U.S., and climbed into a lava tube!

Throughout the trip, we learned about different ways the geology of the island has impacted the people living there. Though most things geologists study happen on timescales much longer than human lives, we saw how rapidly the landscape can change in Hawai'i,. For example, we stood on a 2018 lava flow that was still steaming as it cooled while looking over an area where people's homes had stood merely two years ago. In addition, several roads had to be recreated after they got covered by lava flows or cracked from earthquakes.

*Above: Close-up of sand from Papakōlea Green Sand Beach*

We also saw fault scarps along different parts of the island where large chunks of the island had fallen into the ocean. These kind events can lead to large tsunamis, including one around 100,000 years ago which created deposits that were recently studied by scientists that we got to see in person. Despite the destructive potential of volcanic eruptions, they also created all the land we saw, including, of course, the beaches. In addition to the famed green sand beach, we visited various black sand and white sand beaches. And while discussing the conditions under which these formed was important, afterwards we got to take a break from geology to swim in the water. We also got to see various creatures including sea turtles, crabs, and echinoderms!



*Above: An echinoderm flipped upside down to reveal its tube feet and mouth*

Overall the trip was a fantastic opportunity for experiential learning as well as community building with fellow STEM students. For a chemistry major like me, who has primarily only done research in the lab, it was a taste of what field work could be like. Now that I'm back on campus, I'm attempting to replicate the hands-on learning experience I had in Hawai'i in the more conventional classroom setting. Still, hopefully I can go back sometime soon!

# Daily Wellness Zoom To Combat Heightened Stress

## Aditi Nayak

*Above: Jessica Gifford*

*Above: The Amherst College Wellness Team*

The week of March 23, Jessica Gifford (Associate Director of Mental Health Promotion at Amherst College) will host open Zoom calls from 12-12:15PM EST where students, staff and faculty can actively practice wellness together, even off campus.An almost tangible stress clouded campus following the college's decision to shift to remote learning and move students off campus. Fears of loved ones getting sick, leaving behind networks of support at Amherst, and finding work post graduation just begin the list of concerns raised by this transition. However, as members of the Amherst community take care of their physical and financial wellbeing, it is imperative that we look after our mental health as well.

With regard to students, a 2019 Report from the Blue Cross Blue Shield Association disclosed that "major depression diagnoses are increasing faster in millennials and teens than in any other age groups--63 percent in teens and 47 percent in millennials."

Combined with the health risks posed by coronavirus and seemingly surreal lifestyle changes in response to the virus, it's easy for students—even those with pre-existing conditions —to let mental health fall to Andrea Boskovicthe back burner. Quarantine and social distancing (though necessary to limit the spread of coronavirus) could lead to long-term mental health issues according to a National Institute of Health study led by Dr. Laura Hawryluck.

Analyzing the psychological effects of quarantine during the 2003 Toronto SARS outbreak, this study found that long durations of quarantine and/or exposure to someone with a SARS diagnosis could lead to PTSD and depressive symptoms.The results of this study suggest that recent COVID-19 changes--while much needed--could heighten feelings of anxiety.Dealing with the stress of a global pandemic and the disruptions caused by the virus, it's important to take time to reflect on your own feelings during this time of uncertainty. Gifford's daily virtual Wellness sessions during the first week of remote learning aim to create a space to do so. These calls will feature a different wellness practice every day, ranging from breathing, relaxation practices and visualization exercises to journaling and goal setting.In a remote college experience, it can be easy to feel alone in this time of turmoil; thus, Gifford intends for "the Daily Wellness Zoom to give people the opportunity to come together as a community to practice a brief activity to reduce stress and improve well-being."

# Puppy Love: The Psychological Benefits of Interacting with the Canine Species

TRACY HUANG

On February 14, Valentine's Day, smiles and laughter were abundant as students pet dogs in the Science Center for the Canine Valentine's Day event. Sponsored by the Amherst Counseling Center, the Science Center, and the Alumni and Parent Programs, Canine Valentine's Day provided pet owners with the opportunity to bring their furry friends on campus for Amherst students to play with. The event took place in the Science Center Living Room, filled with provided dog and human treats (delicious cookies!). As my friends and I showed up to the event, I couldn't help but smile as I pet the dogs, which included Daisy, a small but hyper dog who immediately licked my friend on the cheek and was overly excited to enter the biology lab!

While we all know dogs are a man's best friend, it turns out that there are also real psychological benefits when people play with dogs. For one, engaging with dogs can reduce stress levels and increase happiness and energy. In one psychology study at the University of British Columbia, the 246 students that pet and cuddled therapy dogs during drop-in sessions reported decreased stress levels and increased happiness even ten hours after the sessions. In fact, companies such as Amazon and Etsy, just to name a few, are starting to allow dog-friendly work environments since dogs are known to reduce stress in the workplace.

Additionally, interactions with dogs are psychologically beneficial to improving peoples' moods. Studies indicate that dog owners who are able to spend time with their dogs on a daily basis experience lower levels of depression, as dogs have a calming presence and bring feelings of social bonding.

Other research demonstrates that spending time with dogs can boost moods by lessening loneliness, as dog ownership has been correlated with a sense of companionship and social support.

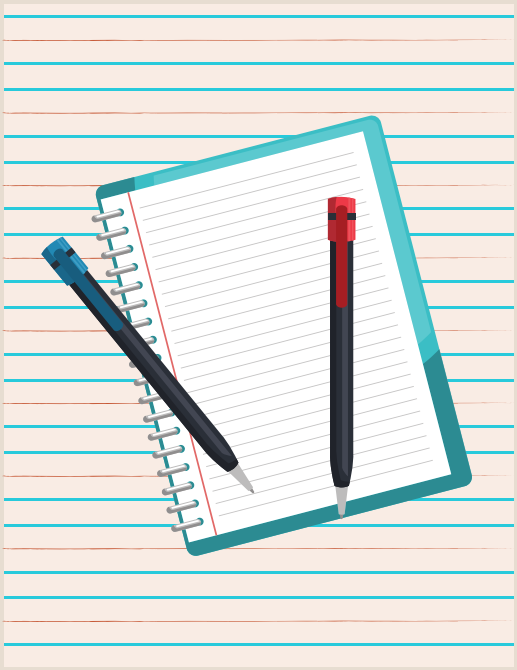
Subsequently, studies have proven that dogs are able to increase our mindfulness, which can in turn lead to feelings of calmness and comfort. Since dogs are able to be more aware of their surroundings and be more engaged in the present rather than worrying about the past or future, they prompt us to do the same. During the Canine Valentine's Day, I observed that the dogs were fascinated by their new environment, constantly staring at their reflection in the glass doors, sniffing the Science Center chairs and carpet, or wagging their tails at every new student they saw. Correspondingly, I noticed that students were able to emulate the mindfulness of the dogs and be more present in the moment, taking the time to notice the wonderfully cheesy Valentine's pick-up lines hanging from the second floor, or stopping to savor scrumptious heart-shaped sugar cookies.

Given that Amherst College students can be stressed by challenging classes, athletics, clubs, and activities, Canine Valentine's Day gave students an opportunity to calm down and simply be in the moment as they basked in the cuteness of the dogs present. In the face of labs, exams, and papers, the carefree smiles and love that the dogs gifted were the perfect thing students needed this Valentine's Day.

# Airlie Rose

## Writing Associate and Interdisciplinary Researcher

Aditi Nayak



Though most students know Airlie Rose as a Writing Associate for the Writing Center, she spent much of her academic career investigating biology. Today, she combines her expertise in both writing and biology not only to help students with science writing but also in her interdisciplinary research.

After majoring in Biology at Oberlin College, Rose worked at Indiana University and Tulane University as a Lab Assistant, researching resistance genes in Arabidopsis in one lab and phylogenetic relationships in Synurophyceae in another. She also taught in an after school support program in science for at risk youth, specifically women. Later, she became a graduate student at Duke University, investigating evolutionary developmental biology (EvoDevo). During her time as a graduate student, she served as a teaching assistant for an Introductory Biology course that focused on science writing.

Today, in addition to being a Writing Associate, Rose is an active researcher. Her interdisciplinary approach draws on the fields of psycholinguistics and cognitive writing studies to describe the inner experience of language during reading and writing. To catch a glimpse into the inner experience of a person writing, Rose asks students to free write. As they type their freewrite, she interrupts students and asks what's happening in their mind. Rose explains that this interviewing portion requires a lot of clarifying questions: "If someone says I'm experiencing movement, that can mean I'm watching a movie or my body is moving." In addition to this self-reported data, Rose uses keyboard logging, which records the time between each click of the keyboard. By integrating the text generated from the freewrite, keyboard logging, and interview results, Rose can get insight into cognitive processes that take place when a person writes.

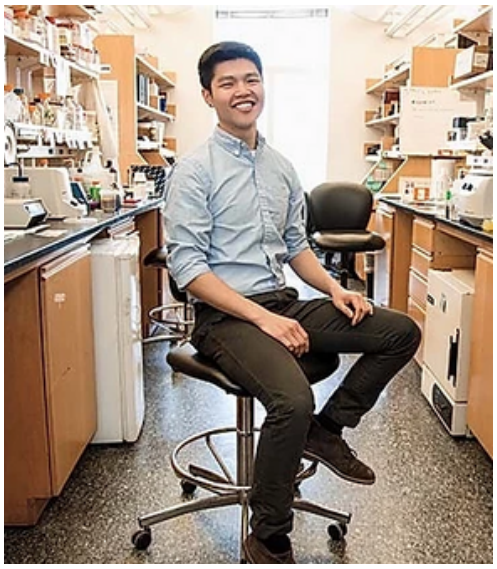
Reflecting on her research, Airlie says she "had this sort of wandering academic career, which makes me perfect for working in a writing center. This is sort of my happy place." With her breadth of experience in STEM, Airlie is able to assist students with writing in a variety of fields. As the STEM-Writing Associate, she specializes in science writing. Her assistance is open to all undergraduates on campus, but she most often meets with thesis students.

Speaking about this trend, Rose noted that "The way students can choose their courses at Amherst, it's...possible for a writing-phobic student to...avoid doing writing.... So, where I often meet them is when they are doing their honors thesis. It's so hard for students if the first time they've tried to write in the sciences is for their thesis because then they have six months or less to learn science writing and do it. But I've worked with several students where this happened, trying to cram this into their last few weeks."

Learning science writing in this context is not impossible, but Rose encourages students to start practicing this skill earlier on, and she is more than willing to help. Whether that takes the form of helping thesis students write about their research, supporting professors in incorporating science writing into their courses, or helping undergraduates make sense of research papers, Rose combines her love of research and writing for the benefit of the Amherst community. Even as Amherst adapts to remote learning, Airlie continues to host appointments with members of the Amherst community that can be scheduled through the WCOnline Scheduler; at the end of the day, she truly loves working with students communicating about science:

"I love talking science--that's what I want to get across to students. There's nothing that makes me happier than to learn more about a student's research project."

# The Perks of Being an Amherst BCBP Major: An Interview with Alumnus Dr. Chris Lim



## Grace Geeganage

Chris Lim '12 came back to Amherst College on February 28, 2020 after completing his PhD in molecular biochemistry and biophysics at Yale University. He spoke with students about his experiences being one of the first Biochemistry/ Biophysics majors and gave advice to future PhD candidates. I sat down with him for a conversation about his experiences in STEM at Amherst and beyond.

Lim took a very roundabout path on his way to a BCBP major. He started as a pre-med neuroscience major. "I switched over to chemistry after I did neuroscience research with rats and obesity. That was a lot of fun, but it actually was really helpful for me to rule out that I didn't want to do animal research. Then after that, I took a lot of bio classes and was interested in proteins, but the chemical properties of the protein. So it just made a natural sense for me to try and get more exposure outside of just pure chemistry. I think if I had just stayed on as a chemistry major I would have had to do something like inorganic and I kind of didn't care that much about inorganic. So [being a BCBP major] gave me more flexibility in the end."

At the time, the BCBP major was in its infancy and still growing. "It was actually a lot of older students [who advocated for the major], and then I was lucky that the program was set up by the chemistry and bio and physics departments together. Me and one other student were the first ones to fulfill all the requirements." A prospective BCBP major myself, I asked if he also had to take the seven common core classes including two semesters of organic chemistry and (unfortunately for me) two semesters of physics."

I don't think it was as organized, it was basically like if you were majoring in one of them, then you only had to tack on a few specialized classes at the end to be able to fulfill the requirements. I remember that I only had to take one extra class outside of Amherst. I took a summer physics class at NYU to get that one requirement in and then the rest of them were things I was already planning on taking, so I think the requirements were a little bit more relaxed back then."

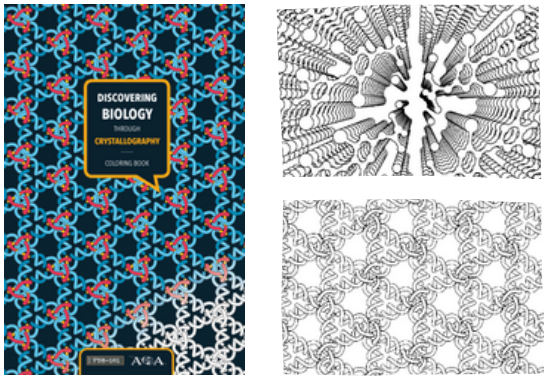
When he was at Amherst, Lim was mostly involved in the sciences. "I liked that it was very humanistic, believe it or not. I liked that I could go to my professor's office and ask them about questions I had without fear of them not having time for me, or something that I would encounter at a larger institution. I liked how grounded it felt. I didn't realize that this was an advantage at the time, but our year we had I think seven chem majors, but nine chem professors, so there was no competition or anything like that. It was easy to just follow your interests. Writing a thesis really confirmed that, for me, with Professor Bishop. It was a great experience that really set me up well to do my PhD. You know, small school things."

I then asked Lim details about his PhD thesis. He focused on pathogen protein structure when they are in complex with their human counterparts. "I was in the department of molecular biophysics and biochemistry (MB&B) at Yale in Yong Xiong's group. We are a structural biology lab, so we solve crystal structures primarily.

We're getting more into electron microscopy nowadays too, and our subject matter is how to solve the structures of proteins in complex with one another, specifically pathogenic proteins and their human counterparts. Most of my lab, for example, studies HIV proteins that sort of subvert or hijack human host molecules to disrupt their normal function to benefit the virus. Solving the structures of them together can inform us about how they do that hijacking. My project was actually not about HIV, it was about a bacterial pathogen, but a similar idea."

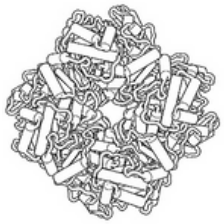
His project used crystallography, a technique to determine the structure of proteins. The procedure involves growing crystals from the purified protein complex and placing them under a beam of X-rays. The patterns of X-ray diffraction indicate where the electrons are in the molecule, allowing researchers to create an electron density map and then a three-dimensional model of the molecule. The whole process of determining the 3D model is called "solving a crystal structure."

Now that he has a PhD, Lim is considering the possibilities for his future. I asked him about his academic and professional goals: "If you asked me this in the first quarter of my PhD, I would have said that I really don't want to be an academic, I really don't want to be a professor. Because none of my science is worth it. And that will probably happen to you if you do a PhD. You struggle for a few years: nothing's going to work, and then at the end, you figure something out. But now, I'm very much more open to doing postdoc research after my PhD. If it pans out well, I would totally be open to an academic career, but I'm not the kind of person who is very gunnery and would only consider becoming a professor. I really like teaching; I taught [high school] after Amherst before doing my PhD, so I could do that."

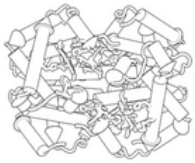



credit: American Crystallographic Association

Insulin



Rubisco



Hemoglobin

I asked Lim if he had any advice for students interested in pursuing a graduate degree: "I would say it's really important to know what your strengths are, coming from a small liberal arts college. I think that we are really good at writing, which is an under-appreciated scientific skill for grant writing or fellowship application writing and writing your manuscripts when you have data. A lot of other people I know who came from larger institutions where writing was not emphasized really struggle a lot with that, even at the end of their PhDs. And I know for a fact that people will look at my scientific writing and be like, "Wow, this is really good. Where did you learn this?" and I'm like "I don't know, I guess it was [at Amherst]." So know what your strengths are, and I think that the Amherst education allows us to be really flexible. I think other education styles will give you a lot of material and a lot of facts, but it doesn't necessarily give the same sort of critical thinking that can be applied to all the different fields you might be interested in. So really take time to think about what your skills are and where they are and try to use that to your advantage during the PhD [process], which is inevitably a really trying and difficult experience." After talking with Chris, I learned that it's okay to go through trial and error in finding your major; you will find the right academic path for you. Even STEM majors should take advantage of the amazing humanities opportunities offered at Amherst because writing is an important skill in any field. And finally, take advantage of going to a small school with enthusiastic alumni and professors who are excited to make time for their students. The experiences that you have at Amherst will set you up for success in the future--whether that's learning what path you don't want to take, or having BCBP lab experiences that help you in a graduate program.Dr. Chris Lim is currently doing postdoctoral research in structural biology at UC Berkeley. Special thanks to Chris for the impromptu interview.

# DNA, Derivatives, and Determining Your Career Path. Oh My!

*Above: Carolyn Margolin*

## Grace Geeganage

Carolyn Margolin, PhD, joined the Amherst College family last December as the program director for Careers in Science and Technology at the Loeb Center. She helps students interested in non-medical STEM paths find internships and explore possible careers. Characteristic of this time, I spoke to her over Zoom to ask her how her role has changed since the move to remote learning.

To start, I asked her specifically what the director of Careers in Science and Technology does to help students. She emphasized that she helps students in all aspects of STEM and not just the first two letters, as her title may suggest.

"I'm here to help students who are trying to figure out what steps to take along their path, whether it's helping them find internships, job hunting, or looking for volunteer opportunities that would complement or supplement what they've done in high school and in college so that they are prepared for whatever their next step might be, whether it's graduate school or going directly into the workforce. I help students with their resumes, personal statements, and any of their essays when it comes to graduate school or internship opportunities. [A lot of times students only know about the clinical path in STEM.] I am here to consult on [the many] opportunities out there that are outside the medical field. Even if you like the medical field but you don't want to be a clinician, you can go into biomedical research, or biopharmaceuticals, biotechnology, all sorts of things that are the wraparound of human health. But again, I also work with technology, engineering, mathematics, anything in STEM."

Margolin also works on creating learning opportunities in STEM, such as organizing "Treks" to expose students to companies within a particular area. The Treks connect students with potential employers in fields from technology to biology She also works on connecting students with alumni in their particular field of interest. Students can ask about career options, the path to a particular career, and more.

“One thing I haven't gotten to do much of yet but I hope to do in the future is STEM programming, like bringing alumni in physically or virtually to talk to students about the different career opportunities and career paths that are out there. And creating more of a STEM community. I know there are some groups that meet regularly and there's a really strong cohort within different majors, and I know parts of STEM have not had that yet, but I really hope to help those form within Amherst for the science and technology students.”

Most importantly for students now, Margolin emphasized that she and all Loeb Center staff are still available to help you find an internship or think about the right career path for you. Margolin used to have scheduled appointments available three times a week in two-hour blocks and drop-in hours at the Science Center. “All of the members of the Loeb Center still have their regular hours. Right now on Handshake you can sign up with me or any of the other advisors for our regular office hours. However, if those times don't work for you, shoot me an email. Usually I say if you give me three options, I can find one that works with my schedule too. I am not limiting students to the six hours that are in Handshake right now. Any student that wants to talk to me, I will find time for them.

*Above: The Amherst College Loeb Center for Career Exploration and Planning*

Absolutely reach out through Handshake or by email (cmargolin@ amherst.edu). Absolutely I will make time, I am available. All members of our staff are. I don't want a student to think that because they are not on campus they cannot get help. Please, we want you to contact us. We are here at our desks, and we are ready to help.”

I asked her if she had any information on how the College's flexible grading option and doing virtual labs instead of in person labs would affect applications to medical school and graduate school. She did talk to a colleague at a Canadian university. "A lot of graduate schools and medical schools will understand an asterisk next to Spring 2020 on your transcript: we all know what happened. You may not have had a choice in taking a class Pass/Fail." However, because of the flexible grading option, she advises that students take a letter grade (if it is a C or above) over a pass on their transcript. Graduate schools and especially medical schools prefer a letter grade if you have the choice. “Continue working hard in your STEM classes, and if your grade is a C or above, take the letter grade if you can.” Medical schools in particular prefer to see a letter grade over a simple pass or fail.

Margolin also mentioned that she has been spending quite a bit of time looking for internships that were posted within the last week for students who may still need something to do this summer. Some existing internships may need to be adjusted to work remotely or be shortened or even canceled. “Everyone at the Loeb Center is keeping their ear to the ground so that we can make sure that when opportunities come up, we can let you know. The majority of my time that I have been remote is looking for internship and job opportunities that are being opened now, because there are a lot of jobs that were posted two months ago that may not be still open. I am looking for things that were posted in the last week for students that are stressed out about internships and jobs not being posted—there are.”

Finally, I asked Margolin if she had any advice on what we could do to make the most of this experience and being stuck inside. In a nutshell: take the time to make long-term plans and take advantage of opportunities to learn a new skill that may be useful later. “If you are a student at home, take some time to update your resume, to look into grad schools and companies that might be related to your interests. You can start making those longer-term plans. There are also a ton of virtual learning opportunities online beyond Amherst. Especially for technology students, this is a time to start looking at some of those other learning opportunities where personal growth can go a long way when it comes to grad school and the job market. Maybe take some time to learn a programming language that you don't normally work with, like SQL, or Ruby, or some of the other programming languages that might be utilized later. Or if you're not technology but you are in another field you might want to look at statistical software or other programs that you can learn through Coursera, or edX, or any of the other virtual classes. I know a lot of other colleges are offering virtual courses for free. That’s something you can add to your resume or CV later. For those tech students who do personal projects: make sure to put them on GitHub or contribute to other people's projects, anything that can get your skills both developed and seen will help later on.”


Two things were made reassuringly clear from my conversation with Carolyn Margolin: make an appointment and take advantage of some extra time. Even though most of us are not on campus, people in the Loeb Center are still ready and willing to help- sign up for an appointment with any of the career advisors through Handshake. Use the time you’re not taking a three hour lab to learn something new, revise (or create) your resume, or explore possible long-term career paths -- what else are you gonna do? Take another nap? Bake yet another batch of cookies? Email Dr. Margolin at cmargolin @amherst.edu to schedule an appointment, or schedule through Handshake for appointments Monday 2-4pm, Wednesday 10am-12pm, and Friday 1-3pm.

# Five College Students Present at the 2020 Joint Mathematics Meeting

**Brendan Harcourt**

Every year, thousands of students and experts gather to share their research and learn about a diverse range of topics within the field of mathematics. The Joint Mathematics Meeting (JMM) hosted nearly 6,000 participants from all levels of the mathematics community at this year's conference held from January 15 to January 18 in Denver, Colorado. As the largest annual mathematics conference in the world, the JMM presents an excellent chance for students to explore and better understand modern mathematics research. Attendees visit hundreds of lectures about the innovative and practical applications of mathematics and have the opportunity to share their own projects with an engaged audience of peers. Students are able to network with notable researchers and authors with similar interests; some even meet over coffee to discuss their work and future aspirations. As an added bonus, this year's participants experienced Denver's nightlife with their friends and fellow mathematicians.

Several students from Amherst College and Mount Holyoke College attended the 2020 JMM. After presenting their individual research projects at the Undergraduate Student Poster Session, Andrea Boskovic '21, Andrew Rosevear '22, and Andrew Tawfeek '21E were recognized as members of this year's Outstanding Posters list.In her research, Boskovic created a series of algorithms capable of distributing products to consumers visiting an e-commerce platform. "Although I have done other research in the past, this was my first time doing math research," she acknowledges.

Left to right: (top) Cole Graber-Mitchell, Andrew Rosevear, Álex Santos, Andrew Tawfeek, Shashank Sule, Noah Solomon, Professor Ryan Alvarado, (bottom) Max Liu (Mount Holyoke College), Professor Amanda Folsom, Phyllis Oduor

Despite this fact, attending the JMM has stimulated her interest in the potential utility of mathematics. She plans to apply her research to the discipline of biology by repurposing her algorithms to optimize iron allocation in cells.

Rosevear studied the field of algebraic graph theory, linking two new "algebraic objects" to point-and-line networks known as "graphs". Since high school, he has possessed a keen enthusiasm for conducting mathematics research. He believes research "feels like solving a specific problem I've been assigned by myself, but more often it feels like exploring and playing around." He engaged his curiosity at this year's JMM, discovering unique and obscure applications of modern mathematics. He currently plans to attend graduate school to pursue a career in academia.

Tawfeek's research focused on discrete Morse theory. He characterized the "gradients" of a specific definition of Morse functions and generated a formula calculating the exact number of gradients for this definition. After traveling to the conference in Denver, he describes the appeal of the JMM in one word: "Socialization!" He thoroughly enjoyed conversing with other mathematicians and encountered top researchers who worked in the same field. He is presently working with Professor Contreras in order to complete his senior thesis.

# Andrea Boskovic

Class of 2021

## Brendan Harcourt

*This article is part of a series on the Joint Mathematics Meeting.*

In her study, Andrea Boskovic addressed the question: "How can we allocate items to users as they arrive one-by-one onto an e-commerce platform?" She approached this resource allocation problem by designing a series of algorithms based on progressive levels of difficulty. Her first algorithm focused on a group of customers simultaneously visiting an e-commerce platform. Her second algorithm heightened the difficulty, with customers visiting one-by-one at a constant rate over time. Her final algorithm focused on the most complex yet practical scenario: customers visiting one-by-one at varyingrates over time, mimicking a realistic e-commerce platform. Boskovic believes that her research could help companies such as Amazon recommend products to consumers while maximizing their revenues and satisfying various practical constraints.

Boskovic conducted her research through the Research in Industrial Projects for Students program sponsored by the Institute for Pure and Applied Mathematics at UCLA. She has developed a newfound appreciation for the feeling of struggling through a challenge. "It's easy to get frustrated when you can't figure something out, and other than research papers on the topic, there usually aren't many resources for help," she notes. "This makes figuring out even a small piece of the question you are trying to answer so satisfying." Her favorite aspects of this year's JMM were spending time in Denver with her friends and learning about new and unfamiliar topics within the field of mathematics.Boskovic plays the violin for the Amherst Symphony Orchestra, works as a Statistics and Data Science Fellow, and works in Professor Carter's biophysics laboratory. This summer, she plans to modify her resource distribution algorithms for the purpose of optimizing iron allocation in cells.

# Andrew Tawfeek

## Class of 2021 E

## Brendan Harcourt

*This article is part of a series on the Joint Mathematics Meeting.*

Andrew Tawfeek researched the field of discrete Morse theory, a counterpart to smooth Morse theory. Smooth Morse theory is concerned with certain continuous functions, known as "Morse functions", on manifolds - smooth objects such as the surfaces of spheres, donuts, or planes. As the term "function" implies, every point on the manifold can be assigned a real numerical value. Morse theory is related to the gradients of Morse functions - every point on a manifold can be assigned an arrow indicating the slope of the function. The gradient can be used to derive the critical points of a manifold: local maximums, local minimums, and saddle points - points at which the manifold slopes upward while moving forward or backward, and slopes downwards while moving left or right. Given the number and location of an unknown manifold's critical points, it is possible to prove the identity of the manifold.

Discrete Morse theory applies these concepts to CW complexes - messier, discrete objects formed by attaching lines, membranes, spheres, etc. to a set of points. Tawfeek focused solely on one-dimensional CW complexes, which only involve graphs consisting of points and lines. Because these graphs have a finite number of vertices and edges, there are only a finite number of possibilities for their gradients. Through his research, Tawfeek characterized all of these possibilities and provided a formula that yields the exact number of gradients given any number of critical points on the graph. Tawfeek states that his field of research could help de-noise digital images, improve surface meshes for computer graphics, and improve memory-efficient computation methods for 3D images.

Tawfeek conducted his summer research under the faculty guidance of Professor Contreras, who invited him to apply to his summer research during last year's JMM in Baltimore, Maryland. He compares research to exploring an uncharted world.

Tawfeek prefers to devote his time to mathematics research and heavier course loads. He also enjoys weightlifting as a hobby, speculating that it helps to alleviate general stress. He is currently working on his senior thesis.

"In the mathematics classes one then takes, you get taught about these tools others have made so you can wield them yourself and use them yourself for your own exploration (theorems!)," he notes. "The more tools you have, the better of course, but more often than not, none of your tools help you get past an obstacle you encounter during your exploration." In this way, his research inspires a sense of childlike wonder as he attempts to solve various problems and learn more about the potential uses of mathematics.

# Andrew Rosevear

Class of 2022

## Brendan Harcourt

*This article is part of a series on the Joint Mathematics Meeting.*

Andrew Rosevear explored a branch of graph theory known as algebraic graph theory. In graph theory, "graphs" refer to several points known as "vertices" connected by lines known as "edges." Social media networks are a real-life example of graph theory: Facebook users (vertices) connect with other users by becoming friends (edges). Algebraic graph theory specifically concerns the relationships between graphs and complex structures known as "algebraic objects". Rosevear studied three types of these algebraic objects: two "cohomology groups" and the graph's "automorphism group". Groups simply refer to a type of algebraic object that represents concrete structures in an abstract way. As an example, a Rubik's cube group represents a Rubik's cube puzzle in mathematical terms. Similarly, cohomology groups are vector spaces - abstract representations of normal n-dimensional spaces - in which every point in space is represented using n coordinates. For the 0th cohomology group, n equals the number of connected components (maximal sets of vertices that are connected by edges) of the graph. For the 1st cohomology group, n equals the number of edge cycles (pathways of edges in which the only repeated vertices are the initial and ending vertices) on the graph. The automorphism group measures the graph's symmetries - the transformations of the graph that preserve its shape.

In his study, Rosevear derived two new algebraic objects by combining each cohomology group with the automorphism group. The 0th "cohomology symmetry group" determines the symmetry of the connected components of the graph. The 1st cohomology symmetry group roughly determines the amount of the graph's symmetry located in its edge cycles as opposed to the rest of the graph. Rosevear acknowledges that his research has no immediate applications, but believes these findings will eventually prove useful in certain fields, such as image processing or social media networking.

Rosevear initiated his study at last summer's SURF program. He thoroughly enjoyed his research experience, describing it as an opportunity to freely explore and play around with a self-assigned puzzle. "I love trying to make new connections and gain intuition for new, unexplored areas," he notes. "Gaining intuition is the first crucial step towards proving theorems, and is one of the most fun parts of math."

Rosevear is the president and co-founder of the Math Club and is a member of the Archery Club board. He is also involved with theater, devoting time to Theater and Dance department shows and student-run Green Room shows. He is currently pursuing a career in academia, likely in some division of pure mathematics.

# Senior Thesis Spotlights

## Emily Ma Class of 2020

### Making Moves in Sperm Cell DNA Folding

**Joanna Idrovo**

How can two meters' worth of genetic information go from being packaged in one cell to another at least six times smaller in size?

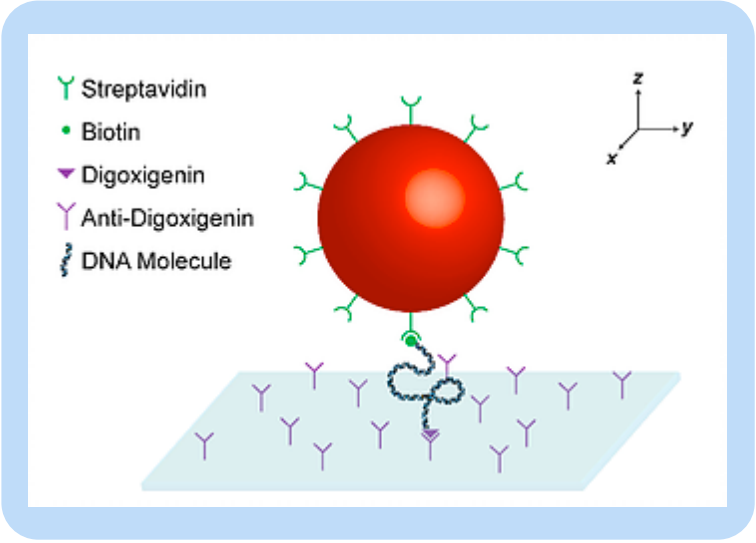
Biochemistry student Emily Ma ‘20 explores this question and many others in her senior thesis in the Carter Lab, using a fish model to research how the protein protamine replaces histones located on DNA to produce even tighter loops that can fit into sperm cells. In a non-reproductive cell, genetic material is coiled by histones, proteins that attach onto DNA. During the formation of a sperm cell, however, DNA must be packaged significantly tighter to fit inside the protective sperm head, allowing the sperm cell to swim towards and fertilize eggs. The ability for DNA to fit within the sperm cell is made possible by replacing histones with protamine, which compacts DNA 10 times tighter than histones.

Despite protamine's importance in the creation of healthy sperm, little is known about the transitional process by which this protein interacts with and replaces histones, prompting Ma to base her thesis on this lesser-known topic.

Although DNA is too small to be viewed under a light microscope, Ma accomplishes her thesis goal with a process known as Tethered Particle Motion. One end of a DNA molecule is attached to "something we can see— a round particle that's 1/50th the diameter of your hair— and the other end to a coverslip." When placed in water, the particle will move due to being bombarded by water molecules but is held in place by the DNA attached to the slip, behaving similarly to a "dog tied to a pole". According to Ma, "tracking how far the particle can travel from the center point tells us how much the DNA has folded", with the addition of histones or protamine further limiting movement.

Ma's path to her senior thesis began in her childhood and teenage years, leading to the moment where she could perform research of her own. As the daughter of a chemist, Ma spent countless hours visiting her father's lab and listening to his lectures, awed by his passion for chemistry. Her high school's science club would eventually provide an outlet through which Ma could first experiment with research, from "balsa bridge building to starting a beef jerky business to constructing a cardboard boat". By the time she entered college, Ma had her mind set on conducting research and participated in Prof. Ashley Carter's lab through Amherst's SURF program after freshman year, a group she has been a member of ever since.

Despite the rigorous hours spent in and out of the lab, Ma's research on DNA folding has future implications for fertility treatments, a cause she finds meaningful. As Ma notes, "A high proportion of sperm produced by infertile males have abnormally large sperm heads... [suggesting] that DNA packing may play a role in infertility." She goes on to state that developing a greater "Understanding [of] how protamine replaces histones on DNA—a process crucial for passing on genetic information—could improve treatments that help couples have children."




*Above: Diagram of a DNA molecule tethered to a particle and a coverslip*

When asked to provide advice for others who may be interested in writing a thesis, this was Ma's response: "Before you decide on a thesis, I would recommend talking to other thesis writers,especially the ones who are in the lab you're interested in... Also, I would recommendtaking a hard look at your reasons for wanting to write a thesis. You need an answer that will sustain you through the inevitable disappointments and setbacks throughout the year and carry you to the finish line!"

# Q&A

*with*

# Emily Kwon

Class of 2020

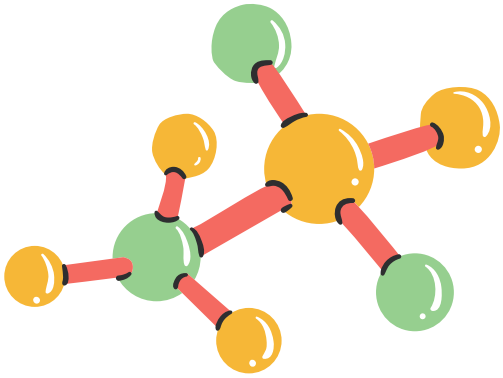
**Joy Won**

Emily Kwon is a senior neuroscience major hailing from central New Jersey. She aspires to go into medicine and plans to take a gap year or two before applying for medical school. On campus, she has been part of the orchestra and chamber music programs, ACEMS (our on-campus emergency medical services), and the First Baptist Church Five College community. A few of her most memorable experiences during college have been studying away at Wellesley College—her sister and mom's alma mater—her junior fall semester, working in a neuroscience professor's lab, and teaching English in China for two summers. She is an avid baker and loves learning languages.

## Q: Could you briefly explain your research?

A: My research focuses on looking at a protein called the BCR (breakpoint cluster region) protein. It's better known for its role in leukemia, but it's also implicated in neuronal function, development, and memory. It's basically an enzyme that speeds up the function of another protein called a small G protein. And I'm trying to isolate certain domains or regions of BCR in order to test whether those domains can increase the protein's enzymatic function.

## Q: Why did you decide to do research?



A: I had some experience with wet lab research in high school but chose to spend the first few years of college exploring other interests. In my junior year, I wasn't sure if I wanted to do a thesis during my senior year, so I decided to join a neuroscience lab while I was studying away at Wellesley College in the fall of 2018. The lab I joined focused on glutamate transmission in C. elegans worms. As I performed experiments, I realized I really enjoyed the independent and collaborative aspects of research. When I came back to Amherst in the spring of my junior year, I was fortunate to be able to join Professor Goutte's lab, since her lab also works with C. elegans but focuses on the gamma secretase complex and notch signaling pathways. When it came time to decide whether to pursue a thesis or not, I talked to a lot of my advisors and classmates who had completed or were still doing their theses for guidance. I think after both semesters of research, I could see myself doing a thesis, and I also wanted to get better at my skills. And now, since starting the process last June, I'm really glad I decided to do it.

## Q: Could you describe some of your summer experiences?

A: In summers 2017 and 2018, I taught English to children ages 5-19 in various camps across China alongside a team of university students from the UK and US. Through this experience, I realized I love teaching and mentoring and hope to go into a career that allows me to do this. In summer 2018, I also shadowed 20 different medical professionals for a month in various settings (in-patient, out-patient, Operating Rooms, Physical therapy centers). I really enjoyed observing the collaboration between physicians, technicians, and nurses as they helped patients and learning firsthand about the lifestyles and specialties of physicians.

## Q: What does a day in your life look like?

A: My schedule allows for some flexibility as my thesis counts for two course credits. I have a twenty hour lab commitment, so I try to spread those hours over the week. Tuesday is my main lab day, so I'm usually there in the 2nd floor bio space from 9-5ish. But my lab schedule really varies depending on the experiments I'm trying to do during the week. Sometimes, I might need to go in on the weekends. On a typical day, I'll try to start my mornings doing some work (emails, homework, job apps), go to class, and in the evenings get some MCAT studying done if I have the time. I try to schedule meals with friends or classmates at least a few times per week.

## Q: Do you have any advice for underclassmen?

A: Some people say that college gets easier over the years, but in my experience, it doesn't get easier, you just get better at handling everything. And I really do think that's true. Learning to go to office hours regularly and actually time managing your schedule are things that have helped me a lot. I use Google calendar for all my meetings and class times, so I don't forget anything and keep track of all my work. SLEEP. Definitely sleep. I think it's taken me awhile to realize that. But, especially this year, I can't really function without a good 7 hours, and I also feel so much better and clearer after a good night's rest, which really helps me get through the day.

I would really encourage people to take advantage of the classes here. I wouldn't trade a better GPA for the more challenging classes I took (like intro to computer science, fiction writing, and various philosophy courses) because those classes are where I learned to really engage with the material and discuss with my peers, as well as access resources like office hours.

Also, I think it's really important to just take a step back and breathe when things get overwhelming with clubs, work, internship apps, etc. Take a walk, go for a run or something, ask your advisors or mentors for advice, or reach out to your friends who love and support you. It can be so easy to get consumed by your inner voice, telling myself that I'm not good enough or that I did something really terribly. We're so much more than just our GPAs or the activities we list on our resumes. It's important to take care of yourself and to be kind to yourself.Special thanks to Emily for participating in this interview about her thesis..cess last June, I'm really glad I decided to do it.

# Q&A *with* Ana Verma

## Class of 2020

### Amritha Anup

***Tell us a bit about yourself; what life experiences inspired you to write a senior thesis?***

I am a Neuroscience major following the pre-medical track. I plan on taking a couple gap years before attending medical school to explore clinical research or pursue public health-related opportunities. On campus, I am involved with AWIS, Project Salud, Choral Society, and DASAC. In my free time I like to learn different languages and binge-watch YouTube videos (the goal is to eventually be a poly-glot).Coming into college I didn't know much about research or neuroscience. In fact, Neuro wasn't even on my radar. However, my first-year seminar professor and my advisor were both Neuro professors and encouraged me to take Intro to Neuro, and I fell in love with Neuroscience! At the end of my sophomore year, I did a research program at Carnegie Mellon University and was able to be part of a lab with other undergraduate students, graduate students, and postdocs. I was fascinated by how the postdocs and graduate students had their own projects and were constantly refining their experiments and approaches to certain problems. Being in that environment made me realize that I wanted a project of my own, and a senior thesis is exactly that! I can do background research in literature, but also carry out experiments and obtain my own data that I can then analyze whichever way I choose.

## *Can you please talk about the research you're doing for your senior thesis?*

I am exploring the effects of knocking out a certain transcription factor (Nfe2) in zebrafish larvae. The gene for this factor is expressed in the ear, and I am interested in seeing whether it plays any role in hearing. I study the effects of the knock-out by measuring activity in the ear of both a wild-type and a knock-out larva and comparing them.

What kinds of responsibilities do you have when conducting your research?Since I work with a live organism, I have the responsibility for caring for my larvae! I do my experiments on larvae that are 5-7 days old, and I acquire them by mating adult zebrafish. I maintain the larvae in petri dishes and change out the water in the dishes daily. I also help (or helped considering most of us are home at this point) feed the adult fish once a week.Of course, there are also the general responsibilities of conducting research as part of a lab. I make sure to clean up after myself, clean dishes, refill things that need to be refilled, etc.

## *What does a typical day or week look like for you?*

I guess I'll describe what my schedule was like prior to Spring Break. Since I wanted to prioritize my thesis this semester, I opted for a lighter course load than usual (3.5 credits). I like to give myself large chunks of type for experiments, and so typically dedicated Wednesday, Friday, and the weekend to them. On Monday, Tuesday, Thursday, I focused on work that didn't involve experiments since those days I had classes and DASAC rehearsals.

## *How has COVID-19 impacted your research?*

A lot of my work in running my experiments involved troubleshooting things. At times different equipment would not work the way I wanted or larvae wouldn't survive, etc etc. By the time spring break came around, I was getting very close to collecting meaningful data. Sadly, due to Covid, I wasn't able to carry out my experiments fully after all that troubleshooting. The most frustrating part is knowing that I was really close — I was probably a week away from completing data collection — but regardless, I am grateful I have the next month to focus on all the writing! Data/results aren't absolutely necessary to write a good thesis, and that's what I'm focusing on as I write about the work I have done in the lab.

## *As a first-year, did you think you'd be writing a thesis? Did you stick with the field of study you originally thought you'd pursue?*

As I mentioned previously, I didn't know much about research or Neuro coming in, so naturally I didn't really know what a thesis was. I thought I was going to be a Computer Science major and eventually go into Software Engineering! So, no, freshman-year me probably had no idea she was going to be writing a thesis, and definitely not one in Neuro.

## *Do you have any advice for students interested in writing a thesis?*

It's never really too early to start research. I would really recommend reading about the research that all the professors in your department do because there is some really cool stuff out there! If you find a professor whose research interests you a lot, just shoot them an email. They will most likely be more than willing to talk to you more about what they do and who knows, you could end up working in their lab! Just jumping into a thesis might be a little difficult, so make sure you take classes that teach you how to read scientific literature and try to get at least some research experience (though that's not mandatory!). Also, schedule, schedule, schedule! It's seriously so easy to fall into the trap of thinking you have lots of time because your thesis is not a scheduled "course". Treat a thesis as more work than even a lab course, and try to set deadlines that you hold yourself accountable for.

# The Humans Behind HSTEM

## Being Human in STEM

Joanna Idrovo

Throughout the four days of the 2015 Amherst Uprising, many professors were made aware of the experiences of isolation and alienation shared by students of diverse backgrounds. These four days would lead to a series of initiatives to promote inclusion on campus, including the efforts of one chemistry professor and a group of students determined to create an environment of acceptance in the STEM community. In the course "Being Human in STEM", Dr. Sheila Jaswal and co-facilitators work with students on issues of diversity and identity in the sciences through the study of academic literature and the gradual build-up to the creation of research-based projects that lead to change on campus. The first few days of the course are centered on building a community in the classroom, from getting to know classmates beyond an academic level to learning about future aspirations. In the following weeks, the focus then shifts to developing a foundation in the intersection between STEM and identity through various readings on a number of topics such as socioeconomic status, race, and sexual orientation.

Along with the background knowledge accrued from readings, discussions, and activities in the classroom equip and prepare students to create projects based on the concepts they have learned with the goal of "creating change on campus or in the wider STEM community." According to Dr. Jaswal, it is at this point "[when] the student creativity and student-driven part of the course comes in, as well as taking ownership of their projects." Ranging in format and audience, many of the projects are focused on increasing awareness for issues of diversity STEM to the community beyond Amherst College. In the Spring 2019 course, three students, with the goal of engaging children in the world of science, set up a strawberry DNA extraction booth at a local elementary school's Science Night, an event hosted to let students explore new scientific topics in a fun environment. Throughout the event, many children expressed their curiosity and learned to work independently, asking a plethora of questions along the way. At the end of the night, students not only left with the DNA samples that they extracted, but with a newfound interest for the code of life.

Targeting a different demographic, four students of the Fall 2017 course began working on a conference to engage stakeholders in Amherst's STEM community. Spanning far beyond the classroom and now in its third year of development, this project has incorporated elements from other conference models on diversity and STEM education as well as commentary and feedback from interviews with staff and faculty. Their plans hold such great promise that just this February, the group was awarded an NSF grant to host the first national conference on Being Human in STEM from the 11th to 13th of June of this year. Although the course is currently in its eighth iteration at Amherst, it would not have been made possible without "developing a process of listening, validating, reflecting, and partnering" with students in order to ensure that students and their voices remain the central point of the course. During the aftermath of the Amherst Uprising, Dr. Jaswal found herself in a situation that "made me reflect on my own process of 'why am I here?' and it really rocked my world". Having been made aware of the struggle of "getting over a barrier that is lowered if you have college-educated parents, are able-bodied, have healthcare," she resolved to "lower that barrier for other students" of diverse paths of life. In her words, "if you are integrating, you can't just leave these structures and traditions in place. If you are going to do this, you are going to have to break bonds to make bonds".

# Professor Tekla Harms Digs Geology

Grace Geeganage

Geology Professor Tekla Harms has found the earth fascinating since ninth grade. Growing up in upstate New York, she took earth science that year, and from that moment she knew she wanted to pursue a career in geology. She spent her childhood outdoors, the highlight being a long road trip with her family to the Rocky Mountains, which is now the area of focus in her research. “We went out west and I saw the Rocky Mountains and I thought that is just spectacular. So even back then I'm the kind of oddball that knew [what I wanted to do] at a very young age, but I thought [the mountains] were cool and I wanted to know more about them and be in them... from age 11 on, it’s been all about mountains.”Harms studies the plate tectonic processes which cause continents to collide, and the consequences of those collisions. In her own works, Harms’ research asks the following basic questions of mountains: “How did you come to be? What are you made out of? What underlies you? Why is this part up in that part down?” For the last twenty years, she has focused on the mountains in southwest Montana. “When I stand on top of a mountain and look around me the more I know geologically, the closer I feel to those mountains, the more I feel like they're part of me and I'm part of them.”Harms focuses on Montana because “those mountains today are up because of geologically very young processes which started about a hundred million years ago and are still going on today...

By coming up and being eroded they've exposed what used to be deeper parts of the crust that hold a much older history. So I'm looking at that upthrown part where this older history is revealed, and that history is anywhere from 2.5 billion to 1.6 billion years old." Harms studies not today's mountains, but the mountains of 1.5 billion years ago.Which brings us to the question we were all wondering about: How does geology impact today's world?Harms' answer: "It doesn't. Except it does." Ah, the glories of science."I'm one of those people who feels that the rising tide floats all boats, that all knowledge is good knowledge of all knowledge helps humanity in one way or another. It may be a very indirect route by which that helps, but I feel like I'm engaged in something that's significant for society and human beings, even though most human beings don't understand what I'm doing and don't see any direct connection. Probably the most direct connection would be that the right people can use what I'm figuring out about the mountains to be more strategic about looking for resources, but that's not why I do it. I do it because we need to know more about the Earth. We live on it. It's our planet and I can't think of any knowledge about the Earth that isn't significant to know.

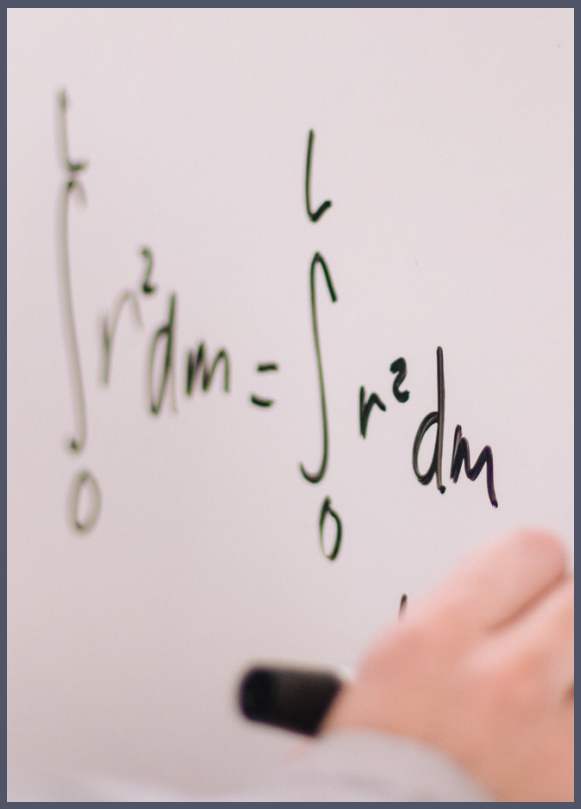
"I do put myself in the same category as people who continue to study Shakespeare's plays. We have studied and studied and studied them, but I think they're worth studying perpetually. New insights come. If you think that studying Shakespeare again or Emily Dickinson again is of value, and I do, then I put myself in that same category."Harms wants more people to be exposed to geology. "Most people aren't exposed to geology most students aren't exposed to geology in high school... so they have to be motivated to take a course and find out more about it." Every semester, Professor Harms teaches Intro to Geology. And every semester, she sees people take it and fall in love with geology. Statistically, 1 in 10 students who take the intro class decide to pursue geology.

"You don't know whether or not you want a career in geology until you take it."Once you are a geology major? "Have fun! If knowledge is important and significant, we will uncover the most important new heretofore not recognized knowledge by someone who's throwing themselves into what they're doing with passion and pleasure...Throw yourself into it. I had a professor a long time ago said, you know, if you're not enjoying what you do and you might as well be selling shoes. It's always in the back of my mind. 'You might as well be selling shoes if you are doing [something you aren't passionate about].'"Geology is Harms' hobby. She likes to travel, hike, and be outdoors. But for her, wondering about how a mountain was formed doesn't interrupt the ability to appreciate the natural beauty of the earth, it deepens it. "There isn't anything about knowing about the Earth that separates me from the earth; it more deeply engages me with the earth."Overall, Harms encourages everyone to try out geology. "If you even have an inkling that you like planet Earth, give geology a try. One of the things that I've always enjoyed about geology is that the topic is big. It's the Earth. Geology is very collaborative, and it brings in physics and chemistry and biology and mathematics. You really need all of those tools. So if you like science in a broad sense, you're going to bring it all together."Take Geology 111 next semester and deepen your understanding of the earth. Most importantly, in the words of Tekla Harms, "Believe that any field of science is open to any person. You just have to want to do it."

# Professor Yacoubou Djima and the Universal Language

Aditi Nayak

Early mornings, even on weekends, were the favorite meet-up times of Deena and Karamatou, two newly minted undergraduate students in the Big City. They would sit in a room of The City University of New York at Staten Island (CUNY-CSI), armed with pencil and eraser (or rubber, as Deena would say), scribbling out the answers to their math problem sets. Both young women hailed from entirely different continents, and countries that did not share a common language. One was a native English speaker, and the other was Francophone, still hesitant in expressing complex thoughts in the language of the new land they were inhabiting. Fortunately, math was their shared speech, allowing them to sporadically ask questions such as "What did you get for number seven?" and happily run through the details of each other's solutions. Today, one of these young women, Professor Karamatou Yacoubou Djima, works at Amherst College where she teaches courses in the Math & Stat Department and does research in applied mathematics. Reflecting on those long hours spent with Deena, who would soon become her best friend, she laughs fondly: "Oh my goodness, we were such nerds!" What's more surprising than Professor Yacoubou Djima passing up days in the dizzying Big City for math problem sets is that she did not even intend on majoring in math at first.




Immigrating to the United States from West Africa (she views Benin, Cote-d'Ivoire and Togo as her homes) to attend CUNY-CSI, Professor Yacoubou Djima initially was set on majoring in electrical engineering. While taking the required courses, however, she found the mathematics underlying many new concepts much more interesting than engineering principles. In the ordinary differential equations course that later led to her adding mathematics as a second major, she recalls how "math principles were unfolding like a beautiful story, and that motivated me to learn more."Beyond the content of her math courses, she found comfort in these abstract stories during her transition from high school in West Africa to the United States."I did study English from sixth to twelfth grade, but mostly written--the speaking part isn't as stressed. So I remember that in my first few classes, even my math class, I could not understand what the professor was saying--not any fault of his- but if you learn a language [without oral practice] and at some point go to a country where they speak it, it's different. Something to do with words concatenation?

Anyway, in math, you write everything on the board, so nothing had changed in that respect and that was so exciting [...] Math is the language. These sequences of symbols contain all the information."At the end of the semester when she took ordinary differential equations, Professor Yacoubou Djima joined her professor, Andrew Poje, as a research assistant. Many math-focused opportunities followed: several undergraduate math conferences and more importantly, an REU, RIPS at UCLA. There, she got her first taste in signal representation using efficient building blocks by examining Pixar animations in order to improve the quality of low-sampled images. She also enjoyed the fact that once again, communicating via math was the first bridge between her and her fellow participants in RIPS, who came from all around the world.

Unlike the hectic lives of the characters in the novels she enjoys reading, the focus of Professor Yacoubou Djima's research has undergone a twists and turns. Except for her change from dynamical systems to applied harmonic analysis, the thread remained constant: efficient representations for functions and signals, images in particular. Years after her Pixar days, her graduate advisor at the University of Maryland--College Park, Wojciech Czaja, suggested an eye imaging project in collaboration with the National Institute of Health. As someone who was always squeamish about looking at unattached eyes, she now laughs at the irony of that research experience.

Despite having to spend hours staring at images that made her squeamish, she appreciates the experience, for it led her to her current image processing challenge: using applied harmonic analysis to extract vessel structures from photos of placentas. Professor Yacoubou Djima never anticipated becoming so involved in the medical field through her harmonic analysis research, but it happened naturally. In fact, that is what she hopes for other students interested in a math career:

*"Give yourself time to really fall in love with something. From what I see, many students want to take as many (STEM) courses or do as many STEM related activities as they can fit in their schedule...I definitely have similar instincts in my own life sometimes. But that can be at the expense of the pure joy that comes from understanding a topic deeply, appreciating its subtleties. In my experience, that comes from spending time on it, thinking about it leisurely... A little bit, but not exactly like the description of time spent with the rose in the Little Prince."*

Reflecting on this very process, Professor Yacoubou Djima says she is truly fortunate to have found applied mathematics--and a few good friendships--along the way.

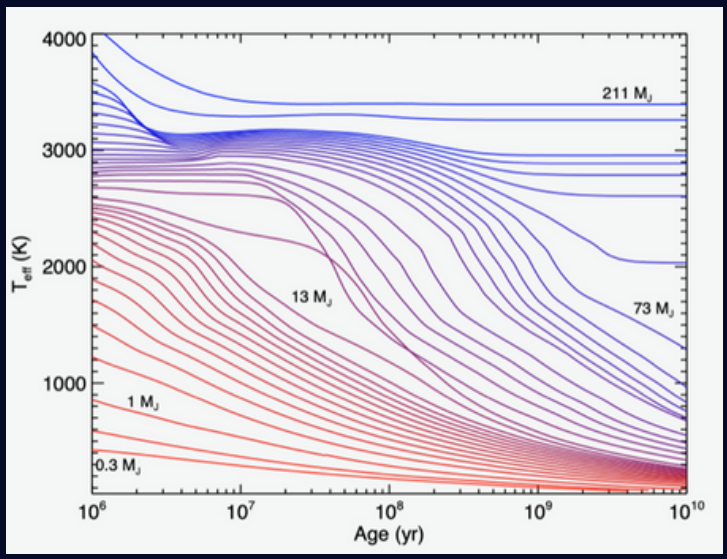
# What makes a planet?

## Daniela Bardalez Gagliuffi seeks answers in the lowest mass stars

William Balmer

If you grew up before the mid-2000s, you probably learned that Pluto is a planet, and might have reacted strongly to its subsequent demotion to "dwarf planet" status on August 24th, 2006. Just as the lower limit of what counts as a "planet" proper has changed over time, so too has the upper limit. Planets are defined as a celestial body which (according to the International Astronomical Union's definitions) has: 1) sufficient mass to collapse into a rounded shape, 2) has sufficiently cleared its orbit of other celestial bodies, and 3) has a mass lower than 13 times the mass of Jupiter, which prevents it from igniting nuclear fusion of any elements.

The second qualifier demoted Pluto, a decision which is still hotly debated, considering most "planets" in our solar system, even behemoths like Jupiter, do not have cleared orbits. Qualifier three enjoys its own fair share of scrutiny: what are we to make of objects with masses greater than this "13Mjup limit" that only undergo nuclear fusion for a short portion of their lives? Daniella Baradelz Gagliuffi, a speaker at the recent Physics and Astronomy Department colloquium, seeks answers to these questions by studying brown dwarfs (BDs): celestial objects that bridge the gap between the smallest stars and the most massive planets.




*This image from Bardalez Gagliuffi's presentation, attributed to Michael Cushing (U. Toledo), shows how the temperature of celestial objects of different masses change as they age. Blue lines represent stars that cool briefly after they form but settle into a constant temperature after igniting hydrogen fusion, which serves as a constant heat source. Red lines represent planets, who form and cool continuously over their entire life because they do not undergo any nuclear fusion. Purple lines represent brown dwarfs that cool after formation, level out briefly while fusing deuterium, and then cool again.*

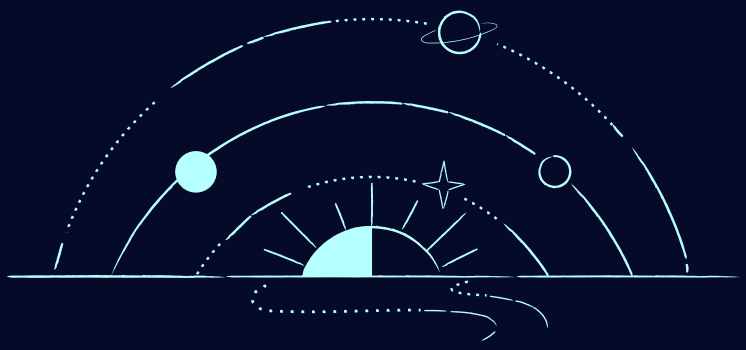
## Enter the stellar Twilight Zone

Stars are celestial objects that sustain hydrogen fusion at their core. If a celestial body doesn't form with the sufficient mass (approximately 80 times the mass of Jupiter) to ignite hydrogen burning it can't be classified as a star. Similarly to how they fail to be stars, BDs also can't be planets. It's generally accepted that planets do not undergo nuclear fusion of any kind. At the beginning of their lives, they fuse deuterium into helium, but eventually run out of deuterium and fizzle out. When prompted to explain the takeaway of her recent colloquia, Bardalez Gagliuffi said "There is this big, open question on how Jupiter formed... there are lots of similarities between low mass brown dwarfs and high mass planets, but... the pivotal difference is how they formed." To understand how Jupiter formed, it's necessary to understand how it's similarly appearing, yet compositionally distinct big cousins—brown dwarfs—form.

In an ideal world, the way to differentiate a planet from a brown dwarf would be to have a measure of its formation process (which takes place over millions of years). Since we can only observe these objects on human timescales, we have to piece together models of how planets and brown dwarfs form by observing lots of them. These observations are difficult to make because of how dim BDs and planets are. They aren't big and they don't fuse hydrogen, so they aren't very bright. Brown dwarfs and planets orbiting nearby stars were only detected in the late 1980's. Our understanding of these objects is further complicated because in the "absence of an internal energy-generation mechanism results in a degeneracy between mass, age, and luminosity [and their observational proxies]" (Bardalez Gagliuffi, 2019).

To put it simply: younger BDs can look like young, massive planets, while old, low mass BDs can resemble older massive planets.

Despite this, the individual and statistical characterization of brown dwarfs is important for understanding the products of stellar and planetary "formation pathways." In her talk, Bardalez Gagliuffi explains the approaches she's undertaken to do so.



## You may be cool, but you'll never be Ultracool SpeXtroscopic Survey cool

To constrain the brown dwarf population statistically, Bardalez Gagliuffi has published the results of the Ultracool SpeXtroscopic Survey, a volume limited (every object within a certain distance from the sun is surveyed) spectroscopic survey of very low mass objects on both sides of the hydrogen-burning limit. Two important properties of the BD population for astronomers to constrain are the luminosity function and the binary fraction. "The [luminosity function] LF is a proxy for the mass function (MF). For stars, there is a mass-luminosity relation. For BDs, since they cool over time (the mass-age-luminosity degeneracy), it's very hard to pin down their ages, and without an age, we can't figure out a mass. So we use a LF as a proxy," said Bardalez Gagliuffi in correspondence.

Brown dwarfs are commonly referred to as "failed stars." Unlike boundaries between dwarf planets and planets, or planets and brown dwarfs, the difference between a brown dwarf and a star is (theoretically) clean cut.

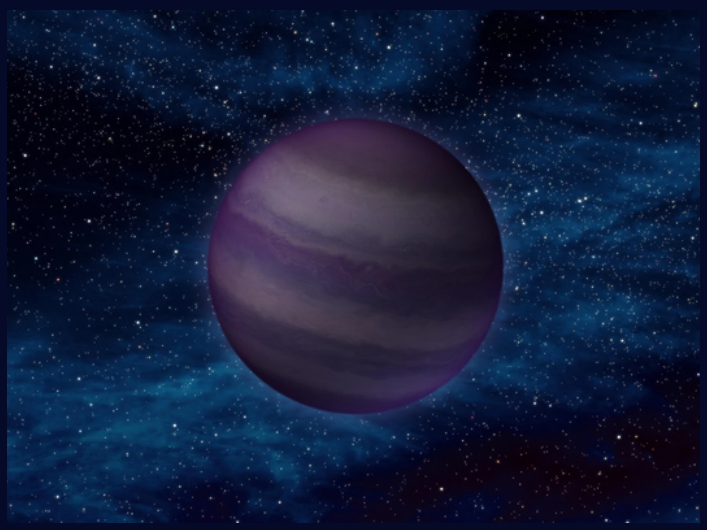
Bardalez Gagliuffi further explains, "The [binary fraction] BF is the fraction of multiple systems vs single objects for a given bin of mass or spectral type. In principle, star formation simulations can return this value as a result, so we can compare it against observations. Hence, this statistic is sensitive to the set of assumptions in your formation model." One of the key takeaways of the survey is that the literature's sample of objects is incomplete both "in terms of the number of objects identified, and … in the number of binary systems discovered." This means that our local astronomical neighborhood isn't as well studied as we might have assumed.

## Citizen Science and Community Engagement

I first met Daniella last semester before her talk at Amherst was scheduled. We both attended the Inclusive Astronomy 2 (IA2) conference Space Telescope Science Institute (STScI) in Baltimore. There, she presented the COSMOAmautas project, an IAU funded program to train teachers in the Junín region of Peru how to integrate astronomy into the coursework. "I was so excited about the project, I really wanted to present [at IA2]," she told me. COSMOAmautas seeks not only to bring astronomy to public schools in the Peruvian highlands, but to teach astronomy in an engaged, unconventional way. In addition to helping teachers design lectures, the project will scaffold discussion sections, integrate astronomy concepts into math and physics coursework, construct demos, and connect astronomy learning in the classroom to state-of-the-art research. "[Teachers] say, 'this is science, here. It's done!' but it's important to teach students that science is always changing," she says. COSMOAmautas mirrors much of Daniella's other work. In addition to her public interactions at the American Museum of Natural History, including participating in "meet a scientist" days, her discovery of WISE J0830+2837 was aided by the Backyard Worlds: Planet 9 citizen science initiative.

## The Missing Link

In addition to her survey work, Bardalez Gagliuffi presented a recent discovery and verification of one of the reddest, coldest brown dwarfs ever found. WISE J0830+2837 is a Y-type brown dwarf and has a temperature of ~350K. Unlike other objects Bardalez Gagliuffi discussed this object is special because it falls between the coldest BD ever discovered and the wider brown dwarf population. More nuanced methods of distinguishing between giant planets and brown dwarfs will become necessary as discoveries like this continue to complicate our assumptions about how stars and planets form.



This artist's interpretation shows a Y-type brown dwarf hanging out in the vacuum of space. These objects are the coolest class of brown dwarfs, and those most similar to giant planets like Jupiter. Image credit: NASA/JPL-Caltech

This crowdsourced project seeks to identify our own solar systems postulated "Planet 9" while also serving to discover new brown dwarfs. You can participate in the project yourself!Bardalez Gagliuffi's work seeks to reckon our rudimentary understanding of star and planet formation with observations of some of the weirdest, label defying celestial bodies in the universe. She provides an incredible working example of a socially engaged, responsible, and community-driven scientist - proving the merit of working collectively to solve some of the most nuanced problems in astronomy.

In response to the current COVID-19 pandemic, Amherst College opted to shift to remote learning beginning March 23, immediately following its spring recess. All students, except for those with extenuating circumstances, were expected to leave the campus by March 18. The college believes that these preemptive measures were necessary to secure the safety of its students, as "neither this College nor others have sufficient quarantine and/or isolation options to protect the community should the virus spread to our campus." However, the transition to remote learning has sparked concern among students and faculty. Amherst College strongly emphasizes the benefits of its hands-on liberal arts education; many fear that an online learning format will inevitably sacrifice some of these values.

The environment inherent to remote learning fundamentally differs from the environment of a conventional classroom. Even in STEM courses more commonly associated with lectures, in-person discussions foster a sense of intimacy, enabling students to confer with peers and seek guidance from professors.

# STEM Courses

## Transition to Remote Learning

**Brendan Harcourt**

Yongheng Zhang, a professor for MATH-211 (Multivariable Calculus), believes that these opportunities are vital for students to effectively advance through calculus. According to Professor Zhang, "One needs to study the concepts and work on the problems incessantly in order to understand and make progress, and it is necessary that one has someone to talk to in order to ask and share." Unfortunately, online learning impedes these advantages by forming a barrier between student and teacher. Julia McQuade, the professor for PSYC-364 (Child and Adolescent Clinical Psychology), anticipates that replicating in-person conversations between students and between students and faculty will prove challenging. "I also have realized, after teaching my 45-person class, that it is challenging to have a discussion with more than six people (and there are 15 in the seminar). Much of the social cues are lost online and so I think it will take my seminar class a bit of time to find a way to interact online that is effective," Professor McQuade notes.

To overcome these obstacles, Professor Zhang will focus on preserving his students' familiarity with the structure and format of MATH-211. He will upload pre-recorded lectures on Mondays, Wednesdays, Thursdays, and Fridays to align with his normal class schedule.

Similarly, students will follow the same schedule of weekly homework and monthly exams. His decisions stem from his previous experience with online learning. He states, "As a MOOC [Massive Open Online Course] learner myself, I found it difficult to get through a 1-month course in a home environment, say nothing of taking four full courses at home." To account for the disconnect between student and professor imposed by remote learning, Professor Zhang will implement resources such as discussion forums and recorded explanations of difficult homework problems. The Math Fellows Program and Moss Quantitative Center have also transitioned online, providing students with additional resources. With these measures, Professor Zhang hopes to create a meaningful online learning community for his students.

In her faculty profile, Professor McQuade describes PSYC-364 as an in-depth seminar that highlights "the importance of developmental changes and the connection between theory, empirical research, and case examples." She encourages her students to engage in thoughtful discussions with an emphasis on critical thinking and nuance. Online courses are not conducive to these values, especially given the college's sudden shift to remote learning. Consequently, she has reduced her expectations for student independence, stating that "Now, I'm providing much more scaffolding in the form of video-taped lectures on the foundational content and critical points of the articles read. This typically would have been interspersed in the in-person meeting and I would have asked students to identify much of this themselves." Despite these limitations, Professor McQuade still strives to promote purposeful thought and reflection in PSYC-364. Students will collaborate during live meetings centered around discerning and understanding big-picture implications; those unable to attend a meeting will complete an alternative assignment based on these big-picture questions. While some of the course's nuances will unavoidably be lost, Professor McQuade hopes that PSYC-364 will remain a valuable learning experience for her students.

# Combating Coronavirus with an Interdisciplinary Approach

JULIA ZABINSKA

It may appear at first glance that college students have life pretty easy. Their prepared meals, exemplary education, and lofty residences, all conveniently located within a tidy 1,000 acre campus, manifest the structured lifestyle that students enjoy and sometimes take for granted. However, I'd also argue that there's more to the typical college student than meets the eye. They are fine-tuned to noticing, processing, and dealing with change, be that by supporting a political candidate they admire, furthering a social justice movement on campus, or doing their part to slow the global spread of a virus.

Students embrace awareness and educate one another in times of duress, knowing that the strength of a community lies in the uplifting of each individual. No event showcases this sensitivity to the changing times more than the Interdisciplinary Roundtable on the Coronavirus hosted by the Five College Program in Culture, Health, and Science on March 4th, 2020 held in Fayerweather Hall.

Amherst College hosted this panel discussion that included presentations from Mandy Muller, Andrew Lover, Katherine Mason, and George Qiao. Entering Fayerweather, it became instantly apparent that this indeed was a Five College colloquium.

Students and professors from Amherst, Hampshire, Mount Holyoke, Smith, and UMASS squeezed into the rows of seats in Pruyne until the event became standing-room only.

Mandy Muller, a virologist from UMASS Amherst, began the panel with a short presentation on the virology of SARS-CoV-2, the virus behind the disease COVID-19. She reiterated facts about the 14-day incubation period of the virus, and warned about the misleading 2-3% mortality rate that she predicted would drop among populations under 50 to 0.4%. She ended the presentation by mentioning research and testing on the most promising antiviral against COVID-19, remidesivir.

Next came Andrew Lover's presentation. Lover, an infectious disease epidemiologist from UMASS Amherst, expanded on the psychosocial impacts that a disease like COVID-19 imposes on patients in quarantine and how the initial quarantining procedures in certain nursing homes invoked feelings of loneliness and isolation among patients. It is important to keep in mind the context in which his remarks were made.

On March 4th, the concepts of quarantining and social distancing weren't yet as engrained in the public psyche as they are now. The fact that 70+ students and adults could sit in the same lecture hall at the same time seemed normal; now, this same presentation would be seen as the ultimate transgression of public health and safety. It is no surprise that when Lover mentioned the importance of finding a "pandemic pal," or someone with whom you can check in with daily and deliver food/medicine to in case of infection, many students and even adults chuckled. The severity of this disease couldn't yet be fathomed on our campus thousands of miles away.

The talk turned towards the social and historical implications of a novel disease like COVID-19 with the presentations of Katherine Mason, a medical anthropologist from Brown University, and George Qiao, a historian of China from Amherst College. Mason discussed the implications of China's "imperfect hierarchy" of news dissemination and pointed out the numerous pitfalls when a central government relies on thousands of provincial officials and courts to report information accurately and speedily.


*Above: Flyer for the COVID-19 Interdisciplinary Roundtable*

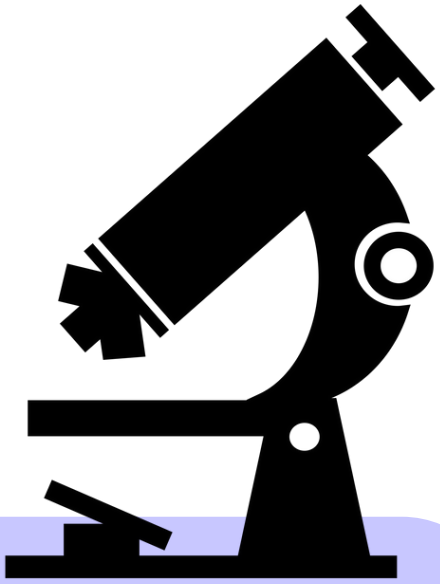
She also noted an interesting point of difference between the current spread of COVID-19 and that of SARS in 2003: the unprecedented presence of social media has untapped potential for publicizing information that the public has a right to know, as seen early on in the virus's timeline with the case of whistleblower Dr. Li Wenliang. His warnings on social media to alert both doctors and the public about the severity of the disease, which the Chinese government attempted to stifle, exhibited the interplay between propaganda and public health during times of uncertainty, a theme that Qiao believes will take off when historians write about 2020 decades from now. His remarks about the remarkable phenomenon of awareness of the present as a potential historical event truly revealed the unparalleled qualities of life in the weeks before COVID-19 became a reality in all of our lives.

And now, this reality has become almost commonplace. Remote learning, social isolation, quarantine, unemployment, instability, and uncertainty; each of these words have undoubtedly earned their place in the historical narrative of COVID-19 and have touched each of our lives to some extent. But I sincerely hope that, when historians write about and analyze the year 2020 in the future, they also feel inclined to include the words "family," "solidarity," "healing," "unity," and "triumph," for I am sure that these words just as equally deserve a spot in the history books. And I hope that college students across the country will feel inclined to shape the narrative of COVID-19 in their own words with a propensity for the truth and a recognition of their indispensable role in this tumultuous time.

# Microscopes & Metamorphosis

## Exploring BIO-191's Lab Transition to Remote Learning

Julia Zabinska



From performing PCR using one's own cheek cells to analyzing corn cob genetics, the lab section of BIO-191 is certainly no joke. Each pre-lab assignment requires attention to course themes and getting accustomed with the instruments and procedures that students would be expected to know.

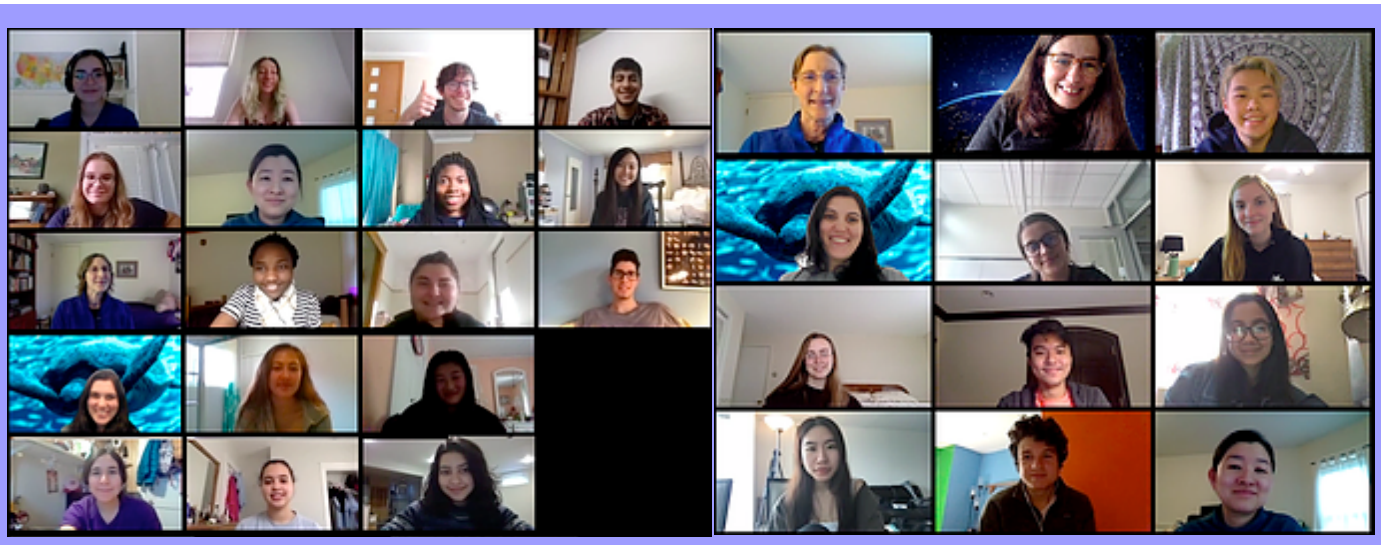
Last semester during the lab sessions themselves, students quickly learned the life cycles of yeast from the posters on the blackboard and looked forward to Professor Goutte's lively lab lectures. Having experienced BIO-191's lab section myself in the fall, I couldn't help but wonder: How did this lab-intensive and interactive course change as a result of this semester's remote learning?

According to Julie Emerson (lab coordinator and course instructor) the answer is, quite frankly, not much. Having already done most of the "wet lab" experiments prior to spring break, Professor Emerson shared that students successfully performed all but one lab throughout the remote learning period. This experiment normally would have required students to perform a phototaxis experiment with the unicellular green algae Chlamydomonas using a compound light microscope.

Allowing students to learn how to transfer species over to a microscope slide and to adjust the microscope's foci to get a clear resolution of the algae, this specific experiment's purpose was to increase student confidence in using laboratory tools, which proved to be difficult to adapt to an online setting.

Difficult, but not impossible. Professor Emerson writes, "Many parts of biology labs, such as asking questions, formulating hypotheses and analyzing data, lend themselves well to remote learning, and bioinformatics approaches allow students to use online databases to test their hypotheses directly," emphasizing the value of turning to technological resources. For this lab in particular, Professor Emerson created a two-part prelab video familiarizing students with the microscope, and the lab itself then required students to explore BioNetwork's Virtual Microscope to apply the prelab's lessons. The final portion of the lab asked students to choose their favorite microscopic images and submit them to their lab professors with a short description. The instructors then compiled all of the images into one file and shared them with the entire class.

Rather than watching Chlamydomonas transition from its non-motile form to its swimming form, students investigated the diverse and multifaceted uses of the compound light microscope and its broader utility in the field of biology.



Perhaps the most pressing question that students had when transitioning to remote learning was how can they possibly receive the in-person guidance that a lab instructor provides during the three-hour lab session if the lab must be completed on a computer screen at home?

To address these concerns, the BIO-191 course instructors tuned into Zoom for one hour of each lab period, creating a "lab office hour" to compensate for the lack of in-person guidance. To additionally simulate a normal lab section, the BIO-101 lab has adopted 20-30 minute "chalk talks," or short discussions aimed at overviewing lab procedures. Many students have found the recorded pre-lab videos to be incredibly helpful with the online format, which allows them to re-watch the videos on their own time to clarify concepts. Professor Emerson believes that the BIO-191 course will continue to post the recorded pre-labs on Moodle as the course evolves in the fall and spring of the next academic year.

Going forward, the lab instructors for this course greatly appreciate student feedback to shape the way remote learning will be carried out in the future.

The most popular comment students had on a Google survey sent out to the BIO-191 class was how much longer every aspect of the course seems to be taking without social interaction. The professors recognize this difficulty and will certainly discuss how to change the lengths and expectations of assignments to fit remote learning criteria should this period continue.

Students have also expressed some frustration with certain computer programs required for the lab that aren't compatible with Mac computers. To address this, lab instructors tried to pair students up so that every "group" had at least one student with a PC in order to be able to access the program and use the "Share screen" function on Zoom to work with their peers.

Remote learning has tested Amherst students, professors, and administrators alike. For Professor Emerson, the greatest loss, "...the energy I [she] get[s] from the students," has challenged her and the way this course is taught in many ways.

However, this period has also been one of discovery and of adjustment as she and the BIO-191 lab instructors uncover what works in this lab section, what students want more of, and what they would like to see change.

# COVID Communications: Coping with COVID19 through Community and Creativity of BCBP400

ADITI NAYAK

Coronavirus has not only changed the platform of college courses from in-person to online, but has also prompted some courses to modify their material to address our current situation. One such course is Amherst College's own BCBP400 Molecular and Cellular Biophysics, in which Professor Sheila Jaswal and Professor William Loinaz took this unprecedented circumstance as an opportunity for their students to apply course material to the real world. They tasked their students with the following challenge:

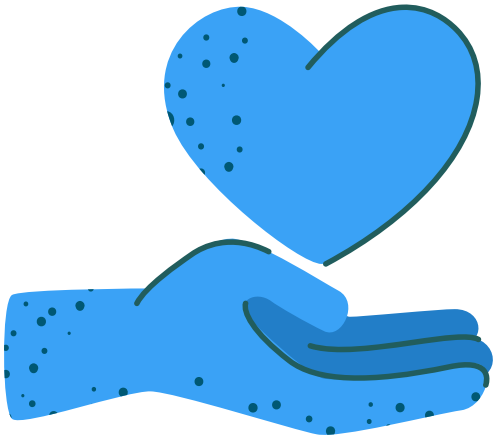
*Let's come up with a module together that lets us investigate the ongoing pandemic using both our human and biophysical lenses. Can we develop an educational process that enables each of us to contribute, that draws on our diverse backgrounds and strengths, while being mindful that these unprecedented circumstances impact our abilities to learn and function at different times in different ways? Let's create something based on our work during this module that we can share with others we care about.*

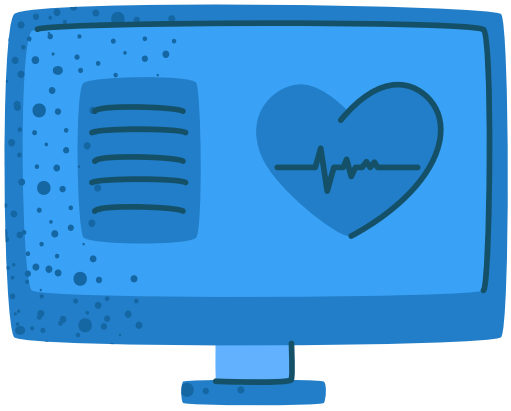
At first, students of this course were surprised by the task. Chris DaVeiga '20 noted that "Up to this point, the class was very quantitative and detail-oriented and the switch to creative expression [was] unexpected but welcome." Furthermore, as coronavirus invaded every aspect of everyday life, some students like Ava Simoncelli '20 worried "that learning about Covid-19 would not be the best thing for me at that moment in time because of all the change and stress it had caused in my life but it turned out to be a positive experience."

Quickly this surprise and apprehension about the turn in the course changed into excitement to tackle a project relevant to our current situation rather than shy away from it and study a different research topic. First, students applied what they learned about the physics and chemistry of biomolecules to scientific writing about coronavirus in an effort to make sense of the virus. For those like Lauryn Aliwas '21, this process "eased some of the emotional burden of the pandemic because I had to think about the virus in more technical and objective terms. A lot of my worries came from not knowing much about the virus, so learning the science of it has made me feel better as well as more immune to the hysteria expressed by loved ones and by the media."

As Hill Yin ‘21 puts it, “We live in a society today that is filled with random media spreading all kinds of news, and as a scientist (kind of) I trust other scientists,” so reading the work of reputable scientists offered students confidence in their understanding of COVID-19. Unfortunately, these trustworthy sources can be inaccessible to some, which led to the second part of this project: make this information accessible.

The flexibility of this prompt led student Kyle Jones ‘21 to wonder “how different people would approach it. [He] always found [himself] coming out of class projects surprised by the different ways people decide to approach them in ways I never would have thought of. As such, I was excited to see the creativity of classmates.” Indeed, these COVID-19 Communication projects were beyond creative. From letters and Zoom events to artwork and poetry, these students employed their unique intersection of talents to share what they learned about coronavirus in a manner accessible to their audience. Now, these students are not only sharing their work with you but also hope that you can use their projects to share this understanding with your loved ones.





For Nejc Nagelj ‘21, “Presenting [his] work to others really made me appreciate how different peoples' background knowledge was and how important it is, especially during these times, to enable everyone equal access to education.” Not only were these final projects rewarding for the students who procured them, but their work was also met with an overwhelmingly positive response from the loved ones they shared it with. Sharing his letters with his parents, Chris DaVeiga ‘20 noted that “Although n=2, 100% of the people I asked were proud of me and thankful for the information.” We at the Amherst STEM Network are certainly very proud of and impressed by the BCBP400 course’s initiative to tackle our current situation and the COVID Communications projects they created as a result. As we increase n to equal the number of members of the Amherst community, we are positive that 100% of those accessing these resources will learn something about the novel virus that they too can share with their loved ones.

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*Thank you to Professor Jaswal and Professor Loinaz for not only challenging their students with this task but also inviting our platform to share the incredible work of their students! Thank you to the students of this course for taking the time to answer our questions and for your hard work and creativity with these projects!*

# Collection of BCBP 400's COVID Communications Projects

Click on student's names to access their projects!

## Letter Templates

### *Kyle Jones '21*

Project Inspiration: "I have always been fond of written communication because of the control that writing gives the reader in shaping the experience of communication. In other media, like speech or video, the speed at which information is delivered is fixed by the creator. By contrast, a reader can read as fast or slow as they like, can skip ahead, or go backwards. Thus, authors must display particular concern for how their words will shape the decisions the reader makes in going through the text. I enjoy working on using precise word choice and strong organization to keep a reader's attention.

### *Chris DaVeiga '20*

Project Inspiration: "My inspiration was my father. Each day I would watch him get up and look at the news. Each day, new numbers are presented about the pandemic: eg. total deaths, total deaths in MA, total number of cases, percent of positive test results, and so on. After about a week, I realized that these numbers are just flashed on the screen and no context is given (besides the occasional graph). Because my father's main source of information is the daily news, he did not fully understand the meaning of these numbers (especially when local news is focused on the greater Boston area). I realized that there was a lack of resources for visual learners and those who might have a hard time accessing the written word. For my project, I looked to address this need by compiling a list of resources that rely heavily on visual information to provide context to the numbers that are driving the COVID-19 pandemic. My goal is to have everyone come to an understanding of the severity of this pandemic and the reason why social distancing efforts have been implemented."

# Articles/Databases

## *Ruth Mosunmade '20*

Intended Audience: High School students that have a general STEM mind, but do not have too much of the background yet. They are still learning about transcription and translation, etc.

## *Scott Song '21*

Intended Audience: This article is designed to inform a non-STEM audience.

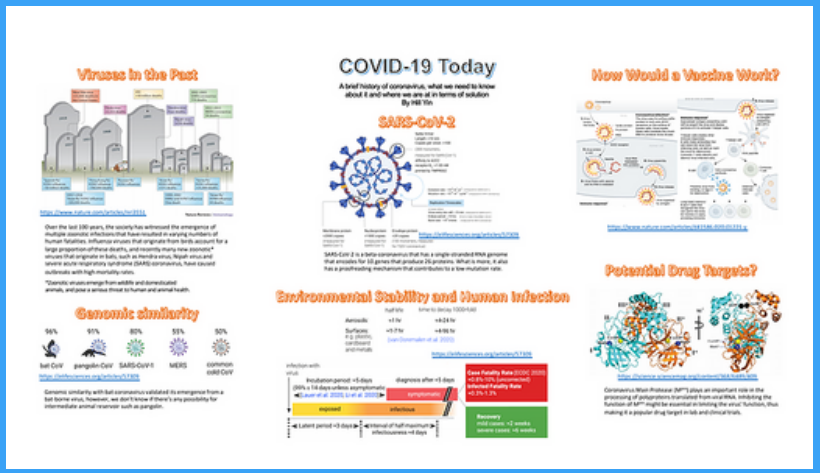
## *Donna Roscoe '21*

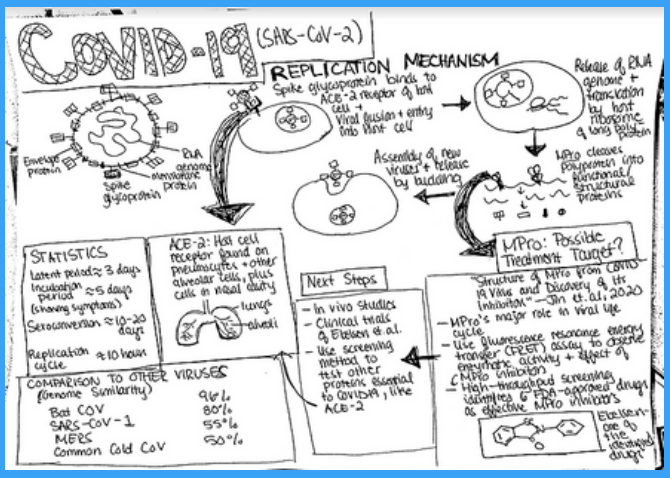
Intended Audience: The intended audience for this database is both a general, non-STEM audience, as well as the STEM audience that may assist in adding to the collection.

# Visual Resources

## *Lauryn Aliwalas '21*

Project Inspiration: "For many of my STEM classes, I watched a lot of Youtube, like Armando Hasudungan's immunology videos, to help me study and learn the material better. I was inspired by the infographic and hand-drawn format of those videos, which also corresponded with the straightforward style in which I wanted to present the information."

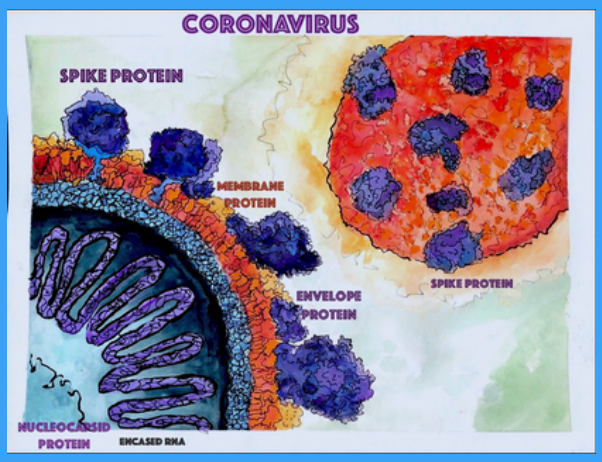


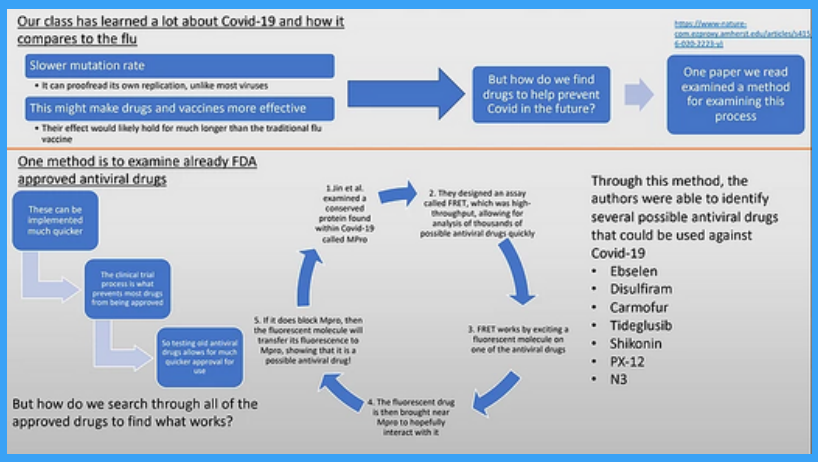

## *Hill Yin '21*

Project Inspiration: "I was most inspired by the "SARS-CoV-2 by the Numbers" article by Rob Philips and others. The paper has an infographic page in the beginning, which my poster took a couple of charts from, and I really liked the way this article was structured with quick and simple facts about the virus and its readability. So, I think it would be a good idea to create something similar that also introduces some history of zoonotic infections and possible resolutions for COVID-19."

## Amila Semic '20




## Nathaniel Johnson '20

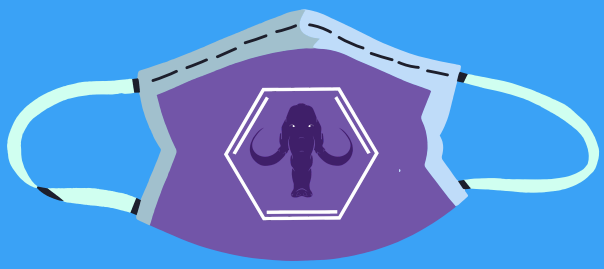



Project Inspiration: "Many structural images of the COVID-19 virus' proteins have been released in such a short time period since the beginning of the pandemic and have aided in drug development efforts and in our understanding of the underlying mechanisms. I wanted to use these structures and some magnificent already existent infographics to demystify the insides and the building blocks of the virus and the processes that go on inside."

# Presentations

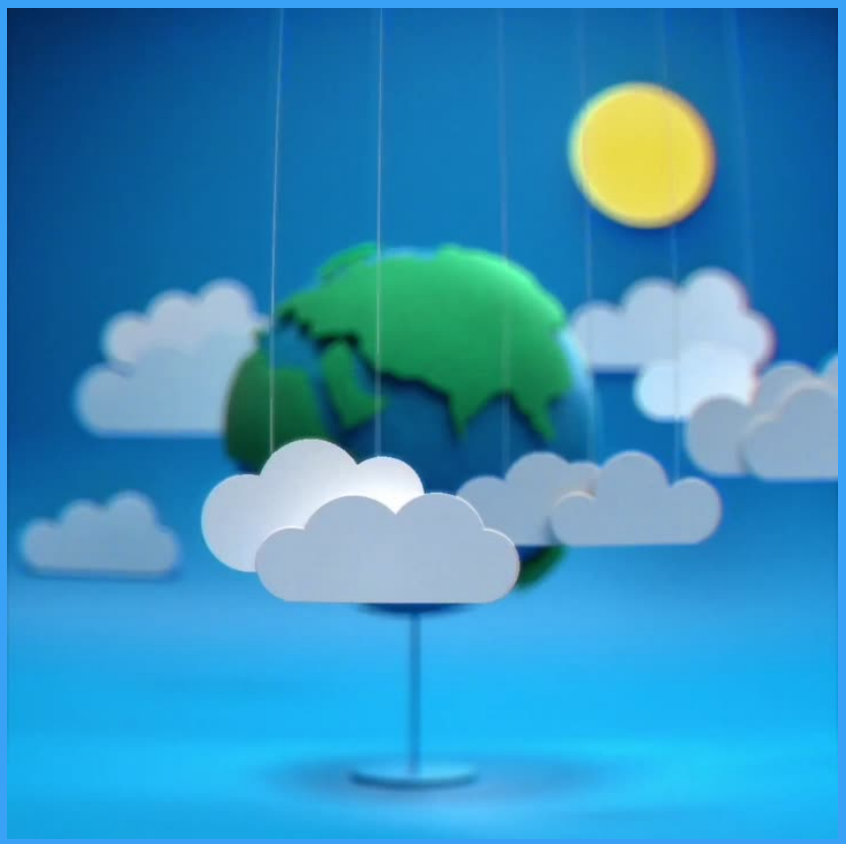
## Nejc Nagelj '21

## Amanda Lopez '20



## Ava Simoncelli '20

Project Inspiration: My inspiration was just my friends and family who are doing everything they can to stay safe and keep others safe.



# Thank you!

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