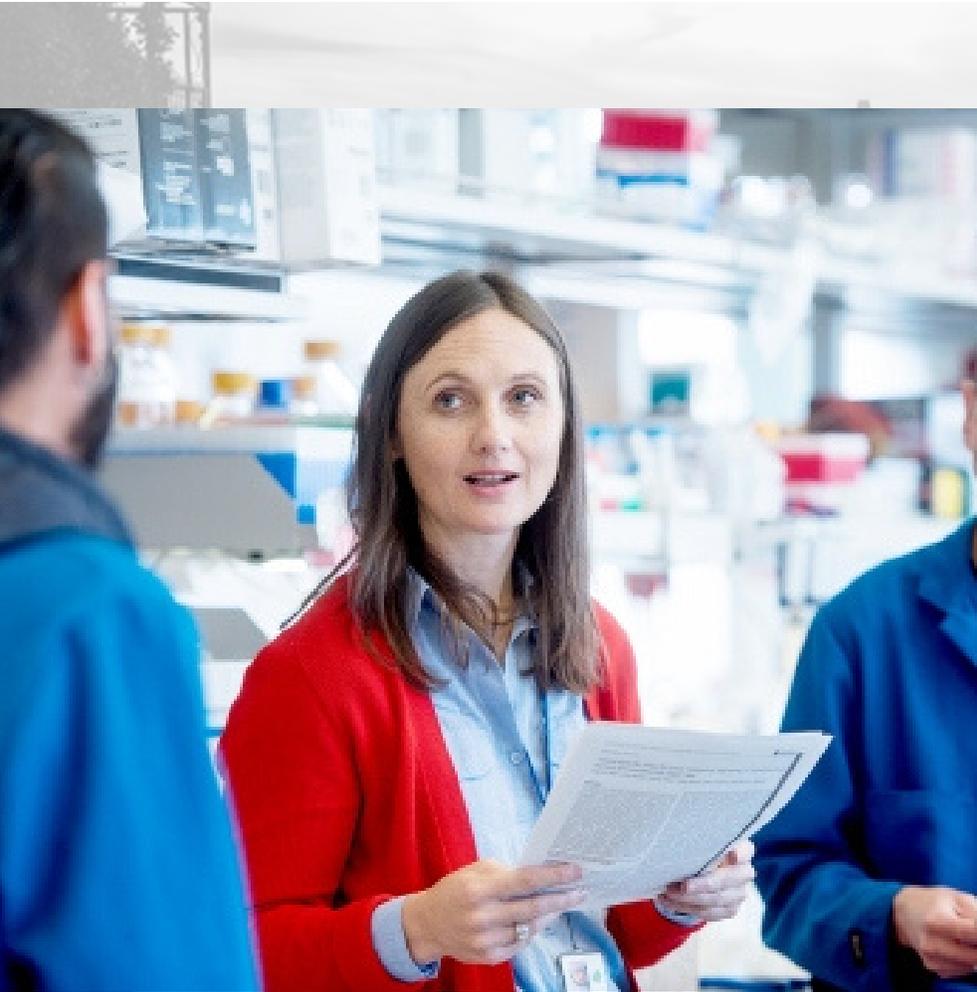


EXPLORATIONS

JOHN C. GREENE SOCIETY NEWSLETTER
WINTER ISSUE 2020



Dr. Sarah Knox (*pictured above*) has been an integral part of the UCSF dental summer research program. She has been a part of the Department of Cell and Tissue Biology and a mentor for the past 8 years, spreading her excitement for tissue regeneration of salivary glands. Turn to **page 8** to learn more about her mentorship style and research

Inside This Issue

- 2 Letter from the President
- 4 Diane Barber
- 6 Alice Goodwin
- 8 Sarah Knox
- 10 Sunita Ho
- 12 Erin Malone
- 14 An Nguyen

LETTER FROM THE PRESIDENT



Dear UCSF Dental Community:

I hope everyone is staying safe and well during this difficult time. Despite the obstacles in our path, JGS is still committed to providing our students with excellent research opportunities such as our winter and spring electives.

In this issue, we are highlighting a few of our summer fellowship mentors. Mentorship is key to a successful fellowship and we deeply value our faculty members who commit their time and effort to help their students succeed in the fellowship. Last year, we received numerous recommendation letters from the students for Mentor of the Year award. Even though we could only award one mentor, we felt it was important as a club to share the many positive and heartfelt messages our students had about their mentors and their experiences. We also interviewed several mentors to hear their insight on mentoring and to learn more about their career path to become a principle investigator. I would like to thank all of the mentors for fostering a welcoming and encouraging research community for our students; without you, there would be no summer fellowship.

In the upcoming quarter, we are bringing back our classic mini research project presentations from our 2020 summer fellows. In this elective, students will present their overarching goals, aims, and hypotheses for their projects and receive constructive feedback from their peers, their student mentors, and their research mentors. This elective has prepared generations of students for their summer fellowship and the many future presentations awaiting them.

I am excited for the new quarter to begin and I am thrilled to work with all of you. Please join our Facebook page (The John C. Greene Society) to stay up-to-date with the latest developments in the club and don't hesitate to reach out to me or any other board members if you have any questions!

Sincerely,

Susan Keefe

THE JOHN C. GREENE SOCIETY



The John C. Greene Society was founded in 2002 under the mentorship of Dr. John S. Greenspan and Dr. John C. Greene, whose leadership was instrumental to the dental school's rise to prominence as a premier research institution. A major goal was to encourage active student participation in meaningful research, bringing student research into alignment with the quality investigations being conducted by the UCSF dental faculty.



Since that time, the John C. Greene Society has grown into one of the most recognizable and respected student groups on campus. Student research participation at UCSF is at an all-time high, with dozens of students conducting fellowships each year, and many more traveling to present their findings at conferences across California, the country, and the world.



Top: Dr. Gurrinder Atwal discusses research with Navtinder Dillon '23 outside Cole Hall

Middle: Second year dental students ('22) Kendall DeKreek, Lori Martinez, Fady Ibrahim, and Zahur Subedar listening to a research poster presentation.

Bottom: Burin Thanasuwat '22 presenting his research project on TGF- β Signaling in cancers.

DIANE BARBER

Dr. Diane Barber, PhD is currently the endowed chair in the Department of Cell and Tissue Biology. She has been a part of the Summer Fellowship Research Program for at least ten years, if not more. Here she discusses her passion for research.

What encouraged you to go into research?

Dr. Diane Barber: It was intellectually challenging, creative, and despite lots of hard work and setbacks, it can have this high energy excitement. I just love pursuing questions and putting things together to make a picture, like a jigsaw.

When do you experience these high energy moments?

DB: Well, there are different ones--sometimes it's when you have a new idea, and as you review literature, you realize no one has caught onto it yet and that builds the excitement. I like the intellectual challenge that research presents. I've been doing this for 30 years and we came up with a new idea a couple months ago that we have just been flying on clouds about because we think it addresses a new view on how transcription factors recognize specific DNA sequencea. We don't know if it's true--we're gearing up test it experimentally, but the more we read and model the idea, the more enthusiastic we become.

A new idea is a high, or me sitting in my office with a student or a postdoc outlining a problem on the whiteboard and we suddenly come up with a new way of addressing the problem is a high. To come into work every day and have it continue to be, after 30 years, intellectually exciting, is very lucky. I don't know how many people experience that in their professions.

I would imagine it's one of the most gratifying things you can have.

DB: It's also a gratifying thing that not everything I do is research. I also mentor young investigators. And then to turn around and see them learn new ways to think about science, to think more broadly about biology, and go on and have successful careers. That's exciting also. For example, Ray Sessanto, a current D4 student did a summer research project, and 3 years later she still comes back and works on it. She's now writing a manuscript of her work that we hope will give her a first author publication. Research excitement and the lab energy appealed to her intellectual curiosity and she now is planning a career as an academic dental scientist as an oral surgeon. One of the most rewarding parts of my myriad roles is to help ignite that spark. I've really enjoyed working with the D1 students. It astonishes me that amidst their busy schedules, they continue to come back during the school year.

Could you give me a brief description of your current research, and which direction you think it'll go in the future?

DB: We're interested in a broad topic called epithelial plasticity. For example, when an epithelial cell is transformed to a cancer cell, or when an epithelial stem cell differentiates into another cell lineage. We found that during epithelial plasticity, there's an increase in intracellular pH and if we block that increase, we block plasticity. We're trying to understand, at the molecular level, how intracellular pH induces changes in protein conformations and activities by bridging protein dynamics and cell behaviors.



Dr. Diane Barber, PhD
Department of Cell and Tissue
Biology

If you weren't doing research, what would you be doing?

DB: A cross between teaching preschool, because I LOVE kids and maybe a chef in a restaurant. Cooking is a lot like science. It's very creative. Putting things together in new and different ways. That's sort of what science is. Let's say you address a question. The cooking parallel is when someone tells you to cook a souffle. You think about all the ways people have done it in the past and you take a little bit of what others have tried and make a new one. And that's a little bit like science.

“
If I was a genre
of movie or
music, I would
probably be a
**Shakespearean
drama.**”

My favorite quote would be **“Smooth seas do not make skillful sailors”**. It is an African proverb that I remind myself of when facing challenges or disappointments.

ALICE GOODWIN

Dr. Alice Goodwin DDS, PhD is an assistant professor in the Department of Orofacial Sciences at the UCSF School of Dentistry. Here she discusses her role as mentor in the Research program.

Briefly- what is your research about?

Dr. Alice Goodwin: I am an orthodontic researcher interested in craniofacial anomalies, specifically cleft palate and disorders of TMJ. I use mouse models with the goal of using therapeutic targets and better treatments. My research fellow also worked on cleft palate, specifically palatal shelf elevation, which accounts for human cleft palate disorders. We looked at a few key genetic pathways in hopes of understanding the fundamental reasons why this is happening.

What is your favorite part about being a summer research fellow mentor?

AG: It is really fun meeting with students who are also interested in research. Everyone is so enthusiastic, passionate, and it's great to hear about all their previous work prior to UCSF. I also really enjoy helping all the students, not just my mentee, in evaluating their progress, and I am always so impressed with their progress. Of course not every dental student will be interested in research, but it is so nice to see very bright students who are similarly curious and able to explore this opportunity. Thi, my mentee last year, was really wonderful, engaged, and thoughtful-- working with students like Thi makes me so excited to continue the program in future years.

“

If I was a gene, I would be a **LOXL-4 gene**, which encodes lysyl oxidase 4 enzymes that cross-links collagen in palatal shelf elevation. Role isn't known yet, but evidence dictates that **LOXL-4 gene** is really important!

”



Dr. Alice Goodwin DDS, PhD
Department of Orofacial Sciences

What are some key characteristics or attributes that students conducting research should have?

AG: Students should be intellectually engaged and more importantly understand the point of the project, as opposed to the techniques. The curiosity is critical-- being engaged and wanting to question things and how things work is really important, because as a clinician, you need to question why you're doing these experiments, and be able to evaluate what you're doing through the use of literature and reading research articles. You should also have an understanding of what you're reading and how that should influence your clinical practice to make for more thoughtful clinicians in the future. But most importantly, you should enjoy what you're doing, and I try to make it as fun as possible for the mentees since this is your first and last summer after all.

What are some key characteristics or attributes that students conducting research should have?

AG: Do's: Make sure you are interested in your project, and make sure you have someone to work with for direct mentorship. Also try to immerse yourself in the lab and in the scientific community for the summer by going to all the lab meetings and seminars. Continue to read papers that are relevant, and as the project unfolds, continue to stay curious and follow up on questions that you begin to arise. We share so much equipment and space with other faculty and researchers, so take advantage of this to meet new people, and always be open minded and respectful.

Don'ts: Summer research is a limited time, so students can be stressed about producing good data. Since it is such a short time, this might not happen. I recommend that students try to be fully engaged and present, regardless of the quality of their data-- even initial preliminary data is still useful! Also, make sure you stay engaged because you've signed up for this and you're getting paid (not very much though), so if you don't stay focused you won't get much out of it.

Any other tips?

AG: For your proposals- make sure your questions are clear and your experimental plans are feasible and straight forward. In the lab, since time is pretty limited, be strategic with how many times you're going to conduct your experiments. For the poster- start thinking about this from the beginning so that you strategically spend time gathering data that will be conducive to a successful poster.

SARAH KNOX

Dr. Sarah Knox, PhD is assistant professor in the Department of Cell and Tissue Biology which she joined in 2012, the same year that she first joined the Summer Fellowship Research Program as a mentor. Here, she elaborates on her excitement for research.



Dr. Sarah Knox, PhD
Asst. Prof in Department of Cell
and Tissue Biology

What encouraged you to go into research?

Dr. Sarah Knox: I'm intensely curious about almost everything. I love trying to figure out how organisms lived. A lot of this stuff I do and explore is because I cannot stop asking why. I'm not a textbook sort of person, but I realized that you only stand on the shoulders of the people who've done research before you. And so all that is in the textbook. And you go forward based on that and the goal is to get as close to the scientific edge as possible. You want to stay close to the edge and ask "I may never know the answer to this question, but what can I know?" You cannot discover something unless you know there's a great big ocean in front of you. It's continuous question seeking. I'm a scientist because I can't stop my brain from asking "why?" The excitement of seeing something develop is incredible. It's a passionate thing.

As a scientist, as you said, there are a huge variety of questions you could seek to answer. How did you choose this one?

SK: Well, back in 2007, I met a man at a party on the last day at a research conference on proteoglycans. He asked me what I was doing and why I was doing it. At the time, I was working at a company, and I was waiting for the right piece of research to step into. He showed me a picture of embryonic salivary glands and the nervous system, and he said "We don't know what these nerves do. Would you like to work on it?" And I thought "YES," because the idea of studying something nobody had ever studied in this setting was thrilling. And that's how I got into salivary glands, from asking the question, "What are the nerves doing in an embryonic organ?" It turns out they're controlling tissue architecture and the stem cell population. If you don't have them, end up with corrupt tissue architecture.

How did that lead you to your current research?

SK: I met Susan Fisher here at UCSF, and she started talking about salivary glands. So many people here studied regeneration, and I thought that I could use my knowledge about development and apply it to tissue regeneration. People were excited about that because there are a lot of head and neck patients here who are treated with radiation that kills their salivary glands. It's all about the environment. UCSF is an amazing environment to get you to get into things that you never thought you'd get into. That's how you get into these things. Another colleague asked me: "Have you ever studied the naked mole rat?" And that's how I ended up studying the naked mole rat. We don't even know when it dies. Currently, they're 40 years old. So, why do they live that long? Do they have really great regenerative potential? They can even reproduce until the day they die. That means their ovaries must be like that of a 20 year old!

What is the question that your research seeks to answer now?

SK: My current research has to do with autoimmune disease, cancer, organ development and organ aging. The naked mole rat fits into organ aging. Nerves play an important role in the function and development of tissue. They're also important essential in regeneration. How are nerves guiding these outcomes. How are they involved in immune regulation and autoimmunity? Why do neuronal changes happen in aging?

What are some tips you have for future mentees?

SK: Just enjoy it. Be a part of it. Get IN there with your hands. You're a dentist, so you've got amazing hands. Make sure you're actively participating and don't be frightened, because researchers love people who want to get involved. You should be thrilled just to be part of it. It should be part of your psyche everyday. It's a teaching process, it's a language you're learning. Keep learning and keep asking questions. This is the time to do it.

“ If I was a gene or protein would have to be **amylase**. It just does so much for you. I would be pancreatic amylase or salivary amylase to digest this beautiful food. ”

If you weren't doing research, what would you be doing?

SK: I would be a community college teacher because I love teaching adults who really love to learn. I'd probably do a lot more rock climbing as well.

SUNITA HO

Dr. Sunita Ho's lab focuses on the response of tissue interfaces through spatiotemporal mapping of "mechano-responsiveness". She is part of the UCSF Division of Biomaterials and Bioengineering, serving four years as a post-doctorate and twelve years as a ladder rank faculty.

What makes your lab unique?

Sunita Ho: This lab is a fertile place to create your own flavor on how the fundamental laws of physics and chemistry work within organisms in a collective and synergistic fashion. I work on the tooth, I work on the bone, I work on the ligament with which the tooth is attached to the bone. It's all-encompassing.

The reason is to get to know the periodontal complex's function and how it adapts to the very fundamental signal that it receives every day: chewing softer and harder foods, foreign loads such as orthodontic forces, or forces such as parafunctional habits.

Another thing is, the periodontal ligament has provided me with insights into mineral formations within softer tissues. These lessons are extrapolated now to other tissues of the human body that now has allowed us to expand the philosophy of our laboratory to solve some of the complex problems related to mineral formations in medicine. If a student is interested, they will get far more than what they had expected to get. Because now you are talking to people from different fields and different schools as well.



The nature of Dr. Ho's research is very interdisciplinary and weaves together concepts that are unconventional. I'm really excited by her novel approach to research and for my summer project because we will be approaching dental research from medical and clinical angles. Dr. Ho's lab provides an opportunity to collaborate with professors and clinicians from different fields, which greatly enriches my learning experience.

-Haeyoon Jung '23 (left)

How do you see your own mentorship style?

SH: In my mind, once you get into professional school, you are not as much a student. You are as much a community builder as I am. I'm here for you and you're here for me. It's a lot of dialogue that goes back and forth. I expect my researchers to challenge me as much as I challenge them. It's teamwork – it's largely teamwork. I am here to see where you are coming from and provide you with the resources so that you can exercise your mind.

How do you guide a student who is new to research?

SH: Some of you might have no idea where you want to go since you are only a first year. If they know where they are going, we have a plethora of projects that would fit within that specific topic that you are interested in. We can always tailor a project that would encourage you to think in that particular space. Everybody is very different, and everybody has their own expression of thought and mind, and they are creators of their own accord. I feel that, at the position at which I am, I am fortunate to give students the space to exercise their own freedom and to be creative in their own way.

What are some must-haves in your lab?

SH: Communication is a must. If there is something that is bothering you or if I am doing something you do not like, I am holding you responsible to talk to me about it. And I would do the same. If I'm holding you responsible to meet a deadline. Then it is your responsibility to come and tell me if the time I'm giving you is going to be valid enough or if you need more time. Open communication is a huge deal. The other thing is keeping in touch and not to be working in a vacuum. Our program is very interdisciplinary, no one person can run things by themselves. Every bit of data needs to be communicated with everyone that is involved in it. If you are the one that is leading, you need to demonstrate to me that you are able to communicate with other people on the team to put the whole story together.

I was able to design, plan, troubleshoot, and evaluate each experiment. Still, Dr. Ho's guidance and mentorship were essential for the success of my project. She thoroughly reviewed the results of the projects I submitted to committees and institutions to make sure that they were meeting her standards. The project was meaningful because it provided me an insight into how dental research is conducted and gave me confidence in how to take advantage of resources available from UCSF.

-Daniel Kim '22

ERIN MALONE

Erin Malone is currently a 5th year graduate student in the Oral Craniofacial Sciences Program and 1st year dental student in the class of 2023. Here he explains his journey in the DDS-PhD program.

How did you decide to pursue a DDS-PhD?

Erin Malone: I love the implications for my career and the different trajectories I can take. I've always wanted to be in healthcare and help people. Dentistry was a great avenue to achieve this goal, along with other goals like being my own boss and an entrepreneur. Research came into my life because of the monetary benefits as an undergraduate student, but I fell in love with the exploration of research. By obtaining my PhD, I can learn how to answer questions nobody knows the answer to, and entertain my wandering mind. With both these careers, there's no way I can be complacent or bored. I can be a change agent to influence the next generation of dental professionals in an academic setting, help advance technological development, and creatively think outside the box of conventional dentistry to provide the best healthcare as possible. I feel it was necessary to chose the DDS/PhD route.

Could you briefly describe what your research is about?

EM: My research emphasizes the interaction between the oral periodontipathic bacterium *Treponema denticola* (Td), and the human periodontal ligament (hPDL). We specifically look the influence of Td on key mechanotransducing functions known to be necessary for extracellular matrix turnover, cytoskeletal organization, and tissue destruction which lead to the progression of periodontitis.

How has working on your PhD influenced your dental school experience?

EM: Working on my Oral and Craniofacial PhD, has enhanced my dental knowledge going into dental school. I was introduced to many concepts of tooth anatomy, development, anomalies, biomaterials, etc. This knowledge has prompted me to think deeply on the clinical applications of the research I've learned about. There's many pathways and systems to learn, and I feel my PhD has groomed me to connect dots quickly. Inversely, I feel dental school has filled in many blanks that could hinder or facilitate research functionality in practice. Ideas are always good, but practicality is often unknown.

How do you plan on integrating your research with a future career in dentistry?

EM: I hope to become academic faculty one day at a dental school. I would love to teach, specialize in some form of dentistry, and research in the field of my practice. I'm very interested in biotechnology and I see many avenues to incorporate innovative technologies to dental care. After working some time, I aspire to be a Dean of a dental school while continuing to be a principal investigator over a lab. It all sounds very crazy, but I'm up for the challenge.

How does dental school compare to working full-time on your PhD?

EM: I feel dental school and working on a PhD are apples and oranges. Each have their own lifestyles and struggles. I've worked crazy hours studying for test or being in sim lab, and I've also slept over night in my lab...multiple nights. I've beat my head against the wall trying to understand direct vision, and I've also felt the same frustration performing an experiment six times with six different results. I feel it's a lot of work to juggle in dental school, which coming from someone who is very unorganized, that's been tough. On the other hand, I have 90 classmates that I'm going through this process with and that's extremely helpful. As a full-time PhD student, I'm more autonomous. I was able to make my own schedule and was much more independent. My work started and ended with me. I have a few people to bounce ideas off of, but the village community was not there. I love both and have enjoyed both thus far.



Erin Malone
5th year Graduate student in the Oral Craniofacial Sciences Program and 1st year dental student

AN NGUYEN

An Nguyen is currently a 5th year graduate student in the Oral Craniofacial Sciences Program and 1st year dental student in the class of 2023. Here she describes her motivations and goals in the DDS-PhD program.

How did you decide to pursue a DDS-PhD?

Ann Nguyen: It all started in my senior year of my undergrad at UC Davis. I had the opportunity to work in the labs of Dr. Sean Burgess and Dr. Bruce Draper, which exposed me to a whole new world of brilliant academic researchers and fascinating science topics. To understand the mechanism of meiosis defects, I spent months looking at beautiful confocal images of chromosome pairing in zebrafish. It sounded simple but it took me almost a year to optimize the imaging protocol as nobody in my lab had done it before. The delayed gratification was so rewarding that I became obsessed with being adept at a specific skill. Naturally, I wanted to pursue an advanced degree where I could ask questions and set out to seek the answers myself. Therefore, I applied for the TETRAD PhD program at UCSF. Subsequently, I got intrigued by the creativity and life-transforming aspect of dentistry from my late personal experience with the dentists that took care of my oral health. As an immigrant growing up in Vietnam, dental care was considered a luxury. Yet, having interacted with many dentists in a short period of time, I came to understand the importance of dentistry. With the hopes of connecting my research training and clinical experience, I decided to switch gears to the Oral Craniofacial Sciences program at UCSF instead of doing a traditional PhD training.

Could you briefly describe what your research is about?

AN: My project focuses on mandibular bone formation during development. Specifically, I want to understand what molecular signals initiate this process. Neural crest mesenchymal cells give rise to bone cells in the mandible, but in order for this process to happen, they require important signals from the overlying epithelial tissue. Up to now, we haven't fully understood what kind of signals the epithelium transmit to the mesenchyme to permit the bone formation process to begin. Knowing what secreted molecules are involved, we can use this knowledge in clinical applications to promote bone formation in patients with bone loss or injuries in the jaw skeleton.

How has working on your PhD influenced your dental school experience?

AN: It is fascinating to see the clinical aspect of the basic science I am working on. For example, daily lab techniques such as micro-CT imaging and ELISA assay are used as diagnostic tools in the clinic. In a way, sometimes it is a little bit backward for us DDS-PhD students compared to our classmates: we learn about a technique or concept to serve our projects and later connect them with the clinical applications. In dental school, we learn about how a clinical application is used to treat a condition or disease.

My PhD training and dental school actually share a lot in common. I have to be good at time management to handle the curricula. Teamwork is also a big part of both programs. Although I am the principal investigator of my own project, I have got a lot of help from other graduate students and postdocs working in my lab. In dental school, I have also learned so many clever tips from my classmates and upperclassmen on crown preps and drilling techniques. At the same time, each program has its unique challenges. My PI has been saying that being in graduate school is like riding a roller coaster and I can't agree more. It gets intense when there are deadlines and endless unpredictable failed experiments as if you are in a free fall and can't control your speed, but there are also times when I just sit there and stare at my own data. In dental school, it is a cycle of midterms and test-cases that you have to stay on top to get control over your schedule.

How do you plan on integrating your research with a future career in dentistry?

AN: I have seen alumni in my program being in various positions after graduation. Some have specialized and practiced full-time, some own their business or join a research company, the rest split time between academia, research and practice. I hope to be in the last category. I want to take my current research to the next step where I could translate the findings into how to deliver drugs to accomplish jaw bone regeneration or how to correct jaw defects in utero. However, it is not necessary that the research I will be doing 4 years from now will be the same project that I am working on. The most important thing I hope to acquire from my PhD training is the ability to understand the unknowns and to find the solutions.



An Nguyen
5th year Graduate student in the
Oral Craniofacial Sciences Program
and 1st year dental student



Top: Nick Hwang, Helena Viets, Muuduu Otgonbold, David Nguyen, Susan Keefe, Erin Malone, Katie DiLeo, Nhat-Thi Vo

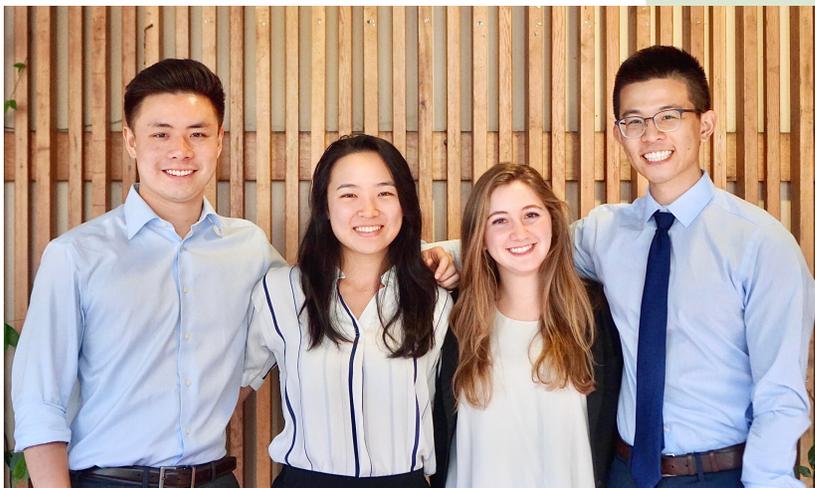
Bottom: Burinratt Thanasuwat, Wesley Kao, Stephanie Ellman, Annie Nguyen, Tiffany Huang, Sarah Anne Wong, Eric Lee, Kenneth Chang

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Newsletter Editor Notes

The UCSF JGS Newsletter Team welcomes Junior Newsletter Editors Stephanie Ellman '23 and Tiffany Huang '23 with the induction of this issue. With a passion for writing, design, and research, Stephanie and Tiffany were crucial to the improvement of this newsletter and we are ecstatic to have them on the team.

The goal of this issue was to highlight summer research mentorship and the DDS-PhD Program. We hope to continue to share the great opportunities and accomplishments going on at UCSF. If you have any questions or are interested, please email JGS@ucsf.edu.

Sincerely,
 JGS 2019-20 Newsletter Editors in Chiefs
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Eric Lee (EricD.Lee@ucsf.edu)