

UC San Diego

THE 34TH ANNUAL

Undergraduate Research Conference

Saturday, May 8
8:00AM - 4:00PM

Brought to you by the
Office of Undergraduate Research

Conference Program

2021 Undergraduate Research Conference at UC San Diego

Welcome to the 2021 Undergraduate Research Conference at UC San Diego, which showcases the scholarly and creative work conducted by undergraduates at UC San Diego during the academic year.

The community at UC San Diego has witnessed the many challenges faced by our student scholars this past year, as well as the fortitude with which they rose to the occasion. Their strength and determination are why we are particularly proud to announce the return of the URC, the only campus-wide conference to recognize and encourage undergraduate researchers in all fields and provide them the opportunity to share their intellectual accomplishments with the broader community. This year's conference features over one hundred and twenty participants who have been nominated by their faculty mentors to be a part of this unique event.

We hope you will enjoy the conference and the students' presentations. We extend our thanks to our moderators for their assistance and support, and to the mentors who have provided training and guidance to their students throughout the academic year.

The Undergraduate Research Conference at UC San Diego is planned and coordinated by the Office of Undergraduate Research (OUR), which is a unit of Student Retention and Success, within Student Affairs.

Thank you to all the Office of Undergraduate Research staff. Additional thanks to Veronica Bejar, Dr. Thomas K. Brown, Dr. Kirsten Kung, Dr. Claire Kim, Tyler Rogers, Dr. Marie Sheneman, and Dr. Sophia Tsai who helped to organize the panels.

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Conference Schedule

Saturday, May 8th

8:00 AM	Opening Remarks featuring Executive Vice Chancellor Elizabeth Simmons, Vice Chancellor of Research Sandra Brown, and Vice Chancellor of Student Affairs Alysson Satterlund
9:00 AM - 10:00 AM	Morning Session I
10:10 AM - 11:10 AM	Morning Session II
11:20 AM - 12:20 AM	Morning Session III
12:20 AM - 1:10 PM	Lunch
1:10 PM - 2:10 PM	Afternoon Session I
2:20 PM - 3:20 PM	Afternoon Session II
3:30 PM	Closing Remarks and plenary speaker spotlights

Zoom Room Registration Links

Zoom Rooms		Registration Link
Opening Remarks		https://ucsd.zoom.us/webinar/register/WN_6LlfSY9jTduTsuwnzEypMw
Student Panel Rooms	Kingdom	https://ucsd.zoom.us/meeting/register/tJcodOqtrzIvGdbriaEtJZu76dlPCQUnBvk
	Phylum	https://ucsd.zoom.us/meeting/register/tJ0sdOCupzIqHdIPPCfD34shcqo3aByluThA
	Class	https://ucsd.zoom.us/meeting/register/tJ0sfuirrTs qG9YicXMUm84Y1GqAlDrwA5nG
	Order	https://ucsd.zoom.us/meeting/register/tJAqcO6grD0oHNKwEf0DUmFdSwtcwhSDbNth
	Family	https://ucsd.zoom.us/meeting/register/tJwudu-rqzwqEt0h6ehGyesOYqvR060bbgqz
	Genus	https://ucsd.zoom.us/meeting/register/tJMrfu-hrj0tGdbkjqsuVVR12O3BUL4ZQltQ
Networking and Q&A Lounge	Species*	https://ucsd.zoom.us/meeting/register/tJ0ucO2srzooHtDGaKEenMI2xPrnFuP_exCuv
Closing Remarks		https://ucsd.zoom.us/meeting/register/tJIqdemhrTooG9AYwkkjMSFtCQytsvk7Ce2S

***If conference participants would like to continue a discussion after their session is over, or if attendees have any questions, you're welcome to regroup in the Networking and Q&A lounge, where a staff member will always be on hand to help out.**

Note: If you are moderating, presenting, and/or attending multiple panel sessions in the same zoom room, you only need to register for that room once. Then you can use the same emailed link to enter the room multiple times throughout the day.

Presentation FAQs

What should I wear?

The dress code for this conference—and for most academic conferences—is business casual. Depending on your own style preferences, this might mean a button-down shirt, a blouse and a sweater, a dress, or something else that represents your best scholarly self. Be sure to wear clothes that are comfortable; you don't want to be adjusting uncomfortable clothing during your presentation.

What should I do while I'm not presenting?

When you are not presenting, turn off your video and microphone and watch the other presentations. Whether you are a fellow panelist or an audience member, you should be actively listening and taking notes as needed. Taking notes is an effective strategy for reminding yourself about possible future directions for your own research, and for preparing to ask questions during a session.

Can I write out my presentation and read directly from it?

We encourage every presenter to have conversations with their faculty mentor about how to best approach the presentation. In some fields of study, the convention is to present more conversationally and refer to talking points as you go. In some fields of study, the convention is that you have a prepared paper that acts almost like a script. There is not a right or wrong way to present, but there are conventions and stylistic choices in every field of study that your faculty mentor can help explain.

If you do have a prepared script for your presentation, please do not simply read from it in a monotonous voice without engaging the audience. Think about your presentation as a performance, which should draw in your audience and get them excited about your project in a way that is different from simply reading a paper.

What should I do if someone asks me a question and I either don't know the answer or only partially know the answer?

When it comes to Q&A, honesty is always the best policy. If somebody asks you a question that you have difficulty answering, you can thank them for their question and explain that you will further pursue the answer to that question in future research. Keep in mind that—in most cases—scholars use conference presentations to workshop their ideas and implement feedback and inspiration

for future work. If you already knew all the answers, why would you be doing research?

How do I ask good questions at a conference?

Audience members who ask good questions are an important part of any academic conference. When posing questions that allow for them to elaborate upon or clarify their argument. Also, ask questions that forge thematic connections between different panelists' presentations, and inspire conversation.

Here is an example of a good question: "Thank you for sharing your research about representations of women in eighteenth-century Japanese art. Based on the research you have conducted, have you observed any recurring visual motifs in these various paintings? If so, what do these motifs illustrate about ideologies of gender during this time period?"

Conversely, we discourage audience members from asking questions that are off-topic or irrelevant to the conversation. As an audience member asking questions, you should feel free to mention your own area of study if it is relevant, but not if it is a distraction from the topics being discussed during that panel.

Here is an example of a bad question: "Thank you for sharing your research about representations of women in eighteenth-century Japanese art. I study the chemical reactions that happen in AA batteries when you leave them out in the sun for too long. Can you please connect your research project to mine in 5 words or less?"

What should I do if I have technical difficulties during the conference?

If you are having trouble accessing a Zoom room, try logging out and then logging back in again. We will also have staff available via email who you can contact in an emergency if you are having technical difficulties, particularly if you are a panelist for that session.

Can my friends/research team/ family etc. attend? How do they register?

Yes! We encourage you to invite anybody who has been part of your ongoing intellectual journey, however directly or indirectly. They need to register through the zoom links (pgs. 5 of this program) for each event/panel they wish to attend.

Will the audience at my panel be knowledgeable about my field of study?

Yes and no. Some audience members might be faculty or fellow students who study related topics. Also, some audience members might know very little about your field of study. Think of your presentation as an opportunity to teach something new to both types of audience members.

Panel Presentation Schedule

Morning Session I, 9:00 AM

Panel #	Panel Name	Location
1	Ecology	Kingdom
2	Art as Reclamation	Phylum
3	Medicine	Class
4	Autism	Order
5	Math and Engineering	Family
6	Data Science	Genus

Morning Session II, 10:10 AM

Panel #	Panel Name	Location
7	Climate and Oceanography	Kingdom
8	Artistic Initiatives	Phylum
9	Bioengineering: Medical Application	Class
10	Education 1	Order
11	Molecular and Cellular Biology	Family
12	Engineering, Environmental Systems, and Renewable Energy	Genus

Morning Session III, 11:20 PM

Panel #	Panel Name	Location
13	Chemistry, Biochemistry, and Particle Physics	Kingdom
14	Micro- & Evolutionary Biology	Phylum
15	Astrophysics and Applied Physics	Class
16	Education 2	Order
17	Reproductive Health	Family
18	Mechanical and Aerospace Engineering	Genus

Afternoon Session I, 1:10 PM

Panel #	Panel Name	Location
19	Neuroscience	Kingdom
20	COVID 1	Phylum
21	The Mind in the World	Class
22	Culture, Sociology, and Anthropology	Order
23	Machine Learning, Artificial Intelligence, and Cognition	Family
24	Cross-cultural attitudes, immigration, and economics	Genus

Afternoon Session II, 2:20 PM

Panel #	Panel Name	Location
25	COVID and disparities	Phylum
26	Sociopolitical issues	Class
27	Students Design	Order
28	Machine Learning and Computer Science Theory	Family
29	Global Sociopolitical Studies	Genus

Plenary Speaker Spotlights

Michael Murphy

Pronouns: he/him/his

Research Programs: TRELS,
Anthropology Honors Thesis Program

Class Standing/College: Senior,
ERC

Major(s): Sociocultural Anthropology

Field of Research: Migration, Crises,
Disasters

Presentation Title: *A Kind of Weapons:
Smuggled Activism from Cox's Bazar*

Mentor: Dr. Rihan Yeh



What has been the most meaningful experience you've had conducting research on your current project?

It has truly been an honor to work with the Rohingya communities in Cox's Bazar, Bangladesh. I am grateful to them for their time, wisdom, stories, and perspectives.



Megan Li

Pronouns: she/her/hers

Research Programs: TRELS Fall 2020 and Spring 2021, FMP 2020

Class Standing/College: Third Year, Muir

Major(s): Physics/Astrophysics

Field of Research: Observational Astronomy

Presentation Title: *Active Galactic Nuclei*

Mentor: Dr. Karin Sandstrom

What has been the most surprising/Strange thing you've discovered about your research topic?

The most surprising thing I've encountered was science that wasn't quite finished. In classes, I only hear about theories and facts that have been proven many times over. When I test them in the lab, there are expected (and correct) results. However, in research, questions remain unanswered, and I have the privilege of trying to answer them. One example of this was the galaxy NGC5253 (PGC48334) which does not yet have a definite answer as to whether or not it has an active galactic nucleus. In my very humble opinion, it does, and its center is just as active as the conversation surrounding it.

Hope Do

Program: she/her/hers

Research Programs: URS

Class Standing/College: third
year/junior; Sixth College

Major(s): Microbiology, Global
Health (minor)

Field of Research: Ophthalmology

Presentation Title: *miRNA regulation
during early development of human stem cell-
derived retinal organoids*

Mentor: Karl J. Wahlin, PhD



What has been the most meaningful experience you've had conducting research on your current project?

I think one of the most meaningful experiences has been spending late nights at lab, working alongside and laughing with my lab family! Being able to bounce ideas and help each other with our respective projects has not only helped to improve our work but also to strengthen our little lab community down here on the 'basement' floor.



Vita Muccia

Pronouns: She/Her/Hers

Research Programs: TRELS

Class Standing/College: Transfer,
Graduating Senior, Eleanor
Roosevelt College

Major(s): Music Major, Theatre
Minor

Field of Research: Arts and
Humanities : Theatre

Presentation Title: *The Tempest in a
Pandemic*

Mentor: Ursula Meyer

What's the best piece of advice your research mentor has given you?

My mentor Professor Meyer has been wonderful to work with, especially through a lot of complications and challenges we have faced over this year. While it is not in one instance or moment, we have wonderful conversations mainly of never limiting your dreams or vision. While there are necessary compromises or changes, pursuing your idea as you have dreamed it and never wavering from the goal has been extremely encouraging during the entire process.



Jason Vega

Pronouns: He/Him/His

Research Programs: McNair (currently), CSE Early Research Scholars Program (CSE-ERSP) (2019-2020 cohort)

Class Standing/College: Senior standing in Muir

Major(s): Computer Science

Field of Research: Artificial Intelligence

Presentation Title: *Training to Promote Certified Neural Network Interpretability Robustness*

Mentor: HDSI Assistant Professor Lily Weng

What's the best piece of advice your research mentor has given you?

Throughout my research project, my mentor has instilled a good research habit in me that helps to make sure I really understand what's going on in the project. The advice is that, if you want to really understand something, try to derive the results on your own, even when the answer is already out there. For example, one of the first things she had me do during our literature review was to rederive the theoretical formulas in a paper from first principles, without looking at the paper. I think doing this really tests if you actually understand something deeply instead of just memorizing facts. I also think it gives you the opportunity to make novel insights in the process of rederiving the results, since you can question and consider alternative approaches at each step of the way.

Angelita Rivera

Pronouns: She/Her/Hers

Research Programs: TRELS Winter 2021 and Spring 2021

Class Standing/College: 3rd year with senior standing, Muir college

Major(s): Human Biology and Global Health

Field of Research: Biology Education

Presentation Title: *Investigating the Impact of Scientist Spotlights on Minoritized Groups in STEM*

Mentor: Melinda T. Owens



What's the best piece of advice your research mentor has given you?

To be grateful for your failures and continue to push forward in your project with creativity and innovation. I've learned to not be discouraged by inconclusive or non-significant results. Instead, with my mentor's guidance, I've been able to seek out new avenues to expand my research methods and analysis. It's this mindset of adaptation that drives me to continuously raise the bar on what I believe I can achieve.

Panel Details

Morning Session I

Panel 01: Ecology

Zoom Room: Kingdom

9:00 AM – 10:00 AM

Moderator: Dr. Andreas Haerer

Karina Halliman - Muir

Mentor: Dr. Maria Vernet

Analyzing potential range shifts in murrelet species in the California Current

Keeley Lanigan - ERC

Mentor: Dr. Jonathan Shurin

Nannochloropsis Field and Laboratory Adapted Strains: Relationship between Productivity and Environmental Factors

Cindy Tran - Revelle

Mentor: Dr. Jonathan Shurin

Flying Plankton: Dispersal Syndromes in Aquatic Microbes

Brandon Tsai - Sixth

Mentor: Dr. Diana Rennison

Coevolution of Morphological Traits on Threespine Stickleback

Panel 02: Art as Reclamation

Zoom Room: Phylum

9:00 AM – 10:00 AM

Moderator: Professor Lily Hoang

Elisa Ady - Marshall

Mentor: Dr. Stephanie Jed

Empire and Indigeneity in Magical Realism

Nathalie Franco - Muir

Mentor: Professor Lily Hoang

Atravesando el Cuerpo: Arboreal Cartographie

Justin Nguyen - Marshall

Mentor: Dr. Nguyen Tan Hoang

Refugeetude: Vietnamese Refugee Experimental Film & Video

Panel 03: Medicine

Zoom Room: Class

9:00 AM – 10:00 AM

Moderator: Dr. Nicole Scharping

Hope Do – Sixth*

Mentor: Dr. Karl J. Wahlin

miRNA regulation during early development of human stem cell-derived retinal organoids

Katelyn Luu, Gordon Ye, and Meghana Ottur – Marshall and Revelle

Mentor: Dr. Eric Zorrilla

Systematic Review and Meta-Analysis Report on Ethanol Drinking and COVID-19 Disease Outcome

Kevin Mazo - Marshall

Mentor: Dr. Karl J. Wahlin

MicroRNA Expression Profiles in Early-stage Human Retinal Organoids

Sapna Mehta - Marshall

Mentor: Dr. Dennis Kuo

Implementation of Universal Screening for Genetic Cancer Predispositions in Pediatric Oncology

Panel 04: Autism, Neurodiversity, and Representation in Education

Zoom Room: Order

9:00 AM – 10:00 AM

Moderator: Dr. Laika Aguinaldo

Dorine Ernst and Emily Nguyen – Revelle, Muir

Mentor: Dr. Rebecca Fielding-Miller

Experiences and Barriers of Neurodiverse UCSD Students

Kat Meza - Marshall

Mentor: Dr. Ivano Caponigro

I can't be funny, can I?

Angel Rivera – Muir*

Mentor: Dr. Melinda T. Owens

Investigating the Impact of Scientist Spotlight Homework Assignment on Implicit and Explicit Bias Towards Minoritized Groups in STEM

Jacqueline Villasenor - Muir
Mentor: Dr. Leslie Carver
Factors Influencing Health Disparities of Autism in Hispanic Children

Panel 05: Math and Engineering

Zoom Room: Family
9:00 AM – 10:00 AM
Moderator: Dr. Mayte Bonilla Quintana

Frederick Rajasekaran and Kin Yau James Wong – Sixth, Revelle
Mentor: Dr. Andrej Zlatos
Optimal Mixing by Shear Flows

Caitlin Villareal and Daniel M. Zubovic – Muir, Sixth
Mentor: Dr. Maziar Ghazinejad
DESIGN AND TESTING OF DIMES CARBON ABLATION RODS IN THE DIII-D TOKAMAK

Panel 06: Data Science

Zoom Room: Genus
9:00 AM – 10:00 AM
Moderator: Dr. Michael Davidson

Dalila Gonzalez Mejia - Marshall
Mentor: Dr. Benjamin Smarr
Using Ambient Data to Quantify Diverse Contributions to Student Performance

Renaldy Herlim and Siddhi Patel – Sixth, Warren
Mentor: Dr. Ilya Zaslavsky
Finding Optimal Locations for Polling Stations in San Diego

Justin Lu and Yuanbo Shi – ERC, Revelle
Mentor: Dr. Michael Davidson
Energy Potential for Wind and Solar Development in China

Morning Session II

Panel 07: Climate and Oceanography

Zoom Room: Kingdom
10:10 AM – 11:10 AM
Moderator: Dr. Andreas Haerer

Steffany Chavez and Adriana Sandoval - Muir
Mentor: Dr. Jennifer Taylor
Growth and Toughness of Shrimp in Ocean Acidification Conditions

William Tallentire - Muir
Mentor: Dr. Andreas Andersson
Inshore-offshore coupling of biogeochemistry on the Bermuda coral reef platform

Rachel Yuen Sum Tam - Muir
Mentor: Dr. Amato Evan
Seasonal Cycle of Arctic Cloud Cover Based on AVHRR satellite data

Blake Walkowiak - Marshall
Mentor: Dr. Amato Evan
On the Misclassification of Remote Sensing Measurements of Dust Storms in the Sonoran Desert

Panel 08: Artistic Initiatives

Zoom Room: Phylum
10:10 AM – 11:10 AM
Moderator: Professor Lily Hoang

Sabrina Chen - Sixth
Mentor: Professor Lily Hoang
Crows and Other Animal Tendencies

Marisa DeLuca - Sixth
Mentor: Professor Monique Van Genderen
Or No Side: Preserving the Memory of a Gentrified Community

Vita Muccia – ERC*
Mentor: Professor Ursula Meyer
Shakespeare Unlimited : The Tempest in a Pandemic

Ryan Phung - Marshall
Mentor: Professor Lily Hoang
The Conqueror

Panel 09: Bioengineering: Medical Applications

Zoom Room: Class
10:10 AM – 11:10 AM
Moderator: Dr. So-Young Kim

Hassler Bueno Garcia and Skye Edwards – Warren, Revelle

Mentor: Dr. Gerardo Arellano

Portable Fluorescent Imaging for TBI Diagnostics

Aditi Gnanasekar - Warren

Mentor: Dr. Weg Ongkeko

The intratumor microbiome predicts prognosis across gender and subtypes in papillary thyroid carcinoma

Alan Hurtado - Muir

Mentor: Dr. Ester J. Kwon

Brain interactions and pharmacokinetics of peptide-modified nanoparticles with engineered physicochemical properties

Hope Leng - Revelle

Mentor: Dr. Ester J. Kwon

Engineering an Activity-Based Nanosensor for the Rapid Diagnosis of Traumatic Brain Injury

Panel 10: Education 1

Zoom Room: Order

10:10 AM – 11:10 AM

Moderator: Dr. Gerardo Arellano

Ivan Chim - Revelle

Mentor: Dr. Stanley Lo

Faculty Conceptions of Teaching, Learning, and Diversity and Their Effect on Exam Writing

Ria Coen Gilbert - Marshall

Mentor: Dr. Leslie Carver

Discrepancies in General Education Requirements at UC San Diego

Sean Mills - Muir

Mentor: Dr. Eli Berman

Is the High Cost of College Tuition Worth it? Examining the relationship between college tuition and wages

Riddhi Patel - Warren

Mentor: Dr. Eli Berman

The Influence of Income and Institution Type on College Attendance Costs

Panel 11: Molecular and Cellular Biology

Zoom Room: Family

10:10 AM – 11:10 AM

Moderator: Dr. Randy Cowling

Saisantosh Attaluri - Marshall

Mentor: Dr. Karl Wahlin

A Cell Based Gene Editing Platform for Stem Cell Biology

Evan Clark - Warren

Mentor: Dr. Galia Debelouchina

Insight into the Effect of Heterochromatin Protein 1 on Chromatin Remodelers in Mononucleosome and Multi Nucleosome Environments

Qianyi Pu - Revelle

Mentor: Dr. Yishi Jin

Investigation of MAPKKK DLK induced neuronal degeneration in mouse hippocampus

Harriet Song - Warren

Mentor: Dr. Elizabeth Komives

Linker mutants of the urokinase-type plasminogen activator (uPA)

Panel 12: Engineering, Environmental Systems, and Renewable Energy

Zoom Room: Genus

10:10 AM – 11:10 AM

Moderator: Dr. Michael Davidson

Shrishti Das - ERC

Mentor: Dr. Jennifer Taylor

Crab Shell Filter

Johnny Nguyen and Ananya Thridandam – Warren, ERC

Mentor: Dr. Michael Davidson

Mapping Interactions Among Renewable Energy Policy Stakeholders in the Western United States

Eleanor Quirk - Warren

Mentor: Dr. Vicki Grassian

Nucleotide Adsorption onto TiO₂ Nanoparticles: A Quantitative Insight on Electrostatic Interactions

Arjun Sawhney - ERC

Mentor: Dr. Michael R. Davidson

Planning for High Penetration Futures of Renewable Energy in India

Morning Session III

Panel 13: Chemistry, Biochemistry, and Particle Physics

Zoom Room: Kingdom

11:20 AM – 12:20 PM

Moderator: Dr. Satarupa Bhaduri

John Brown - Sixth

Mentor: Dr. Lalit Deshmukh

IDE Function and Degradation of Amyloid-Beta

Theophilus Human - Marshall

Mentor: Dr. Liang Yang

Commissioning and Design of Liquid Xenon Systems for nEXO

Christopher Nowak - Revelle

Mentor: Dr. Vicki Grassian

Examining the Salt Dependence of Amino Acid Buffering Capacity in Sea Spray Aerosols

Gordon Peiker - Muir

Mentor: Dr. Vicki Grassian

Liquid water structure as a function of temperature for immersion freezing ice nucleation for water, salt, and atmospherically relevant particles

Panel 14: Micro- & Evolutionary Biology

Zoom Room: Phylum

11:20 AM – 12:20 PM

Moderator: Dr. Sydney Morgan

Aditi Dubey - Warren

Mentor: Dr. Milton Saier

Comparative population genomic analyses of transporters within the Asgard archaeal superphylum

Elijah Horwitz - ERC

Mentor: Dr. Justin Meyer

Viral Protein Stability Influences Evolvability and Host Range Expansion

Brooke Johnson - ERC

Mentor: Dr. Rachel Dutton

Identification of Novel Jumbophages in Cheese

Christina Puzzanghera - ERC

Mentor: Dr. Dianna Rennison

Determining the role of predation in the evolution of sexual dimorphism in Three-spine stickleback

Panel 15: Astrophysics and Applied Physics

Zoom Room: Class
11:20 AM – 12:20 PM
Moderator: Dr. Rui Liu

Julian Beas-Gonzalez - Revelle
Mentor: Dr. Quinn Konopacky

Atmospheric composition of extrasolar object HD 1160B

Yingying Cui - Warren
Mentor: Dr. Tenio Popmintchev

**GENERATION OF FEMTOSECOND ULTRAVIOLET LASER LIGHT FOR MEDICAL APPLICATIONS
AND FOR ATTOSECOND X-RAY GENERATION**

Keenan Hom and Dina Dehaini – ERC, Sixth
Mentor: Dr. Henry Abarbanel

Computational Modelling of Biological Neural Networks with Reservoir Computing

Megan Li – Muir*
Mentor: Dr. Karin Sandstrom
Active Galactic Nuclei

Panel 16: Education 2

Zoom Room: Order
11:20 AM – 12:20 PM
Moderator: Dr. Gerardo Arellano

Caesar Aceituno, Inaaya Hassan, and Gabriella Imai – Muir, Marshall
Mentor: Dr. Abigail Andrews

The Hidden Curriculum and the affects on latinx students at UCSD

Patricia Almaraz - ERC
Mentor: Dr. Gerardo Arellano
Educational Inequity: Immigrants Navigating Higher Education in the United States

Breanne Becker - Sixth
Mentor: Dr. Stanley Lo
STEM Transfer Student Experiences and Shaping Scientific Identity

Anastasia Mentar - ERC

Mentor: Dr. Germaine Hoston

The Impact of Women's Education on Economic Growth in India and Cambodia

Panel 17: Reproductive Health

Zoom Room: Family

11:20 AM – 12:20 PM

Moderator: Dr. Maryan Rizk

Ishita Agarwal - Warren

Mentor: Dr. Marianna Alperin

Pregnancy induced gene expression changes on skeletal muscle : differences between pelvic floor, hind limb and abdominal muscles

Alyssa Kobayashi - ERC

Mentor: Dr. Marianna Alperin

Effect of non-steroidal anti-inflammatory drug use on pelvic floor muscle regeneration after birth injury

Allison Lee - Marshall

Mentor: Dr. Frank Haist

On the Cognitive Sequelae of Preterm Birth in Healthy School-Age Children and Adolescents

Panel 18: Mechanical and Aerospace Engineering

Zoom Room: Genus

11:20 AM – 12:20 PM

Moderator: Dr. Maziar Ghazinejad

Christian Chan and David Morales – Warren, Muir

Mentor: Dr. Maziar Ghazinejad

The NASA BOARDS Launch Acceleration Simulation Tool (BLAST)

Jack Ringelberg - Warren

Mentor: Dr. Maziar Ghazinejad

Design and Implementation of a Traction Controller for Formula Race Car

Rafaela Mayumi Simoes Torigoe - Muir

Mentor: Dr. Frank Talke

Development and Investigation of a Biofilm-Inhibiting Urinary Catheter Coating Containing Silver and Zinc

Afternoon Session I

Panel 19: Neuroscience

Zoom Room: Kingdom

1:10 PM – 2:10 PM

Moderator: Dr. Molly Matty

Lula Cotsirilos - Revelle

Mentor: Dr. Shelley Halpain

Energy-Morphology Coupling in Neuronal Synapses

Jose Figueroa - Muir

Mentor: Dr. Stefan Leutgeb

Investigating the role of theta oscillations behind the sequential activation of Hippocampal CA1 cells during working memory task

Gautam Narayan - Muir

Mentor: Dr. Stefan Leutgeb

CA3 specific hAPP expression impairs spatial memory, theta oscillation frequency and place cell function

Anushka Sinha - Warren

Mentor: Dr. Eric P. Zorrilla

Effects of PDE10A inhibitor on alcohol self-administration in rats

Panel 20: COVID 1

Zoom Room: Phylum

1:10 PM – 2:10 PM

Moderator: Dr. Elaine Tanaka

Manar Alkuzweny - Muir

Mentor: Dr. Nancy Binkin

Evaluating the Return to Learn Program Utilizing Ecological Momentary Assessment

Callie Burns - Revelle

Mentor: Dr. Nancy Binkin

Impact of the COVID-19 pandemic on California lifeguard agencies and staff, 2020-21

Dawn Duong - Revelle

Mentor: Dr. Rebecca Fielding-Miller

Framing Health Communication on Masking Through the Theory of Planned Behavior

Jamie Kwak - Warren

Mentor: Dr. Bonnie Kaiser MPH, PhD

Vaccine hesitancy and attitudes about school safety among teachers in a San Diego County school system

Panel 21: The Mind in the World

Zoom Room: Class

1:10 PM – 2:10 PM

Moderator: Dr. Gail Heyman

Heidy Davila Donis - Sixth

Mentor: Dr. Adena Schachner

From Music to Animacy: Causal Reasoning About Musical Sounds

Fartoon Hagi-Mohamed - Sixth

Mentor: Dr. Stephanie Jed

Memoir Writing as an Antidote to the Effects of Intergenerational Trauma

Phoenix Wang - Marshall

Mentor: Dr. David O. Brink

A Tale of Two Senses of Moral Responsibility: Incurable Psychopathic Wrongdoing

Ulric Wu - Marshall

Mentor: Dr. Pei-An Shih

Recovery Status Influences Differences in Symptomatology in Two Anorexia Nervosa Subtypes

Panel 22: Culture, Sociology, and Anthropology

Zoom Room: Order

1:10 PM – 2:10 PM

Moderator: Tyler Rogers

Kaitlin Clemmer - ERC

Mentor: Dr. Christena Turner

Male Homosexual Representation in Japanese Animated Media: Problematic Fetishization, Heteronormative Framing, and the Dismantling of the 'Other'

Ariel Rosenthal - ERC

Mentor: Dr. Christena Turner

Go Back Into Your Endless Dream: Citypop as the Soundtrack of Japan's Global Modernism

Emma Scott - ERC

Mentor: Dr. Harvey Goldman

**Lucrezia Marinella, Arcangela Tarabotti, and Artemisia Gentileschi: Diverging Social Spheres,
Diverging Feminisms in Early Modern Italy**

Anne Marie Wort - ERC

Mentor: Dr. Amy Non

**Health Care Provisions in Prehistoric Peruvian Trephination: Assessing Health Care Provisions
and their Influence on Long Term Survival after Trephination in Prehistoric Peru**

Panel 23: Machine Learning, Artificial Intelligence, and Cognition

Zoom Room: Family

1:10 PM – 2:10 PM

Moderator: Dr. Paul Siegel

Miriam Hamidi - Warren

Mentor: Dr. Truong Nguyen

Personalization of Spatial Audio

Shubham Kumar - Warren

Mentor: Dr. Truong Nguyen

Human-Inspired Camera: A Novel Camera System for Computer Vision

Bailey Man - Warren

Mentor: Dr. Ilya Zaslavsky

Underwater Animal Tracking and Pose Estimation

Jason Vega – Muir*

Mentor: Dr. Lily Weng

Training to Promote Certified Neural Network Interpretability Robustness

Panel 24: Cross-cultural attitudes, immigration, and economics

Zoom Room: Genus

1:10 PM – 2:10 PM

Moderator: Nhat-Dang Do

Shania Chiara and Emily Zhang - ERC

Mentor: Dr. Muendler

An analysis of the multilateral order of international trade and US-China relations

Melanie Kasparian - Warren

Mentor: Dr. Vanesa Ribas

**The Impact of Dense Versus Scattered Armenian Communities on Armenian-American Ethnic
Identity in the United States**

Haihan Tian - Marshall
Mentor: Dr. Eli Berman
Studying Chinese People's Attitudes Toward America and Japan

Afternoon Session II

Panel 25: COVID and Disparities

Zoom Room: Phylum
2:20 PM – 3:20 PM
Moderator: Dr. Elaine Tanaka

Shruti Magesh - Revelle
Mentor: Dr. Weg M. Ongkeko
Racial, Ethnic, and Socioeconomic Disparities in COVID-19 Outcomes: A Systematic-Review and Meta-Analysis

Kate Magdalene Mallari - Revelle
Mentor: Dr. April Sutton
A Never-Ending Nightmare or a Blessing In Disguise: Understanding and Comparing the Experiences of First-Generation And Continuing College Students During a Global Pandemic

Brianna Murillo - Marshall
Mentor: Dr. Nancy Binkin
Impact Evaluation for UCSD Contact Tracing Program

Naama Nunez - ERC
Mentor: Dr. Amy Binder
Reproduction of Inequality Online: Learning in the Age of COVID

Panel 26: Sociopolitical issues

Zoom Room: Class
2:20 PM – 3:20 PM
Moderator: Nhat-Dang Do

Zion Igwe - ERC
Mentor: Dr. Benetta Jules-Rosette
The Mutilation of Nigerian Women

Austin Katz - Muir
Mentor: Dr. Kaare Strom
How do SMD redistricting institutions affect Partisan Disproportionality, Incumbency Re-election and Voter Turnout?

Payton Montes - Warren

Mentor: Dr. Harvey S. Goldman & Dr. Jeffery Haydu

The Racial Geography of Sacramento, California: Identifying Mechanisms that Foster Residential Integration

Panel 27: Students Design

Zoom Room: Order

2:20 PM – 3:20 PM

Moderator: Srishti Palani

Shimika Basuroy, Mariam Mustafa, and Alan Tram – Sixth, Muir, Warren

Mentor: Dr. Elizabeth Eikey

CAPS Website Redesign

Cedric Hughes - ERC

Mentor: Dr. Zhe Zhang

Sckedio

Allison Santana - Marshall

Mentor: Dr. Stephanie Jed

In Search of Breaking the University Apparatus: A Documentation of Black Student Organization for Today's Organizers

Panel 28: Machine Learning and Computer Science Theory

Zoom Room: Family

2:20 PM – 3:20 PM

Moderator: Dr. Paul Siegel

Sarah Ekaireb - Muir

Mentor: Dr. Paul Siegel

Generative Modeling of Flash Memory Read Voltages

Xiaochen Li - Sixth

Mentor: Dr. Sicun Gao

On the sample complexity of policy gradient under the context of control

Jeffrey Liu - Muir

Mentor: Dr. Mia Minnes

Languages recognizable by two-state DFAs

Minh Vo - Muir

Mentor: Dr. Truong Nguyen

Unsupervised Sequence Alignment between Video and Human Center of Pressure

Panel 29: Global SocioPolitical Studies

Zoom Room: Genus

2:20 PM – 3:20 PM

Moderator: Dr. Rihan Yeh

Alexandra Sarkis - ERC

Mentor: Dr. Claire Adida

Dispelling Anti-Immigrant Misconceptions: A Study of Americans and Immigrant Exclusion Attitudes

Michael Murphy – ERC*

Mentor: Dr. Rihan Yeh

A Kind of Weapons: Smuggled Activism from Cox's Bazar

Yarenni Reyes Medina - Warren

Mentor: Dr. Jose Luis Burgos

Investigating the effects of the COVID-19 pandemic on people living in the border-region of Tijuana, Mexico

* Denotes plenary speakers

Abstracts

Caesar Aceituno, Inaaya Hassan, and Gabriella Imai

Sociology, Muir
Sociology, Marshall
Sociology, Marshall
Mentored by Dr. Abigail Andrews

The Hidden Curriculum and the affects on latinx students at UCSD

In this paper, using testimonials from over 40 in-depth interviews with Latinx students, we argue that the hidden curriculum at UCSD creates barriers to academic success for a growing Latinx population. We argue that these barriers take the form of two main practices: faculty and institutional. Faculty practices that create barriers for Latinx students include a lack of openness or friendliness, as well as an exclusive curriculum that limits student's ability to utilize professors as a resource. An example of faculty creating efforts to overcome this barrier is when they go the extra mile to create a more welcoming environment within their classes and offer more office hours. While these efforts have been present, students still emphasized the need for greater diversity within faculty and curriculum to increase feelings of inclusion. Institutional practices which create barriers for Latinx students include holding expectations of college prep or readiness, exclusion through limits on program availability or resources, and large student to faculty ratios. Examples of Latinx students overcoming this barrier entailed student's use or participation in programs such as CASP, TRIO, and OASIS. In conclusion, as UCSD reaches HSI status, it becomes increasingly necessary to evaluate the level of academic inclusion Latinx students experience. Through evaluating in-depth interviews we found UCSD creates barriers both at the individual faculty level and at the larger institutional level. Overcoming these barriers requires greater investment in faculty diversity and programs which support Latinx student success.

Elisa Ady

Literatures in English, Marshall
Mentored by Dr. Stephanie Jed

Empire and Indigeneity in Magical Realism

Magical realism gathers momentum through glut, an excessive supply of mundanity and magic, little trinkets with otherworldly weight, and an often seemingly endless cast of strange, desire-wrought characters grappling with shifting cultural landscapes. In other words, it is a genre populated with environments in flux, often due to political upheaval.

In *Nation and Narration*, Homi Bhabha calls magical realism, “the literary language of the emergent postcolonial world” (6–7), which we might choose to define as a critical creative study concerned with the lasting legacy of colonization on vulnerable peoples and places. Out of the shrapnel of colonialism and cultural detritus, the magical realist literary landscape blooms, particularly among Latin American writers in the mid-twentieth century. In the spirit of a literary movement that interrogates cultures that have been unsettled, destabilized, and/or disturbed, my project seeks to ask questions like, when a people are forcibly deprived of their imagination, how do they rebuild it? Across what lines does this visualizing capacity manifest and how does that capacity act as colonial escapism, or even colonial capture? What do these people reclaim through their imagination?

Ishita Agarwal

Molecular Biology, Warren
Mentored by Dr. Marianna Alperin

Pregnancy induced gene expression changes on skeletal muscle : differences between pelvic floor, hind limb and abdominal muscles.

Pregnancy induces systemic changes to the whole body and has been shown to cause adaptations of the pelvic floor muscles (PFMs) in the pre-clinical rat model. Specifically, pregnancy-induced an increase in PFM fiber length and intramuscular collagen content. These adaptations appear to protect PFMs from birth injury caused by the substantial strains sustained during vaginal delivery. However, the mechanisms that govern these protective changes have not been elucidated. To this aim, we compared the transcriptional signature of the individual components of the rat PFM complex (coccygeus, iliocaudalis, and pubocaudalis) and non-pelvic muscle groups, such as tibialis anterior, soleus, and abdominal muscle, at different stages of pregnancy. RNA sequencing data were normalized to determine changes in the gene expression profiles across the experimental samples, using the R Bioconductor package DESeq2. First, differential expression analysis was carried out to determine how gene expression of all muscles examined changes along pregnancy continuum. Secondly, we assessed specific pregnancy-induced transcriptomic alterations within each muscle type. Our findings demonstrate that gene expression of all muscles is affected by pregnancy. Interestingly, gene functional enrichment analysis showed that through pregnancy progression, pubocaudalis, coccygeus and abdominal muscle upregulate genes associated with muscle structural pathways, such as extracellular matrix organization and muscle contraction and cytoskeleton reorganization. In contrast, hind limb muscles - tibialis anterior and soleus- exhibit upregulation of genes involved in RNA and protein metabolism pathways. These changes provide a novel mechanistic insight into the pathways that lead to PFM adaptations observed during pregnancy.

Manar Alkuzweny

Public Health: Concentration in Epidemiology, Muir
Mentored by Dr. Nancy Binkin

Evaluating the Return to Learn Program Utilizing Ecological Momentary Assessment

The Return to Learn guidelines were intended to provide a framework for student behavior on UCSD's campus in order to keep campus open and allow campus to return to full capacity. However, measuring adherence to these guidelines is difficult for multiple reasons; self-reported data is susceptible to responder bias, and observation in public spaces may not be an accurate representation of student behavior in private spaces. Measuring compliance in non-observable spaces is most easily facilitated through the use of ecological momentary assessment (EMA), which minimizes recall and social desirability bias. 200 UCSD students living in San Diego County were initially recruited to participate in the study, which involved responding to three short surveys a week asking about masking and social distancing behaviors of their peers. Overall, we found that masking prevalence over the course of the study was 45%, and lower on Halloween and Thanksgiving (33% and 19% respectively), while social distancing prevalence was 57%. We found that students living or currently on-campus and students not in sorority and fraternity life observed higher rates of peer masking, as did students on weekdays and during the daytime. Similarly, we found students living on-campus and student athletes observed higher rates of peer social distancing, as did students during the daytime. This study provided useful insights into groups at UCSD that may participate in higher risk behaviors, who will be important to continue to monitor as the campus opens more fully in the summer and fall of 2021.

Saisantosh Attaluri

General Biology, Marshall
Mentored by Dr. Karl Wahlin

A Cell Based Gene Editing Platform for Stem Cell Biology

Pluripotent stem cells (PSCs) offer an exciting resource for understanding human developmental biology, disease, and regeneration; however, gene-editing efficiency by homology-directed repair (HDR) remains low in many cell types, including stem cells, which reduces its utility as a robust genetic model. Genome editing technology using the Clustered Regularly Interspaced Palindromic Repeat (CRISPR)-Cas9 system offers an attractive solution; however, like other gene-editing technologies, there remain concerns about off-target mutagenesis. Newer high-fidelity Cas9 variants offer a viable solution with little to no detectable off-target mutagenesis. To evaluate the utility of high fidelity Cas9 as part of a cell-based gene-editing platform, PSC lines were generated

with a tetracycline-inducible high-fidelity engineered *Streptococcus pyogenes* Cas9 (HF-iCas9) integrated into the AAVS1 safe harbor locus and demonstrated to be capable of robust gene-editing. By engineering cells with controllable Cas9 expression, we were able to eliminate the need to include a large Cas9 expressing plasmid during transfection of gene-editing reagents. Delivery of gene-editing cargo was further optimized by packaging DNA targeting guide RNAs (gRNAs) and donor fragments into single plasmid backbones. The effectiveness of this system was validated for non-homologous end-joining (NHEJ) based in/del formation as well as HDR for gene knock-in. HDR at the CLYBL safe harbor site was evaluated, in addition to the endogenous SOX2 and SIX6 genes. The combination of streamlined high-fidelity CRISPR tools and the new HF-iCas9 cell lines will facilitate developmental and disease modeling by supporting the accelerated production of cell-type reporters and mutant cell lines across different genetic backgrounds.

Shimika Basuroy, Mariam Mustafa, and Alan Tram

Cognitive Science (design and interaction), Sixth
Cognitive Science, Muir
Cognitive Science w/ Specialization in Design and Interaction, Warren
Mentored by Dr. Elizabeth Eikey

CAPS Website Redesign

Our project revolves around tackling UCSD's Counseling and Psychological Services Website(CAPS). Our team of designers, working under Professor Eikey's guidance, intended to redesign the website in order to promote further usage across our student body. It's rather unfortunate that CAPS is underused among students, due to the obstacles constructed by its design. However, through user testing and rigorous prototyping based on Design principles we've learned here at UCSD; we hope to resolve all the issues that may prevent students from wanting to utilize such a crucial service for college students enduring much mental pressure. Our team is on the verge of releasing our own design that we hope can be adopted by CAPS to use for themselves.

Julian Beas-Gonzalez

Physics with Specialization in Astrophysics, Revelle
Mentored by Dr. Quinn Konopacky

Atmospheric composition of extrasolar object HD 1160B

HD 1160B is a fascinating companion to a nearby young star. Since the discovery of HD 1160B, several studies have used spectroscopy to determine its physical properties and to determine whether it is a gas giant planet or a star-like brown dwarf. However, higher

spectral-resolution observations are needed to obtain measurements that can be used to determine how massive the companion is and possibly how it formed. We use data from Keck Telescope's integral field-spectrograph OSIRIS to produce a K band spectrum of HD 1160B, detecting the presence of sodium, water, and CO spectral lines. We also fit our spectrum to substellar atmosphere models with known physical properties, obtaining values for the effective temperature between 2800 and 3000 K, and for the surface gravity log

Breanne Becker

Human Biology, Sixth
Mentored by Dr. Stanley Lo

STEM Transfer Student Experiences and Shaping Scientific Identity

Studies show academic success and persistence in STEM (Science, Technology, Engineering, and Math) is decreased in transfer students compared to non-transfer students. Additionally, they have shown that both academic success and persistence are factors of students' science identity trajectory and their experiences that move this identity towards or away from science. This project uses the experiences of 29 transfer students pursuing STEM to evaluate connections between STEM events and science identity and trajectory. Interviews were conducted between 2015 and 2018 to explore how transfer students experiences in STEM produce both positive and negative outcomes. The goal of the project is to determine which experiences lead to positive or negative science identity trajectories in an effort to inform staff, mentors, and institutions on the ways they can best support transfer students in STEM.

John Brown

Biochemistry, Sixth
Mentored by Dr. Lalit Deshmukh

IDE Function and Degradation of Amyloid-Beta

Insulin degrading enzyme (IDE) is a eukaryotic zinc metalloprotease involved in proteostasis, a regulatory mechanism responsible for preventing misfolded protein aggregates. IDE primarily hydrolyzes monomeric forms of amyloidogenic peptides, including insulin, amyloid- β ($A\beta$), amylin, and many others. Insulin and $A\beta$ are involved in the development of type 2 diabetes and Alzheimer's disease (AD), respectively, making IDE a molecular link that connects these two debilitating diseases. In addition to hydrolyzing $A\beta$, IDE also functions as a "dead-end" chaperone by forming a proteolysis-independent kinetic trap for $A\beta$. This remarkable activity likely involves confinement of $A\beta$ by IDE, followed by its controlled disposal by proteasomal/lysosomal degradation or

exosome secretion. This proposed mechanism is similar to that of heat-shock proteins (HSPs), and IDE was recently suggested to exhibit an HSP-like expression pattern. At the upcoming undergraduate research conference, I will present my data that show that despite using substoichiometric amounts, the catalytically inactive IDE prevents A β fibrilization at 37 °C. These results imply that A β – IDE interactions are more favorable than the self-association of A β molecules and that IDE increases the critical concentration required for A β nucleation and fibrilization.

Hassler Bueno Garcia and Skye Edwards

Bioengineering, Biosystems, Warren
Bioengineering, Biosystems, Revelle
Mentored by Dr. Gerardo Arellano

Portable Fluorescent Imaging for TBI Diagnostics

The current gold standard in assessing the severity of a TBI involves subjective patient feedback assessments and expensive brain imaging techniques. However, most TBI cases are often mild in severity thus remaining undetected and undiagnosed. Yet, progression of these mild cases can result in a harsh neurodegenerative secondary injury. Therefore, there is an urgent need for a quantitative, affordable and accessible method of TBI diagnosis. This proposed device evaluates severity through analyses of biomarkers using a lateral flow assay with fluorescent tagging. Using a mobile phone, webcam, and microprocessor, the device design and operation focuses on replicating laboratory western blot imaging equipment. Through a calibrated model of the LFA strip dynamics, a sample's analyte concentration can be estimated. Furthermore, the sample's concentration of biomarkers can be compared to available clinical data for diagnosis. Ultimately, this design provides a more quantifiable and inexpensive approach to diagnosing the severity of TBI. Upon implementation, the digitization can allow researchers and clinicians to have more access to data in regards to the secondary neurodegenerative injury following a TBI. Overall, this device will appeal to the elderly, young athletes, military personnel and emergency departments of hospitals due to its portability, low-cost and rapid diagnosis.

Callie Burns

Public Health with a Concentration in Community Health Sciences, Revelle
Mentored by Dr. Nancy Binkin

Impact of the COVID-19 pandemic on California lifeguard agencies and staff, 2020-21

The COVID-19 pandemic has had a major impact on the lifeguard operations and personnel throughout the state. At the request of the California Surf Lifesaving

Association, an evaluation was undertaken to gain a better understanding of the challenges and consequences of the pandemic on the agencies as well as the lifeguards themselves. Forty of the 44 agencies in the state participated in an initial survey of agency heads, and a second survey is currently being completed of the lifeguards themselves. Findings will be used to suggest means of mitigating the negative impacts from the pandemic, and to prepare for the possibility of future pandemics.

Christian Chan and David Morales

Mechanical Engineering, Warren
Mechanical Engineering, Muir
Mentored by Dr. Maziar Ghazinejad

The NASA BOARDS Launch Acceleration Simulation Tool (BLAST)

The pursuit of space as the next frontier of human exploration and colonization raises the question of how the prolonged exposure to space microgravity affects the human brain. To do so, brain samples contained in a SpaceTango CubeLab experiment box will be sent to the International Space Station (ISS) aboard a Falcon 9 rocket. However, the high G-forces of a rocket launch may damage the brain samples before they reach the ISS. As a result, the Arthur C. Clarke Center has commissioned an acceleration centrifuge to simulate a rocket launch profile. Our team has designed the hardware and electronics control system of the centrifuge while holding safety as our highest priority. We hope the centrifuge will serve as a testbed for students and researchers who wish to send experiments to space aboard future rocket launches and further our understanding of interplanetary exploration.

Steffany Chavez and Adriana Sandoval

Environmental Systems:Ecology, Behavior and Evolution, Muir
Environmental Systems:Ecology, Behavior and Evolution, Muir
Mentored by Dr. Jennifer Taylor

Growth and Toughness of Shrimp in Ocean Acidification Conditions

The world's oceans are becoming warmer and more acidic (ocean acidification, OA) due to increases in atmospheric carbon dioxide. Many marine organisms, especially those that calcify, are experiencing detrimental effects as a result. The scope of effects on crustaceans have yet to be realized because of limited research and complex potential responses. At the forefront is their calcified exoskeleton, whose mechanical integrity is critical for every important animal behavior. Yet, maintaining exoskeleton integrity under OA conditions may divert energy away from other important processes such as growth. Here we explore the potential effects of OA and temperature on the survival,

growth, and exoskeleton mechanics of a local caridean shrimp species, *Heptacarpus fuscimaculatus*. We exposed 120 individuals to a factorial combination of pH and temperature conditions (pH: ambient 8.1, reduced 7.7 and 7.5; temperature: ambient 11°C and 15°C) for approximately 5 weeks. At the end of the exposure period, we found that shrimp in warm temperature treatments, regardless of pH, experienced 25-35% greater mortality than in the lower temperature treatments. Shrimp in the lowest pH treatments (7.5) lost body mass (-12 to -17% growth), while those in the remaining treatments experienced increases in body mass (2-20% growth). These results demonstrate that shrimp survival is more sensitive to temperature than to pH, whereas growth is only affected by low pH conditions. Analysis of exoskeleton hardness and toughness is currently underway. This study provides important new insights into the complex responses of shrimp to multiple climate change stressors.

Sabrina Chen

Literature/Writing, Sixth
Mentored by Professor Lily Hoang

Crows and Other Animal Tendencies

Crows and Other Animal Tendencies is a collection of stories that push against and break the conventions of the short story genre while remaining devoutly adherent to the craft of short fiction. Each story is a delicate and cardinal rendering of the unforgiving contemporary.

Shania Chiara and Emily Zhang

Joint Major Economics and Mathematics, ERC
Joint Major Economics and Mathematics, ERC
Mentored by Dr. Marc Muendler

An analysis of the multilateral order of international trade and US-China relations

The status of dispute settlement and prospects at the World Trade Organization (WTO) has changed over time. As China's economy boomed in the past decades, emerging as a new world player, its membership in the WTO has brought about consequences that could largely affect the current international trade system. Examining the issue requires performing an analysis of trade negotiations and agreements the WTO has played an important role in, and an analysis of how the US-China relations have strained on and reform ideas for the WTO.

Evan Clark

Molecular and Cell Biology, Warren
Mentored by Dr. Galia Debelouchina

Insight into the Effect of Heterochromatin Protein 1 on Chromatin Remodelers in Mononucleosome and Multi Nucleosome Environments

Cells have a daunting task when faced with over 6 feet of DNA that must be compacted into the tiny nucleus of the cell. One way that cells accomplish this task is by organizing their DNA into chromatin. This structurally dynamic compaction of DNA has two main regions, heterochromatin and euchromatin. Cells condense DNA very tightly into regions of heterochromatin in order to inactivate the genes contained in the DNA. Regions of euchromatin however, are packed much less tightly and contain active genes. The regulation and creation of these chromatin environments are in part achieved by chromatin remodelers, a class of proteins that serve to rearrange the nucleosomes that make up chromatin. Another big player is a protein called heterochromatin protein 1 alpha (HP1 α). Recent literature has suggested that HP1 α interacts with chromatin and remodelers to repress the activity of chromatin remodelers. Here, I have developed a remodeling assay that has allowed me to test this hypothesis in the context of one and many nucleosomes. I then propose to test the effect of HP1 α on the remodeling activity of the remodellers CHD1, ACF and Brg1. These experiments have begun to reveal how important nuclear proteins work together or against each other to silence genes in the cell.

Kaitlin Clemmer

Japanese Studies & Literature/Writing, ERC
Mentored by Dr. Christena Turner

Male Homosexual Representation in Japanese Animated Media: Problematic Fetishization, Heteronormative Framing, and the Dismantling of the 'Other'

Academic discussion surrounding male homosexual representation in Japanese media concentrates on hetero-normative consumerist patterns and reasons for consumption while creating a deficit in theoretical work analyzing the impact and influence LGBTQ+ media has on the perception of non-hetero-normative relations in society. This study investigated the range of ways in which homosexual men are present and presented in Japanese animated media. The range of representation was divided into positive and detrimental representative sections. Investigation of positive representation was conducted through the analysis of the Japanese animated television show, Yuri on Ice. While the investigation of detrimental representation was conducted through the analysis of the Japanese animated television show, Free! Iwatobi Swim Club.

Analysis of Yuri on Ice showed positive destruction of stereotypical queer identities and the negation of hetero-normative fantasized desires through the presence of non-hetero-normative media portrayals. Analysis of Free! Iwatobi Swim Club showed a continuation of detrimental fan service, queer baiting, and commodification of homosexuality because of stereotypical “Boys Love” tropes present in popular non-hetero-normative media characterization. The results illustrate the materialization of the synchronous, contradictory existence of the LGBTQ+ community in Japanese media and society due to continuing heterosexual framing and erasure of non-hetero-normative realities. Further research is needed to explore the extent of the range of representational impact.

Ria Coen Gilbert

Sociology, concentrated in law and society, Marshall
Mentored by Dr. Leslie Carver

Discrepancies in General Education Requirements at UC San Diego

This research examines general education requirements among the seven colleges at the University of California. Upon investigating, it became clear that almost every college has a different number of units required of their students to complete, while also giving very little information about such requirements during the application process before admittance to UC San Diego. This research aims at analyzing the discrepancy between general education requirements among the colleges and the impact they have on students. Throughout the research project, several correlations were found between colleges with higher general education requirements and lower four-year graduation rates, affecting students time and the level of debt they face after graduation.

Yingying Cui

Physics, Math, Warren
Mentored by Dr. Tenio Popmintchev

GENERATION OF FEMTOSECOND ULTRAVIOLET LASER LIGHT FOR MEDICAL APPLICATIONS AND FOR ATTOSECOND X-RAY GENERATION

In our daily life, a light ray hardly changes its color when it propagates. However, nonlinear optics can convert a light wave of a given wavelength or color into waves of much shorter wavelengths. That means we can begin with visible light and end with X-ray light. This extreme nonlinear process is called high harmonic generation. I propose to generate ultrafast ultraviolet laser light using high-energy high-power ultrafast lasers to convert near-infrared light into the UV spectral region. The optimal lasers to be used

for this research produce ultrashort pulses in the order of femtoseconds, which is 10^{-15} second (a millionth of a billionth of a second). The outcome of this project could contribute to attosecond X-ray generation, ultrafast imaging of bio-systems, and advanced nano-materials with femtosecond-to-attosecond temporal resolution and nanometer spatial resolution.

Heidy Davila Donis

Human Developmental Sciences, Sixth
Mentored by Dr. Adena Schachner

From Music to Animacy: Causal Reasoning About Musical Sounds

What cognitive processes are involved in the perception of music in adults and children? In adulthood, the act of listening activates representations of movement, social agents, and mental states. Why? We propose that high-level causal reasoning about how music was generated can lead people to link music with animate agents. To test this, we asked whether adults (N=60) and children (N=60, age 4 to 6) can intuitively reason about how the sounds were generated. To observe whether they can make flexible inferences on whether an agent caused musical sounds, we used a 2x2 within-subject design by manipulating the type of the visual context and the sound outcome. Participants were presented with a xylophone-like instrument. The xylophone bars were positioned on a ramp (spaced evenly or unevenly) such that a ball rolling down would produce a descending scale with one of two different sound outcomes (evenly, or unevenly timed notes). As a result, we found a significant interaction between sound outcome and visual context in adults and 6-year-olds, but not 4 or 5 year olds. In a context where producing a musical sound would require self-propelled movement, they inferred that an agent produced musical sounds. This study suggests that adults and 6-year-olds can flexibly integrate visual and auditory information to infer whether musical sounds were caused by an animate agent. Future studies aim to observe the possible developmental change in perception of music and agency, from reasoning about surface features to arriving at flexible causal reasoning in music.

Dina Dehaini and Keenan Hom

Cognitive Science with a Specialization in Machine Learning and Neural Computation,
Sixth
Undeclared, ERC
Mentored by Dr. Henry Abarabanel

MODELING BIOLOGICAL NEURAL NETWORKS WITH RESERVOIR COMPUTING

The purpose of this research is to find out whether it is possible to determine gating variables as well other parameters of a neuron model with few measured variables observed in a laboratory setting, such as voltage as a function of time, to better understand what might be taking place through the use of data assimilation and reservoir computing to model biological neural networks.

Marisa DeLuca

Visual Arts - Studio, Sixth
Mentored by Professor Monique Van Genderen

Or No Side: Preserving the Memory of a Gentrified Community

Meditating on my home, Oceanside, California, and drawing on the Japanese philosophy of Wabi-Sabi I represent notions of impermanence in physical spaces, asking questions about the future of the region. This body of work is interested in memory and temporality, and the feeling of longing and loss one experiences navigating endangered urban spaces that are subject to the homogenizing force of gentrification. My experience as a low-income single mother and longtime resident of the region motivates me to investigate socioeconomic justice in Oceanside and create artistic commentary about it. A walking tour of Oceanside is a visual representation of wealth inequality. There are people struggling to feed their families while their neighbor a block down has a garbage bin full of food. My neighbors feel hamstrung witnessing a homogenization of Oceanside's downtown and the encroachment into neighboring low-income communities. The broad systemic problems I see in Oceanside that keep the working poor in challenging situations are ones that I face daily. Oceanside's economic development plasters over blighted areas, refusing to address the societal problems that leave neighborhoods in disarray. This research looks at the role Oceanside City government plays in the pervasive changes in the community, where economic development takes priority over community enrichment. Informed by my personal experience and my research into the behavior of city government I have attempted to preserve sites of eminent gentrification in paint.

Hope Do

Microbiology, Sixth
Mentored by Dr. Karl J. Wahlin

miRNA regulation during early development of human stem cell-derived retinal organoids

Retinal degenerative diseases (RD), such as retinitis pigmentosa (RP) and glaucoma, are leading causes of blindness worldwide. Many forms of RD irrevocably damage weak

links within the intricate system between the eye, optic nerve, and brain that constitutes the ability to see. One promising solution comes in the form of endogenous regeneration, which alludes to inherent regeneration of pre-existing tissues in the body. While best characterized in zebrafish, regeneration following injury to the retina is an ability that many other species possess. In these circumstances, Müller glial cells with stem cell-like properties re-enter the cell cycle and generate new neuronal cells. In the human retina, however, much of the cells are postmitotic and incapable of partaking in reparative processes. To uncover the latent regenerative properties of human retinal cells, we must first explore processes involved in normal retinal development, including retinal differentiation and cell growth. As a first step in this process, we analyzed mRNA and microRNA (miRNA) transcripts in developing human 3-D retinal organoids grown in vitro and obtained transcriptional profiles of cells from pluripotent stem cells (hPSCs) through early retinal development. To elucidate the significance of miRNA within retinal cell cycle mechanisms and cell fate commitment, RNA-seq and small RNA-seq were performed. Subsequent bioinformatics analyses highlighted relationships between miRNA and mRNA within specific cellular pathways associated with retinal development. Our analyses of these miRNAs and their target genes may clarify their functions as post-transcriptional regulators of gene expression with regard to retinal development, and ultimately, regeneration.

Aditi Dubey

Microbiology, Warren
Mentored by Dr. Milton Saier

Comparative population genomic analyses of transporters within the Asgard archaeal superphylum

The study of the archaeal Asgard superphylum has provided valuable insights into the evolutionary relationship between Archaea and Eukarya. This project presents the characterization and comparative analysis of the transportomes of four metagenome-assembled genomes (MAGS) of Odin-, Thor-, Heimdall- and Loki-archaeota and one fully sequenced genome of *Candidatus Prometheoarchaeum syntrophicum* strain MK- D1. Using the Transporter Classification Database (TCDB) as reference, single- and multiple-component systems within each transportome were first characterized by applying multiple criteria including sequence similarity, alignment coverage, shared domains, topological compatibility, shared genomic context and functional annotations. Transportomes were then compared to determine the degree of conservation of transport systems and their substrates. From these analyses, we infer that Asgard organisms rely mostly on the transport of substrates driven by the proton motive force (pmf), the proton electrochemical gradient which then can be used for ATP production and to drive the activities of secondary carriers. The results indicate that Asgard archaea depend heavily on the uptake of organic molecules such as lipid precursors, amino acids and their derivatives, and sugars and their derivatives. Overall, the majority of the

transporters identified are more similar to prokaryotic transporters than eukaryotic systems although several instances of the reverse were documented. Taken together, the results support the previous suggestions that the Asgard superphylum includes organisms that are largely mixotrophic and anaerobic but more clearly define their metabolic potential while providing evidence regarding their relatedness to eukaryotes. The results of this project were recently published.

Dawn Duong

Public Health, Revelle

Mentored by Dr. Rebecca Fielding-Miller

Framing Health Communication on Masking Through the Theory of Planned Behavior

Mask wearing among people in school communities has been an effective mitigation measure to slow the spread of COVID 19; however, little is known about how families influence masking behavior among children in other public settings. The purpose of this study is to conceptualize masking attitudes in school settings and apply the Theory of Planned Behavior (TPB) as a framework for health messaging for masking in public settings. We distributed an online survey among parents and staff from 12 different schools that primarily serve low SES children and have high case rates of COVID-19 relative to the rest of the region. We then built a multivariable linear regression model to assess the role of attitudes and subjective norms on perceived masking efficacy for children. In our regression analysis, we found that family ideology had a major influence on masking. Supportive family attitudes about masking were associated with the belief that masking is an effective preventative measure for children ($\beta = 0.59$). Parents who value their school's opinion on masking behavior were associated with a higher likelihood of believing in mask effectiveness for children ($\beta = 0.24$). The perception of their child's vulnerability to COVID-19 was associated with higher perceived mask utility for children ($\beta = 0.25$). TPB can be used by school communities as a framework for targeted health behavior campaigns that address the individual as part of a family unit. Family oriented health messaging may play a key role in increasing masking behavior in schools and other public settings."

Sarah Ekaireb

Computer Engineering, Muir

Mentored by Dr. Paul Siegel

Generative Modeling of Flash Memory Read Voltages

In this project, we are interested in generative modeling of read voltages in multi-level flash memory. We would like to create a model that can generate realistic read voltages

for use in computer simulations of certain algorithms intended to improve flash memory devices. We are specifically interested in evaluating the performance of a Variational Auto-Encoder / Generative Adversarial Network (VAE-GAN) model on spatiotemporal data to see if this technique can accurately model read voltage data.

Dorine Ernst and Emily Nguyen

Mathematics Applied Science, Revelle
Public Health, Muir
Mentored by Dr. Rebecca Fielding-Miller

Experiences and Barriers of Neurodiverse UCSD Students

The goal of this qualitative research study is to better understand the experiences of neurodiverse UCSD students, especially in regards to accessing academic accommodations. UCSD faculty will also be interviewed to obtain a different perspective of accessible, universally designed learning experiences. Answers from both groups will be compared to better understand how to best to support students. Researchers recruited past UCSD students who have graduated after April 2020 and current UCSD students to participate in a one hour in-depth interview. The investigators intend to share their findings with key stakeholders, like Becky Petit (Vice Chancellor of Equity Diversity and Inclusion) and Joanna Boval (the director of the Office of Students with Disabilities).

Jose Figueroa

Neurobiology/ Cognitive Science w/ Spec. Clinical Aspects of Cognition, Muir
Mentored by Dr. Stefan Leutgeb

Investigating the role of theta oscillations behind the sequential activation of Hippocampal CA1 cells during working memory task

Hippocampal neuron populations known as “time cells” have a sequential firing pattern that code for time components during relatively constant behavior. In past studies, a constant running behavior has been identified to be necessary for the observation of this organized firing pattern. Theta oscillations in the hippocampus are known to be conjunctive to the voluntary mobile states of an animal, increasing in frequency as a function of running speed. In addition, these slow rhythmical oscillations are known to synchronize various neuronal population activities as well as strengthening synapses through long-term potentiation. A possible mechanism underlying the sequential firing patterns of time cells could be related to the periodic properties of hippocampal theta oscillations. Our study attempts to understand how theta contributes to organized time cell spiking activity using implanted tetrode hyperdrives to record CA1 neurons. To

explore this concept, we trained Long-Evans rats to alternate through a Figure 8 maze with a varying 10 or 30 second delay area which had a treadmill that was either on or off. The proportion, temporal accuracy, and stability of time cells from all neurons recorded were found to either be similar in run and no run conditions. This suggests that, in addition to theta oscillations, there might be another mechanism supporting the accurate sequential firing of time cell populations.

Nathalie Franco

Literature/Writing, Muir
Mentored by Professor Lily Hoang

Atravesando el Cuerpo: Arboreal Cartographies

A collection of short prose that intersects the mythology, fairy tales, and settler-colonialism history that remains mapped across various parts of Mexico, and autobiographical experiences of trauma, Latinx identity, sexuality that remains mapped across the body.

Aditi Gnanasekar

Bioengineering: Biotechnology, Warren
Mentored by Dr. Weg Ongkeko

The intratumor microbiome predicts prognosis across gender and subtypes in papillary thyroid carcinoma

While the intratumor microbiome has become increasingly implicated in cancer development, the microbial landscape of papillary thyroid carcinoma (PTC) is essentially uninvestigated. PTC is characterized by varied prognosis between gender and cancer subtype, but the cause for gender and subtype-based dissimilarities is unclear. Women are more frequently diagnosed with PTC, while men suffer more advanced-staged PTC. In addition, tall cell variants are more aggressive than classical and follicular variants of PTC. We hypothesized that intratumor microbiome composition distinctly alters the immune landscape and predicts clinical outcome between PTC subtypes and between patient genders. Raw whole-transcriptome RNA-sequencing data for untreated, nonirradiated tumor, and adjacent normal tissue was downloaded from the Genomic Data Commons (GDC) legacy archive for 563 thyroid carcinoma patients. Microbe counts were extracted using Pathoscope 2.0 software. We correlated microbe abundance to clinical variables and immune-associated gene expression. Gene-set enrichment, mutation, and methylation analyses were conducted to correlate microbe abundance to characterize microbes' roles. Overall, PTC tumor tissue significantly lacked microbes that are populated in adjacent normal tissue, which suggests presence of microbes may be

critical in controlling immune cell expression and regulating immune and cancer pathways to mitigate cancer growth. In contrast, we also found that microbes distinctly abundant in tall cell and male patient cohorts were also correlated with higher mutation expression and methylation of tumor suppressors. Microbe dysbiosis in specific PTC types may explain observable differences in PTC progression and pathogenesis. These microbes provide a basis for developing specialized prebiotic and probiotic treatments for varied PTC tumors.

Dalila Gonzalez Mejia

Bioengineering, Marshall
Mentored by Dr. Benjamin Smarr

Using Ambient Data to Quantify Diverse Contributions to Student Performance

Understanding and quantifying the contributors to academic performance is a key part of ensuring student success. Within the past few years, the worldwide shift to online learning management systems like Canvas and Moodle has allowed institutions to collect a large number of data regarding student engagement with course content. Recent research has presented the ability to use these data to model human circadian rhythms, and understand their biological implications for student performance. In this work, I used preexisting student login timestamps to further explore the relationships between factors of student success like sex, major, variability in daily rhythms, and chronotype. Using python, I cleaned the login data, merged it with relevant student demographic data, and sorted it to create visualizations of correlations between different variables. The outcomes of this research have the potential to help us better understand where to allocate student support resources, and quantify factors of student performance with a higher resolution than ever before.

Fartoon Hagi-Mohamed

Literature/Writing, Sixth
Mentored by Dr. Stephanie Jed

Memoir Writing as an Antidote to the Effects of Intergenerational Trauma

My research examines the creative memoir as a form of expressive writing which can be used to alleviate the effects of intergenerational trauma. There is a well-documented body of research which speaks to the therapeutic benefits of expressive writing, including boosting one's psychological wellbeing and improving aspects of social relationships. But quantitative research is unable to show how the practice of expressive writing works, in particular cases, to alleviate trauma. My skills as a creative writer and scholar of literature enable me to analyze particular works of memoir and expressive writing and to identify concrete ways in which expressive memoir writing responds to

the psychosocial needs of those who have experienced intergenerational trauma to share their experiences – in particular, experiences of social and cultural dislocation and experiences of lack of agency – with an audience of readers who can benefit from and relate to the story written by the memoirist.

Karina Halliman

Environmental Systems: Ecology, Behavior, Evolution, Muir
Mentored by Dr. Maria Vernet

Analyzing potential range shifts in murrelet species in the California Current

Anthropogenic climate change is warming our oceans and has the potential to alter marine ecosystems dramatically. The warming waters have been documented to impact prey's distribution and availability, which may lead to periodic or permanent range shifts of predators reliant on them. Seabirds rely solely on marine prey; therefore, changes in their distribution can be used to alert us about ecosystem health. In the California Current ecosystem (CCE), range shifts of one seabird have been documented. To investigate range shifts occurring in the CCE, I selected a "warm water" and "cool water" seabird species and analyzed changes in their distribution over time (1980-2017). For my study, I used Craveri's murrelets (CRMU) and ancient murrelets (ANMU). Respectively, their northern and southern range overlap in the Southern California region, and they are comparable in their size, natural history, and prey. I hypothesized that the trends in their distribution would match the northward expansion of warm water and periods of El Niño. I expected the CRMU to increase in frequency and northward distribution over time and during El Niño events. For ANMU, I expected to see a decrease in their frequency and a shift northward over time and with El Niño events. I used multiple linear regression models to analyze the relationships between their density with latitude, upwelling, and year and found that latitude was the only significant predictor for both species. This research will be foundation for future research and aid in our understanding of how ecosystems are changing.

Miriam Hamidi

Electrical Engineering, Warren
Mentored by Dr. Truong Nguyen

Personalization of Spatial Audio

As of now, there are not many online tools available to learn about spatial audio, and almost no demos that experiment with the personalization of the head-related transfer function (HRTF). HRTF describes how a sound wave is affected by the head and body as it travels through space, so personalizing it to an individual's anthropometric

measurements can improve sound localization. The CIPIC database contains ear measurements and corresponding HRTFs of 45 people that can be used by researchers to find an individual's closest HRTF match. Previous HRTF matching techniques have extracted distances from ear pictures, relying mostly on ear size. Our Matlab application offers three algorithms that provide a match based on ear shape. The user can select from block segmentation with Hu moment invariants, principal component analysis, and Q-vector analysis. After the closest ear shape match from the CIPIC database is identified, the corresponding HRTF is used in our demo (instead of the standard MIT KEMAR model HRTF). The demo was created by building on a Github program of a sound moving 360 degrees horizontally. We used C language with Simple DirectMedia Layer 2 libraries, creating a layout for the user to specify the azimuth of the sound that they are hearing. We created a module for users to learn about spatial audio, and test for themselves whether the localization of the audio is improved.

Renaldy Herlim and Siddhi Patel

Data Science, Sixth
Data Science, Warren
Mentored by Dr. Ilya Zaslavsky

Finding Optimal Locations for Polling Stations in San Diego

Our project conveys a solution to the obsolete system of picking in-person polling locations. Currently, in-person polling locations are determined by different areas' elections departments, in which they find volunteers in every elections precincts to host polling stations. Due to the unpredictable events that occurred in 2020 with the COVID-19 pandemic and new social distancing rules being put in place, the presidential election needed to limit the amount of polling stations within different counties, thus not putting in-person polling locations in every elections precinct. This meant that elections departments needed to determine which areas were the most suitable to put polling locations. These events inspired us to create a new system for determining in-person polling locations in San Diego county. Using GIS tools and spatial data analysis, we optimized polling station locations by putting more weight onto areas that have a higher percentage of registered in-person voters, while also taking into account locations that satisfies a large enough space for social distancing guidelines. Doing so allows us to strategically put polling locations that will maximize in-person voting in a safe manner.

Elijah Horwitz

Ecology, Behavior, and Evolution (Biology), ERC
Mentored by Dr. Justin Meyer

Viral Protein Stability Influences Evolvability and Host Range Expansion

Viruses are known to be able to expand their range of hosts they infect. Highly evolvable, a genotype can give rise to a large amount of phenotypic variation. This begs to ask what features lead to this property. Examining the evolution of the bacteriophage lambda shows that the stability of a key protein is influential in the virus's ability to infect hosts through a new receptor. It has been shown that stability, the ability for a genotype to reproduce at a high rate or density is a factor in evolvability and host range expansion, and although more stable proteins often have the ability to accumulate mutations without having deleterious effects on the protein, our research showed that it was the unstable variants that had more options to evolve usage of a new receptor and were able to expand their host range faster. These counter-examples in our research show that there is no blanket statement about how protein stability directly interacts with evolvability; however, results provide insight into the relationship between protein stability and evolvability in a model applicable to a wider range of biological systems.

Cedric Hughes

Economics, ERC
Mentored by Dr. Zhe Zhang

Sckedio

Sckedio is an online platform that allows designers, manufacturers, and buyers of consumer products to meet and interact in a marketplace setting. Sckedio allows designers without the means to build their products to get their ideas out into the world, provides manufacturers with new customers at a low acquisition cost, and consumers with access to innovative new products. Sckedio is currently undergoing development with an expected summer launch.

Theophilus Human

Physics, Marshall
Mentored by Dr. Liang Yang

Commissioning and Design of Liquid Xenon Systems for nEXO

The EXO series of experiments aim to search for the neutrinoless double beta decay of Xenon-136. A significant experimental upgrade called nEXO will increase the system to ton-scale and improve the energy resolution of the experiment to approximately 1%. Design and commissioning of a novel particle detector system, in conjunction with laboratory preparation for validation experiments was undertaken in support of the nEXO experiment. The design work for a novel time projection chamber assembly will

support testing for the charge collection and readout systems within the nEXO experiment.

Alan Hurtado

Bioengineering, Muir
Mentored by Dr. Ester J. Kwon

Brain interactions and pharmacokinetics of peptide-modified nanoparticles with engineered physicochemical properties.

Therapeutic development for brain conditions, such as traumatic brain injury (TBI), remains a major challenge due to cell-specific pharmacology of therapeutics and the structure and complexity of the brain microenvironment. Nanoparticle-based therapeutics are promising candidates for cell-specific delivery as their surfaces can be engineered to target a variety of cell types. Peptide modification of nanoparticle surface properties is of particular interest due to the bioactivity and versatility of peptides. However, the effect of peptide physicochemical properties on nanoparticle interactions with brain cells and nanoparticle pharmacokinetics after TBI is poorly understood. We engineered peptide-modified nanoparticles with a range of physicochemical properties and evaluated their interaction with brain cells *in vitro*, their distribution in a healthy mouse brain, and their pharmacokinetics in a mouse model of TBI. In each model, we found that nanoparticle behavior was highly influenced by charge. After direct injection into a healthy mouse brain, we found that nanoparticles with positive charge have restricted distribution away from the injection site compared to negative, neutral, or zwitterionic nanoparticles, likely due to the increased interaction between positively charged nanoparticles and brain cells observed in culture models. When delivered systematically in a mouse model of TBI, we observed that neutral, zwitterionic, and negatively charged nanoparticles accumulated more in the injured brain compared to positively charged nanoparticles. Understanding how the physicochemical properties of peptide surfaces influence nanoparticle pharmacokinetics and cellular interactions is broadly applicable to nanotherapeutic design for systemic delivery using targeting peptides and therapy development for TBI and other brain disorders.

Zion Igwe

Neurobiology, ERC
Mentored by Dr. Benetta Jules-Rosette

The Mutilation of Nigerian Women

Presenting about the exploitation of Nigerian women during colonial and post-colonial Nigeria. Focusing upon how Christianity allowed for the complete takeover of British

Colonists within Nigeria and how that impacts the women of today. I plan on using Walter Rodney's Dialectical Model to demonstrate how Britain shifted the economy and sociopolitical ideals of Nigeria.

Brooke Johnson

Global Health, ERC
Mentored by Dr. Rachel Dutton

Identification of Novel Jumbophages in Cheese

The emergence of widespread antibiotic resistance has led to a need for alternative approaches to combatting bacterial infections. One approach, called phage therapy, uses viruses that infect bacteria to selectively kill bacterial pathogens. Jumbo phages are promising candidates for phage therapy due to their ability to protect themselves from host defenses by building specialized compartments within cells. However, to fully assess the potential of jumbo phages as tools in phage therapy, it is necessary to study their interactions within their hosts in the context of microbial communities. The cheese microbiome was previously established as an experimentally tractable system for studying interactions, but the presence of jumbophage in this system has not been analyzed. In my work, I have used a combination of bioinformatic approaches that have led to the identification of five putative jumbophages within cheese microbiomes. I now aim to characterize the diversity, functions, and dynamics of these jumbo phages. This work will allow me to develop testable hypotheses to better understand the interactions of jumbophages with their hosts in the context of microbial communities.

Melanie Kasparian

Sociology--Culture and Communication, Warren
Mentored by Dr. Vanesa Ribas

The Impact of Dense Versus Scattered Armenian Communities on Armenian-American Ethnic Identity in the United States

As a result of the Armenian Genocide of 1915, and many other world events, Armenians have been consistently immigrating to the United States for over a century. Glendale, California, is known for having the most dense Armenian-American Diaspora population in the United States, and thus, provides its Armenian residents with benefits such as convenience and immersion when it comes to sustaining cultural communities and ethnic identity. In this research, I interview twenty-nine Armenian-American college students from various regions of the country, and explore whether the density of their Armenian communities has impacted their individual cultural identity. I asked questions

targeting specific categories relating to community activity, the impact of their current location, and how they choose to connect to their Armenian identity. By examining the preferences of identity work amongst interviewees from both dense and scattered communities, I was able to assess how interactive these individuals are with their ethnic identity. These findings shed light on how identity work amongst Armenian-Americans from dense and scattered regions are quite similar, such as their shared connection to cultural names and passion for preserving the Armenian language. However, the main way that these individuals differed was in community involvement. The institution of the Armenian Church plays a powerful role in keeping the Armenian Diaspora in scattered regions together. Without attending church, it is seemingly impossible to have a connection to the Armenian community, whereas in more dense regions such as Glendale, church isn't necessary in order to preserve cultural identity.

Austin Katz

Political Science, Muir
Mentored by Dr. Kaare Strom

How do SMD redistricting institutions affect Partisan Disproportionality, Incumbency Re-election and Voter Turnout?

As electoral systems and redistricting institutions have become a hotly contested political issue in states throughout the world, my research seeks to determine to what degree differences in redistricting institutions have on electoral results. Specifically, I ask how does the institutional makeup of SMD redistricting institutions effect aggregate partisan disproportionality, incumbency re-election, and voter turnout? I look at U.S. House results in California, Arizona, Texas and Wisconsin and lower house results in France and England from 1990-2020 adding SMD majoritarian and multiparty institutions to the study while controlling for potential variance inherent in specific countries. On aggregate partisan disproportionality, I find that while disproportionality is nominally higher in partisan institutions compared to independent redistricting commissions, it isn't statistically significant. However, unified government partisan institutions are correlated with a near 3-point increase in disproportionality when compared to divided government partisan institutions. On incumbency re-election, I find strong evidence that partisan institutions are correlated with a near 6% increase in incumbency re-election when compared to independent commissions while finding an unexpected slight positive increase in incumbency re-election for unified partisan institutions when compared to divided partisan institutions. On turnout, I find that partisan redistricting institutions are correlated with 10% lower levels of voter turnout when compared to independent redistricting commissions. I found through my study of California and Arizona's divergent results on disproportionality after their change to independent redistricting commissions, that a commission's political preconditions, institutional motivations and design can either mitigate or add to disproportionality in an electoral system.

Alyssa Kobayashi

Human Biology, ERC
Mentored by Dr. Marianna Alperin

Effect of non-steroidal anti-inflammatory drug use on pelvic floor muscle regeneration after birth injury

Pelvic floor muscle (PFM) mechanical injury is a common sequela of childbirth. Following vaginal delivery, the most widely-used analgesics are non-steroidal anti-inflammatory drugs (NSAIDs). While these drugs help relieve postpartum pain, previous studies of appendicular muscles have found that NSAIDs negatively affect immunological and cellular processes involved in muscle regeneration after injury. Although multiple studies have been conducted in limb skeletal muscles, the impact of postpartum NSAID use on PFM regeneration is unknown. To elucidate the effects of NSAIDs on PFM recovery after birth injury, we used the validated rat simulated birth injury (SBI) model. PFMs were harvested at biologically relevant acute and subacute time points (1, 3, 5, 7, and 10 days post-SBI) and prepared for histological analyses. We found that across these time points, there was no significant difference in leukocyte infiltration (measure of immune response) between injured rats (SBI only) and injured rats given NSAIDs (SBI+NSAIDs). When we evaluated muscle stem cells (MuSCs) that are indispensable for the injured muscle repair, we observed a substantial decrease in MuSC number in the PFMs across all time points in SBI+NSAIDs rats compared to the SBI only group. Moreover, we discovered a delay in MuSC differentiation in SBI+NSAIDs rats relative to SBI only rats, evident from a delayed peak in cell number during the analyzed time course. Overall, our data indicate that even though NSAIDs do not impact immune infiltrate into the injured PFMs, these medications appear to negatively impact PFM early regenerative response following birth injury.

Shubham Kumar

Electrical Engineering, Warren
Mentored by Dr. Truong Nguyen

Human-Inspired Camera: A Novel Camera System for Computer Vision

Computer vision models aim to emulate biological design so that systems can perform meaningful tasks. We believe that the underlying processes of the human visual system hold the keys to further improving the performance of such computer vision solutions. This exploratory paper investigates the swaying motion of human vision when walking to develop a novel camera system. We successfully demonstrate that this design is able

to improve performance in computer vision tasks, such as monocular and stereo disparity estimation.

Jamie Kwak

Public Health, Warren
Mentored by Dr. Bonnie Kaiser

Vaccine hesitancy and attitudes about school safety among teachers in a San Diego County school system

Drawing on interviews and surveys, students explored teacher and staff attitudes at Del Mar USD toward COVID-19 vaccination and perceptions of safety at work. This information was used by the district administration to assess their current strategy to maximize the safety of teachers, staff, and students moving forward.

Keeley Lanigan

Ecology, Behavior, & Evolution, ERC
Mentored by Dr. Jonathan Shurin

Nannochloropsis Field and Laboratory Adapted Strains: Relationship between Productivity and Environmental Factors

The focus of this project is on generating a field adapted *Nannochloropsis* sp. growing in outdoor conditions by optimizing selection pressures and pest management. We are interested in identifying the main environmental parameters affecting the microalgae performance in the field. This research is of high impact since it provides a renewable and carbon-neutral energy source alternative to the detrimental effect of fossil fuel on the planet in regards to global warming. *Nannochloropsis* is a fast-growing photosynthetic microorganism with high lipid production, which makes it a good candidate for algae-based biofuel and other natural products. We have been monitoring *Nannochloropsis* growths and productivity in 4 mini-ponds over 3 seasons: Fall, Winter, and Spring at the UCSD Biology Field Station. Based on data collected so far, temperature and light availability seems to be the main drivers enhancing microalgae growth and productivity. On the other hand, rain events and cloudy weeks are the main causes of reduced productivity and slower microalgae growth. In terms of ponds invaders, we have observed the arrival of new pests over the seasons (e.g. bacteria, flagellates, ciliates, and amoeba), becoming a more complex community than the original one, however, always dominated by *Nannochloropsis*. Understanding the nature of *Nannochloropsis*'s local growth patterns, identifying the beneficial/detrimental associated microbial community, and potentially finding ways to

improve its adaptation to field conditions to create a greater yield of oil is the goal of this research.

Allison Lee

Human Developmental Sciences, Marshall
Mentored by Dr. Frank Haist

On the Cognitive Sequelae of Preterm Birth in Healthy School-Age Children and Adolescents

Preterm birth, defined as birth before 37 gestation weeks (GW), happens in 10% of all live births in the USA. As the prematurity rate continues to rise, thus increasing the preterm population, it is imperative that the long-term neurocognitive consequences of interrupted fetal development are explored. I used curated data from the 2.01 release of Adolescent Brain Cognitive DevelopmentSM study (ABCD Study[®]), the largest longitudinal study of its kind, to examine 9- and 10-year old children that were born very preterm (VPT; 28-32 GW), late preterm (LPT; 33-36 GW), or full term (FT; > 37 GW). Neurocognitive performance was assessed using a battery of tests that assessed general cognitive abilities (i.e., crystalized and fluid intelligence), non-verbal intelligence, reading, attention, executive functions, verbal memory, risk tolerance, and visuospatial functions. Factor analyses and analysis of variance revealed that VPT children performed significantly worse overall relative to children born LPT and FT. Performance in the LPT group was more variable showing that problems in this group are less severe and less broad. Overall, my results show that VPT children show noteworthy long-term cognitive problems crucial for academic and daily performance. These results may help guide early identification of problems and guide remediation possibilities in children born very preterm.

Hope Leng

Bioengineering: Biotechnology, Revelle
Mentored by Dr. Ester J. Kwon

Engineering an Activity-Based Nanosensor for the Rapid Diagnosis of Traumatic Brain Injury

Traumatic Brain Injury (TBI) is the leading cause of death for individuals under the age of 45 in the world, yet there are currently no point-of-care (POC) diagnostics available that evaluate the pathophysiologic protease activity that leads to secondary injury in TBI. Here, we optimized the molecular weight of a scaffold that presents a substrate for a specific protease that is upregulated at the site of injury after TBI. The intravenously administered nanosensor (scaffold + substrate) passively accumulates at the site of

injury in a mouse model of TBI, and cleavage of the substrate releases a peptide that can be measured through application of a blood sample to a lateral flow assay, which is currently being optimized in silico. This low-cost, engineered POC diagnostic has the potential for sensitive and subjective assessment of TBI severity for rapid triage and improved patient outcomes.

Megan Li

Physics/Astrophysics, Muir
Mentored by Dr. Karin Sandstrom

Active Galactic Nuclei

Active galactic nuclei are accreting supermassive black holes in galaxy centers that are sometimes significantly brighter than their surrounding galaxy in wavelengths of electromagnetic radiation that are not dominated by starlight. Active galactic nuclei can be difficult to detect and classify due to the angle of the galaxy with respect to our viewing angle, contamination by the light from stars, and interstellar dust in between the observer and the galaxy. The goal of this project is to overcome these complications in the detection and classification of active galactic nuclei by using diagnostics of infrared radiation on nearby galaxies. Specifically, this project uses a simple test on a large sample of nearby galaxies mapped with the Wide-Field Infrared Sky Explorer satellite to gather inferences on what types of galaxies may have previously undetected active galactic nuclei.

Xiaochen Li

Computer Science, Sixth
Mentored by Dr. Sicun Gao

On the sample complexity of policy gradient under the context of control

Recent empirical advancement in reinforcement learning empowers larger and more complex tasks. Our work analyze the sample efficiency of gradient based reinforcement learning algorithm with knowledge from optimal control theory such as the linear quadratic regulator (LQR) and the linear quadratic gaussian (LQG). This paper surveys relevant works from both fields and shows a polynomial bound on the sample complexity and a global convergence of gradient based algorithm.

Jeffrey Liu

Computer Science, Muir
Mentored by Dr. Mia Minnes

Languages recognizable by two-state DFAs

Through the process of this research project, we explore and determine the languages that are recognizable by two state deterministic finite automatas(DFAs) with an alphabet of size two. We can use combinatorics to determine the total number of two state DFAs in order to ensure that the languages that we later establish accounts for the entire set of DFAs that we are interested in. Then using a combination of graphing and listing, we group the DFAs into languages represented using set-builder notation and regular expressions, thus ensuring that we account for all the languages recognizable by the two state DFAs. By generating a comprehensive list of all possible languages that are recognized by a two-state two-alphabet DFA, we are also able to use complementary methods to establish the set of languages that are not accepted by the DFAs we are concerned with.

Justin Lu and Yuanbo Shi

Data Science, ERC
Data Science, Revelle
Mentored by Dr. Michael Davidson

Energy Potential for Wind and Solar Development in China

The burning of fossil fuels to generate electricity creates emissions that cause climate change and contribute to human respiratory issues through smog and air pollution. Therefore, it is imperative to deploy large quantities of alternative sources of energy like wind and solar energy. However, renewable energy can require significant amounts of land. Through our study, we find the most suitable areas for building solar or wind energy farms in China, by manipulating global weather datasets and geospatial land use layers. We report our findings as supply curves for various levels of land use restrictions and identify where provinces within the same grid region can beneficially share deployment of renewable energy.

Katelyn Luu, Meghana Ottur, and Gordon Ye

Public Health, Marshall
Neurobiology, Revelle
Computer Science with Specialization in Biomedical Computation, Marshall
Mentored by Dr. Eric Zorrilla

Systematic Review and Meta-Analysis Report on Ethanol Drinking and COVID-19 Disease Outcome

Excess alcohol use compromises the immune system, increases the risk for ARDS, and promotes comorbidities implicated in poor COVID-19 outcomes. Ethanol drinking also increases infection risk behavior, including maskless congregation. Thus, we used meta-analysis to test the hypothesis that ethanol drinking is a risk factor for COVID-19 infection and severe outcomes, including hospitalization, ICU, invasive ventilation, and death. Two coders independently used ethanol and SARS-Cov-2 keywords to identify articles from electronic bibliographic databases and triaged the articles. Of 23,738 search hits, 95 relevant articles were identified with quantitative data. Data were extracted independently, and study quality was assessed. Studies with a cutoff of 2 or “fair” were included in final analyses. Risk ratios were calculated through Comprehensive Meta-Analysis software, inverse-variance-weighted, fixed- and random-effect models were created using metafor in R, and associated risk factors were identified by study-wise Spearman correlation. Heavy drinking carried significantly increased relative risk for hospitalization and mortality. Heavy drinking correlated significantly with being male, smoking, having preexisting liver, hypertension, obesity, stroke, or cardiovascular conditions, and higher platelet and D-Dimer levels; drinking associated negatively with preexisting neurological conditions and C-reactive protein levels. Heavy ethanol drinking is associated with increased risk for hospitalization and mortality, but not infection incidence, and correlated with multiple comorbidities implicated in poor COVID-19 outcomes. The results indicate that heavy ethanol drinking associates with increased susceptibility to poor COVID-19 outcomes.

Shruti Magesh

Human Biology, Revelle
Mentored by Dr. Weg M. Ongkeko

Racial, Ethnic, and Socioeconomic Disparities in COVID-19 Outcomes: A Systematic-Review and Meta-Analysis

COVID-19 has disproportionately affected minorities, with race/ethnicity being strongly correlated with disease severity. However, it is unclear how socioeconomic determinants cause racial disparities in COVID-19 outcomes. In this study, we assessed the correlations between race/ethnicity and COVID-19 positivity and disease severity, and examined the relationship between these correlations and socioeconomic determinants. We conducted a systematic search of Pubmed, medRxiv, bioRxiv, EMBASE, and WHO COVID-19 databases for studies that reported data on correlations between race/ethnicity and COVID-19 positivity, disease severity, socioeconomic status, and political affiliation. 4,325,061 patients from 69 studies were included in this meta-analysis. Hispanics were the most likely to test positive for COVID-19 (RR:3.10; 95% CI:1.69-5.67, $P<.001$), followed by Asian-Americans (RR:1.29; 95% CI:0.98 - 1.70, $P<.001$) and African-Americans (RR:2.17; 95% CI:1.30 - 3.63, $P<.001$) when compared to Whites. Asian-Americans were more likely than Whites to be admitted to the ICU (RR:1.72; 95% CI:1.35 - 2.19, $P<.001$). We found that an increase in the area deprivation index was

correlated with increased mortality rates in African-Americans and Hispanics ($P < .001$), and an increase in county median income was correlated with decreased mortality rates in African-Americans ($P < .001$). In conclusion, we observed that racial/ethnic minorities face higher risks of COVID-19 positivity, ICU admission, and hospitalization, and that socioeconomic determinants are strong moderating variables for COVID-19 severity in minorities.

Kate Magdalene Mallari

Sociology, Revelle
Mentored by Dr. April Sutton

A Never-Ending Nightmare or a Blessing In Disguise: Understanding and Comparing the Experiences of First-Generation And Continuing College Students During a Global Pandemic

First-generation college students encounter academic, social and financial obstacles when navigating the college experience. The COVID-19 pandemic also heightened these students' ongoing challenges and created new hurdles to surmount. In this research study, I examined the differences between first-generation college students and their non-first-generation counterparts in managing the pandemic while attending college. I interviewed nine first-generation college students, seven of which self-identify as a continuing college student. I define a continuing college student as those who have one or both parents who have obtained a college degree. This study aims to highlight how the COVID-19 pandemic has exacerbated pre-existing struggles for first-generation college students.

Bailey Man

Data Science, Warren
Mentored by Dr. Ilya Zaslavsky

Underwater Animal Tracking and Pose Estimation

Cognition in non-human animals has always been a topic of discussion, and with the influx of widely-available computational techniques, the field has rapidly generated advances in deep-learning computer vision applications in order to better quantify animal behavior. Here we focus on the dolphin, whose capacity for social interaction is sophisticated and yet difficult to discern. The purpose of this work is twofold; to create a data workflow to parse months of video data across 13 concurrent cameras and filter out sections where no dolphins are visible, and to implement a deep-learning model for multi-animal pose estimation and tracking of dolphins in a non-continuous system.

Using this workflow, we have generated sections of video with dolphins present for ease of labeling, as well as successfully identified individual dolphins within these sections. By leveraging the SLEAP (Social LEAP Estimates Animal Poses) framework for multi-animal tracking, this project focuses on detection and analysis of multiple interacting underwater animals. In addition, the implementation of multiple synchronous video data sources will allow for exploration of additional automated feedback on the deep learning model. Identification and tracking of unique dolphins in video data is a key step in identifying specific elements of their social interactions and cognitive behavior, and as such the function of the model is both to detect and track unique dolphins in an enclosure with blind spots and interference, as well as create an analytical framework for the future study of dolphins and other marine animals.

Kevin Mazo

Neurobiology, Marshall
Mentored by Dr. Karl Wahlin

MicroRNA Expression Profiles in Early-stage Human Retinal Organoids

During differentiation, genes are coordinately expressed to drive cells towards a fate. MicroRNAs (miRNAs), a class of small non-coding RNA, serves as ‘fine tuners’ of differentiation by inhibiting translation or degrading messenger RNA. During development of human retinal organoids (RO), miRNAs changes are evident during the transition of a stem cell line from pluripotency into neural progenitor cells, from neural progenitors to retinal progenitor cells (RPC) and finally into retinal ganglion cells (RGCs). To identify significantly differentially expressed miRNAs, we harvested differentiated ROs and isolated RNAs. RNAseq was performed to determine the mRNA and miRNA profiles. Bioinformatic analyses from samples collected between days 0 (D0) and 45 (D45) revealed dynamic miRNA expression patterns, including that of the Let-7 miRNA family. Many microRNAs are predicted to target mRNAs involved in Axon Guidance, Neurotrophin Signaling, and Regulation of Actin Pathways. Together, these are likely to participate in determining retinal cell fate.

Sapna Mehta

Global Health, Biology, Marshall
Mentored by Dr. Dennis Kuo

Implementation of Universal Screening for Genetic Cancer Predispositions in Pediatric Oncology

Growing availability of gene sequencing has increased awareness of pediatric oncology cancer predisposition syndromes (CPS's) as studies indicate about 8.5% of pediatric

oncology patients have a CPS. This study investigates facilitators and barriers of the pediatric oncology CPS testing plan while providing the opportunity to receive genetic counseling and testing for patients along with potential family cascade testing. This study surveys parents and adolescent patients before, during and after optional CPS testing and genetic counseling to analyze their knowledge, attitudes, and behaviors regarding CPS screening and survey their health literacy, demographic characteristics and cancer diagnosis. The study is in the process of finishing data collection for the remainder of the 100 patients in the trial. From the genetic testing results of 87 patients that have completed the entire study, 37% had negative results and 54% had variants of uncertain significance. 8% of the participants (n=7) tested positive for likely pathogenic CPS mutations, which is similar to the aforementioned national statistic of 8.5% of pediatric oncology patients possessing CPSs. This study includes a racially and socioeconomically diverse participant demographic. Higher health literacy is found to be linked with higher knowledge and awareness of CPS testing. There is positive parent and patient interest in conducting testing and receiving CPS knowledge, exemplified by how most patients opted to receive testing. This study informs about knowledge, attitudes and behaviors regarding pediatric oncology CPS's and guides scientists in educating about genetic testing which can preemptively inform and empower families with life-saving measures.

Anastasia Mentar

International Studies -- International Business, ERC
Mentored by Dr. Germaine Hoston

The Impact of Women's Education on Economic Growth in India and Cambodia

This study examines the effects of educating women and girls on economic development in the cases of India and Cambodia. This study aims to prove that educating women and girls causes not only higher GDP growth, but also higher levels of social trust and better short-term and long-term health outcomes for communities and individuals. There is evidence to suggest that educating women and girls at all levels promotes long-term, sustainable economic growth and poverty alleviation.

Kat Meza

Anthropology, Marshall
Mentored by Dr. Ivano Caponigro

I can't be funny, can I?

Since its first descriptions in the 1940s (Verhoeff, 2013), autism has been defined by the allistic, or non-autistic, majority. These descriptions were by necessity based on what an

outside observer sees rather than on our experiences and currently, autism is defined by “deficits in social communication and social interaction... restricted and repetitive patterns of behavior, interests, or activities” (American Psychological Association, 2013). While useful for diagnostic purposes, this continuing trend of deficit-focused definition of autism has resulted in several inaccurate stereotypes about Autistics: we lack humour, cannot lie, cannot have relationships, lack interest in other people, and we are rude. By describing Autistic humour in a systematic way from an Autistic linguist's perspective, I intend to contribute to a growing body of research which shows that Autistics are different, not less. In particular, alongside evidence of both media and academic bias, I will present examples of autistic-produced humour with the goal of encouraging audience members to think past their biases and see the capacity that autistics have, rather than looking for our deficits first.

Sean Mills

Economics, Muir
Mentored by Dr. Eli Berman

Is the High Cost of College Tuition Worth it? Examining the relationship between college tuition and wages

This project analyzes the relationship between college tuition and expected earnings of attendees from those institutions using an ordinary least squares model. Specifically, this paper focuses on institutions which primarily award bachelor's degrees. Data is collected by the U.S. Department of Education and contains observations across every accredited university in the U.S. from the school year 2013-2014. The results of my model find a consistent positive and significant relationship between college tuition and expected earnings of attendees of institutions. The project then explores possible explanations for this finding such as: higher college tuition buys higher skilled peers and/or higher college tuition buys higher social-valued peers.

Payton Montes

Political Science, Sociology, Warren
Mentored by Dr. Harvey S. Goldman & Dr. Jeffery Haydu

The Racial Geography of Sacramento, California: Identifying Mechanisms that Foster Residential Integration

Residential segregation is a social, economic, and historical process that has been well documented across sociological literature. However, little research investigates the casual mechanisms behind segregation variability between urban areas. This study seeks to address this gap in research by utilizing Sacramento, California as a case study for

identifying possible mechanisms that foster integration amongst nonwhite groups. I first use the index of dissimilarity to confirm Sacramento's racial integration between other California cities. Using data from the U.S. Census Bureau, I then rely on a comparative analysis between Sacramento, San Francisco, and Los Angeles to test the correlation of nonwhite in-migration patterns and nonwhite socioeconomic status to decreased levels of observable segregation. I find that nonwhite in-migration trends were significantly lower in Sacramento when compared to San Francisco and Los Angeles, demonstrating nonwhite in-migration as a possible factor in Sacramento developmental divergence. However, I also find that SES does not appear to explain for Sacramento's lower levels of residential segregation, with median nonwhite income being lower if not comparable to San Francisco and Los Angeles. I conclude that the findings of the in-migration exercise bode a promising direction for future research. I also recommend that future research be dedicated to analyzing additional measures of SES and other mechanisms of variability to gain a more comprehensive understanding of Sacramento's racial development. Furthermore, such research will be consequential for sociologists to better understand residential segregation as a historical process and gain insights into solutions that may curtail it.

Vita Muccia

Music, ERC

Mentored by Professor Ursula Meyer

Shakespeare Unlimited : The Tempest in a Pandemic

I am developing the student theatre company, Fair Play, into a committed group of students who study and perform Shakespeare plays. Our mission is to create an educational outreach program that brings more relatable and understandable adaptations of Shakespeare's works to middle and high school students, reiterating that many themes Shakespeare wrote about are truly human experiences that anyone can relate with. In the Fall Quarter, we studied Shakespeare's work and time period from analytical and performative perspectives through mentorship and lectures from multiple theatre department faculty, PhD and Graduate members. After a quarter long research process, we transitioned into rehearsing the production in the Winter Quarter, focusing more on performance, but informed by the analytical research from the preceding quarter. We also are beginning to develop our educational curriculum we would pair with our production for the schools that view the production. We are in the process of virtually filming the production, and will edit it through the rest of this month and next. After this production is filmed, the company will analyze and abridge our performance to form a shortened production to circulate virtually to our interested schools, along with the finalized curriculum. We are developing this entire process collaboratively between myself as Artistic Director of the company, the company and the theatre department mentorship to create our clearest and most creative curriculum and performance for secondary school reception.

Brianna Murillo

Political Science and Public Health, Marshall
Mentored by Dr. Nancy Binkin

Impact Evaluation for UCSD Contact Tracing Program

Introduction: Early in the COVID-19 pandemic, UCSD hired a number of current and former UCSD students to serve as case investigators and contact tracers with the UCSD COVID-19 Response Team. In many settings, case investigator and contact tracer jobs are considered to be high stress because of the large volume of work and the emotional toll of having to inform people of their condition and the major steps they need to take to protect others.

Methods: To assess whether the response team has adequate resources and support available, we undertook a mixed-methods study consisting of 11 in-depth interviews and a quantitative questionnaire of team members to determine levels of job satisfaction, stress, and how they are dealing with the stress.

Results: In-depth interviews demonstrated that the sense of community established among team members play a major role in alleviating job stress. Team meetings, game nights, UCSD wellness resources have helped to foster the sense of community, which has in turn created a supportive work environment. The qualitative survey results support the interview findings.

Conclusions: Unlike many other settings, members of UCSD's COVID response team appear to experience a manageable level of job stress, although management can improve communication among the COVID response teams to reduce job stress and address the team's feelings of under-compensation during especially stressful times, such as during surge periods, by providing them with incentives/rewards.

Michael Murphy

Sociocultural Anthropology, ERC
Mentored by Dr. Rihan Yeh

A Kind of Weapons: Smuggled Activism from Cox's Bazar

In Cox's Bazar, Bangladesh, Rohingya refugees have developed a deep proficiency with documentary methods and social media. Since their initial flight from state violence in 2017, small coalitions have repurposed these newly acquired technical skills to fit the evolving humanitarian and political conditions within the camps. Notably, digital literacy

has allowed them to represent themselves on the world stage, both in depicting their conditions from an insider's perspective and in engaging with international discourses on their own terms. Most recently, this has taken the form of protesting the military coup in their homeland of Myanmar from a distance. This presentation examines one social media post, which acts as a gateway for the larger narratives being built on such platforms. It is a study in the anonymity and voice granted to Rohingya refugees by digital platforms, and in how refugees have used these tools in Myanmar's ongoing political crisis.

Justin Nguyen

Ethnic studies, Communications, Marshall
Mentored by Dr. Nguyen Tan Hoang

Refugeetude: Vietnamese Refugee Experimental Film & Video

My research is interested in the mode of experimental film and video and the ways in which Vietnamese refugee/diasporic filmmakers reckon with war and its afterlives, and the construction of the refugee subject from the contested position of exile and the margins. In this paper, I look at works made by Vietnamese refugee filmmakers that incorporate experimental strategies of articulating the refugee/diasporic subject's unique experience of displacement, liminality and temporality. I argue that the taking up of the experimental mode not just an aesthetic choice, but also a political one that seeks to represent refugee subjectivity in more complex ways.

Johnny Nguyen and Ananya Thridandam

Mechanical Engineering, Warren
Mechanical Engineering, ERC
Mentored by Dr. Michael Davidson

Mapping Interactions Among Renewable Energy Policy Stakeholders in the Western United States

Greater integration of energy planning and markets have the potential to lower costs, and facilitate the transition from fossil fuels to renewable energy as the Western United States' primary source of energy. Currently, there are proposals to expand the California Independent System Operator into a Western Regional Independent System Operator (ISO) in order to reach California's ambitious renewable portfolio standard of 100% renewable energy by 2045. However, reaching this goal by means of a regionalized energy grid faces unique political hurdles. Stakeholder resistance to the creation of a Western regional ISO stems from concerns regarding equitable cost

allocation of transmission lines and generation resources, as well as the preservation of state legislative autonomy under a Western Regional ISO governing the western energy grid. This study assessed the likelihood of collaboration between various states involved in the Western Electricity Coordinating Council (WECC), under a Western Regional ISO. To perform this analysis, energy stakeholders were categorized into six groups, and their positions regarding three renewable energy policy categories were recorded across the states involved in the WECC. It was found that states and stakeholders held neutral, mixed, or supportive positions with regard to these policy categories, and Colorado and Arizona across stakeholder groups which were generally opposed to the policy category of net metering. These results can be used in addition to technical and geographic constraints in subsequent resource assessment models to analyze state collaboration on overall costs, generation mixes, and emissions in the western United States.

Christopher Nowak

Chemistry, Revelle
Mentored by Dr. Vicki Grassian

Examining the Salt Dependence of Amino Acid Buffering Capacity in Sea Spray Aerosols

Sea spray aerosols (SSA) are small particles ejected into the atmosphere through wave breaking and bubble bursting at the air-sea interface. These aerosols present a novel environment for chemistry as they can have salt concentrations reaching 5 M NaCl and they are rapidly acidified. Furthermore, they have significant implications for the environment and global warming as well as for human health as more acidic aerosols are increasingly harmful to lung health. Past research has demonstrated that enzymes such as methionine aminopeptidase are also active in these aerosols, which removes a terminal methionine from a protein chain. Therefore, this project seeks to better understand the chemistry of biologically relevant molecules in sea spray aerosols. Specifically, the amino acids methionine, glycine, and aspartic acid, which have all been detected in aerosols but have not been thoroughly investigated at salt concentrations higher than 1M, were examined in high salt and both high and low pH conditions. Results suggest that the buffering capacity of these amino acids is greatly reduced in the presence of high salt concentrations (analogous to those found in SSA). Characterizing this phenomenon could help reveal whether these amino acids are available to react in SSA. Additionally, calculating the pKa values of these amino acid solutions, and how they may change, may shed light on the general behavior of enzymes in aerosols. Ultimately, the results of this project can inform our understanding of SSA chemistry and biology and, in turn, how these particles impact our environment and health.

Naama Nunez

Sociology, ERC

Mentored by Dr. Amy Binder

Reproduction of Inequality Online: Learning in the Age of COVID

The COVID-19 pandemic has reshaped the day to day lives of millions of people across the world. However, the degree of impact varies across different peoples and communities. In this study, I ask the question: what is the relationship between parents' social, economic, and cultural resources and their children's experiences with online learning during the COVID-19 induced quarantine? To tackle this question, families of middle and working class backgrounds were interviewed with a series of questions ranging from child emotional well-being to parental support. These interviews were then transcribed and coded using qualitative data analysis software. The findings of this study confirmed a commonly known hypothesis- families from economically disadvantaged backgrounds not only faced a larger number of obstacles during online learning, but also found themselves with less resources to combat these obstacles. I also found areas in which the two socioeconomic groups shared difficulties, and how each respective group dealt with them. The intricacies of how this happens are detailed in this study.

Riddhi Patel

Joint Mathematics and Economics, Warren
Mentored by Dr. Eli Berman

The Influence of Income and Institution Type on College Attendance Costs

This paper aims to estimate the effects that family income and institution type have on the cost of college attendance in the United States using a linear regression. The best linear predictor finds that family income, SAT score, and institution type are significant explanatory variables when determining college attendance costs. The regression results predict that increases in one's family income also increase their cost of attending college on average, whereas increases in one's SAT score decrease their cost of college attendance on average. I conclude that colleges and financial aid resources consider family income and merit when giving out financial aid packages. They also explain that differing costs to attend distinct college institutions; therefore, varying financial aid awards may be offered based on the type of college institution.

Ryan Phung

Lit/Writing, Political Science, Marshall
Mentored by Professor Lily Hoang

The Conqueror

Hybrid coming-of-age story combining elements of speculative fiction, creative nonfiction, and playwriting. Set in a United States on the brink of nuclear apocalypse, a stage actor leaves his family in LA for a racist Midwestern town to perform an adaptation of the 1956 film "The Conqueror". Themes include Asian-American identity and racialization, homemaking, masculinity, and family.

Qianyi Pu

Neurobiology, Revelle
Mentored by Dr. Yishi Jin

Investigation of MAPKKK DLK induced neuronal degeneration in mouse hippocampus

Understanding the mechanisms of neuronal stress response in the central nervous system is important for the development of new therapeutic strategies for neurological diseases. A key signaling molecule in pro-regenerative and pro-apoptotic neuronal responses is MAPKKK, dual leucine kinase (DLK). DLK functions as an upstream kinase in the JNK/MAPK pathway and is expressed in many cell types in the nervous system, including glutamatergic neurons. To better understand how DLK leads to neuron death, we have generated mice with increased expression of DLK in glutamatergic neurons. We have found that increased DLK expression leads to activity of the downstream transcription factor, c-Jun, and neuron death in hippocampal CA1 pyramidal neurons. To determine how early neuron death occurs and how increased DLK expression affects glial response, I used immunofluorescence to characterize the increase of DLK expression at several time points. My results showed at P10, DLK is already active in DLK overexpressed mice, but neuron death is not obviously observed at this time point. At later points where neuron death was obvious, I found evidence for microgliosis in response to DLK overexpression. To understand the type of cell death, I stained markers for apoptosis. I found that the neuron death associated with this model is maybe through apoptosis.

Christina Puzanghera

Marine biology, ERC
Mentored by Dr. Dianna Rennison

Determining the role of predation in the evolution of sexual dimorphism in Three-spine stickleback

The Three-spine stickleback has been known to exhibit sexual dimorphism in a variety of traits in the wild. Our research is focused on decoding what mechanisms contribute to this dimorphism. We used a controlled experiment, that manipulated environmental

factors including predation to determine the effect of said factors on dimorphism. We hypothesize that sexual dimorphism in the three spine stickleback could be caused because male and female sticklebacks interact differently with their environment and in particular, predators.

Eleanor Quirk

Chemical Engineering, Warren
Mentored by Dr. Vicki Grassian

Nucleotide Adsorption onto TiO₂ Nanoparticles: A Quantitative Insight on Electrostatic Interactions

Titanium dioxide (TiO₂) is a ubiquitous additive in industrial and consumer products, as it is used in cosmetics, paints, and pharmaceuticals. Consequently, it has the opportunity to interact with biomolecules present in environmental systems, including proteins and nucleotides. These nano-bio interactions are not well understood, and can have significant influences on the physicochemical properties that impact the persistence of both nanoparticles and biomolecules in the environment. In this study, two nucleotides, deoxyguanosine monophosphate (dGMP) and deoxycytidine monophosphate (dCMP), were observed as they adsorbed independently onto anatase titanium dioxide nanoparticles as a function of pH. Ion-pairing high performance liquid chromatography was used to quantify nucleotide surface coverage on TiO₂ at pH 5 and 9. The results indicate that dGMP has a higher affinity to the nanoparticle surface than dCMP under both acidic and basic conditions. Under acidic conditions, more adsorption was observed for both nucleotides. This indicates that adsorption occurs mainly through electrostatic interactions, since at acidic pH the nucleotides and nanoparticle surface have attractive charges, while at basic pH they have repulsive charges. Overall, this study provides new insight about the molecular interactions between nucleotides and titanium dioxide, thus enhancing our understanding of nano-bio interactions and their impact on environmental and biological systems.

Frederick Rajasekaran and Kin Yau James Wong

Mathematics & Physics, Sixth
Mathematics - Computer Science, Revelle
Mentored by Dr. Andrej Zlatos

Optimal Mixing by Shear Flows

The optimal rate at which incompressible flows can mix substances in fluids has been theoretically proven to be exponential in time. Flows which do achieve this rate have been constructed, but have challenging and complicated geometric properties. We used

numerical simulations to assess the mixing properties of shear flows, and our research strongly suggests that this much simpler class of flows still provides exponential mixing. Further, we studied both random and deterministic shear flows, and found those that provide the best mixing rates.

Yarenni Reyes Medina

Biological Anthropology, Warren
Mentored by Dr. Jose Luis Burgos

Investigating the effects of the COVID-19 pandemic on people living in the border-region of Tijuana, Mexico

Latinos have been disproportionately affected by the COVID-19 pandemic. This is mainly attributed to having limited access to healthcare, treatment and medications. This longitudinal research project explores how COVID-19 has affected patients at the Health Frontiers in Tijuana (HFIT) clinic, a student run free clinic located in Tijuana's Zona Centro, an area where drug use and sex work are pervasive and hundreds of deportees and homeless live. An exit satisfaction survey was designed and translated to Spanish which included demographic and open-ended questions related to COVID-19 personal experiences, and knowledge about vaccines and testing. Surveys were conducted for a period of 9 months during weekly clinic visits via zoom. The hope for this research is to bring visibility to the experiences and health inequalities vulnerable communities like HFIT patients are experiencing during this pandemic.

Jack Ringelberg

Mechanical Engineering, Warren
Mentored by Dr. Maziar Ghazinejad

Design and Implementation of a Traction Controller for Formula Race Car

Formula SAE is a yearly intercollegiate competition consisting of static and dynamic events in which students defend and test their design of a formula-style racecar. UC San Diego's Formula SAE team has been improving the power output of their engine year after year, making it difficult for student drivers to control the car. Implementing a traction control system will assist an amateur driver in maximizing the car's performance by electronically controlling the engine output to ensure tire wheel grip remains in the optimum range throughout various driving scenarios. The goal of this project is to design, implement, and tune a traction control system which produces measurable improvements in car accelerations and lap times. The system will be initially designed by applying classical control techniques to a simplified car model based on

engine and tire data. The system will then be tuned through various physical tests including launching, steady-state cornering, and dynamic courses. Controller performance will be quantified by measuring acceleration, slip, and lap times using different controller designs in comparison to no control. Controllers will be tested with multiple student drivers to ensure statistical significance of results. Beyond testing and tuning of the original design, the controller can be further enhanced through modeling improvements and adjusting sampling and control rates. Some potential areas of model improvement include obtaining an accurate relationship between spark to engine torque, considering normal load sensitivity of tires, and incorporating tire grip dependency on temperature.

Angel Rivera

Human Biology / Global Health, Muir
Mentored by Dr. Melinda T. Owens

Investigating the Impact of Scientist Spotlight Homework Assignment on Implicit and Explicit Bias Towards Minoritized Groups in STEM

Scientist Spotlight homework assignments highlight minoritized scientists and their research areas. They increase students' identification with scientists and decrease scientist stereotypes. We ask whether Scientist Spotlights can change students' implicit and explicit biases towards women in science. We divided two quarter-long, lower-division biology classes at a large R1 university into an experimental and control group. The experimental group was assigned an increased proportion of Spotlights featuring women. For measuring explicit bias (two quarters), we used pre- and post-course Explicit Bias Index (EBI) surveys with Likert-type questions to see whether students believe that women are under-represented in science because of societal or personal factors. For implicit bias (one quarter), we administered an Implicit Association Test (IAT) on Gender/Science pre- and post-course. The IAT measures the automatic association between stereotypical versus non-stereotypical groupings of gender and science words. EBIs and IAT scores were compared pre-and post-course. The class averaged EBI indicated most students believed societal factors like discrimination underlie gender disparities in science. IAT data showed that students held a slight automatic bias towards stereotypical associations of gender and science, such as Male/Science and Female/Liberal Arts. Neither average EBI nor IAT scores changed in any group in either quarter. However, our study is still in progress to see what effect, if any, Scientist Spotlights have on stereotypical gender associations. Our study contributes to understanding the effects that Scientist Spotlights might have on students and their biases towards minoritized groups in science.

Ariel Rosenthal

Japanese Studies & Public Policy, ERC
Mentored by Dr. Christena Turner

Go Back Into Your Endless Dream: Citypop as the Soundtrack of Japan's Global Modernism

Japan became the world's second-largest economy in the 1970s and 80's as a result of revolutions in industrial manufacturing and global trade. To fill cutting-edge electronics and automobile factories, Japanese workers migrated to the cities in droves, enjoying numerous improvements to their quality of life, including stronger labor rights such as higher wages & shorter hours, a robust social safety net, and access to world-class public works, all of which were enabled by equitable public policy. Japanese society underwent a deliberate, policy-led cultural revolution as well, which sought to make Japan more like the wealthy nations of the West in their consumption and lifestyle. Redefined by technology, wealth, and ingenuity, Japan's strong middle class became modern cosmopolitan consumers in the truest sense, filling their lives with technology and global culture in the form of commercial products like personal stereos and music albums. In particular, the new largess of urban life was reflected in the popular music of the era, which in recent years has come to be known as "Citypop" thanks to a new life online. Combining universal Pop conventions with unique Japanese characteristics, Citypop reflected the Japanese urban middle class' experience of global modernism from the mid-70's until the end of the "bubble" in 1990. Citypop was meaningful because it hit the perfect balance of Japanese and global cultural influences, and it was valuable for its popularity and because it incorporated the technology so essential to newfound Japanese identity in its very creation process.

Allison Santana

Literature in English, Marshall
Mentored by Dr. Stephanie Jed

In Search of Breaking the University Apparatus: A Documentation of Black Student Organization for Today's Organizers

My research focused on these two questions: Does the lack of diversity in curricula have a direct impact on non-white student population at UCSD? Does the population of African Americans on campus remain relatively low due to their choice to not come to UCSD, or because the admissions process remains biased? To answer these questions first I looked into the history of UCSD as an institution and read several documents and newspapers that focused on the organization that happened during the student's struggles in trying to create Third College, known as Marshall College today. Through this, I was able to analyze the actions of the university at an institutional level in its discouragement and attacks on student organizers, as well as learning about the support students received from faculty and other administrators. My project tries to

acknowledge the work done by the Black Student Union at UCSD and allies, in order to create what they called a “Third World Studies College”, and to also look into the deeper systemic issues that have prevented student organizers work from having the impact it initially aimed to create.

Alexandra Sarkis

Political Science-Public Law, ERC
Mentored by Dr. Claire Adida

Dispelling Anti-Immigrant Misconceptions: A Study of Americans and Immigrant Exclusion Attitudes

Immigration has been a highly contested issue in American politics. Researchers have attempted to explain why Americans express anti-immigrant sentiments using economic and cultural explanations. In my paper, I propose a new mechanism that combines both economic and cultural theories of immigrant exclusionary attitudes in order to explain what stereotype about Mexican immigrants most Americans believe, what stereotypes Americans have about undocumented Mexican immigrants, and what, if any, stereotype can be corrected. I argue that Americans use stereotypes about Mexican immigrants to make inaccurate assumptions about the economy, and therefore develop anti-immigrant sentiments. To test this, I fielded a representative survey to Americans that asked what concerns, if any, they had about Mexican immigrants and used two metrics, a feeling thermometer and a question about amnesty, to measure their opinions on immigration. I found that most Americans believe that undocumented Mexican immigrants will cause a decrease in American wages. However, it was found that it is challenging to correct individual stereotypes about Mexican immigrants. This paper raises questions about the role of stereotypes in American politics, race, and ethnicity.

Arjun Sawhney

Data Science, ERC
Mentored by Dr. Michael R. Davidson

Planning for High Penetration Futures of Renewable Energy in India

Emerging research shows that the falling cost and widespread availability of renewable energy have great promise in economically reducing CO2 emissions. For instance, Lu et al (2020) describes how wind and solar in India could meet 80% of anticipated 2040 power demand and lead to a reduction of 85% in CO2 emissions, dramatically reducing the country's reliance on coal. However, planning for high-penetration futures of renewable energy sources in India must also consider the unique regional political constraints, socio-economic conditions, and availability of labor that might impact the

future of India's clean energy transformation. We propose that locations nearby existing energy facilities such as coal plants and mines are more politically suitable for building renewable energy plants as they reduce dislocation associated with retiring fossil fuel infrastructure and employment. Close in proximity to high-voltage transmission lines, these locations provide economic benefits to distribution companies associated with a lower cost of providing transmission access and a grid connection. We examine the wind and solar capacity factors and energy potentials of Indian states under different assumptions of politically-suitable siting decisions: unconstrained and constrained to an adjustable radius of coal mines and plants. We aim to answer pertinent questions regarding the extent to which prioritizing political suitability influences renewable energy potential in India. In this undertaking, our hope is to establish adaptable guidelines for policy makers to meet renewable energy development targets in their states.

Emma Scott

Sociology: Culture and Communication, Political Science: Data Analytics, ERC
Mentored by Dr. Harvey Goldman

Lucrezia Marinella, Arcangela Tarabotti, and Artemisia Gentileschi: Diverging Social Spheres, Diverging Feminisms in Early Modern Italy

Artemisia Gentileschi, the Baroque Italian painter has received a much-deserved increase in attention over the last few decades. She is frequently considered a feminist icon for her dramatic portrayals of women with agency in an era of art history where women subjects were typically presented only as hypersexualized objects. However, Artemisia was not the only feminist in 17th century Italy—there was an explosion of feminist manifestos and literature written in her lifetime that are frequently overlooked in analysis of her paintings. This project studies the feminist statements presented in her paintings compared to those in the writings of Lucrezia Marinella, a conservative feminist patrician, and Arcangela Tarabotti, a comparatively progressive feminist nun. The project starts by using a sociological analysis to compare the expectations and influences on the three women, as well as on typical women of their era and backgrounds. The paper proceeds to compare their respective feminisms by analyzing their different portrayals of the same “femme forte” icons to further their feminist arguments. These “femme forte” icons range from presentations of the Roman mytho-historical character of Lucretia whose damaged honor sparked a revolution, to presentations of Judith, the biblical heroine who saved her city by beheading a general. This research concludes that 17th-century Italian feminism was far from monolithic, and that while all three women dared to present women as equal (or in some cases superior) to men, they had remarkably different intentions and priorities in doing so.

Rafaela Mayumi Simoes Torigoe

Bioengineering: Biosystems, Muir
Mentored by Dr. Frank Talke

Development and Investigation of a Biofilm-Inhibiting Urinary Catheter Coating Containing Silver and Zinc

Catheter associated urinary tract infection (CAUTI) is a major complication occurring in hospitals. It is strongly associated with the accumulation of biofilm on the surface of urinary catheters. In this project, a biofilm-inhibiting coating consisting of silver, silver oxide, and/or zinc particles combined with polydimethylsiloxane (PDMS) that can be applied to the surface of urinary catheters was developed. Experimental catheters coated with the coating were tested for its antimicrobial properties with respect to inhibiting planktonic and biofilm growth. Coatings consisting of Ag, Ag/Ag₂O, or Zn/Ag₂O in polydimethylsiloxane (PDMS) binder were all able to inhibit the growth of E. Coli in both planktonic and biofilm form and exhibited no biofilm formation on the surface of the catheters for the entire duration of the antimicrobial resistance tests (6 days). Additionally, Scanning Electron Microscopy (SEM) images were taken in order to characterize the particle distribution and surface of the heavy metals in the developed coating.

Anushka Sinha

Neurobiology, Warren
Mentored by Dr. Eric P. Zorrilla

Effects of PDE10A inhibitor on alcohol self-administration in rats.

The striatum is a subcortical structure in the forebrain which heuristically consists of two distinct pathways: Direct MSN (dMSN) and indirect (iMSN) medium spiny neuron projections. Previous experiments suggest that disinhibition or excitation of iMSNs reduce the amount and compulsivity of ethanol intake. Phosphodiesterase 10A (PDE10A) inhibitors putatively increase activity in the iMSN pathway. We tested the hypothesis that a specific PDE10A inhibitor, would dose-dependently reduce alcohol self-administration in rats. Young adult male (n=10) and female (n=10) rats were exposed to intermittent ethanol vapor for 8 weeks to produce dependence and trained to self-administer alcohol in operant chambers for four weeks. Post-dependent rats were then pretreated with each of five doses (i.p., 0, 0.025, 0.05, 0.1, and 0.2) of PDE10A inhibitor in a within-subject design. Self-administration of 10% (v/v) ethanol vs. water was measured in 1-hour sessions (fixed ratio-1, 0.1mL/reinforcer). Subgroup analyses differentiated drug effects between high vs. low drinkers using a threshold of 0.6 g/kg of alcohol intake. Across males, increasing inhibitor doses showed an inverted quadratic effect on alcohol intake. A significant DoseXDrinker interaction showed that inhibitor effects differed between high vs low drinking rats. In low drinkers, increasing doses

produced an inverted quadratic effect on alcohol intake. However, in high drinkers, increasing inhibitor doses decreased alcohol self-administration in linear fashion. Inhibitor treatment did not alter water self-administration. Female data are in progress. Thus, PDE10A inhibition differentially reduces operant alcohol self-administration in high drinking vs. low drinking rats, perhaps via its actions on iMSN activity.

Harriet Song

Molecular and Cell Biology, Warren
Mentored by Dr. Elizabeth Komives

Linker mutants of the urokinase-type plasminogen activator (uPA)

The urokinase-type plasminogen activator (uPA) is a serine protease that activates the inactive plasminogen to plasmin. In turn, plasmin activates uPA and therefore results in a positive feedback loop and the subsequent cascade. The uPA-plasmin system is involved in cancer metastasis. The focus of this project will be on the uPA because the activity of the uPA is essentially the rate-limiting step in the system. The uPA has essentially four "domains" or regions: the N-terminal EGF-like domain, a kringle domain, a linker region that links the EGF-like domain and the kringle domain to the C-terminal protease domain. Active plasmin activates inactive single-chain uPA by cleaving it at the linker-protease domain region and creating a two-chain uPA protein. The two chains are attached via a cysteine disulfide bond formed between the linker region and the protease domain. The main research questions of this project are what are the effects of the linker region on uPA protease activity and how the linker communicates with the protease domain of the uPA.

William Tallentire

Oceanic and Atmospheric Sciences, Muir
Mentored by Dr. Andreas Andersson

Inshore-offshore coupling of biogeochemistry on the Bermuda coral reef platform

Global coral cover has declined in recent decades under environmental change, but Bermuda platform coral reefs have remained stable. This could in part be due to a combination of hypothesized offshore food subsidies and acclimatization to seasonally fluctuating environmental parameters. However, elucidating the mechanisms for these hypotheses has been limited by a lack of data and studies explicitly investigating the relationship between coral reef biogeochemical variability and offshore processes. We address this relationship by quantifying the differences in the variability, timing, linkages, and drivers of Bermuda platform and offshore biogeochemistry using a four year time series of monthly sampled biogeochemical parameters (n=52) at six platform stations

and the offshore Bermuda Atlantic Time Series station (BATS). Biogeochemical parameters showed distinct seasonal cycles with local extrema typically occurring in March and September. Many reef platform variables converged to the offshore value in March when seawater temperatures were lowest and diverged with a gradient among the offshore to inshore stations in September when seawater temperatures were highest. This initially suggests that seasonal temperature fluctuation is likely to be a strong driver of biogeochemical variability. Moreover, the data indicated an offshore phytoplankton bloom in March, and a reef platform phytoplankton bloom in September, suggesting different drivers of phytoplankton bloom dynamics. Consequently, we posit a negligible impact of offshore biogeochemical dynamics on reef processes, and other mechanisms driving late summer primary productivity maxima on the Bermuda coral reef platform that could have implications for coral food availability and resilience to environmental change.

Rachel Yuen Sum Tam

Oceanic and Atmospheric Science, Muir
Mentored by Dr. Amato Evan

Seasonal Cycle of Arctic Cloud Cover Based on AVHRR satellite data

The seasonality and long-term trends in Arctic cloudiness are quantified using 40 years of measurements from polar orbiting satellites. These results are compared with proposed Arctic sea ice retreat and cloud feedback mechanisms.

Haihan Tian

Economics/Data Analytics, Marshall
Mentored by Dr. Eli Berman

Studying Chinese People's Attitudes Toward America and Japan

The development of China associates with the conflicts and corporation with America and Japan. This makes me wonder about Chinese people's attitudes toward these two countries, are different people having different opinions? If that is the case, which factors are affecting their attitudes and by how much? To find out the answer, I made an online anonymous survey that asking Chinese people about their attitudes toward America and Japan and with other variables like their age and income. In this paper, I will use the results from the survey to find out the answer. As the result, Chinese people's attitudes are predicted by several factors, and their attitudes to these two countries are predicted by different factors. My explanation is that the historical events between these three countries, the influence of the media, and the spread of culture are the major reasons that shaped people's attitudes.

Cindy Tran

General Biology, Revelle
Mentored by Dr. Jonathan Shurin

Flying Plankton: Dispersal Syndromes in Aquatic Microbes

It has been observed that many prokaryotic and eukaryotic microbes have ubiquitous and cosmopolitan distributions, being found across a wide range of habitats and regions. From this, microbiologists and ecologists have concluded that they must disperse through the atmosphere successfully and frequently enough to overcome biogeographic barriers. What has not been determined, however, is whether this phenomena occurs for all microbes, or if the ability to disperse is related to certain cellular characteristics such as size and shape, or ecological strategies including resource acquisition and predator resistance. To investigate this, we used a data set which, through 16s rRNA sequencing, identified the composition of prokaryotic and eukaryotic microbe communities in the soils, water, air, and experimental ponds in and around the Salton Sea. We analyzed this data to see if the dispersing or colonizing communities differed taxonomically or in functional traits from the terrestrial or aquatic source environments. We found that larger eukaryotes and those that contained a siliceous covering tended to be poorer dispersers and colonizers. Green algae tended to more frequently be aerial dispersers, while diatoms and ciliates were rare among the aerosol and colonist communities compared to the source samples, suggesting lower dispersal rates. We see that dispersal ability for microbes is not universal, and that microbes vary in their ability to disperse and colonize new habitat. The traits which make microbes well or poor at dispersing also affect ecological functions such as competition and predation resistance, which might suggest tradeoffs for dispersal ability.

Brandon Tsai

General Biology, Sixth
Mentored by Dr. Diana Rennison

Coevolution of Morphological Traits on Threespine Stickleback

The central theory of evolution states that natural selection and environmental conditions influence the direction of evolution that species undertake, yet the exact mechanisms driving diversification in many cases remain to be identified. Our study investigates coevolution as a possible mechanism underlying the evolutionary dynamics of suites of morphological traits. We analyze whether trait correlations are strengthened or weakened under certain ecological or functional conditions. Using wild and lab-reared threespine stickleback fish (*Gasterosteus aculeatus*), we studied patterns of trait correlations within and across three functional categories: armor, foraging, and

swim. Pairwise estimates of trait correlations reveal that correlation coefficients are generally stronger in traits compared within the same functional category than those compared across different functional categories. Furthermore, other analyses indicate that trait correlations are generally stronger in lab-reared fish than in wild fish. These findings suggest that functionally similar traits tend to evolve together in response to the same environmental conditions and that trait evolutions are dissipated by a variable environment.

Caitlin Villareal and Daniel M. Zubovic

Mechanical Engineering, Muir
Mechanical Engineering, Sixth
Mentored by Dr. Maziar Ghazinejad

DESIGN AND TESTING OF DIMES CARBON ABLATION RODS IN THE DIII-D TOKAMAK

We present the design of ATJ graphite rods developed for ablation experiments under high heat flux (up to 50 MW/m²) in the lower divertor of the DIII-D tokamak [1], a magnetic plasma confinement device. This work is motivated by the need to test ablation models relevant to carbon-based thermal shields used in high-speed spacecraft atmospheric entries, where the heat fluxes encountered can be comparable to those achieved in the DIII-D divertor plasma. Several different designs for the flow-facing side of the rod are analyzed, including "sharp nose," "blunt," and "concave". The last shape is studied for its potential to lower heat fluxes at the rod surface by increased radiation from trapped neutrals and reduced parallel plasma pressure. We also analyze the possibility of applying a thin (approximately 30 microns) layer of silicon carbide (SiC) to the exposed part of several carbon ablation rods to benchmark its erosion calculations and lifetime predictions. Such calculations are of interest as SiC represents a promising material for both thermal protection systems (TPS) and a fusion plasma-facing material (PFM). Preliminary results from the DIII-D rod ablation experiments are also discussed.

Jacqueline Villasenor

Nuerobiology, Muir
Mentored by Dr. Leslie Carver

Factors Influencing Health Disparities of Autism in Hispanic Children

In 2020, the CDC reported that One in fifty-four children are diagnosed with Autism Spectrum disorder. It is four times as prevalent in boys than it is in girls, affecting 1 in 34 boys and 1 in 144 girls. This statistic does not include the Hispanic children in the United States that have not yet been diagnosed and counted. This literature review focuses on struggles experienced by Hispanic families leading to the late and missed diagnoses of

Autism for their children. Among the various influencing factors, socioeconomic and parental lack of education were found across various studies to be the most common link in access to care. However, what was not as commonly mentioned, but just as significant is the lack of attention from physicians to the child and family when care is accessed.

Minh Vo

Computer Engineering, Muir
Mentored by Dr. Truong Nguyen

Unsupervised Sequence Alignment between Video and Human Center of Pressure

Estimating the human center of pressure (COP) from videos can achieve great precision with the development of human skeleton joint extraction networks. To be able to estimate COP from video using two different types of input sequences, video and ground truth COP, one important requirement is synchronization. If these two different sequences of different data types are misaligned, the estimation task, along with other application's precision is affected significantly, and application field is restricted due to the inaccurate label from the COP sequence. In this paper, we used a synchronized dataset and unsupervised deep learning to train an Alignment Network to align video and COP sequences on another unsynchronized dataset where each sequence starts at a different time and has different frame rates. On the synchronized dataset, the Alignment Network removes 84.4% temporal offset. On the unsynchronized dataset, we proposed a simple yet effective Differential Network to simulate one practical downstream task. We used the differential Network to estimate the sway level of COP. Results indicated this method achieved significant improvement (over 20% improvement on three sway level cases) over the misaligned dataset.

Blake Walkowiak

Oceanic and Atmospheric Sciences, Marshall
Mentored by Dr. Amato Evan

On the Misclassification of Remote Sensing Measurements of Dust Storms in the Sonoran Desert

Here we describe solar radiance measurements of dust storms made in southeastern California as part of the NASA AERONET network. We explain how the processing algorithm for these data regularly misclassify dust as ice clouds. Such misclassifications may be pervasive, which would imply an underestimate of the global dust burden by this network.

Phoenix Wang

Philosophy (BA); Clinical Psychology (BS), Marshall
Mentored by Dr. David O. Brink

A Tale of Two Senses of Moral Responsibility: Incurrigible Psychopathic Wrongdoing

Gary Watson famously distinguishes two senses of moral responsibility: attributability and accountability. The former reflects the agent's true self and his quality of will (including his character, evaluative orientation toward others); the latter concerns whether it will be fair to blame or punish him in light of the fair opportunity conception of moral responsibility. In this paper, I will elaborate on how psychopathy (or the psychopathic wrongdoer) represents an interesting and difficult "tale" for thinking about responsibility and excuse. I will cover the following points:

- Reactive attitudes
- Challenges from criminal laws
- Psychological and philosophical constructs of the problem
- Characteristics of psychopathy as aggravating or excusing/mitigating factors?

In light of the above points that I'm going to discuss, I intend to highlight the most important one: I argue that attributability is not sufficient for accountability. Even if we could trace back some characteristics of psychopaths and treat them attributively responsible, psychopathic wrongdoers are still not responsible in the sense of accountability. Therefore, the tale of attributability and accountability in conjunction with the fair opportunity conception of responsibility emphasizes the reasons-responsiveness of the agents, namely — agents are responsible for the actions if and only if they have intentionally performed just in case they were normatively competent and reasons-responsive to their actions. Moreover, individual differences among psychopathic wrongdoers³ contribute to different degrees of moral sentiments when we assess their moral responsibility and tailor blame or punishment to make it commensurate with their just desert.

Anne Marie Wort

Anthropology, ERC
Mentored by Dr. Amy Non

Health Care Provisions in Prehistoric Peruvian Trephination: Assessing Health Care Provisions and their Influence on Long Term Survival after Trephination in Prehistoric Peru

Trephination is the earliest known globally practiced surgical procedure, garnering attention both from archeologists and neurosurgeons. Since the discovery of the procedure in Peru, nearly 155 years ago, academics have been enthralled with the

practice in the region. The absence of a written language and lack of description in Spanish chronicles during the conquest, however, has left many aspects of trephination in prehistoric Peru a mystery. In particular, how prehistoric Peruvians were able to achieve a high percentage of long term survival after trephination. In contemporary research, academics typically cite the trephination method and advance knowledge of cranial anatomy as the primary reasons for this phenomenon. However, this generalization disregards and downplays how postoperative health care provisions and communal care could have influenced the outcome. This research aims to assess possible health care provisions conducted in prehistoric Peru that would have influenced the recovery period after trephination, creating the high percentage of long-term survival witnessed in the region. By examining trephined crania from Cinco Cerros and San Damien held within the Hrdlička Paleopathology Collection Catalog using the Index of Care web application, this research creates a better, more rounded understanding of the factors that influenced healing and survival after trephination in prehistoric Peru.

Ulric Wu

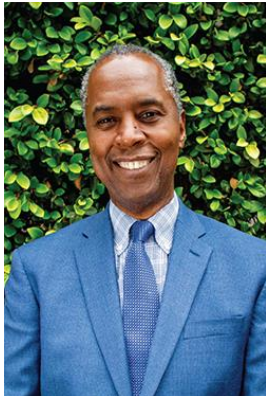
Clinical Psychology, Marshall
Mentored by Dr. Pei-An Shih

Recovery Status Influences Differences in Symptomatology in Two Anorexia Nervosa Subtypes

Anorexia nervosa (AN) is one of the deadliest psychiatric disorders. AN patients are categorized into two clinical subtypes based on their eating behaviors: the restricting subtype (AN-R) and the binge-purge subtype (AN-BP). It is important to understand the psychopathological differences between AN subtypes to improve treatments and outcomes. We compared eating disorder psychopathology between age-matched women with the AN-R subtype (n=44) and the AN-BP subtype (n=52) using the Eating Disorders Inventory-3 (EDI-3) and the Eating Disorder Examination-Questionnaire (EDE-Q). To further determine if patients' recovery status impacts symptom differences between subtypes, analyses were stratified by recovery status (25 ill/19 recovered AN-R; 38 ill/14 recovered AN-BP). Among all patients, AN-BP showed significantly worse symptoms than AN-R on the EDI-3's bulimia, personal alienation, and ineffectiveness measures, and on six EDE-Q questions related to the binge-purge behaviors. In ill patients only, these differences remained significant, along with more severe EDE-Q restraint, shape concern and global scores in AN-BP than in AN-R. Among recovered patients only, the two subtypes did not statistically differ in any EDI-3 measures. Surprisingly, recovered AN-BP had significantly better symptoms on the EDE-Q's restraint, shape concern, and global measures compared to AN-R. We found significant differences directionally in eating disorder psychopathology between AN subtypes depending on their recovery status. Unexpectedly, when recovered, AN-BP patients displayed better symptomatology than AN-R patients. These findings highlight the

importance of considering patient's recovery status when investigating phenotypic differences, including symptom severity and prognosis, between AN subtypes.

UR Staff



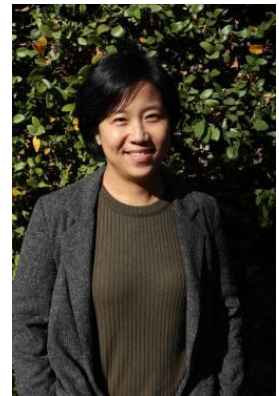
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