2021 OURS Program

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Conference Schedule

Wednesday, May 26th

5:00 PM - 5:30 PM   OURS Opening Remarks and Outstanding Mentor Awards
                     Ceremony

5:30 PM - 6:15 PM   Session 1
5:15 PM -7:00 PM   Session 2

Live Session Times & Zoom Room Links

Zoom Rooms		Registration Links
OURS Opening Remarks and Outstanding Mentor Awards Ceremony		https://ucsd.zoom.us/meeting/register/tJAlcu6ppjkiGNOKnfCK3sXQX-z4xMJnfvUV
5:30 - 6:15 PM	Arts & Humanities	https://ucsd.zoom.us/meeting/register/tJwpcuyrrDIiGdFTRvpcpES2UdQGXca7I1Du
	Biological Sciences & Medicine	https://ucsd.zoom.us/meeting/register/tJUoc-CvqTMqE9JB3lQPRJwLZET9jAlwZxvy
	Biological Sciences I	https://ucsd.zoom.us/meeting/register/tJMsd-goqDIvE9X1UqcnwJunvMKEnyImfwEz
	Computational & Data Sciences	https://ucsd.zoom.us/meeting/register/tJ0udOqurD8oHt3euZUyWYojNPDiZkPy4rEI
	COVID	https://ucsd.zoom.us/meeting/register/tJMscOygrDwvHNYcK5kTBHZpiLbg2W6ABH9B
	Education	https://ucsd.zoom.us/meeting/register/tJYsfuGgrjktGtKeGzfGYAzD1SFgGL0ZC7U3
	Engineering	https://ucsd.zoom.us/meeting/register/tJIkceyurjgsGdaJ5JZFuwB-AOQdlbQgwkvF
	Misc. STEM	https://ucsd.zoom.us/meeting/register/tJcscOCurjItHNQS7AimEXNIlCZRZolsoLXS
	Physics I	https://ucsd.zoom.us/meeting/register/tJIudOisrj8rGdY4U1sBhVQURsTxARluFVjA
	Public Health	https://ucsd.zoom.us/meeting/register/tJElfumsqDorHt3HNi0XCwv2UGdgkC0pV_ig
	Public Health & Policy	https://ucsd.zoom.us/meeting/register/tJwvcumsrTsrGtxPdYDQpsgo7i78Wfr6lqon
6:15 - 7:00 PM	Biological Sciences II	https://ucsd.zoom.us/meeting/register/tJ0sf-ugrD4iG9P05IY-kCmJx_PuFCMaCALF
	Biological Sciences III	https://ucsd.zoom.us/meeting/register/tJAuduutqz0iHtf3ogRlolijjYCSOvu5EXdg
	Cognitive Science	https://ucsd.zoom.us/meeting/register/tJ0oc--hqTMvEtMYUeyyPXXgDV7UyROU0lS2
	COVID II	https://ucsd.zoom.us/meeting/register/tJwlduqrrzoqHtMvbK52pm23B9LfusMPNl2e
	Engineering Applications	https://ucsd.zoom.us/meeting/register/tJcsde6hqz0jGdSEIDckgwNWSjwFKBuzq5YG
	Environmental Sciences	https://ucsd.zoom.us/meeting/register/tJ0pcuqqrjspHdS4N4-4gBAppDrzULkbg66E
	Medical & Health Sciences	https://ucsd.zoom.us/meeting/register/tJMpcO2rrT4uGdZYE5PhHd50JxUWBdVFvIRB
	Molecular & Cell Biology	https://ucsd.zoom.us/meeting/register/tJckf-GvqT4iEtNIfeDItRUvgbQu_4P9JX4g
	Physics II	https://ucsd.zoom.us/meeting/register/tJIvdOGrpjojE9zFBlvQcHh0rkEUhLqXvIjI
	Political Science	https://ucsd.zoom.us/meeting/register/tJwvduuhrT0tG9YmuZ0zZWyGVEf8nlAfSsSF

Outstanding Mentor Spotlights

Dr. Javier Duarte

Please tell us a bit about your educational background and current research

I am an Assistant Professor of Physics and a member of the CMS experiment at the CERN Large Hardon Collider (LHC). Before joining UCSD, I was a Lederman postdoctoral fellow at Fermilab. I received my Ph.D. in Physics at Caltech and B.S. in Physics and Mathematics at MIT. My main research focus is measuring the properties of the Higgs boson and searching for exotic new physics at high energy particle colliders. Toward these goals, my group studies real-time artificial intelligence (AI) algorithms on field-programmable gate arrays (FPGAs), and geometric deep learning for particle physics.

Did you do research as an undergraduate student? How did you get started in your current field?

I did research as an undergraduate in neutrino physics at Fermilab with Professor Janet Conrad at MIT and in collider physics at CERN with the late Professor Homer Neal at the University of Michigan. Being a part of research at those labs as well as interacting and working fellow students and scientist had a major impact on me and helped convince me to pursue a career in experimental high energy physics research.

Who are some of your most memorable mentors, and how did you meet them?

I've had many excellent mentors (too many to name) over the years that have helped me at every phase of my career. Often, my mentors included the PI I worked with, but also included graduate students, postdocs, and others around the labs who graciously took the time to help me or give me advice.

Why do you enjoy being a mentor?

I really enjoy showing students how accessible research in AI and particle physics can be and helping them make an impact in the field. It's incredible to see their growth as the students come into their own as independent researchers.

What's the most useful piece of advice a mentor gave you?

Probably the most useful piece of advice a mentor gave me was that it's ok to say "I don't know" and equally ok to ask for help.

Dr. Rebecca Fielding-Miller

Please tell us a bit about your educational background and current research

My undergraduate degree is from UC Davis. I majored in comparative literature (English and French), with a minor in music history. After graduating I joined the Peace Corps and served in South Africa for two years, where I became interested in public health, especially the social drivers of HIV for young women and girls. I went on to earn an MSPH in International Health from John Hopkins, and then decided that I enjoyed research so much that I wanted a PhD in public health, which I earned at Emory University. My research has always focused on the social drivers of health disparities, especially infectious disease like HIV and COVID-19, and gender-based violence in the United States and sub-Saharan Africa. Currently I lead the Safer at School Early Alert (SASEA) project, a COVID-19 monitoring project for elementary schools and childcare across San Diego County.

Did you do research as an undergraduate student? How did you get started in your current field?

I did not! I learned a lot of things in undergrad about leadership and what kind of person I wanted to be, but I was not very involved with research. At the time I thought maybe I wanted to be a pediatrician, but then I took organic chemistry and realized I definitely did not want to go to medical school. When I joined the Peace Corps, I saw every day how big social issues like gender, and history, and race, and poverty drove health disparities. I wanted to learn more about how to address people's health in the big picture rather than one at a time.

Who are some of your most memorable mentors, and how did you meet them?

The mentors I most remember are the ones who were kind, and the ones who took a chance on me. My PhD mentor emphasized the importance of mental health and self-care even when things were stressful, and I am deeply grateful that she modeled that for me early on so that I knew how to do the same with my mentees. Some of my very best mentors were my peers. I'm lucky to have a lot of friends who know things I don't, and who are always willing to answer questions.

Why do you enjoy being a mentor?

Our students at UCSD are really wonderful. I love spending time with students one-on-one, getting a chance to learn about them and their interests, and supporting them to engage in research that they think is interesting. I love helping students learn how important and smart they already are. My job is just to facilitate.

What's the most useful piece of advice a mentor gave you?

You don't have to choose what you want to so forever, you just have to choose what you want to do next.

Professor Paul Siegel

Please tell us a bit about your educational background and current research

I received my bachelor's and Ph.D. degrees in mathematics from M.I.T. long enough ago that my current FMP mentee and her father both took ECE 101 from me! (Okay, the degrees date back to 1975 and 1979.) My specialization was algebraic topology – not very applied stuff. Over the course of the next year, I followed a rather circuitous route, which I will describe in more detail below, to my current area of specialization: information and coding theory. My primary interests are in the mathematical foundations and algorithmic implementation of data encoding and detection methods, with applications to digital communications and, especially, data storage. Target technologies include future-generation wireless communication, magnetic storage, non-volatile memories, DNA-based storage, and data centers.

Did you do research as an undergraduate student? How did you get started in your current field?

I started doing research in math when I was in high school, with encouragement from my calculus teacher. I continued some of that work at MIT, but my real immersion into research began when I was a first-year graduate student. I attended a presentation by a new post-doctoral researcher and knew I wanted to work with him on that topic.

My journey to my current field began when, as I was nearing graduation, I saw a job posting from Lockheed Missiles and Space Company seeking a Ph.D. in math. I wondered what such a job might involve, so I inquired about it when their representatives visited campus. They offered me a summer internship with the Satellite Communications group, and, to my surprise, I found the problems they were working on really interesting and suitable for my math background. They offered me a job, but I had already accepted a post-doctoral fellowship at the Courant Institute at NYU. While teaching a graduate course there on Modern Algebra, I included lots of examples of things I had learned about in my internship – shift-register sequences, error-correcting codes, public-key cryptography. One of the students was a manager at IBM Research. He asked if he could circulate my resume around the company and one day I got a call from my future manager at IBM in San Jose, asking if I would like to work on signal processing and coding for advanced magnetic recording. It sounded interesting, and somehow, I got the job! The moral I draw from this story is that it pays to stay curious, follow your interests, and be open to serendipity! It was at IBM that I first began working with people at the Center for Magnetic Recording Research (CMRR) at UCSD, spending a wonderful sabbatical year here in 1989. When the ECE department began a wave of hiring in 1994, they approached me about joining the faculty. I accepted and have never regretted my decision.

Who are some of your most memorable mentors, and how did you meet them?

My high-school calculus teacher, Mr. Angelo Di Domenico. He was also the soccer coach and when his chalk broke he would often send it flying across the room with a full volley kick.

Prof. Jim Munkres, who taught me algebraic topology at MIT. He was an amazing teacher and textbook author. He had a profound impact on my teaching style.

Dr. Mark Goresky, the post-doctoral instructor who inspired my first research interest and served as my de-facto dissertation advisor. When he took a position at the University of British Columbia, I would send drafts of my thesis to him by mail – no email back then! Mark taught me how much fun it was to do research.

Prof. Jack Wolf, my colleague and close friend at CMRR. Jack was a role model for many people, including me. He was a brilliant researcher, but I think his greatest passions were teaching and mentoring students.

Why do you enjoy being a mentor?

I love introducing students to research. Research is hard work, but it is really a form of creative play. And nothing can rival the feeling you get when you finally figure things out. Also, I welcome new ideas and perspectives. Every student I have worked with has brought a fresh viewpoint that I truly value. Finally, I get tremendous satisfaction in seeing the great things my mentees accomplish.

What's the most useful piece of advice a mentor gave you?

It's not so much a piece of advice as it is a research philosophy: ``The only thing better than the joy of discovery is the joy of shared discovery.''

Dr. Leslie Lewis

Department of Urban Studies and Planning
Director of Urban Health and Equity Initiatives

Spotlight coming Soon!

Panel Details

Session 1

Zoom Room: Arts & Humanities
5:30 PM-6:15 PM

Elisa Ady (McNair)
Mentor: Dr. Stephanie Jed
Empire and Indigeneity in Magical Realism: A Colonial Unraveling

Riley Glenn-Hernandez (FMP)
Mentor: Dino Dinco
Class of '18

Fartoon Hagi-Mohamed (McNair)
Mentor: Stephanie Jed
Memoir Writing: A Tool to Combat the Potential Effects of Intergenerational Trauma

Tommy Lim (TRELS)
Mentor: Hoang Nguyen
Demonic and Christ-like: Using Christological and Rabinnic lenses to Recognize the Emerging Feminism in the Lesbian Vampire Trope

Denia Marquez (McNair)
Mentor: Monique Wonderly
Addiction, Attachment and the Ethics of Grief in Recovery

Zoom Room: Biological Sciences & Medicine
5:30 PM-6:15 PM

Caitlyn Callaway (McNair)
Mentor: Kuo-Fen Lee
Neural Mechanism of Resting Tremor in Cdk5 Parkinson's Disease Model

Esha Kaur (FMP)
Mentor: Dr. Willis Li
Binding of uSTAT dimer, HP1 dimer and DNA Double Helix

Skyler Liu (FMP)
Mentor: Willis Li
HP1 and the Inhibition of Cell Proliferation

Ann Truong (FMP)
Mentor: Dr. Faith Quenzer
COVID-19: Lasting Symptoms and Effects on the Cardiovascular System

Dorothy Tsai (FMP)
Mentor: William Kim
Engineering Cancers Representative of the Heterogeneity of Triple-Negative Breast Cancer

Flora Wong (FMP)
Mentor: Willis Li
Heterochromatin Protein 1 and Cell Proliferation

Zoom Room: Biological Sciences I
5:30 PM-6:15 PM

Anastacia Carrick-Gonzales (McNair)
Mentor: Amina T. Schartup
Influence of Trace Metal Concentrations on Phytoplankton Community Dynamics in La Jolla Coastal Waters

Nadia Haghani (FMP)
Mentor: Sreekanth Chalasani
A closer look at cuticle-resident microbes and their impact on Caenorhabditis elegans physiology

Ahmed Mabrouk (FMP)
Mentor: Milton Saier
The role of c-di-GMP in the Regulation of FlhDC operon of Escherichia Coli

Jennifer Nguyen (FMP)
Mentor: Anjan Debnath
Activity of a Natural Product Derivative against Naegleria fowleri

Milan Sandhu (BIMM170)
Mentor: Rachel Dutton
Function and Phylogenetic History of Erwinia phage;RAY protein gp048

Brandon Tsai (TRELS)
Mentor: Diana Rennison
Coevolution of Morphological Traits on Threespine Stickleback

Zoom Room: Computational & Data Sciences

5:30 PM-6:15 PM

Anshul Birla (FMP)
Mentor: Dr. Amarnath Gupta
Generating Training Data Sets for Relationship Extraction

Isac Lee (FMP)
Mentor: Michael Davidson
Financial Benefits and Inequities of Household Solar PV Support Programs;

Lehan Li (FMP)
Mentor: Eran Mukamel
DNA Methylation Prediction in Deep Learning

Bo Su (FMP)
Mentor: Gupta, Amarnath
Temporal Relation Extraction with a Graph-Based Deep Biaffine Attention Model

Yizhi Yuan (FMP)
Mentor: Marcelo G Mattar
Algorithm of Your Brain: Hippocampal Replay Patterns Improve Prioritized Experience Replay

Zoom Room: COVID
5:30 PM-6:15 PM

Dawn Duong (FMP)
Mentor: Dr. Rebecca Fielding-Miller
Framing Health Communication on Masking Through the Theory of Planned Behavior

Vy Le (FMP)
Mentor: Dr. Georgia Robins Sadler
Facebook

Yingyin (Katie) Li (FMP)
Mentor: Dr. Georgia R. Sadler
Using Culturally Relevant Designs for Social Media Public Health Outreaches on Facebook;

Shina Luu (FMP)
Mentor: Georgia Robins Sadler
TikTok: A Promising Platform to Spread Public Health Information

Alex Zhao (McNair)
Mentor: Kirk Bansak

The Variation In Stay-At-Home Orders: A Case Study Of COVID-19 Politics In The Navajo Nation And Neighboring States

Zoom Room: Education
5:30 PM-6:15 PM

Caesar Aceituno (McNair)
Mentor: Abigail Andrews
The Hidden Curriculum and the Barriers on Latinx Students at UCSD

Ivette Martinez (McNair)
Mentor: Makeba Jones
'I Wish I Would Have Taken More Advantage of GEAR UP': Looking at the Impact of Federal Educational Intervention Programs;

Emily Nguyen (TRELS)
Mentor: Rebecca Fielding Miller
Experiences and Barriers of Neurodiverse and Disabled Identifying UCSD Students

Esmeralda Salas (McNair)
Mentor: Dr. Amy Bintliff
Impacts of Social and Emotional Learning at Akanksha Foundation

Jeremy Stark (FMP)
Mentor: Stanley Lo
Effect of Group Participation and Jigsaw Method On Student Performance

Zoom Room: Engineering
5:30 PM-6:15 PM

Sarah Ekaireb (FMP)
Mentor: Paul Siegel
Generative Modeling of Flash Memory Read Voltages

Juliana Foley (McNair)
Mentor: Darren Lipomi
Aqueous Interface-Directed Phase Separation of Polymer Blends

William Hu (FMP)
Mentor: Ryan Kastner
Optimizing the Estimate Precision Visualization for the Radio Telemetry Tracker

Hridayanand Khemchandani (TRELS)

Mentor: Ping Liu
Simulation of Shorting in Etched NMC Cathode Li-ion Cells Using COMSOL Multiphysics

Shi Minjing (TRELS)
Mentor: Gary Cottrell
Domain Adaptation In Facial Recognition for all Races

Zoom Room: Misc. STEM
5:30 PM-6:15 PM

Erick Cervantes (McNair)
Mentor: Dionicio Siegel
Identification of fatty acid esters of hydroxy fatty acids through MASST

Annie Nguyen (FMP)
Mentor: Jyoti Mishra
Cognitive Correlates of Suicidal Ideation

Gerardo Ontiveros Cortes (McNair)
Mentor: Olivia A. Graeve
Thermal Conductivity of Water-Based Alumina Nanofluids

Alexander Perez de Leon (McNair)
Mentor: Professor Sheng Xu
Simulating Inorganic Perovskite Light Emitting Diodes

Crystal Zhan (FMP)
Mentor: Mishra Jyoti
Cognitive Correlates of Suicidal Ideation

Zoom Room: Physics I
5:30 PM-6:15 PM

Malina Desai (FMP)
Mentor: Liang Yang
Next-Generation Enriched Xenon Experiment (nEXO): Designing a Test System for Neutrinoless Double Beta Decayfor 0νββ

Zichun Hao (FMP)
Mentor: Javier Duarte
Lorentz Group Equivariant Jet Autoencoder

Natalia Henriquez (FMP)

Mentor: Adam Burgasser
SpeX Archive Reduction to Build a Catalog for Low-Mass Star and Brown Dwarf Data;

Mikaela Larkin (FMP)
Mentor: Adam Burgasser
Identifying Brown Dwarfs and Very Low Mass Stars by Reducing Infrared Spectral Data

Tianxing Wang (FMP)
Mentor: Ivan Schuller
A Literature Review on Vanadium Oxide's Application in Neuromorphic Computing

Zoom Room: Public Health
5:30 PM-6:15 PM

Anamaria Ancheta (TRELS)
Mentor: Dr. Leslie R. Lewis
Analyzing the Benefits of the Market Match Program and the Incorporation of CalFresh Benefits at San Diego Farmers Markets

Natalie Chavarria (TRELS)
Mentor: Dr. Leslie R. Lewis
Analyzing the Benefits of the Market Match Program and the Incorporation of CalFresh Benefits at San Diego Farmers Markets

Bethelihem Gebremeske (McNair)
Mentor: Dr Dennis Trinidad
Too Young For Marriage: child marriage in Ethiopia

Simran Patel (TRELS)
Mentor: Danielle Raudenbush
How Hospitals Address Healthcare Needs for the Homeless

Songyuan Tan (FMP)
Mentor: Jyoti Mishra
Technology and Cognition: A Modern Way to Equality

Zoom Room: Public Health & Policy
5:30 PM-6:15 PM

Jimin (Kristin) Kim (FMP)
Mentor: Seth Hannah
Patient-Provider Interactions: Role of Race, Social/Cultural Dynamics, Cognition in Clinical Decisions that Deepen Health Disparities in African American Populations

Allison Morgan (TRELS)
Mentor: Drew Walker
Presenter: Allison Morgan

Donna Pham (TRELS)
Mentor: Dr. Leslie Lewis
Optimizing the Triton Food Pantry Organizational Layout: A Community Service Initiative

Theodore Vuong (FMP)
Mentor: Professor Stanley Lo
The Role of Transfer Student Experiences in Constructing Student and Scientific Identities

Mia Cameron (BIMM170)
Mentor: Rachel J. Dutton
The Predicted Function and Phylogeny of Erwinia phage RAY gp153.

Session 2

Zoom Room: Biological Sciences II
6:15 PM-7:00 PM

Demyan Davydov (BIMM170)
Mentor: Rachel Dutton
Erwinia phage RAY_gp116 and its putative function.

Melissa Guereca (BIMM170)
Mentor: Rachel Dutton
Unusual Helicases Found in Erwinia phage RAY

Kiley Hearst and Adamari Martinez (BIMM170)
Mentor: Rachel Dutton
The Predicted Function of RAY_gp220 as a DNA Polymerase

Zichen Jiang (FMP)
Mentor: Ferhat Ay
Three-dimensional organization of X chromosome in relation to gene expression

Aaron Sonin (BIMM170)
Mentor: Rachel Dutton
RAY phage proteins gp223 and gp249 as DNA-Dependent RNA Polymerase Beta' Subunits

Zoom Room: Biological Sciences III
6:15 PM-7:00 PM

Amber Lee Annika Sy (BIMM170)
Mentor: Rachel Dutton
Tubulin-Like Protein gp210 From Phage RAY Forms a Filament Across Infected Cells

Allison Cafferata (BIMM170)
Mentor: Rachel Dutton
RAY_gp315, a Putative DNA Helicase Protein

Nicholas Chiu (BIMM170)
Mentor: Rachel Dutton
RAY_gp299: An Analysis of its Function and Evolution

Miles Corley (TRELS)
Mentor: Matthew Daugherty
Evolutionary-Guided Analysis of Human Host Factors Gives Insight into Host-Pathogen Conflicts

Steven Luong (McNair)
Mentor: Dr. Michael David
Human Schlafen-11 Blocks Synthesis of SARS-CoV-2 Viral Proteins

Angel Sarabia (BIMM170)
Mentor: Rachel Dutton
Evolutionary Analysis of the Exoribonuclease-like Protein RAY_gp064

Zoom Room: Cognitive Science
6:15 PM-7:00 PM

Gabriella Busco (FMP)
Mentor: Job Godino
Body Image, Mental Health, and Quality of Well-being: A Cross-Sectional Study of Young Adults in a College Setting

Angela Chapman (McNair)
Mentor: Dr. Savita Bhakta
Event-Related Potential Biomarkers in Schizophrenia Patients: A Systematic Review

Suyeun Choi (FMP)
Mentor: Edward Castillo, Ph.D, MPH
Cognitive Screening in a Geriatric Emergency Department

Isabel Tate (McNair)
Mentor: John H. Evans
Examining the Factors Behind the Facilitation of Social Cohesion Through Online Interactions During the Covid-19 Pandemic

Julia Yu (FMP)
Mentor: Douglas A. Nitz
What, When, and Where: Phase Precession in Different Routes

Zoom Room: COVID II
6:15 PM-7:00 PM

Hannah Abraham (FMP)
Mentor: Dr. Hemal Patel
A substance that confers immunity from a pseudo-COVID-19 virus for those who regularly practice meditation

Amberine Kabir (FMP)
Mentor: Georgia Robins Sadler
Attracting Target Audience by Utilizing Instagram to Spread Public Health Information

Xingchen(Stars) Xu (FMP)
Mentor: Georgia Robin Sadler
Measuring Instagram's Delivery of Clinical Trials Information;

Danny Yu (FMP)
Mentor: Georgia Robins Sadler
Using TikTok as a Public Health Dissemination Platform: The Analytics

Zoom Room: Engineering Applications
6:15 PM-7:00 PM

Nathan Bradshaw (McNair)
Mentor: Andrea Tao
Surface-enhanced Raman Spectroscopy (SERS) Lateral Flow Immunoassay (LFIA)

Amio Das (TRELS)
Mentor: Nicholas Gravish
Implementing pitch control to understand flapping flight

Samantha Fong (FMP)
Mentor: Albert Lin

Simulation and Analysis of Additively Manufactured Prosthetic Devices

Rachel Luu (McNair)
Mentor: Marc Meyers
Bioinspired Modeling of Horse Hooves for Material Characterization

Eleanor Quirk (TRELS)
Mentor: Dr. Vicki Grassian
Nucleotide Adsorption onto TiO2 Nanoparticles: A Quantitative Insight into the Role of Electrostatics in Nano-Bio Interactions

Jose Gonzalo Rivera (FMP)
Mentor: Professor Aaron J. Rosengren
Artificial Satellites Orbiting in Cislunar Space

Rushil Roy (FMP)
Mentor: Javier Duarte
Low-Power Tiny Machine Learning using hls4ml

Zoom Room: Environmental Sciences
6:15 PM-7:00 PM

Natalia Berrios-Rivera (McNair)
Mentor: Ross Parnell-Turner
Spatial Distribution of Faults and Fissures at the East Pacific Rise 9°50'N

Veronica Berta (McNair)
Mentor: Lynn Russell
Resolving Organic Nitrogen from Single Particle AMS Measurements

Tajairi Brown-Neuson (McNair)
Mentor: Adam Aron
e UC System Tackling the Climate Crisis: How are we doing?

Angelica Dimas (McNair)
Mentor: Jennifer Smith
Correlation between direct coral competitors and coral demography on Rarotonga Island from 2018 to 2019

Jeffrey Feng (FMP)
Mentor: Michael R. Davidson
Implementation of Geodata package for renewable energy research

Leslie Garcia (FMP)

Mentor: Amato Evan
The Impact of Rising Global Temperatures on Mountain Snowpack

Marinelle Villanueva (McNair)
Mentor: Tarik Benmarhnia
The Impact of Climate Shocks & Women's Empowerment;on;Child Undernutrition in Mozambique

Zoom Room: Medical & Health Sciences
6:15 PM-7:00 PM

Juancarlos Cancilla (FMP)
Mentor: Pam Taub
Effects of Time Restricted Eating on Patients with Metabolic Syndrome

Anu Chaparala (FMP)
Mentor: Gary M. Vilke
Review of Alpha-Pyrrolidinovalerophenone (Alpha-PVP) aka 'Flakka' in its Surveillance, Presentation, and Treatment in the Emergency Department

Kyra Hulse (FMP)
Mentor: Dr. Christopher Coyne
Preventing Thrombosis in Cancer Patients Presenting to the Emergency Department

Nkechinyere Iroanusi (FMP)
Mentor: Edward Castillo
Trends in Marijuana Use Before and After Recreational Legalization in California

Jacob Kattoula (FMP)
Mentor: Dr. Richard Childers
Overdiagnosis of Urinary Tract Infections in the Emergency Department

Srimaye Samudrala (FMP)
Mentor: Dr. Cristian Achim
Background on Methamphetamine effects in HIV+ patients;

Zoom Room: Molecular & Cell Biology
6:15 PM-7:00 PM

Meliné Norquist and Ariya Uyeno (BIMM170)
Mentor: Rachel Dutton
The Function of RAY protein gp94: an antitoxin in Erwinia amylovora

Alison Zhao Leyi Huang (BIMM170)
Mentor: Rachel Dutton
Putative Function of vB_Eamm_Ray Protein gp039 in Erwinia amylovora as Stringent Starvation Protein B

Vince Ly (McNair)
Mentor: Dr. Milton Saier
Assignment of the TRAP-T family to the IT superfamily

Joey Truong (TRELS)
Mentor: Samara Reck-Peterson
Utilizing Fusion Proteins to Create Stable Truncations of Coiled-Coil Proteins

Ziqi Yu (FMP)
Mentor: Pradipta Ghosh
Role of GIV in NOD2/MDP Signaling and in Progression of Crohn's Disease

Zoom Room: Physics II
6:15 PM-7:00 PM

Haifeng Ding (FMP)
Mentor: Javier Duarte
Improving Di-Higgs Sensitivity at Future Hadron Colliders with Machine Learning.

Sohan Ghosh (FMP)
Mentor: Adam Burgasser
Reduction and Analysis of Archival Brown Dwarf and Cool Star Spectra

Rocco Novello (FMP)
Mentor: Adam Burgasser
The Coolest Stars in the Universe

Tianxing Zhou (FMP)
Mentor: Adam J. Burgasser
Identification and Reduction of the Spectral Data of VLMs and Brown Dwarfs

Zoom Room: Political Science
6:15 PM-7:00 PM

Solmaz Azhdari (McNair)
Mentor: David Lake
It is about A theoretical framework to explain the enduring conflict in U.S.–Iran relations after 1979.

Jayson Cayanan (FMP)
Mentor: Dr. LaGina Gause
Framing and Messaging Trumps All:Investigating the Role of Public Statements and Tweets of Members of Congress during President Trumps's Executive Order 137689

Cole Evarts (FMP)
Mentor: Dr. Pamela Ban
Committees of the U.S. House Representatives: Exploring Legislator Behavior in the 116th Congress

Esha Kamra (FMP)
Mentor: Dr. Fabian Trottner
Trade Liberalization and Differing Effects on Racial Groups in the United States

Gonzalo Rocha-Vazquez (McNair)
Mentor: Simeon Nichter
State Factors Contributing to The Spread of Prison-Based Gangs

Mignote Tadele (McNair)
Mentor: Dr. Dennis Childs
The Foster Care System maybe used as a Punitive system against Black parents and children with incarcerated parent(s)

Abstracts

Hannah Abraham

Molecular and Cell Biology/ Biology Department, FMP
Mentored by Dr. Hemal Patel

A substance that confers immunity from a pseudo-COVID-19 virus for those who regularly practice meditation

In patients who have practiced meditation regularly for long periods of time, decreased levels of infection rates to a COVID-19 pseudovirus have been found. To determine what component of the plasma confers this increased immunity, the proteins will be precipitated out of the plasma. The following techniques will be used to precipitate the protein out of the plasma: Methanol, Acetone, Salting In/ Salting Out and Proteinase K. The best method of precipitation will be used to separate the proteins from the plasma. A549 cells will be plated on glass for live imaging. Aliquots of virus and plasma with and without proteins will be administered to experimental and control samples to determine is a protein is the substance which confers immunity.;

Elisa Ady

Literature, McNair
Mentored by Dr. Stephanie Jed

Empire and Indigeneity in Magical Realism: A Colonial Unraveling

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 legacy of colonization on vulnerable peoples and/or places. Out of the shrapnel of colonialism and cultural detritus, the magical realist literary landscape blooms. In the spirit of a genre that interrogates cultures that have been unsettled, destabilized, and/or disturbed, my project seeks to ask questions like, When 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? Most significantly, how does the visualizing capacity embedded in the genre parallel certain Indigenous scholarship, thinking, and creation?

Anamaria Ancheta

Biochemistry and Cell Biology, TRELS
Mentored by Dr. Leslie R. Lewis

Analyzing the Benefits of the Market Match Program and the Incorporation of CalFresh Benefits at San Diego Farmers Markets

The State of the Food System 2019 Region Report, 25% of San Diego is considered to be food deserts, with the majority deserts being located in areas containing high populations of minorities. Additionally, at the height of the pandemic the U.S. Census Bureau reported an 11% increase in food insecure households in San Diego with households making below $25,000 experiencing a 17% increase. To address the issue of food insecurity, research supports that the implementation of government benefits at farmers has resulted in both an increase in access and consumption of nutritious food among disadvantaged communities. Our research objective is to gather data via a survey in support of the expansion of government benefits at farmers markets in South San Diego. Our survey titled "Healthy Neighborhood 2021" contains questions such as "Do you have concerns about any of the following when purchasing groceries?" and "During the pandemic, how often have you had to limit or forgo the amount you spent on groceries to fund another necessity." It is available in English, Spanish, and Tagalog and accessible through our student organization's social media, community fridge, and farmers market locations. At the end of the survey period, correlations between zip code, access to quality food, and involvement in government benefit programs will be analyzed and incorporated into a detailed policy brief. Our data will be used to advocate for an increased implementation of government benefits at farmers markets to increase healthy food access for low-income communities in South San Diego.

Meliné Norquist and Ariya Uyeno

Biology (Molecular Biology), BIMM170
Mentored by Rachel Dutton

The Function of RAY protein gp94: an antitoxin in Erwinia amylovora

"The Function of RAY protein gp94: an antitoxin in Erwinia amylovora" is a research project exploring an uncharacterized protein on the genome of the jumbo phage RAY. Throughout this project, the presenters utilize the term jumbo phage - referring to phage with larger and more complex genomes. Typically, these jumbo phage also create nuclei. Phage such as RAY have potential applications in phage therapy, such as combating fireblight infections caused by RAY's host bacteria Erwinia amylovora. The presenters examined the putative role of RAY protein gp94 in infection of Erwinia amylovora. Utilizing GFP fusions and bioinformatic techniques such as phylogenetic tree construction and local alignment comparison, evidence was found to suggest gp94's putative function is that of a DNA-binding antitoxin, most likely homologous to HigA. As a DNA-binding antitoxin, gp94 likely regulates the expression of its host bacteria's antiviral toxin genes during phage replication. Experiments characterizing

unknown proteins in jumbophage are highly important in pioneering modern science's understanding of phage and their uses in phage therapy.

Amber Lee Annika Sy

Molecular and Cell Biology, BIMM170
Mentored by Rachel Dutton

Tubulin-Like Protein gp210 From Phage RAY Forms a Filament Across Infected Cells

Jumbo phages are viruses that infect bacteria and have a genome size larger than 200kbp. vB_EamM_RAY (RAY) is a jumbo phage that infects the plant pathogen Erwinia amylovora, which causes the contagious disease fire blight in plants including apple and pear trees. RAY encodes gp222, which is similar to the shell protein which forms the phage nucleus that shields the phage DNA in PhiKZ-like jumbo phage. In addition, RAY, like many jumbo phages, has many uncharacterized proteins in its genome that may provide insight to how the phage replicates and kills its host. One of these proteins is gp210, a proposed tubulin-like protein. Phage tubulin (PhuZ) has previously been shown to form a filament that centers and rotates the phage nucleus, and delivers capsids to the nucleus. Here we use bioinformatic analysis and fluorescence microscopy to study the potential function and evolutionary history of gp210. Gp210's amino acid sequence contains the major tubulin motifs, T1-T4, T6, and T7. The protein appears to be conserved in many jumbo phages, and a few smaller phages. During infection, gp210 appears to form a long filament extending across infected host cells, but it does not appear to form any specific pattern in uninfected cells. Phages may occasionally undergo horizontal gene transfer of the protein. Based on this evidence, we believe that gp210 is similar to the PhuZ protein found in PhiKZ-like phage.

Solmaz Azhdari

Political Science , McNair
Mentored by David Lake

It is about A theoretical framework to explain the enduring conflict in U.S.–Iran relations after 1979.

In my poster, I explained all the works and researches I have done.

Natalia Berrios-Rivera

Mechanical Engineering/Department of Mechanical and Aerospace Engineering, McNair
Mentored by Ross Parnell-Turner

Spatial Distribution of Faults and Fissures at the East Pacific Rise 9°50'N

Mapping the spatial distribution and geometry of faults and fissures at the East Pacific Rise (EPR) 9°50'N is significant to our understanding of fast-spreading mid-ocean ridge systems. Such tectonic discontinuities influence the boundaries of lava flows from major submarine volcanic eruptions that have occurred at the EPR 9°50'N. Previous estimates for the spatial distribution and geometry of faults and fissures at mid-ocean ridges are limited due to the lack of high-resolution seafloor data. In 2018, autonomous underwater vehicle (AUV) Sentry surveyed a ~2 km long segment of the EPR between 9°45'N and 9°55'N, mapping the seafloor at the EPR study area with a higher resolution than had previously been done, creating the opportunity to obtain accurate fault geometry measurements. Here we use the 1-m resolution near bottom bathymetry data collected with AUV Sentry in order to analyze the spatial distribution of faults and fissures at the EPR 9°50'N. Fault and fissure interpretations were initially made by extracting 2D bathymetric profiles in map view. Fault scarp measurements were then used to map the spatial distribution of faults based on quantitative fault geometry measurements. By comparing the fault distributions from both maps, we show that using fault geometry to map inward facing faults can provide an accurate interpretation of tectonic features on the seafloor.

Veronica Berta

Oceanic and Atmospheric Sciences / Scripps Institution of Oceanography, McNair
Mentored by Lynn Russell

Resolving Organic Nitrogen from Single Particle AMS Measurements

Mass spectrometry (MS) is a powerful tool for characterizing the chemical components of aerosols but current techniques for identifying organic nitrogen are limited to bulk-measurements. This project aims to apply these established methods to single-particle measurements using data collected during the third cruise of the North Atlantic Aerosols and Marine Ecosystems Study (NAAMES) cruise by a HR-ToF-MS. PIKA data analysis software is utilized to fit known organonitrate and amine ion fragments to individual mass-to-charge ratio (m/z) for high-resolution analysis of W-mode bulk measurements in order to resolve the fraction of signal that each fragment contributes to its corresponding m/z signal. Single particle event trigger (ET) measurements clustered using the Cluster Analysis Panel (CAP) resulted in six particle classes with mass spectrums that can be displayed as fractions of total ion signal. Using the fraction of the m/z determined to be organonitrate or amine from bulk analysis, the fraction of total ion signal which organonitrate and amine account for can be determined for each class. The result of this method showed that the amine and organonitate total contributions to the ion signal was 0.59% & 0.08% for Class 1,

1.60% & 0.19% for Class 2, 1.28% & 0.15% for Class 3, 1.65% & 0.10% for Class 4, 2.14% & 1.69% for Class 5, and 1.69%; 0.17% for Class 6, respectively. For all particles comprising the six classes, organic nitrogen attributed to 1.5% of the total signal. Further analysis will be done to determine the extent to which the organic nitrogen present in aerosol impacts cloud formation and properties.

Anshul Birla

Computer Science, FMP
Mentored by Dr. Amarnath Gupta

Generating Training Data Sets for Relationship Extraction

Unbeknownst to most, knowledge extraction is one of the most prominent sectors in technology today. Knowledge extraction is defined as the creation of knowledge from structured (databases) and unstructured (documents, texts, etc.) sources. In more simple terms, knowledge extraction is to examine a given source and derive conclusions from it, usually by inferences. An important step in Knowledge Extraction is Relationship Extraction, which is the process of extracting the relationships between words in a given sentence. Relationship Extraction software needs training data to run, which is time consuming to construct. Thus, we propose a tool that uses active reinforcement learning and leverages the multi arm bandits problem to construct training data for Relationship Extraction from a given corpus.;

Nathan Bradshaw

Nanoengineering, McNair
Mentored by Andrea Tao

Surface-enhanced Raman Spectroscopy (SERS) Lateral Flow Immunoassay (LFIA)

The goal of this project is to develop a sensor that can rapidly detect antibodies against SARS-CoV-2 from a patient's sample at lower concentrations and with higher accuracy than other available tests. Such a biosensor would be helpful in curbing both the ongoing pandemic as well as other future viral outbreaks. To accomplish our goal, we have combined a classic medical technique – the lateral flow sandwich immunoassay – with a nanoengineering principle, using nanocube LSPR (localized surface plasmon resonance) properties to facilitate surface enhanced Raman spectroscopy (SERS). The immunoassay aspect of the work proposes to sandwich our analyte – the antibodies – between a gold substrate and silver nanocubes (AgNC). In this gap between cube and surface, one can obtain a Raman spectroscopy signal for an analyte with an intensity two to five orders of magnitude greater than an unenhanced molecule. This is due to the size confinement of the metal nanoparticles; because they are smaller than the

wavelength of light, they create an LSPR effect that effectively functions as an antenna for the Raman signal. Thus, the nanocubes focus the signal into one location, which causes the Raman enhancement. To prove the viability of this system, we are testing the concept with streptavidin as our analyte, which binds specifically to biotin on the Au substrate and AgNC. If we successfully can use SARS-CoV-2 antibodies in conjunction with AgNC, we anticipate a powerful biosensor that would help detect even trace viral responses within patients.

Tajairi Brown-Neuson

Literature/Writing, McNair
Mentored by Adam Aron

e UC System Tackling the Climate Crisis: How are we doing?

The Climate Crisis is a global slow-unfolding catastrophe that threatens to upend all aspects of human life. To mitigate the effects of climate change every industry and institution must take transformative actions to limit their greenhouse gas emissions. The UC System is a world-class research institution, so its actions to mitigate the climate crisis should match its prestige. In fact, UC San Diego's very own scientist, Charles David Keeling created the "Keeling Curve" which surveys the concentration of CO_2 in the atmosphere and has shown us how human activity has added an excessive amount of Carbon Dioxide to the atmosphere (Harris). Yet, its current sustainability initiatives have not matched its prestige nor even lived up to its own goals. Take for instance UC San Diego's 2019 Sustainability report. While discussing the previous 2008 iteration of this report, the authors of this document state their previous goals were to achieve "20% below 1990 levels by 2020" (UCSD CAP, 2019) Yet upon examining the 2008 Sustainability report it references "1990 levels by 2020" (UCSD CAP, 2008). This inconsistency may seem like a minor typo, but it is emblematic of UC San Diego's lack of dedication to its sustainability initiatives. On the UC Sustainability Report web page, the UC System projects a steep decrease in emissions (UCSD SAR 2019).

Gabriella Busco

Public Health and Physiology & Neuroscience, FMP
Mentored by Job Godino

Body Image, Mental Health, and Quality of Well-being: A Cross-Sectional Study of Young Adults in a College Setting

Objective. To examine the relationship between body image and mental health among young adults (ages 18 to 35) who have overweight and obesity ($25 \leq BMI \leq 40$ kg/m2) and are students, faculty, and staff at universities and community colleges in San Diego. Methods. The population studied was SMART 2.0

(NCT03907462) participants, aged 18-35 years, BMI 25-40 kg/m2, and affiliated with universities and community colleges in San Diego. Measures included CES-D (0-30 [worse]), STAI (6-24 [worse]), QWB-SA (0-1 [better]), and body image (0-27 [worse]). A linear regression adjusted for age, sex at birth, and body mass index was conducted. Results. Worse body image (M 11.5, SD 5.3) is associated with more depressive symptoms (M 8.8, SD 5.4, Beta .18, p <0.001), more anxiety (M 11.9, SD 3.5, Beta .10, p <0.01), and less quality of well-being (M .7, SD .1, Beta -.002, p <0.027). Conclusion. The association between poor body image and increased levels of depressive symptoms and anxiety and decreased levels of quality of well-being was replicated. A further understanding if the association is moderated by accuracy of perceived healthy weight, social support, and self-esteem will more thoroughly inform potential targets for psychosocial intervention.

Allison Cafferata

Microbiology/Biology, BIMM170
Mentored by Rachel Dutton

RAY_gp315, a Putative DNA Helicase Protein

Jumbo phages are viruses that infect bacteria and have a genome of more than 200,000 base pairs. Jumbo phage RAY was isolated as a phage that infects Erwinia amylovora. Erwinia amylovora is a bacterial pathogen that kills ornamental plants of the Rosaceae family. It is also closely related to Salmonella and Escherichia coli, so studying Erwinia phage could help with developing phage therapy in regards to treating infections of Salmonella and E.coli. Jumbo phage similar to RAY have been found to develop a structure known as a "phage nucleus" during infection, which consists of a proteinaceous shell around the phage DNA. This organizes the cytoplasm and separates the DNA replication from protein synthesis and metabolic enzymes. Here we present bioinformatic evidence that RAY_gp315 is a putative dnaB helicase involved in DNA replication. During this process, dnaB helicase binds with dnaC helicase to form a hexameric ring, which is then loaded onto the lagging DNA strand. DnaB helicase is required to unzip the DNA double helix and initiate DNA replication and is also required for continued migration of the DNA replication enzyme complex along the lagging strand. All other proteins at the DNA replication fork interact with dnaB helicase, either directly or indirectly. By fusing GFP to gp315, we found that this phage protein localizes inside the phage nucleus, consistent with our prediction that it is involved with DNA replication.

Caitlyn Callaway

Division of Biological Sciences, McNair
Mentored by Kuo-Fen Lee

Neural Mechanism of Resting Tremor in Cdk5 Parkinson's Disease Model

D1 and D2 neurons comprise the substantia nigra of the dorsal striatum, which is involved in motor control. D1 receptor-expressing neurons make up the excitatory striatonigral pathway, which is active during movement [1]. In contrast, D2 neurons compose the inhibitory striatopallidal pathway, which is active during rest. Parkinson's disease results from the death of these dopaminergic neurons, leading to a dopamine (DA) dearth [2]. The disease is marked by motor symptoms such as resting tremor, slow movement, and poor posture control. Deregulation of cyclin-dependent kinase 5 (Cdk5), a gene that negatively regulates DA neurotransmission, is implicated in Parkinson's disease. It is shown that Cdk5 knockout leads to neuronal death in the striatum. This causes decreased excitability of D1 neurons, increased excitability of D2 neurons, and D2 synapse elimination as a homeostatic response to increased excitability [1]. Loss of glutamatergic input in the inhibitory pathway disrupts movement related activity and results in unwanted movements such as resting tremor. e research question the project will address is: How does DA depletion and the resulting physiological change of neurons cause the resting tremor seen in Parkinson's disease? It is unknown whether the tremor phenotype is caused by the effects of DA loss in D1, D2, or both neuron types. The proposed experiment will test the hypothesis that the resting tremor is caused by the overactivation of D2 neurons alone by using optogenetics to control the activation of the D2 pathway and by quantitatively measuring the tremor phenotype.

Mia Cameron

Molecular and Cell Biology, BIMM170
Mentored by Rachel J. Dutton

The Predicted Function and Phylogeny of Erwinia phage RAY gp153.

Jumbo phage are a newly characterized group of bacteriophage with genomes larger than 200kbp. Erwinia phage RAY is a jumbo bacteriophage that infects the pathogenic bacteria Erwinia amylovora, which is responsible for fire blight. Despite their great ecological and evolutionary significance, many jumbo bacteriophage proteins remain uncharacterized. In this study, we predict the function and phylogeny of the RAY protein gp153, using a series of bioinformatics tools and fluorescent microscopy. Using Phyre protein structure prediction, we hypothesized that gp153 is a homolog of the bacterial protein DprA. In bacteria, DprA (DNA Processing protein DprA) facilitates the loading of RecA onto ssDNA, and activates strand exchange during DNA recombination. Using GFP-tagging, we found gp153 localizes in the phage nucleus during infection, indicating it is likely to play a role in DNA replication. NCBI PSI-BLAST was used to find homologs of gp153 in other bacteriophage; where it was found mostly in jumbo phage, with few homologs found in non-jumbo phage. Alignment

of the homologous sequences with Clustal Omega revealed a high divergence between the related proteins.

Juancarlos Cancilla

General Biology/Biology, FMP
Mentored by Pam Taub

Effects of Time Restricted Eating on Patients with Metabolic Syndrome

Metabolic syndrome (MetS) is characterized by having multiple related risk factors for type 2 diabetes and cardiovascular disease. In industrial societies like the U.S., a combination of unhealthy eating choices and chronic circadian rhythm disruption are common, and have contributed to about 30 percent of the adult population to being diagnosed with MetS. The TIMET [AP1] study is a research study designed measure the health impact of a dietary intervention known as time restricted eating (TRE) on patients with metabolic syndrome. Participants in the experimental group, being the time-restricted eating (TRE) group, will reduce their energy consumption window to 8-10 hours every day in addition to receiving a Mediterranean diet recommendation. The standards of care group (SOC) will only receive general health guidance and a recommendation of the Mediterranean diet. This study aims to evaluate whether participants who implement TRE will experience any changes in glucose homeostasis, metabolic biomarkers, body composition, or mitochondrial function compared to participants who do not implement TRE. Data in the first 20 participants has demonstrated significant improvements in mean glucose, glycated hemoglobin, fasting insulin, triglycerides, weight, BMI, and body fat percentage, and no improvements found in the control standard of care group. Additionally, certain mitochondrial functions significantly improved in male TRE participants and similar trends were found in female TRE participants. This preliminary analysis of the first 20 participants suggests that TRE has the potential to improve biomarkers of cardiometabolic health and improve mitochondrial function.

Anastacia Carrick-Gonzales

Chem/Biochem, McNair
Mentored by Amina T. Schartup

Influence of Trace Metal Concentrations on Phytoplankton Community Dynamics in La Jolla Coastal Waters

The aim of this work is to identify a relationship between trace metal concentrations in La Jolla coastal waters and the phytoplankton community structure of the area through a metal analysis. The productivity, growth patterns, and community structure of phytoplankton are dependent on the concentration of macronutrients and trace metals (micronutrients) present in the ocean. Regional

communities have varying trace metal requirements based on the environmental conditions, bioavailable macronutrients, and biochemical needs of the phytoplankton to grow and produce organic matter (Twining & Baines, 2013). Although there is an idealized abundance pattern for trace metals with biological function in phytoplankton across the oceans, it falls short because nutrient availability is not uniform and because there are other trace metals in seawater. During the upwelling season along the La Jolla coast, several studies have characterized the marine environment as one of high productivity and low species diversity, in which large, fast growing phytoplankton dominate (Goebel, 2010 & 2013, Venrick, 2002, Wilson et. al, 2020). Though this characterization has been made, there has never been an analysis done to examine how trace metals influence this community pattern. Our goal is to develop a relationship between this trace metal-phytoplankton interaction. In future work, we hope this relationship will make it possible to predict which size classes are present in the water when certain trace metals are present because they will outgrow other size classes.

Jayson Cayanan

Political Science, FMP
Mentored by Dr. LaGina Gause

Framing and Messaging Trumps All Investigating the Role of Public Statements and Tweets of Members of Congress during President Trumps's Executive Order 137689

A week after assuming office, Donald Trump penned the Executive Order 13769– effectively barring refugees and nationals of seven Muslim countries. The Executive Order sparked nationwide protests calling for the Trump Administration to rescind it, prompting elected officials to speak on the matter. How do Members of Congress frame their statements regarding the Travel Ban? My research suggests that the more moderate Democrats get, the less they frame their public statements through a Human Rights lens. In Contrast, the more conservative Republicans become, the more they utilize the Human Rights Frame.Moreover, The more conservative Republicans are, the more they utilize the Security Frames. Further, the more moderate Democrats get, the more they utilize the Security Frames, though the differences in the use of Security Frames are more significant in Contrast with Republicans. Lastly, my findings indicate that Republicans and Democrats used similar language to framed their Public Statements. Though, I would argue that the intentions in how they utilized this similar language were starkly different.

Erick Cervantes

Chemistry and Biochemistry, McNair
Mentored by Dionicio Siegel

Identification of fatty acid esters of hydroxy fatty acids through MASST

Fatty acid esters of hydroxy fatty acids, also referred to as FAHFAs, are a group of lipid molecules that are composed of two fatty acids linked together by an ester linkage. These set of lipid molecules have been shown to contain promising anti-diabetic properties. My research will identify patterns of FAHFA presence in biological samples.

Anu Chaparala

General Biology/Division of Biological Sciences, FMP
Mentored by Gary M. Vilke

Review of Alpha-Pyrrolidinovalerophenone (Alpha-PVP) aka 'Flakka' in its Surveillance, Presentation, and Treatment in the Emergency Department

Alpha-Pyrrolidinovalerophenone (Alpha-PVP), known colloquially as the street drug 'Flakka' or 'gravel,' is a fairly new psychoactive substance (NPS) that is slowly making its deadly mark across the United States. Within the last decade, the production and variety of novel man-made street drugs has drastically increased, leading to a large increase in drug presentations in the Emergency Departments of hospitals across the US. As one of these novel drugs, there is a very limited amount of literature and information on Alpha-PVP available to Emergency Medicine health professionals for reference, should they encounter such cases in the ED. To address the lack of comprehensive publications on this substance, we aim to provide Emergency Medical professionals with collective documentation of Alpha-PVP ED surveillance, presentations, and treatments that have been previously noted in medline publications, since the arise of this strikingly potent and dangerous drug.

Angela Chapman

Psychology, McNair
Mentored by Dr. Savita Bhakta

Event-Related Potential Biomarkers in Schizophrenia Patients: A Systematic Review

Schizophrenia (SZ) is a complex neuropsychiatric disorder, characterized by cognitive impairment across various domains including, attention, executive functioning, and verbal memory which could act as significant predictors of socio-occupational disability. Despite the substantial research that has been conducted to develop cognitive-enhancing treatments, there is still the variable treatment response to cognitive remediation techniques in SZ patients. In recent years, biomarkers are being identified to predict the subgroups of SZ patients sensitive

to these techniques. We focused on neurophysiological measures including mismatch negativity (MMN), P300, P50, P100, N100, and N400, and their role as potential biomarkers in predicting sensitivity to procognitive treatment as well as indicating psychosocial/functional outcome in SZ patients. To do this, we examined PubMed database search using keywords words, which resulted in 8 articles being selected for the systematic review. In addition, a systematic search focused on MMN resulted in 11 articles being selected for the systematic review. We found that neurophysiological measures, particularly, N400, P50, and P300 predicted psychosocial/functional outcomes with greater significance. However, MMN was found to be a sensitive predictive biomarker for both treatment response and psychosocial/functional outcome in SZ patients with statistical significance ($p < 0.05$). Given the biomarker potential of MMN, future studies should focus on improving the sensitivity of MMN measures to predict response to cognitive remediation treatment in SZ patients by using a combined virtual reality (VR)-electroencephalogram (EEG) naturalistic oddball paradigm.

Natalie Chavarria

Human Biology, TRELS
Mentored by Dr. Leslie R. Lewis

Analyzing the Benefits of the Market Match Program and the Incorporation of CalFresh Benefits at San Diego Farmers Markets

The State of the Food System 2019 Region Report, 25% of San Diego is considered to be food deserts, with the majority deserts being located in areas containing high populations of minorities. Additionally, at the height of the pandemic the U.S. Census Bureau reported an 11% increase in food insecure households in San Diego with households making below $25,000 experiencing a 17% Increase. To address the issue of food insecurity, research supports that the implementation of government benefits at farmers has resulted in both an increase in access and consumption of nutritious food among disadvantaged communities. Our research objective is to gather data via a survey in support of the expansion of government benefits at farmers markets in South San Diego. Our survey titled "Healthy Neighborhood 2021" contains questions such as "Do you have concerns about any of the following when purchasing groceries?" and "During the pandemic, how often have you had to limit or forgo the amount you spent on groceries to fund another necessity." It is available in English, Spanish, and Tagalog and accessible through our student organization's social media, community fridge, and farmers market locations. At the end of the survey period, correlations between zip code, access to quality food, and involvement in government benefit programs will be analyzed and incorporated into a detailed policy brief. Our data will be used to advocate for an increased implementation of government benefits at farmers markets to increase healthy food access for low-income communities in South San Diego.

Nicholas Chiu

General Biology, BIMM170
Mentored by Rachel Dutton

RAY_gp299: An Analysis of its Function and Evolution

Bacteriophage, viruses that infect bacteria, are some of the most abundant and genetically diverse biological entities on the planet. One category of phage are "jumbo phage," bacteriophages with genomes greater than 200 kb. Erwinia phage RAY, a jumbo phage, infects the bacterium Erwinia amylovora and has a genome size of 271,182 base pairs. Ray, along with 8 other very closely related phages, make up the Agrican357virus genus. Although phage are common, research on these newly discovered jumbo phage has been limited so far. The specific replication mechanisms for RAY, as well as the function of many RAY proteins, are unknown. Here we analyze the evolutionary history of RAY_gp299 and investigate its potential function and localization during infection using GFP-fusion experiments and various bioinformatics/phylogenetic programs. We show that RAY_gp299 likely localizes around the phage nucleus, where viral capsids are thought to assemble. The phage nucleus is a structure that forms in the middle of the infected cell and contains all of the phage DNA and associated replication proteins. Using PSI-BLAST, we found that 27 out of the 32 included jumbo phage contained gp299 homologs, indicating that RAY_gp299 is widely conserved among jumbo phage, with a section of high conservation occurring between 140 - 200 bp. Lastly, many of the PSI-BLAST homologs and neighboring proteins on the genome are labeled as "virion structural proteins". The gp299 homolog in phage PhiKZ is also a known head protein. While the exact function of RAY_gp299 is still unknown, our experimental data points to RAY_gp299 being a virion structural protein.

Suyeun Choi

Neurobiology, FMP
Mentored by Edward Castillo, Ph.D, MPH

Cognitive Screening in a Geriatric Emergency Department

Introduction: The Emergency Department (ED) is most utilized by the geriatric population. In efforts to accommodate for older adults in the ED, Geriatric Emergency Departments (GED) have been populating the United States. With the focus on improving geriatric emergency care, there proves to be a need for geriatric cognitive screening in order to provide appropriate and adequate amount of care. The objective of this study was to identify geriatric ED patients at risk for delirium, dementia, and cognitive impairments. Method: This was a retrospective, multicenter study utilizing ED data on adult patients 65+ with a specialized geriatric nurse consultation. Montreal Cognitive Assessment (MOCA)

and Abbreviated Mental Health Task 4 (AMT4) were used to cognitively screen these patients. Results: There were 861 geriatric patients who received cognitive screening during geriatric nurse consultation. Older adults were more likely to have a positive result (p<0.001) and non-Hispanic white were less likely to be positive (p=0.002). Conclusion: A large proportion of older adults were identified as positive for cognitive impairment. Older adults aged 85+ were more likely to be positive while non-Hispanic white patients were less likely to be positive. Further analyses should incorporate additional demographic and clinical characteristics and outcomes such as referrals, revisits, and readmissions.

Miles Corley

Microbiology, TRELS
Mentored by Matthew Daugherty

Evolutionary-Guided Analysis of Human Host Factors Gives Insight into Host-Pathogen Conflicts

The intrinsic immune system rapidly responds to viral infection and acts as a first line of defense against disease. As a result, intrinsic immune proteins have two functions: suppress invasive viruses and avid antagonism by the invaders. This molecular "arms-race" leaves behind regions with signatures of positive selection that can be analyzed retrospectively and used to predict new host proteins involved during viral infection. Previous evolutionary data was only concerned with the canonical transcripts of each immune factor and does not account for the evolutionary profile of other isoforms. This insight suggests that we should examine exons from all isoforms for signatures of positive selection.

Amio Das

Aerospace Engineering/MAE, TRELS
Mentored by Nicholas Gravish

Implementing pitch control to understand flapping flight

Every living thing on earth has evolved for a long time to give them the edge needed for survival and prosperity. This fact allows scientists and engineers to analyze what really gives them this advantage. When tackling the problem of creating Micro Air Vehicles, we must look to insects and small birds for reference of good design that was the fruit of evolution. This project is meant to help answer questions about the interaction of insect wings with the fluid around it to give us a better understanding of how insects fly so efficiently. The most convenient way to collect data on these effects would be to dynamically scale an insect wing to a size that is easier to manufacture, handle and control. For our assembly, we will upscale a hawkmoth wing to one that spans around 8 inches from the body. To create a dynamically similar flow on this scale, water comes to

work well as the working fluid substituting for air. The current assembly was made to gather data on how the elasticity of the thorax effects flapping flight. However, the limitation here is that the angle of attack is fixed since the pitch axis is also fixed. This project proposes to add an active pitch control assembly to this existing setup to help produce a more diverse and accurate set of data to reproduce the wing kinematics of the insect since pitching may be a core component to a key metric that is vortex generations and capture.;

Demyan Davydov

Molecular and Cellular Biology, BIMM170
Mentored by Rachel Dutton

Erwinia phage RAY_gp116 and its putative function.

Jumbo phages are most notable for their large genomes (>200 kbp) and exhibition of various novel characteristics. In this study, jumbo phage RAY was isolated against Erwinia amylovora, which is a bacterium that is known to cause the rather destructive disease–fire blight. With over 10^31 bacteriophages in the world, there is still a lot that remains unknown about these diverse entities, thus why more studies are required to truly understand the great breadth of bacteriophages. By studying phage RAY we can better understand the phage life cycle and develop phage therapies to treat the corresponding pathogen that causes diseases such as fire blight. Here we show our favorite protein RAY_gp116– a chaperone protein. In phage, chaperone proteins are involved in folding protein intermediates and participate in the assembly and degradation of proteins essential for the phage. Using these initial results we hypothesized that RAY_gp116 might be important for unfolding nonfunctional proteins in phage RAY and thus we would expect it to localize in the cytoplasm. Through the use of GFP-fusion, gp116 was found in the nucleus. This contradicted our initial hypothesis, so the exact function of the protein, as well as the reason for its placement, requires more research to be determined. Our new hypothesis is that this protein unfolds the likes of helicases and polymerases, to correct misfolded proteins. To further develop our knowledge of RAY_gp116, we could employ a procedure such as FRET to determine the exact proteins gp116 interacts with.

Malina Desai

Astrophysics/Physics Department, FMP
Mentored by Liang Yang

Next-Generation Enriched Xenon Experiment (nEXO): Designing a Test System for Neutrinoless Double Beta Decayfor 0vββ

The standard model of particle physics classifies neutrinos as leptons. According to this model, all particles can have antiparticles. The The next generation

Enriched Xenon Observatory (nEXO) project aims to see if the neutrino is its own antiparticle through observing a neutrinoless double beta decay reaction. A double beta decay of xenon to barium releases two electrons and two antineutrinos. In a theorized version of the decay, a neutrino would take the place of one of the antineutrinos and the two particles will negate each other. This neutrinoless double beta decay would only create two electrons.;By observing this decay, the neutrino would be classified as a Majorana particle, where it is its own antiparticle.nEXO aims to create a new liquid xenon detector that can hold up to 5,000 kg of sub-zero xenon in order to increase the amount of decay reactions to raise the probability of observing a neutrinoless decay. Professor Yang is part of the nEXO consortium and is building a smaller test version at UCSD. I am involved in creating a 3D model of the proposed new liquid xenon chamber, called the LXe system. I rendered the frame of the system and am working on modeling the dewar and flange containing the liquid Xenon, as well as commissioning a pulley system. After the system is built, further electronic and cryogenic testing will be done. Further research and development will then take place to improve the system in preparation for nEXO.

Angelica Dimas

Marine Biology, McNair
Mentored by Jennifer Smith

Correlation between direct coral competitors and coral demography on Rarotonga Island from 2018 to 2019

Coral reefs are constantly being threatened by both natural and anthropogenic stressors. These stressors have led to coral mortality and ultimately algal increases. Whether corals can thrive and outcompete algae is important to understand when considering if coral communities can maintain resiliency as these disturbances become more frequent. Competition among members of the benthic community revolves around space and light (Benayahu et al, 1981) which primarily involves corals and algae. To better understand if corals are capable of outcompeting different algal taxa, I will observe the relationship between four genera of coral and their direct competitors. Specifically exploring how the proportion of direct contact with crustose coralline algae (CCA), turf algae, and Lobophora relate to changes in coral colony size over time. To conduct this study, I will use photoquadrats and a large-area imagery (100m2) of reefs to determine change in benthic community composition, and competitive outcomes over the course of a year. Preliminary findings demonstrated a significant negative correlation (p<0.05), between Leptoria and turf algae, and a significant positive correlation between Leptoria and Lobophora at an island level, but no significant correlations were observed at the site level.;

Haifeng Ding

Physics, FMP
Mentored by Javier Duarte

Improving Di-Higgs Sensitivity at Future Hadron Colliders with Machine Learning.

For boosting H→ bb, due to the properties of the color singlet scalar of Higgs particles, the radiation patterns inside and around the bb jet are expected to be different from those of g →bb jet. Different generation mechanisms also lead to different number and direction of jets in the event. This project include obtained lxplus account and access to the FCC files to editing the code of the jetPt and run the other events by using Jupyter notebook, also training a neural network to enhance the sensitivity of the equipment to H → BB decay.

Dawn Duong

Public Health, FMP
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

CSE, FMP

Mentored by 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.

Cole Evarts

Political Science, FMP
Mentored by Dr. Pamela Ban

Committees of the U.S. House Representatives: Exploring Legislator Behavior in the 116th Congress

Congressional committee behaviors largely influence America's legislative process. At committees, House of Representatives members sit on jurisdictional bodies, headed by a committee chair, responsible for evaluating and passing legislation. These committees intend to facilitate knowledge proliferation with a subject area focus on behalf of the broader House. Members of committees deal with an increasingly polarized landscape that can make bipartisan efforts for bill passage difficult. Although committees' operations are multivariate and nuanced, this study focuses on legislator participation measured by formal political participation indicators, namely voting behaviors. I look at nine committees in the 116th Congress and all associated bills with voting records to determine participation. By focusing on voting behavior, I seek to identify factors that explain or lead to absences at the committee stage due to polarization. Are minority party legislators disincentivized to participate because bipartisan efforts are lacking? This study's findings conclude that significant numbers of minority party members are not dissuaded from participating in committee votes due to polarized committees. Further, it calls for additional analysis using data already collected to explore the idea that members of the minority party engage in significant amendment-seeking behaviors to build legislative portfolios. Lastly, the inclusion of other, more challenging to collect measures of participation variables may allow us to grasp the underpinnings of legislator behavior more definitively.

Jeffrey Feng

Data Science, FMP
Mentored by Michael R. Davidson

Implementation of Geodata package for renewable energy research

For my research with the FMP program, Led by Dr. Michael R. Davidson, I helped to build open-source Python package Geodata to automate API data retrieval and streamline manipulations of renewable energy resource profiles and land use datasets with high geographical resolution. Using Geodata, Cartopy shapereader, and Xarray datasets, examining the rebound of PM2.5 in China after the Covid-19 lockdown and calculating the potential solar and wind capacity for each province of China after masking out unavailable lands.

Juliana Foley

Chemical Engineering, McNair
Mentored by Darren Lipomi

Aqueous Interface-Directed Phase Separation of Polymer Blends

Organic solar cells (OSCs) are becoming a growing industry as they provide many benefits to the innovation of renewable energy. With the demand for solar cells becoming increasingly high, it has become more difficult to keep up with the new technology that has been created to make it better. Additionally, there continues to be a lag between how small-area devices fabricated on rigid substrates perform, and polymer-based solar cells devices that are functional. These include flexible, stretchable, and fabric-mounted photovoltaics, which are typically produced using inexpensive, high-throughput roll-to-roll (R2R) processes, such as blade coating and inkjet printing. Recently, a promising new technique for OSC fabrication has been reported, with polymer active layers generated via a solution-floating method on an aqueous substrate. In this process, first reported in Noh, et al in 2016, a polymer solution is deposited onto a water bath, then allowed to spread and solidify, before being transferred onto the desired (rigid or flexible) substrate. Not only was this technique shown to yield devices with improved efficiencies compared to spin-coating, but crucially, it can be easily modified into a R2R process, by replacing the discrete addition of polymer solution with a continuous injection. Additionally, since the polymer films produced are free-floating on a water bath, they can be coated directly onto any number of flexible, porous, textile, or other uneven substrates, enabling facile applications for which OSCs are uniquely suited over other emerging photovoltaic technologies. To keep up with this demand, research has been done to determine the properties of solar cells and how they can be useful in the long run, my research focuses on using a blend of thin filmed polymers on a water bath to test the properties of vertical phase separation. This is important to the field of nanotechnology and chemical engineering because it can enhance the electronic performance in organic solar cells. If solar cells are efficient, they can provide a better source of electricity to the world.

Samantha Fong

Mechanical Engineering / Mechanical and Aerospace Department , FMP
Mentored by Albert Lin

Simulation and Analysis of Additively Manufactured Prosthetic Devices

Additively manufactured prosthetic devices are a promising method for lowering the cost and increasing the accessibility of prosthetics for millions of amputees worldwide. However, further evaluation methods are needed to ensure their safety and validate their compliance with safety standards like ISO 10328. This research presentation will explore the viability of using 360° 3D digital image correlation as an evaluation tool for prosthetic devices with complex geometries like prosthetic feet and highlight limitations that occur throughout the process. 360° 3D digital image correlation shows promise for analyzing strain over intricate geometries, but some changes need to be made to the experimental process to ensure higher success of collecting usable data and completing the entire analysis efficiently.

Leslie Garcia

Oceanic and Atmospheric Sciences/Scripps Institute of Oceanography, FMP
Mentored by Amato Evan

The Impact of Rising Global Temperatures on Mountain Snowpack

The objective of this study is to visualize the disparities in the amount of snowpack melt and the melt date in the Northern Hemisphere. We processed satellite data that was provided by the National Snow and Ice Data Center (NSIDC) that has a resolution of 24 kilometers and was retrieved from the Interactive Multisensor Snow and Ice Mapping System (IMS). We found that our model was successful in visualizing melt date and increase in snow free days in the Northern Hemisphere. Regional differences reveal the sensitivity of mountain snowpack differs despite experiencing the same amount of atmospheric warming.

Bethelihem Gebremeske

Public Health, McNair
Mentored by Dr. Dennis Trinidad

Too Young For Marriage: child marriage in Ethiopia

Ethiopia is home for more than 100 million people. About 85% of women in Ethiopia live in the rural area. According to prborg, In Ethiopia, the Amhara region, 50% of young girls get married before the age of 15 and as young as 11

years old. Additionally, 80% of them get married at the age of 16. Ethiopian Girls are at high risk of obstetric fistula. Obstetric fistula is a child birth injury.

Sohan Ghosh

Physics with Specialization in Astrophysics, FMP
Mentored by Adam Burgasser

Reduction and Analysis of Archival Brown Dwarf and Cool Star Spectra

A brown dwarf is an intermediary, substellar object that lies in between giant planets like Jupiter and hydrogen fusing stars like the Sun in terms of mass and size. Brown dwarfs allow us to examine the properties of our galaxy because of their long lifetimes and abundance; hence we need to analyze as many possible brown dwarfs that have been observed. However, there are thousands of archival spectral data captured by the NASA Infrared Telescope Facility (IRTF) SpeX spectrograph that have not yet been analyzed. This project has allowed me to investigate these dormant data and further develop our brown dwarf spectral database using a tool called SPLAT. The output spectrograph from SPLAT will now be used in future projects such as, comparing and contrasting various spectra models given an input of spectral data to see which model fits best within a preferred Brown Dwarf spectral characteristic.

Riley Glenn-Hernandez

Visual Arts, FMP
Mentored by Dino Dinco

Class of '18

Synopsis: Freshman Students at Tech Prep High are throwing a Homecoming dance. They plan extravagant proposals for their special night of the year. But when disaster strikes the dance floor, will the students be able to hide expulsion-worthy mistakes from the teachers? I'm interested in how high school education is portrayed in film and media and how project-based learning environments could be perceived on-screen in the realm of comedy and mockumentary. My research and writing practice culminated in an episodic screenplay marrying the two genres into a mockumentary format with a high school narrative based on my own experience. My final product is a table read of the first episode mediated over Zoom.

Melissa Guereca

Biological Sciences, BIMM170
Mentored by Rachel Dutton

Unusual Helicases Found in Erwinia phage RAY

Jumbo phages, a type of bacteriophage with unusually large genomes, are a newly-discovered biological phenomenon whose behavior and protein functions remain relatively unknown. Erwinia phage RAY is a jumbo phage species that infects the bacteria Erwinia amylovora, responsible for fire blight within plants. By studying unknown portions of RAY's genome, we hope to better understand how jumbo phages function and identify potential methods to cure diseases caused by their host bacteria. We identified two unknown proteins, gp131 and gp250, from RAY's genome for study within this project to discern their functions within the phage. Using Phyre2 and BLAST analyses we identified putative functions for both proteins, tagging each as a transcriptional regulator within the SWI/SNF nucleosome complex. We then designed a GFP fusion for each protein to visualize any localization patterns during cell infection. We also generated a phylogenetic tree of phage genomes related to RAY via iTOL to depict relationships between gp131 and gp250 and their protein homologs. To better visualize these conservation patterns we generated sequence alignments comparing gp131 and gp250 to their most closely related homologs. Conserved domains identified through NCBI's Conserved Domain Search tool were also overlaid onto the resulting alignment. Our results indicate that both gp131 and gp250 are helicases within phage RAY, potentially aiding in transcription and modification of DNA during phage infection.

Nadia Haghani

Biological Sciences, FMP
Mentored by Sreekanth Chalasani

A closer look at cuticle-resident microbes and their impact on Caenorhabditis elegans physiology

All animals are in contact with communities of microbes, termed a microbiome. Microbiomes play a large role in the determination of host physiology, health, and behavior. While the gut microbiome takes the spotlight of current research, the skin microbiome is an unrecognized area of study despite harboring a diverse community of microorganisms. This is the case for the model nematode, Caenorhabditis elegans; despite subtle yet convincing implications of surface-adherent bacteria, microbial interactions with its cuticle (skin) remain understudied and a "skin microbiome" unacknowledged in literature. C. elegans is constantly surrounded by microorganisms in their natural habitat, proven by their common isolation from rotting plants filled with microbes. These microbes inevitably come into contact with the worm cuticle and so the adherence of these microbes is a likely reality. Existence of these surface-adherent microbes is further supported by the adoption of extensive washing protocols which aim to rid the cuticle surface of all residual microbes. We seek to identify, characterize, and define a role for these cuticle-resident microbes in C. elegans using a natural

model microbiota, CeMbio. Significantly, we characterize a discrepancy between the sheer number of bacteria between surface-bleached and unbleached animals via Colony Forming Unit (CFU) counts. We demonstrate that a large number of cutaneous bacteria reside on the C. elegans skin. Furthermore, our preliminary results suggest that bacterial isolates within CeMbio can be primarily gut- or skin-dominating based on the relative bacterial abundances from 16S rRNA sequencing. To understand how skin-dominating bacteria affects host physiology, we use Hoechst 34580 uptake to assess how CeMbio variably affects cuticle integrity in mutant animals. From our results, we hypothesize that CeMbio bacteria interact with the cuticle structures of C. elegans to impact worm integrity both positively and negatively. These studies can provide a deeper understanding of how environmental microbes elicit changes in host physiology and explain the role of natural microbes in an animal's primary defense—the skin.

Fartoon Hagi-Mohamed

Literature/Writing, McNair
Mentored by Stephanie Jed

Memoir Writing: A Tool to Combat the Potential Effects of Intergenerational Trauma

My research examines the creative memoir as a form of expressive writing which can be used to potentially combat the effects of intergenerational trauma–in particular, experiences of sociocultural dislocation and a lack of agency. 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. However, quantitative research is unable to show how the practice of expressive writing works, in particular cases, to alleviate trauma. Using my skills as a creative writer and scholar of literature, I examine specific aspects of the craft and process of memoir writing, namely the conveyance, distribution, and reconstruction of a narrative, and analyze the ways in which they might respond to the psychosocial needs of those who have experienced intergenerational trauma.

Zichun Hao

Physics, FMP
Mentored by Javier Duarte

Lorentz Group Equivariant Jet Autoencoder

Symmetries are ubiquitous and essential in physics, and the framework to describe symmetries is group theory. The symmetry described by the Lorentz group is essential in the dynamics of all particle physics experiments. The

Lorentz group equivariant deep neural network structure, called Lorentz Group Network (LGN), has been built by Bogatskiy et al. and tested for performance in classifying 'jets' — sets of particles produced after collisions such as at the CERN Large Hadron Collider (LHC). The model uses irreducible representations of the Lorentz group to achieve equivariance with respect to Lorentz transformations. However, the architecture has not been tested on generative tasks yet. An autoencoder based on the architecture of the LGN is introduced for the jet simulation task. The model was tested to be fully equivariant and will be trained on a dataset of high momentum jets simulated at the LHC. The decoder in the autoencoder can later be extended to a generative model such as a generative adversarial network (GAN) for jet simulations.

Kiley Hearst and Adamari Martinez

Biological Sciences , BIMM170
Mentored by Rachel Dutton

The Predicted Function of RAY_gp220 as a DNA Polymerase

Erwinia amylovora is a plant pathogen that causes the contagious disease fire blight affecting members of the Rosaceae family, including apple and pear trees. Phage RAY is a recently discovered virus that infects E.amylovora; however, very little is known about phage RAY and its proteins. Therefore, we sought to learn more about the function of one of RAY's proteins, RAY_gp220. We did so with the use of bioinformatic tools (including Phyre and BLAST) and GFP fusions to localize the protein inside E.amylovora during infection by RAY. Our bioinformatic analysis predicted that RAY_gp220 may be a DNA polymerase. Through our comparison of phylogenetic and proteomic trees, we found that 26 out of the 28 diverse jumbo phage we studied (phages with a genome size greater than or equal to 200,000 nucleotides) on the phylogenetic tree encoded a homolog for gp220. In addition, gp220 contained amino acids that are highly conserved in other DNA polymerase proteins including T4 DNA Polymerase. Using GFP fusions we found that RAY_gp220 localizes inside the phage nucleus after infection; the phage nucleus was recently discovered as a structure in which DNA replication for some jumbo phage including phage RAY. The localization of gp220 within the phage nucleus further supports the prediction that gp220 may be a DNA polymerase since in jumbo phage, DNA replication occurs in the phage nucleus. In summary, through the bioinformatic analysis and the GFP fusions experiments, the evidence suggests that RAY_gp220, is likely to be a DNA polymerase.

Natalia Henriquez

Physics, FMP
Mentored by Adam Burgasser

SpeX Archive Reduction to Build a Catalog for Low-Mass Star and Brown Dwarf Data;

This project is a student-centered research endeavor aiming to extract and analyze about 20 years' worth (30 terabytes) of spectral data in the form of over 1.5 million exposures, with specific interest in studying brown dwarfs and other low mass stars. This data has been recorded at NASA's Infrared Telescope Facility (IRTF) employing the use of the SpeX near infrared (NIR) imager/spectrograph. The NIR regime is optimal for detecting brown dwarfs due to their low temperatures (ranging between 3500K – 600K with some hypothesized to be even cooler) and thus extremely faint, emitting most of their light at NIR wavelengths between 1-5 µm (Burgasser, 2008). Our team has worked with a Python-based software program called SPLAT (SpeX Prism Library Analysis Toolkit) to reduce two-dimensional images from SpeX into one-dimensional spectra. First-order analysis including quality checks of the spectral plots and classification of objects has been conducted.

William Hu

Applied Mathematics, FMP
Mentored by Ryan Kastner

Optimizing the Estimate Precision Visualization for the Radio Telemetry Tracker

The Radio Telemetry Tracker project is a collaboration between the San Diego Zoo's Beckman Institute for Conservation Research and UC San Diego's Engineers For Exploration to develop a small unmanned drone system capable of determining the locations of wildlife radio collars. The estimate precision visualization program calculates the precision of an estimated location through a probability density function and displays it on a heat map. However, this program is computationally intensive as the runtime required to populate and display this heat map increases drastically as more and more pings are received. My research consists of a broad analysis and evaluation of different source code implementations and their effectiveness to improve the runtime performance of the estimate precision visualization program. Prior to any optimization on my part, the average runtime for the program was roughly 3.569 seconds using an Intel Core i5-10210U CPU and 16 gigabytes of installed RAM. To reduce this time, I explore the uses of techniques such as a lookup table to replace runtime computation with a pre-computed array, reducing reliance on imported functions, implementing map and starmap functions in place of loops, and using the Cython module to compile to C and statically type variables.

Kyra Hulse

Bioengineering: Bioinformatics, FMP
Mentored by Dr. Christopher Coyne

Preventing Thrombosis in Cancer Patients Presenting to the Emergency Department

In cancer patients, thromboembolism (blood clots) is the second leading cause of death - the first being cancer itself. For this reason it is beneficial to investigate ways to reduce the risk of thromboembolism in cancer patients. Thromboprophylaxis (blood thinners) can reduce the risk of blood clots in any patient, however, it increases the risk of bleeding, which can also lead to death. In this research, we investigate scores to assess which patients are high risk for thromboembolism in the Emergency Department.

Nkechinyere Iroanusi

Human Biology, FMP
Mentored by Edward Castillo

Trends in Marijuana Use Before and After Recreational Legalization in California

Marijuana, also known as Cannabis, is one of the most used psychotropic drugs in the United States after alcohol. The use of medical marijuana became legal in 1996 while recreational use became legal in 2016 with legalized sales becoming legal in 2018. The purpose of this study is to assess and understand the trends of marijuana usage before and after legalization. This study was done using electronic health records from both UCSD Hillcrest and UCSD La Jolla hospitals between 2016-2019. The overall rate of confirmed positive marijuana tests in this time increased by 11.9%. Those between the ages of 18-59 tested positive for marijuana at a much higher rate than those 60 years and older. Additionally, males tested positive for marijuana at a much higher rate than females. However, for both ages and sexes, it can be seen that confirmed positive test slightly increased in the year 2018, as dispensary sales became legal but then slowly declined or plateaued in 2019. With this study, there are certain limitations including the fact that this data is not able to be generalized for other institutions as the number of Emergency Department visits and positive confirmatory tests are unique to the San Diego area. In conclusion, since the legalization of marijuana for recreational use, there have been observed changes in the number of positive screenings and tests in the Emergency Department across different demographics, and further analysis will be done to incorporate these differing characteristics, including race, ethnicity, income level and education level.

Zichen Jiang

Biology: Bioinformatics, FMP
Mentored by Ferhat Ay

Three-dimensional organization of X chromosome in relation to gene expression

My project will focus on the sex chromosomes in the male cell lines because these cell lines provide a unique opportunity for studying a single copy of the X chromosome rather than averaging data from two X copies that exist in the female cell lines. Being the only sex chromosome that carries active DNA functions, X chromosomes in males may have their distinguishing features of structure and organization that make them unique from all other autosomal chromosomes. My project will investigate the following three questions. What are the levels of organization in the male X chromosomes? What are the unique features that construct their 3D architecture? How do these features change from cell type to cell type? These three questions can help us understand how differences in X chromosome 3D organization relate to changes in the level of genes expressed from this chromosome.

Amberine Kabir

Cognitive and Behavioral Neuroscience / Psychology, FMP
Mentored by Georgia Robins Sadler

Attracting Target Audience by Utilizing Instagram to Spread Public Health Information

My poster discusses the various ways in which I approached creating Instagram posts in order to attract the Asian, Pacific, and Islander community. The purpose of this project is to increase the API community clinical trial literacy using social media. Instagram is a growing social media platform, with a growing audience, so I evaluate whether the Instagram platform could be used to disseminate clinical trial information. I analyze how effective the approaches that I took were, the things that I did to the posts on Instagram, such as captions, timing, content, and account interaction. There were a few limitations and potential improvements with this, as it was more difficult to target specific API groups. However, as the Instagram account became more active with its followers, there was a surge in likes and popularity. Essentially, using Instagram to promote public health information seems to be very effective and can be used in the future for the public to retain health information.

Esha Kamra

Economics, FMP
Mentored by Dr. Fabian Trottner

Trade Liberalization and Differing Effects on Racial Groups in the United States

I will attempt to examine the effects of trade liberalization on labor market outcomes - employment and wages - across different racial and ethnic groups in the United States. After China's introduction into the World Trade Organization in

2001, the U.S. has faced a major increase in import competition from China without an offsetting increase in demand for U.S. exports (Autor, Dorn, and Hanson, 2013). Manufacturing industries in the U.S. see the effects of trade with higher unemployment, lower labor force participation, reduced wages, and higher social welfare benefits such as unemployment, disability, retirement, and healthcare. Areas more exposed to trade experience more significant declines relative to those less exposed (Choi, Kuziemko, Washington, and Wright, 2021). Historically, manufacturing industries have been instrumental in helping close the racial gap in the United States, allowing Black men to obtain high-paying jobs without necessarily needing to be highly educated, and creating job security especially in the case of unions (Gould, 2018). Because Black workers are more concentrated in areas that have a high volume of manufacturing jobs, a decline in manufacturing might affect them more profoundly. We predict that we will find gaps in how trade liberalization affects differing racial groups in the United States.

Jacob Kattoula

Emergency Medicine, FMP
Mentored by Dr. Richard Childers

Overdiagnosis of Urinary Tract Infections in the Emergency Department

Urinary tract infections (UTI) is traditionally a clinical diagnosis with testing typically unnecessary and should only be for patients displaying UTI symptoms. However, it is often seen that the diagnosis made for Emergency Department (ED) patients without UTI symptoms is solely based on urine testing (UT) results. We investigated how often ED patients who are prescribed an antibiotic for UTI, actually have UTI symptoms or positive urine culture results.

Esha Kaur

Human Biology, FMP
Mentored by Dr. Willis Li

Binding of uSTAT dimer, HP1 dimer and DNA Double Helix

Generally, heterochromatin is very densely packed and will need to be unwound to form euchromatin (active DNA material). Heterochromatin is usually dormant genetic material that won't get transcribed. There are three different sites at which DNA will bind to the HP1: alpha, beta and gamma. These different sites represent different isoforms of the HP1 dimer. Previously in our lab, there has been research into the interactions between heterochromatin and uSTAT within the cell. uSTAT is the unphosphorylated STAT protein produced from the JAK/STAT pathways. Although they are usually dormant, research has shown that even then they can bind with HP1 and stabilize it. Specifically, the uSTAT5a

can bind with the HP1a through the PxVxL which is a binding motif. Currently my hypothesis is that the uSTAT will bind to the DNA which will then recruit the HP1 for heterochromatin formation. This will then lead to the promotion of HP1.;

Hridayanand Khemchandani

Chemical Engineering, TRELS
Mentored by Ping Liu

Simulation of Shorting in Etched NMC Cathode Li-ion Cells Using COMSOL Multiphysics

Safety is a crucial factor in the use of lithium-ion batteries. Most accidents caused by batteries are related to electrical and thermal hazards which originate from short circuits. A short circuit is caused when current flows along an unintended path while facing no resistance, which can lead to excessive heating inside a battery. It is essential to study the temperature distribution inside a battery during a short circuit and determine ways to make them safer. This research project uses COMSOL to determine the effectiveness of an etched cathode design in decreasing the temperature increase due to an electrical short in a battery.

Jimin (Kristin) Kim

Public Health, FMP
Mentored by Seth Hannah

Patient-Provider Interactions: Role of Race, Social/Cultural Dynamics, Cognition in Clinical Decisions that Deepen Health Disparities in African American Populations

Research consistently shows that African Americans receive lower quality care and service than other Americans, even after controlling for income, symptoms, and access. To investigate the sources of this difference, using Michelle Van Ryn's hypothesized patient-provider model, I had examined how race, social and cultural dynamics, and cognition influences the patient-provider relationship and shape clinical decisions. The patient, provider, and interplay of both agents were further dissected to explain the assumptions, interpretations, and behaviors that arises in each part of the pathway. Through the investigation, as a whole, it is my hopes that many have awareness of these current health and health care disparities African Americans face and move towards a trajectory to help reduce them.

Mikaela Larkin

Physics with a Specialization in Astrophysics, FMP

Mentored by Adam Burgasser

Identifying Brown Dwarfs and Very Low Mass Stars by Reducing Infrared Spectral Data

Brown dwarfs are a unique celestial object found in the infrared spectrum. They are too massive to be classified as planets and have temperatures too low to be classified as stars. These properties indicate a lifespan longer than the age of our universe, meaning once they are created, brown dwarfs are not naturally destroyed as stars and planets are. Around 20 years ago, thousands of images were taken by the NASA Infrared Telescope Facility (IRTF) of objects in space that are likely brown dwarf candidates. In this project, several of these images in order to identify unknown objects using a program entitled SpeX Prism Library Analysis Toolkit (SPLAT). Reduction of spectral images using SPLAT consists of three major steps. The first is to create subtracted images and to produce initial spectral plots. The next step is to combine each spectra for a specific object in order to average out the plots and to better define its properties. The final step is to perform a telluric correction which eliminates errors caused by Earth's atmosphere. The plot shown indicates the object to likely be a white dwarf, but in order to officially classify the object it will need to be compared to models of more well-known stars. Our future research will match this spectra and others with models in order to classify unknown objects in the universe and to clarify the properties of brown dwarfs and low mass stars in the infrared spectrum.

Vy Le

Cognitive Behavioral Neuroscience/ International Business, FMP
Mentored by Dr. Georgia Robins Sadler

Facebook

With the ongoing COVID-19 pandemic, people tend to more aware of the clinical trial term due to the vaccine distribution. From there, our group decided to focus on providing helpful resources about clinical trials via a variety of social media platforms, including Facebook, Instagram, and Tiktok, since it is not highly recommended and unsafe to have face-on-face interaction with a lot of people during the pandemic. Our goal is to educate people about clinical trials, with the target audience are UCSD students and the Asian Pacific Islander community. My part of the project is doing the pilot test and analyzes data from Facebook to see if it is a great tool to spread out the information to the community.

Isac Lee

Data Science, FMP
Mentored by Michael Davidson

Financial Benefits and Inequities of Household Solar PV Support Programs;

Prior studies have shown a strong correlation between solar photovoltaic (PV) adoption and household income as well as other demographic characteristics. We aim to further understand the energy justice implications of solar support programs which can complicate equitable low-carbon energy adoption. We analyze two primary benefits of adopting solar PV: (1) direct subsidies for the investment cost and, (2) indirect benefits during production due to net-metering programs. To accomplish this, we have compiled a novel dataset combining CaliforniaDGStats, which contains data for all interconnected solar PV projects through net-metering tariffs, and monthly customer usage data from three major investor-owned utilities in California: Southern California Edison (SCE), Pacific Gas and Electric (PG&E), and San Diego Gas and Electric (SDG&E). Preliminary analysis has shown that higher-income households adopt at a higher rate than low- and middle-income households, confirming prior findings. Moreover, although lower-income communities in general benefit from a more abundant solar resource, the California subsidy per solar generation is higher for high-income households. This dataset will also enable us to compare the financial benefits between solar and non-solar households by zip code and across other demographic variables through a monthly bill simulation.

Alison Zhao Leyi Huang

Biological Sciences, BIMM170
Mentored by Rachel Dutton

Putative Function of vB_Eamm_Ray Protein gp039 in Erwinia amylovora as Stringent Starvation Protein B

"Putative Function of vB_EamM_RAY Protein gp039 in Erwinia amylovora as Stringent Starvation Protein B" focuses on inferring the function of the vB_EamM_RAY protein gp039 from the RAY bacteriophage during its infection process. RAY is a jumbo bacteriophage that belongs to the Agricanvirus genus, which is a group of lytic jumbo bacteriophages that infect Erwinia amylovora, a phytopathogen that causes fire blight in apple and pear trees. As a jumbo bacteriophage, RAY has many novel genes that encode unknown hypothetical proteins worthy of further study. Additionally, as a bacteriophage that infects Erwinia specifically, RAY can help us find potential weapons against fire blight. By understanding RAY's proteins, researchers can better understand the evolution and ecology of pathogenic strains of Erwinia. After using bioinformatic tools and reading previous scientific literature, we've concluded that the function of gp039 is predicted to be an SspB-like protein, meaning it likely helps free stalled ribosomes by working with ClpXP protease. Furthermore, gp039 appears to be exclusive to Erwinia and Pseudomonas jumbo phages. We theorize that during the infection process, gp039 helps the RAY phage rescue more stalled ribosomes in order to streamline the phage protein production process. The

bacterial stress response, which creates more stalled ribosomes, may also help explain why phage would need SspB-like proteins during infection.;

Lehan Li

Cognitive Science, FMP
Mentored by Eran Mukamel

DNA Methylation Prediction in Deep Learning

DNA Methylation is essential in the field of research since it impacts biological development, and are able to help identify common patterns for cancer. This project seeks to predict DNA Methylation Level across 15 different cell types using Deep Learning Model. The data is acquired by single cell recording of mouse's brain, specifically in Frontal Cortex. Convolutional Neural Network is one the model in deep learning, and it's used in this project. One convolutional layer is used to extract useful information. The weights in the first layer is later extracted to compose position weight matrix. Pooling Layer is used to reduce dimensionality, as well as to reduce noise. Two fully connected layer at last to predict final methylation level for 15 cells. Deep Learning allows model to have better accuracy with fewer parameters. And this project provides an easy way to predict methylation and advances our understanding about the brain.

Yingyin (Katie) Li

BIOLOGICAL SCIENCES, FMP
Mentored by Dr. Georgia R. Sadler

Using Culturally Relevant Designs for Social Media Public Health Outreaches on Facebook;

Clinical trials are important for the advancement of medical intervention. A diverse clinical trial participant population is needed to ensure that the results of clinical trials are generalizable to the entire population. However, members of the Asian and Pacific Islander (API) community are underrepresented in clinical trial participation. In the past, traditional community-based outreaches have been proven to be effective in increasing clinical trial literacy and raise participation rates. The Covid-19 pandemic prevented in-person community-based education efforts but increased public awareness of clinical trials. Taking advantage of the rise of clinical trial awareness in the public, our group's project aims at adapting traditional clinical trial program dissemination onto social media platforms and create a clinical trial education program on social media that is culturally aligned to the API community. For our project, we pilot tested 3 social media platforms: Tiktok, Instagram, and Facebook. My part of the project focusing on examining what modification is needed to make the public health information more culturally aligned and accessible to the API community in order to make Facebook an

effective platform to disseminate information. We analyzed whether the incorporation of artistic elements culturally relevant to the APIs to the public health infographics would motivate the viewing of content.

Tommy Lim

Linguistics and Religious Studies, TRELS
Mentored by Hoang Nguyen

Demonic and Christ-like: Using Christological and Rabinnic lenses to Recognize the Emerging Feminism in the Lesbian Vampire Trope

This project investigates the development of the lesbian vampire trope as it accommodates a narrative of female empowerment. The investigation is accomplished by applying Rabinnic and Christological lenses to the filmic analysis of Dracula's Daughter (1936), The Vampire Lovers (1970), and Jennifer's Body (1970). Application of these lenses to the films illustrates how the lesbian vampire trope revisits preexisting, misogynistic notions of femininity as well as more recent, feminist notions of female empowerment. Furthermore, these contrasting notions are explored through themes of death, resurrection, liminality, and violence. While the lesbian vampire is initially portrayed as a demonic sexual predator that resembles Rabinnic demons like Lilith and succubi, the experiences that characterized them as demons become subverted by their characterization as Christ figures. Effectively, while many of the lesbian vampire's traditional traits (violence, bloodlust, misandry) are still acknowledged in more recent films like Jennifer's Body, their characterization as Christ figures infuses their demonic nature with a sense of reason, and even justice. It is in reframing the once utterly egregious behavior of the lesbian vampire as responses to patriarchal abuse of female bodies that a feminist narrative arises. In understanding how the lesbian vampire comes to resemble Christian (Jesus) as well as Rabinnic (Lilith and the succubi) figures, this project uncovers an effort to redefine a historically sexist trope by criticizing Christianity, as well as the patriarchy enabled by the religion.

Skyler Liu

Human Biology, FMP
Mentored by Willis Li

HP1 and the Inhibition of Cell Proliferation

HP1 or heterochromatin protein 1 refers to non-histone chromosomal proteins involved in establishing and maintaining higher-order chromatin structures. In the Li Lab, we found that by over-expressing HP1 in Drosophila led to a smaller wing size and depleting HP1 led to a larger wing size. We hypothesize that HP1 inhibits cell division. The goal of this independent research project is to look into

the possible mechanisms by which HP1 inhibits cell division by investigating other research papers. This poster shows my progress of searching for possible mechanisms by compiling the results of various experiments done by over-expressing and depleting HP1 in Drosophila and HeLa cells. Based on the experiments I have looked at, the over-expression of HP1 has been shown to alter chromosome morphology and decrease stem cell proliferation in humans and Drosophila. The altered chromosome morphology may lead to the inhibition of the cell cycle, resulting in less cell division. HP1 depletion experiments have been linked to the down-regulation of genes associated with DNA replication, resulting in more cells in the DNA replication phase of the cell cycle. Due to this, HP1 is necessary for the regulation of DNA replication, which is what is influencing the rate of cell proliferation. More research is needed to determine a possible mechanism of how exactly HP1 is able to inhibit cell division.;

Steven Luong

Biochemistry and Cellular Biology/Department of Biology, McNair
Mentored by Dr. Michael David

Human Schlafen-11 Blocks Synthesis of SARS-CoV-2 Viral Proteins

In mammals, an important biological pathway in counteracting viral infections is the production of type I interferons and the activation of interferon-stimulated early response genes (ISGs) upon viral infection. Recent research has identified a specific type of ISGs known as Schlafen genes for which their role in counteracting viral infections remains poorly understood. This project seeks to understand the effects of human Schlafen-11 protein expression on SARS-CoV-2 viral protein production. Using in vitro culture methods, we demonstrate that transfection of plasmid DNA constructs containing human Schlafen DNA and Spike Protein DNA into HEK 293T and 293 SLFN 11 knockout cells has a diminishing effect in overall spike protein production. We show that human schlafen-11 but not human schlafen-5 exerts an inhibitory effect on the wild-type SARS-CoV-2 Spike protein expression while no such effect is observed in the case of SARS-CoV-2 codon-optimized (CO) spike protein.

Shina Luu

General Biology, FMP
Mentored by Georgia Robins Sadler

TikTok: A Promising Platform to Spread Public Health Information

Clinical trial participation is especially low among the Asian Pacific Islander community and previous efforts to reach out to this community have primarily been in person. However, as the COVID-19 pandemic disrupted our in-person outreaching activities, our team has transitioned into a virtual platform where we

can continue our mission to increase clinical trial literacy among the API community. Through a multimodal demonstration project, we chose to utilize three different social media platforms as a means for clinical trial dissemination. Since many of our college student peers are active on social media, we decided to create content that we hope they can share with their families who may benefit more from learning about clinical trials. One of the platforms we've chosen is the popular video-sharing platform, TikTok. It has the potential to reach a very large and diverse audience where other health professionals have also created educational content to share with TikTok users. After spending months of thorough research on topics surrounding clinical trials, we've created a handful of informative and funny videos that have reached hundreds of viewers each. As we analyzed the specifics of our data, we have come to the conclusion that TikTok is an appropriate and effective platform for reaching a large audience. Despite a few limitations to our study, we hope that our project has built a foundation for further research in the use of TikTok for public health dissemination on a grander level.

Rachel Luu

Mechanical Engineering, McNair
Mentored by Marc Meyers

Bioinspired Modeling of Horse Hooves for Material Characterization

Biological materials present an abundance of structures that can serve as an inspiration for designs of new synthetic materials for various technological applications. In particular, the horse hoof yields outstanding mechanical properties with a large resistance to high speed impact, compression, and bending. Thus, we studied the hoof for its great potential in designing new high strength structures for materials. The horse hoof structure consists of a hierarchical assembly of helical, layered, tubular and cellular microstructures. In order to deepen our fundamental understanding of these micro-mechanisms, we created bioinspired models using computer aided design and additive manufacturing methods, thereby enlarging this structure from the microscopic to macroscopic scale. Using drop tower tests, we will analyze impact resistance, deformation behavior, and mechanical properties present in these models. Likewise using compact tension tests, these models can be characterized in a variety of mechanically loaded settings. As an intersection point of materials science, biology, and mechanical engineering, our research both will catalogue property findings and cultivate design guidelines for new synthetic materials. Our study on the microstructure of the horse hoof will provide novel insights in the burgeoning field of bioinspiration and will contribute to the next generation of high strength materials.

Vince Ly

Molecular and Cell Biology, McNair

Mentored by Dr. Milton Saier

Assignment of the TRAP-T family to the IT superfamily

The Tripartite ATP-independent Periplasmic Transporter (TRAP-T) family permeases consist of three components which facilitate the secondary active transport of solute and protons across the cytoplasmic membrane in bacteria and archaea. This study aims to assign the TRAP-T family to a superfamily, namely the Ion Transporter (IT) superfamily, from a bioinformatics approach. FASTA sequences were extracted for TRAP-T, as well as its homologs DASS and ArsB. FASTA sequences between families were compared using Protocol2, which assigned GSAT scores based on the similarity between FASTA sequences. The top GSAT scores were used to generate hydropathy plots with projected Pfam domains that were analyzed using Hvordan. Together, the results provide strong evidence that the TRAP-T family is a member of the IT superfamily. A protein tree generated using mkProteinClusters revealed members of DASS and ArsB isolated from their families. This may be due to the presence of fusion proteins with domains belonging to TRAP-T and other members of the IT superfamily. This will be further studied in future projects.

Ahmed Mabrouk

Global Health, FMP
Mentored by Milton Saier

The role of c-di-GMP in the Regulation of FlhDC operon of Escherichia Coli

Bacterial motility is a key adaptation that promotes survival as it allows for an increased range of movement which provides better access to nutrients. For the organism E. Coli, multiple flagella are distributed asymmetrically across the cell surface. Regulation of bacterial motility can occur through mutations in the FlhDC operon. One such mutation takes place through the insertion of IS elements 1,3, and 5, 370 base pairs upstream of the FlhDC operon control region which leads to a significant increase in the expression of the operon thus producing more flagella. Another mode of regulation of bacterial motility occurs through the interactions of the secondary messenger c-di-GMP with the YcgR protein which prevents flagellar movement from taking place. The primary aim of this study is to determine if there exists a relationship between the intracellular levels of c-di-GMP and the development of insertional mutants. Swarming assays were conducted through the preparation of sub agar plates. These plates were then inoculated with cultures grown in zinc, which is a known inhibitor of a cyclase enzyme that produces c-di-GMP. Preliminary results suggest that the reduction of c-di-GMP may increase the incidence of insertional mutations. This could be as a result of the unique interactions between c-di-GMP molecules and the YcgR protein, as this may reduce the incidence of insertional mutation in the FlhDC operon in order to preserve energy for other, more functional processes.;

Denia Marquez

Philosophy, McNair
Mentored by Monique Wonderly

Addiction, Attachment and the Ethics of Grief in Recovery

Grief is often thought to be experienced when we suffer an irrevocable loss of a non-fungible object, paradigmatically of a person and a death. Interestingly, addicts during and post-recovery have reported experiencing grief from the loss of their addiction. The anomaly here is that the addict's loss is not strictly irrevocable, is not of a person and a death, and is of an object that should not be seen as positively significant. Here, I address this anomaly by first drawing from philosophical literature on attachment to identify the key features that would warrant the addict to grieve from the loss of their addiction. Further, I draw distinctions between many modes of mattering (viz., caring, felt need, and loss) that are normatively significant for both attachment and grief. I then argue that the sense of loss the addict feels from exiting their past addicted life is of the same kind that we experience when we lose someone significant to our lives. I then suggest that it is morally permissible for the addict to experience and respond to such grief. Next, I address a couple of worries that could arise if we were to acknowledge, and eventually, encourage the addict to respond to their grief. Finally, I draw out important ethical implications, particularly those in the contexts of disenfranchised grief, the ethics of social identity, and addiction recovery treatments.

Ivette Martinez

Education Studies, McNair
Mentored by Makeba Jones

'I Wish I Would Have Taken More Advantage of GEAR UP': Looking at the Impact of Federal Educational Intervention Programs;

My goal is to investigate if federal educational intervention programs, like GEAR UP, are really effective, considering they have been around for decades, yet there still exists significant disparities in educational outcomes.

Allison Morgan

Cognitive Behavioral Neuroscience, TRELS
Mentored by Drew Walker

Presenter: Allison Morgan

Past studies that investigated the educational character of student persistence in community college students have highlighted the importance of meaningful classroom interaction for shaping student persistence among these students who face a host of intersecting stressors or obligations. However, little research has touched on the alterability of student persistence post-transfer and if it is sustained by dispositional tendencies. In this study, we examine how student persistence in transfer students has changed as a result of their transition and if the dispositional tendency, John Henryism (JH), may influence their goal striving JH is the dispositional tendency to employ high-effort coping strategies when faced with persistent structural obstacles. Universities reflect the structural and material conditions of society which could influence subscription to JH and reflect in academic performance. Higher subscription to JH has been correlated with a higher likelihood of risk for diseases such as cardiovascular disease, especially among students of color who identify as low socioeconomic status (SES). Previous findings also stress the importance of interactions between educator and student in a physical space in order to facilitate the shaping of student persistence. If the definitive elements of these interactions change, this could result in the dampening of student persistence. As a sub-focus, we would like to explore if student persistence in transfers has shifted in response to pandemic-related effects. We would like to use the insights we gain from our findings to inform and improve transfer-specific services so that student engagement is facilitated with adaptive coping strategies in mind.

Jennifer Nguyen

Pharmacological Chemistry, FMP
Mentored by Anjan Debnath

Activity of a Natural Product Derivative against Naegleria fowleri

As primary amebic meningoencephalitis still remains with a 97% fatality rate, the search for new potential drug leads that are more potent than amphotericin B continues. Here we will analyze the effect of an anti-Naegleria marine natural product derivative, compound 2.

Emily Nguyen

Public Health/Herbert Wertheim School of Public Health and Human Longevity Science, TRELS
Mentored by Rebecca Fielding Miller

Experiences and Barriers of Neurodiverse and Disabled Identifying UCSD Students

Objective: To describe the experiences and barriers of neurodiverse and disabled identifying students from the University of California, San Diego to better

formulate ways to make academic accommodations more accessible. Methods: For our qualitative research, we conducted in-depth interviews with participants for about an hour. After transcribing the interviews, the transcriptions are uploaded to MAXQDA, a qualitative research software, for analysis. We currently have a total of 18 participants. Recruitment and interviews took place in April of 2021 over Zoom. Results: We are currently working on finalizing our findings. There are 3 main takeaways that we've noticed in our data so far. Some students have a poor understanding of the Office for Students with Disabilities, internal and external stigma can influence one's use of academic accommodations, and that the specific disability specialist majorly influences students perception of overall support from the institution. Conclusions: Based off our findings, it is clear that the University of California, San Diego has a lot to improve on in terms of creating a neurodiverse and disability friendly environment for students. Areas of improvement could be targeted at the Office for Students with Disabilities (OSD) and lecturers, who participants felt like were not understanding of them and their conditions. In addition, it is important to find ways to alleviate the burden and minimize the need for self advocacy for neurodiverse and disabled students when they try to get and use academic accommodations.

Annie Nguyen

Math-CS/Management Science, FMP
Mentored by Jyoti Mishra

Cognitive Correlates of Suicidal Ideation

According to the CDC suicide statistics, about 9.3 million adults, or 4% of the adult US population, had suicidal thoughts in the past year, and there were 41,000 suicides throughout the year1. Furthermore, suicidality is a complicated state that involves suicidal ideation, suicide plans, and suicide attempts, alongside the multitude of risk factors that contribute to it, like mental disorders and substance abuse. Currently, there has not been a reliable biological risk marker found, which could be imperative to identifying who is at risk of suicidal behaviors. One approach for this is looking at brain structures and correlate them to suicidality and depression to find potential causation between them. To do this, we used electroencephalograms (EEGs) to record activity in that brain region as the participant plays a series of games specifically made for looking at reward processing. The platform used, Brain Engagement (BrainE), is a platform with a series of eight games that look at selective attention and inhibition (Go Green), distractor processing (Middle Fish), working memory (Lost Star), emotion processing (Face Off), feedback and reward processing (Lucky Door), internal attention (Two Tap), preattentive processing (Lion Cage), and resting state (Rest)2. We also had the participants answer a series of questions about different factors of their life through a platform called RedCap. Correlates between each game, EEG data, and survey questions will be investigated to find potentially new neurological markers in suicidality.;

Rocco Novello

Physics - Astrophysics Specialization, FMP
Mentored by Adam Burgasser

The Coolest Stars in the Universe

Brown dwarfs are failed low mass stars that are unable to begin the process of hydrogen fusion. This sets them apart from traditional stars, and has a significant effect on their evolution. While traditional stars (like our sun for instance) maintain relatively constant surface temperatures throughout most of their lives, brown dwarfs cool off gradually over time, and can even become cool enough to have solid ice in their atmospheres. As such, the spectral properties of brown dwarfs are unique, and have warranted the interest of this study. Over the past 20 years, observations of brown dwarfs have been conducted at the Keck Observatory in Hawaii, and the purpose of this project is to process this data and convert it to meaningful spectrographs which can then in turn be used to reveal important properties about the objects of interest. A computer program nicknamed SPLAT is used to digest the raw data, and the output spectrographs will be subject to future studies, including ones to examine the relationship that stellar age may have on spectral features.

Gerardo Ontiveros Cortes

Chemistry/Department of Chemistry and Biochemistry, McNair
Mentored by Olivia A. Graeve

Thermal Conductivity of Water-Based Alumina Nanofluids

In this work, we present a study on the thermal conductivity enhancement of water-based alumina nanofluids. Our motivation for this study is the variety of applications in systems reliant on efficient heat transport materials. Recent research has focused on the specific properties of the alumina nanofluids responsible for the enhancement in thermal conductivity. Powder volume fraction, and solution stability (estimated from corresponding zeta-potentials) are recurring parameters in the existing literature investigating the thermal conductivity of alumina nanofluids, such as is particle size, viscosity, and pH. Therefore, our studies have a focus on the particle size, pH, stability, and powder volume fraction of water-based alumina nanofluids. The main goal of the current research is to investigate the enhancement in thermal conductivity when compared to the base-fluid itself. Experimental factors such as the formation of agglomerates, and the precipitation of the solid nanoparticles in the solution are addressed by investigating the particle size distribution, and the zeta-potentials of the solution using the dynamic light scattering technique. Our results indicate that the solution stability is excellent, while the particle size distribution is slightly

greater than the nominal 100 nm particle diameter specified by the manufacturer of the nanopowder. Also, for a 0.1 vol% solution of water-based alumina nanofluid, our findings suggest a small improvement in the thermal conductivity of water (1.01%), which is consistent with existing literature. Further experimentation at higher volume concentrations should allow to demonstrate the possibility to employ these nanofluids as coolants for a variety of engineering systems.

Simran Patel

Human Biology/Biology, TRELS
Mentored by Danielle Raudenbush

How Hospitals Address Healthcare Needs for the Homeless

One of the major problems when dealing with the homeless population is addressing their healthcare needs while avoiding major costs. Oftentimes, the homeless end up in emergency rooms either for health problems that could have been easily avoided with early prevention methods, for substance abuse issues, or for mental health care. As a result, hospitals are left caring for the homeless at a much more expensive cost than if they were to go elsewhere for basic care. I aim to address how the hospitals in the U.S. work to address the care for the variety of health issues that the homeless population faces.

Alexander Perez de Leon

Nanoengineering, McNair
Mentored by Professor Sheng Xu

Simulating Inorganic Perovskite Light Emitting Diodes

Light emitting diodes (LEDs) are the tiny devices that power the beautiful displays we are all familiar with today. It likely LED's you're looking at as you read this. My research is dedicated to simulating a new type of LED which utilizes a promising class of material called perovskites. By simulating perovskite LEDs (PeLEDs) the theoretical efficiency and lifetime of such devices can be determined. Red and green PeLEDs have been demonstrated, however, blue and near-infrared (NIR) LEDs have yet to be shown. It is my goal to use an inorganic cation in the A-site to overcome the challenges that are facing blue and NIR.Recently, perovskites have shown to be a very impressive semiconducting material, and this has fueled research interest in perovskite semiconductor devices, such as perovskite light emitting diodes (PeLEDs). By simulating these new PeLEDs the optimal device structure and other certain device characteristics can be determined. This can accelerate research progress because simulating the devices before in-lab experimentation saves time and provides a solid theoretical foundation for impactful research.

Donna Pham

Public Health , TRELS
Mentored by Dr. Leslie Lewis

Optimizing the Triton Food Pantry Organizational Layout: A Community Service Initiative

The Triton Food Pantry provides discreet basic needs services to UCSD students on campus by offering dried goods, canned goods, and produce to combat food-insecurity. However, the problem is that the Pantry is very limited in space. In order to serve as many students as they can, they need to better organize the Pantry layout so that it is as efficient as possible. My proposed project is to improve the Triton Food Pantry by organizing the space in a more efficient way by upgrading its physical organizational layout. My plan is to research organizational products that can better hold canned goods/produce as well as improve the presentation of the layout. With the stipend, some products I would like to purchase are cereal dispensers and shelf organizers. The cereal dispensers will be mounted on the wall, conserving more space and refining the layout. This will allow the staff to buy cereals/grains in bulk instead of individual cereal boxes, making them more cost-effective purchases. Moreover, it removes the need for the large, bulky bins that are currently there and can provide more space for the Pantry. In addition, shelf organizers will allow canned goods to be displayed in a staircase fashion so students can see all the types of cans that are on the shelf, since with the current shelves students cannot access the cans in the back since the cans in the front block them. With the leftover funds, I would like to improve the accessibility of the snack area by purchasing bins with reusable chalk surfaces so students know what type of goods are in each bin. This execution of this project will allow the Pantry to maximize its space, better present the goods, and improve its accessibility to the students.

Eleanor Quirk

Chemical Engineering, TRELS
Mentored by Dr. Vicki Grassian

Nucleotide Adsorption onto TiO2 Nanoparticles: A Quantitative Insight into the Role of Electrostatics in Nano-Bio Interactions

Titanium dioxide (TiO_2) 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.

Jose Gonzalo Rivera

Aerospace Engineering/MAE, FMP
Mentored by Professor Aaron J. Rosengren

Artificial Satellites Orbiting in Cislunar Space

One of the most debatable and prominent problems in Space Flight Mechanics is understanding the impact of the gravitational force that celestial bodies have on other smaller bodies that are travelling near them. This phenomenon causes notable disturbances in the orbital elements of numerous satellites when they are travelling through space. In the Solar System, one problem of tremendous interest is the third-body perturbations problem between the Sun, the Earth and the Moon. This topic focuses on the gravitational forces generated by these three bodies, which had a tremendous influence in objects that navigate through this concrete region of space. is research will only focus on a specific section of space called cislunar area. This section of space is between the Earth, the Sun, and the Moon. The main purpose of this project is to explore how the orbital elements of satellites, who have navigated or are navigating through cislunar space, change due to gravitational perturbations present in this area of space. This research will provide useful information of the behavior of these satellites through time. Furthermore, it will allow us to investigate how can we achieve orbital stability for selected space probes. This will only be achieved once the precise orbital information on these satellites has been properly characterized. By understanding how these satellites behave in this concrete area of space, more stable orbits will be able to be created.

Gonzalo Rocha-Vazquez

Political Science: Comparative Politics, McNair
Mentored by Simeon Nichter

State Factors Contributing to The Spread of Prison-Based Gangs

Organized Crime is the most prevalent problem in Latin America; however, it is still one of the most understudied subjects. Studying Organized is not only difficult—often requiring connections with public officials and institutions—but also very dangerous. This project seeks to build on the work of other scholars in the use of quantitative data available online to study crime, and explore a different method of mapping crime. This project utilizes Google Trends data to map criminal activity using Brazil's Primeiro Comando da Capital as a case study and proceeds to provide an analysis of state factors contributing to the spread of prison-based gangs. Based on the literature, prison-based gangs increase their membership by providing club goods, financial security, and protection for those who expect to be incarcerated in the future.

Esmeralda Salas

Psychology with a Specialization in Clinical Psychology/Psychology, McNair
Mentored by Dr. Amy Bintliff

Impacts of Social and Emotional Learning at Akanksha Foundation

The purpose of this mixed-methods study is to investigate the impact of a social and emotional learning (SEL) curriculum on students and staff members at Akanksha Foundation, a set of K-12 schools based in Mumbai, India. Surveys and ten in-depth, semi-structured interviews were conducted with staff from the Akanksha Foundation recruited through a university-community partnership between Akanksha and the Partners at Learning (PAL) program at UC San Diego. Findings reveal that Akanksha's commitment to parent engagement, youth leadership and voice, and SEL during the COVID-19 pandemic promote students' and parents' wellbeing, a renewed sense of passion for school, and a sense of community and connection to others. Findings support the need for schools to integrate SEL in normal school activities and at home.

Srimaye Samudrala

Human Biology, FMP
Mentored by Dr. Cristian Achim

Background on Methamphetamine effects in HIV+ patients;

When looking into antiretroviral treatments for HIV-associated neurologic disorders (HAND), clinical studies have shown that neuropsychological impairment is about 20% higher in HIV+ methamphetamine (METH) users than HIV+ non-METH subjects which is due to METH pathways that induce HIV neurotoxicity. The key players in this process are the role of the monocyte in

regulating and monitoring the brain along with how it could be related to the neuro-immune response in HIV+ individuals. With this in mind, the project will examine how cellular distribution of brain immunophilins in autopsy tissues from HIV+ patients with a history of METH use and compare it to postmortem markers of neuropathology and clinical HAND scores. There are actually no research studies that share data on the relationship between immunophilins, METH, and HIV neuropathology.;

Milan Sandhu

Molecular Biology, BIMM170
Mentored by Rachel Dutton

Function and Phylogenetic History of Erwinia phage RAY protein gp048

Bacteriophage are viruses that infect bacteria and have existed for billions of years, leading to an ever-evolving biological war between bacteria and phages. Jumbo phage are classified as any bacteriophage with a genome length of 200 kB or greater, and some have recently been observed forming nucleus-like structures during infection. Erwinia phage RAY, a newly discovered nucleus forming jumbo phage, was chosen to be studied to identify proteins that may be important for nucleus forming jumbo phage during viral replication. Here we report evidence suggesting that RAY_gp048 functions as a tRNA ligase during phage replication. We show that RAY_gp048 localizes in the cytoplasm during infection, as would be expected for a tRNA ligase. We also show that the amino acid sequence for RAY_gp048 contains conserved domains of RtcB, which is a family of tRNA ligases. The amino acid sequence of gp048 also includes nucleotide binding sites found in the amino acid sequence of the Human RtcB protein. These findings strongly suggest RAY_gp048 functions as a tRNA ligase during phage infection, assisting in translation during the life cycle of Erwinia phage RAY. The findings regarding the function of gp048 allow us to better understand the mechanisms used by nucleus forming phage such as RAY.

Angel Sarabia

Molecular and Cellular Biology, BIMM170
Mentored by Rachel Dutton

Evolutionary Analysis of the Exoribonuclease-like Protein RAY_gp064

It is predicted that there are 10^31 bacteriophages in the world today. Making it one of the most diverse and plentiful entities found on Earth. One particular bacteriophage that we know very little about is the RAY phage which contains more than 200,000 base pairs making it a jumbo phage. These bacteriophages infect the Erwinia amylovora bacteria which cause fire blight and severely damage crops. RAY contains numerous proteins that are uncharacterized, some

of which could provide researchers insight into the replication process of phage, leading to potential advancements in phage therapy. Our analysis of the RAY_gp064 sequence revealed a putative function of an exoribonuclease. This enzyme works by managing genetic material through excision of nucleotides in the 3 -5 direction of RNA. Through comparing the phylogenetic tree and protein tree of RAY_gp064 and its homologs we deduced that our protein was not derived from horizontal gene transfer. Instead this protein coevolved with bacteri.

Aaron Sonin

Biology, BIMM170
Mentored by Rachel Dutton

RAY phage proteins gp223 and gp249 as DNA-Dependent RNA Polymerase Beta' Subunits

Recently, bacteriophages with genomes longer than 200kb (jumbo phage) have been discovered. Some jumbo phages have been discovered to express the phage nucleus, which consists of a protein shell and tubulin-like filaments wherein the phage DNA is stored and phage replication is facilitated. RAY, the Erwinia phage we studied, expresses a phage nucleus and the functions of 63% of its proteome are currently unknown. Our experiments aimed to identify the functions of two of RAY s proteins, gp223 and gp249. Using Phyre2, we found that both were structurally similar to other DNA-directed RNA polymerase (RNAP) beta subunits. RNAP is responsible for primary DNA transcription, and is therefore an integral part of gene expression. GFP fusions of the proteins showed that they localized in the phage.

Bo Su

CSE, FMP
Mentored by Gupta, Amarnath

Temporal Relation Extraction with a Graph-Based Deep Biaffine Attention Model

Temporal information extraction plays a critical role in natural language understanding. Previous systems have incorporated advanced neural language models and have successfully enhanced the accuracy of temporal information extraction tasks. However, these systems have two major shortcomings. First, they fail to make use of the two-sided nature of temporal relations in prediction. Second, they involve non-parallelizable pipelines in inference process that bring little performance gain. To this end, we propose a novel temporal information extraction model based on deep biaffine attention to extract temporal relationships between events in unstructured text efficiently and accurately. Our model is performant because we perform relation extraction tasks directly instead of considering event annotation as a prerequisite of relation extraction. Moreover,

our architecture uses Multilayer Perceptrons (MLP) with biaffine attention to predict arcs and relation labels separately, improving relation detecting accuracy by exploiting the two-sided nature of temporal relationships. We experimentally demonstrate that our model achieves state-of-the-art performance in temporal relation extraction.

Mignote Tadele

Poli Sci IR, McNair
Mentored by Dr. Dennis Childs

The Foster Care System maybe used as a Punitive system against Black parents and children with incarcerated parent(s)

The Foster care system disproportionately impacts Black children and Black incarcerated parents. The system itself is not sustainable and hurts 1% of Black families in America.

Songyuan Tan

Psychology, FMP
Mentored by Jyoti Mishra

Technology and Cognition: A Modern Way to Equality

The mindfulness or the mindful attention, is an ability in human species which help people be more focus on their current situations, be able to increase the awareness of the surrounding environment and better sense to themselves. Although it's an instinctive ability, it still takes a while for practicing. Some stereotypes and biases state that it's related to gender and racial background. In order to challenge this type of assumption, we set a correlational study. We recruited 312 participants to come to our lab to fill the REDCap surveys and to complete EEG brain mapping. Then we analyzed a huge set of data we collected. Unfortunately, we currently just finished the REDCap data analysis, and the EEG study is still ongoing. Through the survey and assessment, we found that the mindful attention is not correlated to gender, neither to race. Therefore, it should not confirm the biased and stereotypical statements.

Isabel Tate

Sociology, McNair
Mentored by John H. Evans

Examining the Factors Behind the Facilitation of Social Cohesion Through Online Interactions During the Covid-19 Pandemic

As users of platforms like Zoom are reporting experiencing negative effects from being on their computers all day like fatigue and increased social anxiety, there is still a need to understand why certain aspects of online communication and communication technology cannot replicate our in-person interactions and why this is the case. The sense of social presence and cohesion online can be influenced by the interactions within communication technology, for example turning your camera on or off on Zoom. It is increasingly more significant to consider how the sense of social cohesion and social presence is created online. In this project, I introduce an analysis of social cohesion in a university setting where students are attending courses virtually in order to understand the requirements for social cohesion to occur in communities of different social norms and dynamics as in this situation and many others during Covid-19.;

Ann Truong

Human Biology/Biology, FMP
Mentored by Dr. Faith Quenzer

COVID-19: Lasting Symptoms and Effects on the Cardiovascular System

The main objective of this study is to specifically determine the effects of COVID-19 on the cardiovascular system, its most common complications, and its implications regarding long-term symptoms. Interestingly, a majority of patients' symptoms persist even after full recovery, gaining them the name 'long-haulers'. In order to specifically focus of COVID-19 on the cardiovascular system, I conducted a literature review where I collected and analyzed the best and most relevant articles to be included in this study. I also included multiple specific and fascinating case studies that allow viewers to understand the breadth in which COVID-19 can damage the heart and its surrounding tissue. In conclusion, further treatment and research studies for the effects of COVID-19 are still unknown since the disease is still ongoing.

Joey Truong

Molecular Cell Biology, TRELS
Mentored by Samara Reck-Peterson

Utilizing Fusion Proteins to Create Stable Truncations of Coiled-Coil Proteins

Movement and distribution of cellular components is critical for proper function of all eukaryotic cells. Diverse cargoes, including organelles, nucleic acids, macromolecules, and viruses are transported along a polarized cellular microtubule cytoskeleton by sophisticated biological machines, called molecular motors. One such motor, "dynein" transports multiple cargos, across microtubules, which typically is towards the nucleus. Dynein is a large multi-subunit complex that associates with its cargoes through an interaction with an

"activating adaptor" molecule. Disruption of cellular transport due to disturbances to the function of dynein or its interacting partners, including activating adaptors lead to neurodegenerative diseases and cancer. Activating adaptors are proteins that activate dynein for motility and link it to cargo. One activating adaptor, Hook2, forms a cargo complex at its C-terminus called the FHF complex. The molecular interactions within the complex is poorly understood. To better understand this complex, FHF complexes will be imaged using Cryo-EM. An obstacle in imaging the FHF complex is the coiled-coil structure of Hook2. A long, flexible structure is more difficult for Cryo-EM to model. To account for this, a truncation in Hook2 is needed. To preserve the coiled-coil structure, a dimerization domain from Xrcc4 was fused to the N-terminus of Hook2, producing a stable truncation of Hook2.

Dorothy Tsai

Molecular and Cell Biology, FMP
Mentored by William Kim

Engineering Cancers Representative of the Heterogeneity of Triple-Negative Breast Cancer

Triple-negative breast cancer (TNBC) is a notably aggressive subtype of breast cancer known for its atypical molecular characteristics. While most breast cancers express human epidermal growth factor receptor 2 (HER2) and estrogen (ER) and progesterone receptors (PR), TNBC does not express any of the three proteins. One potential treatment strategy lies in immunotherapy, designed to target cancer cells with specificity achieved by the patient's own immune system. My research will establish a proof of concept for producing a variety of tumor profiles that mimic the heterogeneity of TNBC in the context of preserved immune systems by genetically engineering cancers via the CRISPR/Cas9 system. Additionally, my research will utilize mouse and organoid models in order to provide more accurate representations of cancer activity than the common two-dimensional tissue culture.

Brandon Tsai

General Biology/Biological Sciences, TRELS
Mentored by 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.

Marinelle Villanueva

Environmental Systems & Global Health, McNair
Mentored by Tarik Benmarhnia

The Impact of Climate Shocks & Women's Empowerment on Child Undernutrition in Mozambique

Climate change threatens child nutritional outcomes by decreasing food productivity and availability, particularly in Sub-Saharan Africa. The frequency and magnitude of droughts and floods in Mozambique are projected to increase, necessitating efforts to understand and protect children's health. I aim to distinguish which climate shocks are most detrimental to child nutrition and focus on climate shocks during the main crop growing season. In addition, I will investigate the potential of women's education and empowerment for reducing climate-related vulnerabilities of children. Identifying population groups most vulnerable to the impacts of climate change will be important for reducing social inequities and ensuring the continued economic progress of Mozambique. This cross-sectional study links a Demographic Health Survey (DHS) with regional gridded climate data (SPEI) to provide information on the impact of climate shocks on child stunting and wasting. This study contributes to the understanding of which populations of children are most vulnerable to climate shocks in the effort to inform early warning systems and effective interventions. The initial findings indicate a significantly greater burden of stunting than wasting in the entire population. Croppers, in comparison to Fishers, have lower wealth percentiles and education attainment while having a higher prevalence of stunting and wasting.

Theodore Vuong

Molecular and Cellular Biology, FMP
Mentored by Professor Stanley Lo

The Role of Transfer Student Experiences in Constructing Student and Scientific Identities

Conceptual barriers in science are of little concern if students cannot overcome cultural barriers and feel as if they do not belong in the classroom. Academia is often the main pathway to the world of science, so pushing someone away from the classroom also means pushing them away from science. Therefore, it is vital to understand what factors contribute to the construction of students' identities in order to accommodate them within a classroom and make science accessible to them. Transfer student identities are especially fragile as they form given the nontraditional path these students take to enter science. By examining transfer students specifically, we are working with students who are most likely the most estranged or removed from the science classroom. Data analysis will occur when examining existing transcripts of interviews. As this is qualitative data, a method of "coding" will be applied where "a short word or phrase" will be utilized to represent/summarize a larger collection of words or phrases said by the interviewee (Saldana 2015). The code will then be organized in a manner coherent with the researchers so that patterns may be detected in interviewee responses. Researchers are currently in the process of coding, but have started to pick up on a few trends.

Tianxing Wang

Physics, FMP
Mentored by Ivan Schuller

A Literature Review on Vanadium Oxide's Application in Neuromorphic Computing

Neuromorphic chips are computer chips that are inspired by human brains. Unlike traditional computer chips, neuromorphic chips are made of artificial neurons. The input and output signals are trains of "spikes" instead of numerical values. These chips are believed to have high energy-efficiency and can be used for information processing. Notable efforts are made such as the TrueNorth, an FPGA-based neuromorphic chip developed by IBM. However, a hot topic today is to search for alternatives to FPGA platform to achieve even higher energy-efficiency. The idea is that instead of using many transistors to build an artificial neuron, maybe we can mimic the functionalities of those of a biological neuron on the material level. Among many candidates that are actively being studied today, vanadium oxides offer us a simple yet effective platform that shows promising results through its controllable metal-to-insulator (MIT) transition.

Flora Wong

Biochemistry/Chemistry, FMP
Mentored by Willis Li

Heterochromatin Protein 1 and Cell Proliferation

Heterochromatin Protein 1 (HP1) is a chromosomal protein that affects the formation of heterochromatin, a tightly packed and condensed form of DNA that prevents polymerases, transcription factors, and other regulatory proteins from accessing the DNA. We observed from our preliminary data (Fig. 1) that in Drosophila wings, when HP1 was overexpressed, there was reduced cell proliferation and reduced organ size in the posterior wing. In comparison, when HP1 was depleted using RNAi, this led to cell over proliferation and organ enlargement. With our hypothesis that HP1 inhibits cell division, we examine and evaluate previous research findings to explain this observation and propose and design further experiments to test this hypothesis. Cancer cells continue proliferating and cellular division cannot be controlled; therefore, our investigation of how different levels of HP1 can impact cell proliferation can become important knowledge in how we design drugs to treat cancer and prevent the uncontrolled growth of cancer cells from developing into malignant tumors. Current scientific literature suggests that the mechanism by which HP1 inhibits cell proliferation may be through the pathway of the retinoblastoma tumor suppressor protein.

Xingchen(Stars) Xu

Psychology, FMP
Mentored by Georgia Robin Sadler

Measuring Instagram's Delivery of Clinical Trials Information;

Due to the COVID-19 pandemic, using social media platforms has become prevalent and further steps into people's life. Given such a situation, we think we could take a social media-based program developed for a community at large and adapt the program to pertain to the Asian Pacific Islander's (API) community health needs. Therefore, we choose Instagram as one of the social media platforms to measure Instagram's delivery of clinical trials information. We posted six topics that explain the information of clinical trials and monitor the data on Instagram. Based on the data we got from our program that launched over a month, we found that the ability to disseminate clinical trials information on Instagram is based on the number of followers. More followers mean a greater ability to reach out to a large audience. Besides, our findings indicate that there is a limitation of Instagram analytics which it cannot analyze data by gender and mean age. Furthermore, we concluded that Instagram attracts people with higher socioeconomic status, leading to disparities of information dissemination.

Julia Yu

Cognitive Science, FMP
Mentored by Douglas A. Nitz

What, When, and Where: Phase Precession in Different Routes

Spatial cognition consists of understanding the place and time of locations visited by an organism. In order to do this, the brain uses an underlying pattern that helps establish the temporal relationship of spatial locations. This project will analyze how phase precession in the brain changes rates for different lengths of routes run by rats. Phase precession occurs when the CA1 place cell fires in the late phase of each cycle as the rat enters a place field, middle phases when the rat is in the center of a place field, and early phases when the rat is leaving a place field. The rate of this precession depends on the size of the place field, with smaller place fields requiring faster precession, and larger place fields requiring slower precession, as the place cell needs to have fired at all different phases (early, middle, late) to encompass the place field in a single theta cycle. For this project, rats were trained to run paths of different lengths. The reason for having different length paths is to see how phase precession adjusts for the different sizes of the paths; if the rate of phase precession can increase or decrease depending on the size of the place field, it may also be able to do so for different sized paths that contain the same proportions.

Danny Yu

Molecular and Cell Biology, FMP
Mentored by Georgia Robins Sadler

Using TikTok as a Public Health Dissemination Platform: The Analytics

Throughout the past year, the COVID pandemic has disrupted our ability to do in-person activities and outreaching. As we transition virtually, our group decided to utilize social media platforms to disseminate public health information through Facebook, Instagram, and TikTok. Our project is a multimodal demonstration project, and pilot study that aims to be the foundation for more research on the use of social media in disseminating public health information as the literature review on this topic is sparse. Our goal is to reduce the disparities in public health information within underrepresented communities. The main topic our group decided to focus on was clinical trials. While the COVID pandemic has disrupted multiple aspects of our lives, the pandemic brought attention to clinical trials as society followed the development of the COVID-19 vaccine. The poster portrays the numerical aspects of using TikTok as a public health dissemination platform. We analyzed the data collected from TikTok and from surveys comparing the effectiveness of different video characteristics in creating short videos for the TikTok platform. The data is then used to interpret whether TikTok is a useful social media platform in disseminating information to the Asian Pacific Islander community or can be utilized to promote other public health topics.

Ziqi Yu

Molecular and Cell Biology, FMP
Mentored by Pradipta Ghosh

Role of GIV in NOD2/MDP Signaling and in Progression of Crohn's Disease

Crohn's Disease (CD) is a type of Inflammatory Bowel Diseases (IBD) and usually causes inflammation in the gastrointestinal tracts. Nucleotide-binding Oligomerization Domain 2 (NOD2) gene is one of the major CD-associated genes. Variants in the LRR region of NOD2 proteins are more susceptible to Crohn's Disease. Our research group studied the interaction between NOD2 protein and Girdin (GIV) protein, which plays an important role in inhibiting proinflammatory signaling. Our group also proposed the model of how GIV affects NOD2 self- oligomerization, which further leads to downstream signaling and elicits immune response. Moreover, muramyl dipeptide (MDP), a bacterial cell wall peptide, can activate proinflammatory cytokines when interacting with the Leucine Rich Region (LRR) of NOD2. We hypothesized that MDP signaling can affect the interaction between NOD2 and GIV and NOD2 self-oligomerization. Our data showed that C-terminus of GIV interacts with the LRR region of NOD2, simultaneously with MDP. MDP simulation does not affect NOD2-GIV binding in the first few hours, but decreases the binding at 6 hours of stimulation. This is due to the dissociation of GIV from the NOD2 LRR region being a prerequisite for NOD2 self- oligomerization. This project provides us with a better understanding of the role of GIV in NOD2 signaling and offers insights of the structure, functions and conditions for the interaction between NOD2 and GIV.

Yizhi Yuan

Computer Science, FMP
Mentored by Marcelo G Mattar

Algorithm of Your Brain: Hippocampal Replay Patterns Improve Prioritized Experience Replay

Prioritized Experience Replay (PER) is an algorithm to prioritize samples so that the Reinforcement Learning agent can learn efficiently from past experiences. This prioritization is based on the temporal difference error of each individual transition. While PER has proved successful in DeepRL problems, prioritization by temporal difference error can still be improved, as more factors can be taken into account to help the agent sample more relevant and significant experiences. We propose a novel prioritization scheme to prove PER based on a similar mechanism of how the hippocampus in human brains retrieve memory.;

Crystal Zhan

Psychiatry, FMP
Mentored by Mishra Jyoti

Cognitive Correlates of Suicidal Ideation

According to the CDC suicide statistics, about 9.3 million adults, or 4% of the adult US population, had suicidal thoughts in the past year, and there were 41,000 suicides throughout the year. Furthermore, suicidality is a complicated state that involves suicidal ideation, suicide plans, and suicide attempts, alongside the multitude of risk factors that contribute to it, like mental disorders and substance abuse. Currently, there has not been a reliable biological risk marker found, which could be imperative to identifying who is at risk of suicidal behaviors. One approach for this is looking at brain structures and correlate them to suicidality and depression to find potential causation between them.;;;To do this, we used electroencephalograms (EEGs) to record activity in that brain region as the participant plays a series of games specifically made for looking at reward processing. The platform used, Brain Engagement (BrainE), is a platform with a series of eight games that look at selective attention and inhibition (Go Green), distractor processing (Middle Fish), working memory (Lost Star), emotion processing (Face Off), feedback and reward processing (Lucky Door), internal attention (Two Tap), preattentive processing (Lion Cage), and resting state (Rest). We also had the participants answer a series of questions about different factors of their life through a platform called RedCap. Correlates between each game, EEG data, and survey questions will be investigated to find potentially new neurological markers in suicidality.

Alex Zhao

Political Science, McNair
Mentored by Kirk Bansak

The Variation In Stay-At-Home Orders: A Case Study Of COVID-19 Politics In The Navajo Nation And Neighboring States

An understudied subject in political science is Indigenous American governance. This is odd, especially when considering some tribal sovereigns, like the Navajo Nation, have existed since the 1920s. In the presence of COVID-19, indigenous communities have been one of the most adversely affected groups in the United States and few of them have the political capacity to enact public health policy strong enough to protect themselves. Fortunately, there is data available for this study to compare the Navajo Nation's political structure with neighboring states in their approaches toward public health policy. While states continue the flow of federalist power to counties and even more locally through city or town governments, the Navajo Nation exists as a unitary state. Therefore, policies, like stay-at-home orders, are implemented at the reservation level as it lacks effective local governance to engage more precise public health measures. The primary

research question of interest is answering whether Navajo stay-at-home orders are enacted in response to aggregate or regional increases in positive cases of COVID-19. An aggregate approach corresponds with unitary state theories of subnational governance, while a regional approach reflects ideas regarding regionalist political economy. Through logistic regression testing, I argue that the Navajo Nation stay-at-home orders are best explained through a regional political economy framework that is limited by the institutional structure of the tribal sovereign. In doing so, this paper reveals evidence that Navajo Nation stay-at-home orders are less connected with its regions compared to state governments and their counties.;

Tianxing Zhou

Physics, FMP
Mentored by Adam J. Burgasser

Identification and Reduction of the Spectral Data of VLMs and Brown Dwarfs

Brown Dwarfs are substellar objects that have the masses and sizes in between a giant planet and a small star. Unlike a typical star, brown dwarfs have insufficient mass to carry out nuclear fusion but are hot enough to emit infrared radiation. In the current study, we demonstrate the process we take to identify and reduce the data of brown dwarfs. We will mainly be focused on the applications of the SpeX Prism Library Analysis Toolkit(SPLAT). Besides data reduction, we also present our motivation to build the Late-Type(>M5) Extension to MoVeRS(LaTE-MoVeRS) catalog, which is based on the largest proper motion catalog----the Motion Verified Red Star(MoVeRS) catalog.