UC San Diego
UNDERGRADUATE RESEARCH HUB

URC

37th Annual UNDERGRADUATE RESEARCH CONFERENCE

Saturday, April 20, 2024

8am - 4pm

CONFERENCE PROGRAM

Contents

Welcome Message

Welcome to the Annual UC San Diego Undergraduate Research Conference.

For more than 35 years, the Undergraduate Research Hub has provided UC San Diego faculty members an opportunity to recognize students who have conducted outstanding mentored research by nominating them to present at this Conference.

This year, 180 students will present findings from the work their research performed in programs stretching from the 2023 Summer Research Program to this quarter. We have presenters from all major areas of academic inquiry, from a variety of backgrounds, and with unlimited aspirations.

We always warmly acknowledge the support of the students' faculty mentors, post-doctorate, graduate, or other supervisors. This Conference would not exist without the commitment of these advanced scholars.

As always, we are grateful for the support of our Chancellor Pradeep Khosla, Executive Vice Chancellor Elizabeth Simmons, Vice Chancellor of Student Affairs and Campus Life Alysson Satterlund, Assistant Vice Chancellor of Student Retention and Success Maruth Figueroa, Vice Chancellor of Research and Innovation Corinne Peek-Asa, and many more supporters than we can name here.

Thank you for attending and demonstrating support for Undergraduate Research at UC San Diego.

Conference Schedule

8:00 - 8:45 AM	Check-in & Breakfast (Faculty Club)
8:45 – 9:15 AM	Welcome Remarks (Faculty Club)
9:30 – 10:30 AM	Morning Session I (Varies)
10:45 – 11:45 AM	Morning Session II (Varies)
11:50 AM – 12:50 PM	Lunch (Faculty Club)
1:00 – 2:00 PM	Afternoon Session I (Varies)
2:15 – 3:15 PM	Afternoon Session II (Varies)
3:15 PM – 4:00 PM	Photos & Certificates (Faculty Club)

Panel Presentation Schedule

Morning Session I, 9:30 – 10:30 AM

Panel #	Panel Name	Location
1	Immunology	CSB 004
2	Women's Health & Obstetrics	CSB 005
3	Physics	FC - Atkinson Pavilion
4	Education II	FC - Cecil's Lounge
5	Social Media & ChatGPT	FC - Cnf 1-3
6	Causal Reasoning	FC - Cnf 4-5
7	Econ II	FC - Cnf 6
8	Alzheimer's & Neuroinflammation	FC - Seuss Library
9	Chemistry	Peterson 102
10	Neuroscience & Methodology	Peterson 103
11	Diverse Topics in Engineering	Peterson 104
12	University Public Health	Solis 111

Morning Session II, 10:45 – 11:45 AM

Panel #	Panel Name	Location
13	Gene Regulation & Infection Studies	CSB 004
14	Bioengineering & Imaging	CSB 005
15	Developmental Psychology	FC - Atkinson Pavilion
16	Metabolic Disorders & Inflammation	FC - Cecil's Lounge
17	Molecular & Protein Studies	FC - Cnf 1-3
18	Arts & Humanities: Gender	FC - Cnf 4-5
19	Econ I	FC - Cnf 6
20	Public Health	FC - Seuss Library
21	Aerospace Engineering & Astrophysics	Peterson 102
22	Stress & Addiction	Peterson 103
23	Data Science & Mathematics	Peterson 104
24	Acoustics & Vertebrates	Solis 111

Afternoon Session I, 1:00 – 2:00 PM

Panel #	Panel Name	Location
25	Neuroscience & Cell and Developmental Biology	CSB 004
26	Neurobiology	CSB 005
27	Cultural Studies	FC - Atkinson Pavilion
28	Bioengineering & Regeneration	FC - Cecil's Lounge
29	Education I	FC - Cnf 1-3
30	Law	FC - Cnf 4-5
31	Environmental Interactions & Stimuli	FC - Cnf 6
32	Neurodegenerative Diseases	FC - Seuss Library
33	Cognitive Science	Peterson 102
34	Fear Stimuli & Fear Behaviors	Peterson 103
35	Mathematics, Computer Science, & Economics	Peterson 104
36	Climate Change Ecology	Solis 111

Afternoon Session II, 2:15 – 3:15 PM

Panel #	Panel Name	Location
37	Molecular Neurobiology & Neurodevelopment	CSB 004
38	Substances, Cognition, Emotion, & Behavior	CSB 005
39	Film & Literature	FC - Atkinson Pavilion
40	Cancer Biology & Oncology	FC - Cecil's Lounge
41	Political Science	FC - Cnf 1-3
42	Autism & Joint Attention	FC - Cnf 4-5
43	Stem Cell Biology & Regenerative Medicine	FC - Seuss Library
44	Prosocial Behavior & Learning	Peterson 102
45	Psychology & Psychiatry	Peterson 103
46	Robotics Engineering	Peterson 104
47	Microbial Dynamics in Extreme Environments Across Ecosystems	Solis 111

Panel Details

Morning Session I

9:30 AM – 10:30 AM

Panel 01: Immunology

Room: CSB 004
Moderator: Granton Jindal

Belinda Chiu - Biology with a Specialization in Bioinformatics

Mentor: Gerald Morris, Associate Professor

High-throughput testing of T cell alloreactivity at the clonal level

Daniel Gurholt - General Biology

Mentor: Dr. Maripat Corr

Nucleic Acid Sensing Receptors and Sex Differences in a Murine Arthritis Model

Ryan Phan - Mollecular and Cell Biology

Mentor: Professor Dr. Corr

Type I interferon receptors modulate sex differences in murine arthritis

Megha Srivatsa - Molecular and Cell Biology

Mentor: Dr. Sara Gianella Weibel

Impact of Gender Affirming Hormone Therapy on HIV Reservoirs and Inflammation in Transgender Women

Panel 02: Women's Health and Obstetrics

Room: CSB 005
Moderator: Kathleen Fisch

Katya Kazulina - Neurobiology

Mentor: Shiri Gur-Cohen, Ph.D, Assistant Professor

Sexually Dimorphic Niche Organization Dictates Mammary Gland Development

Hannah Manoochehri - General Biology

Mentor: Dr. Marianna Alperin

Effect of Delivery and Lactation on the Pelvic Floor Muscle Stem Cells in the Early Postpartum Period

Yvonne Yu - Molecular and Cell Biology / Public Health with a Concentration in Epidemiology

Mentor: Kathleen Fisch, PhD

Molecular Mechanism of Aspirin Resistance in Pregnancy

Emily Zhang - Bioinformatics

Mentor: Kathleen M. Fisch, Ph.D.

Characterizing the Somatic Mutational Landscape in Placentas with Preeclampsia and Maternal Vascular Malperfusion

Panel 03: Physics

Room: FC - AtknP
Moderator: Andrea Rodriguez-Marin

Chalach Kasemtantikul - Physics

Mentor: Dr. Brian Maple

An Investigation into an Emerging Topological Kondo Insulator UFe4P12.

Farhad Taraporevala - Physics

Mentor: Professor M. Brian Maple

Designing and Implementing an Adiabatic Demagnetization Refrigerator

Nat Terry - Physics

Mentor: Professor Richard Averitt

Terahertz Characterization of Correlated Materials

Panel 04: Education II

Room: FC – Cecil's Lounge
Moderator: Melinda Owens

Patrick Begg - Sociology

Mentor: Professor Michel Estefan

Within the Lines: DEI Impact on the Conception of Whiteness

Lilyan Mendez and Izabella Vasquez – Biochemistry and Cognitive Science & Neuroscience

Mentor: Melinda Owens, Assistant Teaching Professor

Effect of a Chemistry Learning Intervention on Introductory Biology Students' Sense of Belonging in Biology

Robert Nasanbat and Nam Nguyen - Neurobiology and Human Biology

Mentor: Stanley Lo - Teaching Professor

Teaching Towards Justice and Equity: Integrating Sociopolitical Frameworks into STEM and Life Sciences Education

Panel 05: Social Media and ChatGPT

Room: FC – Cnf 1-3
Moderator: Jonathan Parra Santiago

Somalea Hayward - Sociology

Mentor: Professor Kevin Lewis

Negotiating Masculinity and the Female Gaze: Men's Presentation of Self in their Tinder Profiles

Elizabeth Kao - Cognitive Science spec. Machine Learning and Neural Computation

Mentor: Professor Mary ET Boyle

Exploring the Relationship Between Gender Bias and Semantic Sensitivity in ChatGPT's Responses

Sidney Ma - Cognitive Science

Mentor: Sean Trott

Using GPT to Reconstruct Human Response Distributions in Social Science Research

Maya Ordonez - Communication

Mentor: Andrew deWaard

How Does Spotify Make You Feel?

Panel 06: Causal Reasoning

Room: FC – Cnf 4-5
Moderator: Sophia North

Zara Fearns - Psychology / Clinical Psychology

Mentor: Dr. Leslie Carver

Infant sensitivity to causal associations generated by a moving visual object

Alan Lopez - Psychology B.S.

Mentor: Dr. Celeste Pilegard

Using Gestures to Signal a Causal Lesson Structure: Effects on Meaningful Learning

Rob Ethan Santiago - Psychology (B.S.), Philosophy (B.A.)

Mentor: Dr. Adena Schachner

Children's reasoning about how social factors shape where others put possessions

Zhihui Sheng - Psychology

Mentor: Dr. Celeste Pilegard

Investigating Individual Differences in the Effectiveness of Causal Reasoning Diagram Training

Panel 07: Econ II

Room: FC – Cnf 6
Moderator: Julianne Cullen

Ayad Hawa - Mathematics-Economics

Mentor: David Arnold | Assistant Teaching Professor (LPSOE), Co-Director of Instruction

The Impact of Right-to-Work Laws on Labor Productivity

Mia Koga - International Business

Mentor: Dr. Munseob Lee

South Korea's Aging Demographic

Audrey Lopez - Communication

Mentor: Erin Hill, Ph.D

Part of That World: Dispelling the Magic of the Disney College Program and Disney's Working Conditions in the U.S.

Panel 08: Alzheimer's & Neuroinflammation

Room: FC – Seuss Library
Moderator: Omar Mesarwi

Sophia Echeverria - Neurobiology

Mentor: Christina J. Sigurdson, DVM, PhD

Comparison of Aß plaque burden, pTau levels, and glutamatergic receptor levels in frontal cortex of AD patients

Carina Rocha - Neurobiology

Mentor: Stephanie Cherqui, PhD

Role Of Microglia

Sahiti Yenumula - Human Biology

Mentor: Dr. David Vera

Assessing Pineal Gland as a Biomarker for Neuroinflammation through Tilmanocept Labeling following Blast-induced Traumatic Brain Injury

Panel 09: Chemistry

Room: Peterson 102
Moderator: Lucia Cancelada

Marie Joe Franci - Pharmacological Chemistry

Mentor: Anjan Debnath

Pitavastatin and Isavuconazonium Effect on AcMa Cysts

Jason Tuermer-Lee - NanoEngineering & Molecular Synthesis

Mentor: Prof. Darren J. Lipomi

Synthesis of PEDOT:PSS Brushes Grafted from Gold Using ATRP for Increased Electrochemical and Mechanical Stability

Ruby Wen - Chemistry

Mentor: Yitzhak Tor, Distinguished Professor

Unraveling Local Chirality in Nucleic Acids via Fluorescence-Detected Circular Dichroism

Simon Zhang - Chemistry and Biophysics

Mentor: Dr. Andrew Pun (Assistant Professor)

Novel Functionalized Dipyrrolonaphthyridinediones (DPND) for Efficient Triplet-Triplet Annihilation Upconversion

Panel 10: Neuroscience and Methodolgy

Room: Peterson 103
Moderator: Mahsa Pourhamzeh

Maureen Dinata - Neurobiology

Mentor: Kim Dore

Easy and Affordable Way of Labeling Dendrites in Fixed Brain Slices with the Lipophilic Carbocyanine Dye DiI

Veronica Hernandez - Psychology With a Specialization in Clinical Psychology

Mentor: Dr. Emilie Reas

RSI vs. NODDI: A head-to-head comparisons of two diffusion MRI analysis techniques

Sylvia To - Biochemistry

Mentor: Nathan Shaner, Ph.D.

Optimizing a Unique Fluorescent Protein for Recording Biochemical Activity

Tomosuke Yamaguchi - Neurobiology

Mentor: Dr. Matthew Shtrahman

Clinical Applications of Two-Photon Microscopy

Panel 11: Diverse Topics in Engineering

Room: Peterson 104
Moderator: Alberto Avalos

Eesa Khan - Mechanical Engineering

Mentor: Professor Mike Tolley

Shape Sensing for Soft Robots Driven by Ionic Fluid

George Nakoud - Mechanical Engineering with a Specialization in Controls and Robotics

Mentor: Michael T. Tolley (Associate Professor)

Development of a Robust Waterproof Enclosure for Hydraulically-Actuated Underwater Soft Robots

Aatash Pestonjamasp - Computer Engineering

Mentor: Dr. Edward Wang

Postable Spirometry: User-Assembled Vortex Whistle Spirometer

Dominic Tran - Structural Engineering

Mentor: Georgios Tsampras

Preliminary Experimental Research Studies for the Development of a 3D-Printed Friction-Based Force Limiting Connection for Buildings

Panel 12: University Public Health

Room: Solis 111
Moderator: Olivia Sanchez

Shivani Sharma - Human Developmental Sciences

Mentor: Dr. Cheryl Anderson

Diabetes Risk Perceptions for South Asian College Students

Lauren Younk - Social Psychology

Mentor: Dr Matthew J Irwin

Temporary Solutions Don't Fix Permanent Problems: How Affirmative and Enthusiastic Consent Undermine Consent Laws Within Universities

Ding Ding and Elsa Schmidt - Public Health

Mentor: Dr. Rebecca Fielding-Miller, Associate Professor

An analysis of baseline data and the implementation process of the I-SHIP-US study: Understanding self-compassion disparities among UCSD undergraduate students

Morning Session II

10:45 AM – 11:45 AM

Panel 13: Gene Regulation and Infection Studies

Room: CSB 004
Moderator: Granton Jindal

Allison Ea - Microbiology

Mentor: Hiutung Chu, PhD

Bacteroides fragilis adaptation to oxygen during inflammation and infections

Kyra Fetter - Bioengineering: Bioinformatics

Mentor: Dr. Ferhat Ay

Loop Catalog: a comprehensive database of uniformly processed human and mouse HiChIP datasets curated from the literature

Omar Halawa - Biology with a Spec. in Bioinformatics

Mentor: Jill P. Mesirov, Ph.D.

Network-enhanced Gene Set Refinement: A data-driven approach to improving gene sets for enrichment analysis

Millie You - General Biology

Mentor: Joseph Pogliano

Characterization of Novel Jumbo Bacteriophage WinchesterEllie

Panel 14: Bioengineering and Imaging

Room: CSB 005
Moderator: Kathleen Fisch

Kameron Gano - Computer Engineering

Mentor: Dr. Gert Cauwenberghs & Dr. Margot Wagner

EigenMarkov Diffusion: Stochastic Spectral Markov Diffusion using Random Walk Eigenmode Decomposition

Daniel Nguyen - Biology w/ spec. Bioinformatics

Mentor: Nathan Shaner, Associate Adjunct Professor

Engineering bioluminescent calcium indicators for imaging neurons

Sirasit Prayotamornkul - Bioengineering

Mentor: Dr. Lingyan Shi

Subcellular Imaging of Lipid Metabolic Dynamics Reveals the Anti-Aging Effects of Metformin

Simona Wu - Bioengineering - bioinformatics

Mentor: Dr. Lingyan Shi

Neural Network Based Automatic hyperspectral metabolic imaging Analysis for Studying Aging and Diseases

Panel 15: Developmental Psychology

Room: FC - AtknP
Moderator: Celeste Pilegard

Kaye Han - Psychology and Cognitive Science

Mentor: Dr. Adena Schachner

Dance begins early in infancy, even in a representative sample of U.S. infants

Kaitlin Lee - Cognitive Science — Specialization in Language and Culture

Mentor: Dr. Sarah Creel

Children's Perceptions of Gender Ambiguity in Voices

Emma Tai - Clinical Psychology

Mentor: Adena Schachner

Children's reasoning about the reality of Augmented Reality content

Vicky Zhao - Clinical Psychology

Mentor: Professor Gail Heyman

Young Children's Lie Detection: Considerations of Base Rates and Ulterior Motives

Panel 16: Metabolic Disorders & Inflammation

Room: FC – Cecil's Lounge
Moderator: Partha Ray

Varsha Beldona - Molecular and Cell Biology

Mentor: Dr. Wei Ying, Associate Professor

A crosstalk between macrophages and adipocyte precursors that contributes to a healthy adipose tissue expansion

Elizabeth Barsegyan, Tamar Khaled, and Yuxin Wu - Psychology, Biochemistry, and Molecular Cell Biology

Mentor: Dr. Omar Mesarwi

Time Restricted Eating in Sleep Apnea (TERESA) Trials

Panel 17: Molecular and Protein Studies

Room: FC – Cnf 1-3
Moderator: Jonathan Parra Santiago

Blake Estefan - Bioengineering

Mentor: Karsten Zengler, Professor (PhD)

Next-generation Genome-scale Model of the Pathogenic Bacterium Staphylococcus aureus

Emily Pan - Bioengineering: Biotechnology

Mentor: Dr. Prashant Mali

BioID Approach to Study the Protein Interactome in the ADAR Protein

Sela Peters - molecular and cell biology

Mentor: Dr. Joseph Pogliano

Selecting phage with protein defecting in nuclear trafficking using cas13

Sahana Rangarajan - bioinformatics

Mentor: Dr. Joseph Pogliano

Role of gp173 in Early Jumbo Phage Infection

Panel 18: Arts and Humanities: Gender

Room: FC – Cnf 4-5
Moderator: Carl Schmitz

Adella Anggraeni - Communication

Mentor: Dr. Boatema Boateng

Battling Biopolitics, Racialization, and Pariah Femininity: An Intersectional Reading of the 'Female Titan' in Hajime Isayama's Attack on Titan

Navíl Martínez - Visual Arts Media

Mentor: Dino Dinco, Professor and Mentor

El Topito

Casey Toy - Visual arts-Media

Mentor: Dino Dinco

Rising

Panel 19: Econ I

Room: FC – Cnf 6
Moderator: Beatrice Allamand

Oren Ciolli - Data Science and Math-Economics

Mentor: Professor Julie Berry Cullen

A Tale of Two Cities: The Effects of Upzoning on Local Rent

Lu Tong - Economics/ Critical Gender Studies

Mentor: Julie Cullen, PhD

Assessing Wage Disparities: A Comparative Analysis of H1B Workers and U.S. Citizens in the Trump Era and COVID-19 Pandemic

Benjamin Wagar - International Studies - International Business

Mentor: Professor Munseob Lee

Effects of Adult Education and Training on Korean Wages

Panel 20: Public Health

Room: FC – Seuss Library
Moderator: Elaine Tanaka

Zaira Leal - Biological Anthropology

Mentor: Amy L. Non

Did preterm birth rates shift by nativity among Hispanic women in the United States during the COVID-19 pandemic?

Annette Lee - Global Health

Mentor: Dr. Amy Non

Missed Indicators, Overmedicalization, or Other Perspectives Explaining Reduction in PTB rates during early COVID-19, A Mixed Methods Study

Bella Pipke - Communication

Mentor: Caroline Jack, PhD

Growing Pains: Navigating Eating Disorder Content in Digital Girlhood Spaces

Daisy West - Public Health

Mentor: Dr. Fielding-Miller

Stories of Care: Community-engaged action research to address caregiver burn-out in socially vulnerable communities

Panel 21: Aerospace Engineering & Astrophysics

Room: Peterson 102
Moderator: Brooklyn Asai

Seven Dunn - Physics, with Specialization in Astrophysics

Mentor: Dr. Karin Sandstrom

GBT Search for High Latitude "CO-Dark" Molecular Gas

Jason Liu - Physics with Specialization in Astrophysics

Mentor: Karin Sandstrom, Associate Professor

Ionization of Polycyclic Aromatic Hydrocarbons around H? regions in the nearby galaxy M33

Esther Park - Physics

Mentor: Karin Sandstrom, Professor and Researcher

The Relationship between Star Formation Rate and Stellar Mass Resolved with Nearby Galaxies

Binyamin Stivi - Aerospace Engineering

Mentor: Assistant Professor Aaron Rosengren

Long-Term Orbital Predictions of Cislunar Satellites Using Ephemeris-Quality N-Body Codes

Panel 22: Stress and Addiction

Room: Peterson 103
Moderator: Sharon Nichols

Mustafa Ali - History

Mentor: Dr. Eric Zorrilla

Effects of PDE10A Inhibitor AMG 579 on Alcohol Self Administration on Post Dependent Rats

Dylan Fernandez - Neurobiolgy

Mentor: Dr. Eric Zorilla

The Role Infralimbic Kappa Opioid Receptors Play in stress-induced ethanol reinstatement

Julie Qian - Cell and Molecular Biology

Mentor: Olivier George

Cocaine Activated CeA CRF Neurons in Modulating Cocaine Response and Cocaine Self-Administration

Linda Lou and Allyson Nguyen - Cognitive Science and General Biology

Mentor: Eric Zorrilla, PhD, Adjunct/Neurosciences

TRAPping Ensembles for Predator Stress

Allyson Nguyen - General Biology

Mentor: Dr. Eric Zorrilla

TRAPping Ensembles for Predator Stress

Panel 23: Data Science and Mathematics

Room: Peterson 104
Moderator: Divya Seshadri Murali

Adi Krishnamoorthy – Mathematics - Computer Science

Mentor: Paul Siegel

Coding Theory for DNA Storage: Synthesis, Retention, and Reconstruction

Yongce Li - Data Science and Math

Mentor: Dr. Lily Weng

SNIP: Machine Unlearning via Selective Neuron-wise Interpretable Pruning

Hou Wan - Data Science

Mentor: Lily Weng

CLIP Dissect Automatic Evaluation

Lucy Zhang - Mathematics

Mentor: Professor Jiawang Nie

Polynomial Optimization over Unions of Sets

Panel 24: Acoustics & Vertebrates

Room: Solis 111
Moderator: Vikram Shende

Kaya Cohen - Ecology, Behavior, and Evolutionary Sciences

Mentor: Dr. Simone Baumann-Pickering, PhD

A dive into blue whale acoustic behavior in Southern California from 2007 to 2020

Angeles Rios - Marine Biology

Mentor: Dr. Simone Baumann-Pickering

Exploring Baird's beaked whale presence in the North Pacific through long-term passive acoustic monitoring

Lucas Kuhnau, Alina Siddiqui, and Marissa Todesco - Cognitive and Behavioral Neuroscience, Neurobiology, & Cognitive and Behavioral Neuroscience

Mentor: Timothy Gentner, Professor

The Neuroscience of Vocal Flexibility: Exploring The Relationship Between Auditory-Motor Neuronal Dynamics During Song in the European Starling

Afternoon Session I

1:00 PM – 2:00 PM

Panel 25: Neuroscience & Cell and Developmental Biology

Room: CSB 004
Moderator: Barbara Calabrese

Tyler Diep - Human Biology

Mentor: Binhai Zheng

Assessing the impact of DLK/LZK deletion in injured corticospinal motor neurons

Shanti Reed - Cognitive & Behavioral Neuroscience

Mentor: Dr. Julian I. Schroeder

Stomatal Analysis of a CO2 Sensing Protein Phosphatase in Arabidopsis

Pansée ElGhayati and David Melendez-Perdomo - Cognitive and Behavioral Neuroscience & Biochemistry

Mentor: Dr. Lisa Stowers

Investigating the Interplay Between the Vomeronasal Organ and Main Olfactory Epithelium in Mice

Panel 26: Neurobiology

Room: CSB 005
Moderator: Fatima Abdelmajid

Ibrahim Khan - General Biology

Mentor: Kenta Asahina, PhD

Using a Two-Choice Assay to Investigate Yeast Preference in Hugin-Mutant Drosophila

Jerick Kim - Neurobiology

Mentor: Nathan Shaner, PhD

Directed evolution of novel genetically encoded pH indicators to sense acid secretion

David Ngan - Neurobiology

Mentor: Matthew Lovett-Barron, Assistant Professor

Timescale of odor-driven persistent internal states in zebrafish

Shishir Ravipati - Neurobiology

Mentor: Dr. Shelley Halpain

Characterization of ER F-actin in the somatodendritic compartment of hippocampal neurons

Panel 27: Cultural Studies

Room: FC - AtknP
Moderator: Boatema Boateng

Andjela Gushiken - Political Science (Int'l Relations) & Communication

Mentor: Elana Zilberg

Hawai'i: Cultural Rejuvination and Expanded Autonomies

Kieli Leon - Speculative Design

Mentor: Professor Christena Turner

The Mischaracterization of the Gyaru: Subculture as a Form of Social Protest in Japan

Luolan Zhao - Japanese Studies

Mentor: Christena Turner

When Japanese Cuisine Becomes World Heritage: Washoku as Social Practice and Branding of Japan

Panel 28: Bioengineering and Regeneration

Room: FC – Cecil's Lounge
Moderator: Partha Ray

Mary Li - Bioengineering: biotechnology

Mentor: Lingyan Shi, Assistant Professor

Fasting Induced Lipid Metabolic Changes in Drosophila Intestines During Aging

Angela Liu - Bioengineering

Mentor: Robert Sah, MD, ScD

Biaxial Tensile Testing Apparatus for Small Soft Tissue Samples

Veda Palaparty - General Biology

Mentor: Dr. Karl Wahlin, Associate Professor

Developing an Approach for Adeno-Associated Viral Vector Mediated Cellular Reprogramming

Nayana Tellakula - General Biology

Mentor: Dr. William B. Kristan, Distinguished Professor Emeritus

Planarian Amputation and Regeneration Modify Behavioral Responses

Panel 29: Education I

Room: FC – Cnf 1-3
Moderator: Gail Heyman

Arlene Grace Nagtalon - Molecular & Cell Biology + Community Research, Education, and Well-Being (C.R.E.W. - Individual Major)

Mentor: Dr. Angela Booker

Unity - A Board Game: A Study in Gamified Changemaking

Saisha Nandamuri - Cognitive Science

Mentor: Victoria Ojeda, PhD, MPH

Service Learning for Medical Students in Laser Medicine

Kyle Kan and Kimberly Pham - Math/Econ

Mentor: Professor Melissa Famulari (Teaching Professor (SLSOE), VC of Undergraduate Studies)

High School Social Capital and College Applications: The Case of California

Panel 30: Law

Room: FC Cnf 4-5
Moderator: Jody Blanco

Rishi Antoo - History

Mentor: Professor Kwai Ng

First Amendment Speech in the Digital Age

Jingyi Chen - Political Science - Data Analytics

Mentor: Weijing Lu, PhD

Domestic Abuse and Women's Legal Consciousness: Cases From Magazines and Newspapers During the 1930s in China

Rachel McChesney - Political Science

Mentor: Karen Ferree, PhD

Wrongful Arrest Theory: Justice For Individuals With Diabetes In Criminal Law Procedure

Riley Torgerson - Communication

Mentor: Akosua Boateng

Youth Mental Health Outcomes of Gender Confirmation Surgery Legislation

Panel 31: Environmental Interactions & Stimuli

Room: FC – Cnf 6
Moderator: Qianqian Tao

Yige Gong - Biology-bioinformatics

Mentor: Karsten Zengler

Ecological Niche Characterization of a Bacillus Isolate through Metabolic and Gene Expression Analysis

Gabriela Marcial - Environmental Systems: Ecology, Behavior, Evolution

Mentor: Dr. Julian Shroeder

Plant stress hormone signal transduction

Rachel Survilas - Marine Biology

Mentor: Dr. Lisa Levin

Characterizing faunal methane dependence on the Southern California continental margin

Panel 32: Neurodegenerative Diseases

Room: FC – Seuss Library
Moderator: Darren Casteel

Monica Jensen - Neurobiology

Mentor: Dr. Nicola J. Allen, Principal Investigator

MoleculeX reduces amyloid burden and improves hippocampal dependent spatial learning in the APP/PS1 model of Alzheimer's Disease

Haritha Karthikeyan - General Biology

Mentor: Kim Dore, Assistant Professor

Investigating a Mutation in the Depalmitoylating Enzyme ABHD17a that is Protective Against Alzheimer’s disease

Celeste Morales - Molecular and Cell Biology

Mentor: Dr. Kim Dore

Inhibiting PSD-95 Depalmitoylation as a Potential Approach to Promote Synaptic Resilience Against Alzheimer's Disease

Joseph Romero - Neurobiology

Mentor: Dr. Nicola Allen

Lipid metabolic dysregulation in patient-derived Alzheimer's disease astrocytes

Panel 33: Cognitive Science

Room: Peterson 102
Moderator: Sharon Nichols

Antara Sengupta - Cognitive Science w/ Specialization in Machine Learning

Mentor: Dr. Andrea Chiba

LIGHT Hypnotherapy Treatment for Physician Burnout Alleviation

Emily Xu - Cognitive Science, Linguistics

Mentor: Dr. Douglas A Nitz

CA1 and subiculum object-centered encoding of self-location in landmark-based navigation

Trinity Gao, Lucy Wang, and Keyi Yu - Cognitive Science with Specialization in Neuroscience, Human Biology & Cognitive Science, and Cognitive Science & Behavioral Neuroscience

Mentor: Lara Rangel, Assistant Professor

The temporal relationship between hippocampal oscillations in dentate gyrus during learning and recall

Panel 34: Fear Stimuli and Fear Behaviors

Room: Peterson 103
Moderator: Ece Bayram

Izzie Cohen - Neurobiology

Mentor: Matthew Lovett-Barron

Temporal dynamics of internal state habituation

Sarah Flores - Bioengineering: Bioinformatics

Mentor: Dr. Kay Tye

Investigating the Role of Shared Trauma on Fear-Related Behavior

Linisa Williams - Clinical Psychology

Mentor: Victoria Risbrough

Neural Markers Associated With The Effect of Working Memory Training on Fear Extinction

Panel 35: Mathematics, Computer Science, and Economics

Room: Peterson 104
Moderator: Divya Seshadri Murali

Connie Chang - Math-Computer Science and Cognitive Science (Machine Learning and Neural Computation)

Mentor: Assistant Professor Michael Davidson

Geodata: Empowering Renewable Energy Exploration in China with Python Geospatial Analysis

Annabelle Min - Math-Comptuer Science

Mentor: Michael Davidson, Assistant Professor

A plan for just renewable energy transition in India with geospatial analysis

Srivatsava Missula - Math-Economics

Mentor: Dr. Julianne Cullen

Determinants of Differential Growth Paths in India

Affaan Mustafa - Math - Computer Science + Business Economics

Mentor: Dr. Anya Samek, Associate Professor of Economics and Strategy

Discovering Market Manipulation Through Social Media Sentiment Analysis in Microcap Cryptocurrencies

Panel 36: Climate Change Ecology

Room: Solis 111
Moderator: Vikram Shende

Ananya Giri - Ecology, Behavior, and Evolution

Mentor: Dr Jonathan Shurin

Does local adaptation alter microbiome response to environmental warming?

Isabelle Jeuris - Marine Biology

Mentor: Dr. Simone Baumann-Pickering

Blue, fin, and humpback whale spatio-temporal presence in the Southern California Bight during the 2014-2015 marine heatwave

Fnu Kalkin - Computer Engineering, Mathematics

Mentor: Dr Sarah T. Gille

Predicting Argo Float Trajectories with a Neural Network to Improve Sampling Efficiency

Troy Weldon - Ecology, Behavior, and Evolution

Mentor: Dr. Jonathan Shurin

Integrating DNA Metabarcoding and Conventional Biomonitoring Techniques to Unravel the Impacts of Climate Change on Zooplankton Communities in the Sierra Nevadas

Afternoon Session II

2:15 PM – 3:15 PM

Panel 37: Molecular Neurobiology & Neurodevelopment

Room: CSB 004
Moderator: Barbara Calabrese

Amoolya Chandrabhatta - Molecular and Cell Biology

Mentor: Maria Carolina Marchetto, Assistant Professor

Human Stem Cell Model for AUTS2 Syndrome: Implications for Neurodevelopment

Samuel Kahn - General Biology

Mentor: Dr. Diana Hargreaves

Evaluating Perineuronal Net Maturity in the Auditory Cortex of Fragile X Syndrome Mice with Suppression of Astrocyte Signaling

Melia Movsesian - Human Biology

Mentor: Nicola Allen, PhD

Characterization of astrocyte proteins alterations in Alzheimer's disease mouse models

Laura Noronha - Human Biology

Mentor: Dr. Nicola J. Allen

Dysregulated Cholesterol Metabolism in Alzheimer’s Disease Astrocytes

Panel 38: Substances, Cognition, Emotion, & Behavior

Room: CSB 005
Moderator: Fatima Abdelmajid

Sarah Hasheem - Clinical Psychology

Mentor: Sharon L. Nichols, Ph.D.

Exploring the Influence of Childhood Adversity and Cannabis Use on Cognitive Flexibility in Individuals with Behaviorally Acquired HIV

Neal Jha - Biochemistry

Mentor: Jared W. Young, Ph.D.

Acute nicotine vapor normalizes sensorimotor gating and locomotor activity deficits in a rat model of HIV-associated neurocognitive impairment

Brett Johnson - Cognitive and Behavioral Neuroscience

Mentor: Christina Gremel, PhD

Recruitment of Endocannabinoids During Goal-Directed Behavior in Alcohol Exposed Mice

Manuel Vasconcelos - Cognitive and Behavioral Neuroscience

Mentor: Dr. Kay Tye

Assessing the pharmacobehavioral space of psychoactive substances

Panel 39: Film & Literature

Room: FC - AtknP
Moderator: Alain J.-J Cohen

Hannah Drake - Ethnic Studies & History

Mentor: John D. Blanco, Associate Professor

Depictions of Philippine Monstrosity in Literature and Film

Serena Spada - Business Psychology

Mentor: Gail Heyman

Exploring Preferences Between Overcoming and Removing Obstacles in Children's Stories

Isabelle Stad - Business Economics

Mentor: Alain JJ Cohen

Hiroshima Mon Amour, Freud's Dream Theory in Flashbacks

Kleo Zhou - Philosophy and Visual Art Studio

Mentor: Dr. Alain J.-J. Cohen

Discipline and Resist

Panel 40: Cancer Biology & Oncology

Room: FC – Cecil's Lounge
Moderator: Partha Ray

Pranava Gande - Mathematics

Mentor: Associate Professor

The microbiome in castration-resistant prostate cancer

Cindy Zhong - Human Biology

Mentor: Jean Y J Wang, Ph.D

Regulation of CHK1 Expression by Replication Stress

Annie Do and Megan Ngo - Human Biology and Biology

Mentor: Dr. Weg M. Ongkeko, MD, PhD

tRNA-Derived Fragments as Post-Transcriptional Regulators of Oncogenes and Tumor Suppressor Genes in Papillary Thyroid Carcinoma

Panel 41: Political Science

Room: FC – Cnf 1-3
Moderator: Fan Fu

Jacky Liang - Political Science: International Relations

Mentor: David A. Lake, Distinguished Professor

Why Do Populist Republicans Oppose Supporting Ukraine?

Aleksandra Ristova-Sanyal - Political Science / International Relations

Mentor: Philip Roeder, PhD

Deferred Gratification: Evaluating the Impact of EU Accession Delay on North Macedonian Support

Anita Sun - Sociology

Mentor: Dr. Kevin Lewis, Faculty

Telling Right From Wrong: Exiting the Alt-Right Pipeline

Chen Zhang - Sociology & Political Science

Mentor: Professor Dr. Christena Turner

Examining the Surge in Undocumented Chinese Immigrants at the United States' Southern Border

Panel 42: Autism and Joint Attention

Room: FC – Cnf 4-5
Moderator: Leslie Carver

Angela Liu - Cognitive Behavioral Neuroscience

Mentor: Gedeon Deák, PhD

Investigating the effect of using infant's name, object name, and attention language on the success of a joint attention episode between caregivers and infants.

Cameron Manard - Psychology with a Specialization in Social Psychology

Mentor: Dr. Leslie J. Carver

Reward Anticipation to Social and Nonsocial Dynamic Stimuli in Preschool-Age Children With and Without Autism Spectrum Disorders

Nicola Schmelzer - Psychology

Mentor: Dr. Leslie Carver

Joint attention cues for social encoding in infants with a familial history of autism

Panel 43: Stem Cell Biology and Regenerative Medicine

Room: FC – Seuss Library
Moderator: Darren Casteel

Sophia Jaberi Vivar - General Biology

Mentor: Dr. Shiri Gur-Cohen

Unveiling the Role of the Lymphatic Niche in Guiding Stem Cell Fate Decisions During Tissue Regeneration

Lee Le - Neurobiology

Mentor: Dr. Karl Wahlin

Muller Cell Reprogramming for Retinal Regeneration Research

Avel Mandap - General Biology

Mentor: Dr. Karl Wahlin

Human retinal photoreceptor cell neurons produced by transcription factor mediated reprogramming

Ian McNellis - Biology with specialization in Bioinformatics

Mentor: Heidi Cook-Andersen, MD, PhD

Mechanisms Driving the Primed-To-Naive Transition in Human Embryonic Stem Cells

Panel 44: Prosocial Behavior & Learning

Room: Peterson 102
Moderator: Ece Bayram

Jacquelyn Garabedian - Cognitive Behavioral Neuroscience and Clinical Psychology

Mentor: Andrea Chiba, Principal Investigator

Neediness, co-distress, and helping behavior in rats

Annie Tang - Cognitive Psychology

Mentor: Dr. Celeste Pilegard

Understanding expertise and spatial contiguity in multimedia learning through eye movements

Clara Yi - Cognitive Science

Mentor: Kay Tye, PhD

Neuromodulated mixture of experts: A prefrontal cortex inspired architecture for lifelong learning

Panel 45: Psychology & Psychiatry

Room: Peterson 103
Moderator: Debra Lindsay

Christian Cortes - Clinical Psychology

Mentor: Dr. Victoria Risbrough

Post-deployment PTSD Symptoms Predict the Development of Attentional Deficits 10 Years Later

Amber Jiang - Psychology, Cognitive Science

Mentor: Victor Ferreira

Reaching for the unknown: sentence production under uncertainty

Sara Northup - Psychology with a specialization in clinical psychology

Mentor: Dr. Jessica Bomyea

Comparing Brain Volume and Cortical Thickness in Individuals with PTSD only and PTSD with Comorbid Major Depressive Disorder

Tianyu Wang - Psychology

Mentor: Christina Gremel, Associate Professor

Dopamine Modulation of Hunger State in Orbital Frontal Cortex-Dorsal Medial Striatum

Panel 46: Robotics Engineering

Room: Peterson 104
Moderator: Louis Lin

Emily Huang - Mechanical Engineering

Mentor: Michael Tolley

Volumetric Control System for Fluidic Soft Robots

Judy Mohamad - Mechanical Engineering

Mentor: Dr. Sylvia Herbert

Drone Obstacle Avoidance using Control Barrier Value Functions

Jeffrey Chen and Girish Krishnan - Mechanical Engineering and Electrical Engineering

Mentor: Nikolay A. Atanasov

Python Robotics: Developing a Learning and Testing Platform for Robot Navigation

Panel 47: Microbial Dynamics in Extreme Environments Across Ecosystems

Room: Solis 111
Moderator: Vikram Shende

Saloni Dangre - Molecular and Cell Biology

Mentor: Dr. Douglas Bartlett

Isolating Anaerobic, Extremophilic Microbes from Western Australia Transient Lakes

Kendra Lee - Marine Biology

Mentor: Lisa Levin, Emeritus

The characterization of macroinvertebrate communities inhabiting hard substrates at southern California methane seeps

Juliana Loaiza - Environmental Systems, EBE

Mentor: Dr. Lisa Levin

Methane Seep Depth and Benthic Invertebrates

Abstracts

Mustafa Ali

History, ERC

Mentored By Dr. Eric Zorrilla

Effects of PDE10A Inhibitor AMG 579 on Alcohol Self Administration on Post Dependent Rats

Due to proprietary information this abstract has been redacted.

Adella Anggraeni

Communication, Marshall

Mentored By Dr. Boatema Boateng

Battling Biopolitics, Racialization, and Pariah Femininity: An Intersectional Reading of the 'Female Titan' in Hajime Isayama's Attack on Titan

This project examines how Attack on Titan manga (Japanese comics) delves into complex contemporary social issues through the characterization of Annie Leonhart, the 'Female Titan'. As one of the main female characters, Annie is situated at the intersection of her nationality, ethnicity, gender, and class, which constrains her bodily autonomy and human agency, thus shaping her political experience within the narrative. s one of the main female characters, Annie is situated at the intersection of her nationality, ethnicity, gender, and class, which constrains her bodily autonomy and human agency, thus shaping her political experience within the narrative. Although there have been studies on the underlying sociopolitical themes and gender representation in shounen manga/anime, it is rarely explored through an interdisciplinary framework that examine the complexity of one’s experience in relation to power structure. I argue that Attack on Titan, through the characterization of Annie Leonhart, demonstrates the interlocking system of multiple social identities that shapes Annie’s unique experience with discrimination and her journey to self-discovery. This project uses textual analysis that draws on Michel Foucault’s biopolitics, Kimberlé Crenshaw’s concept of intersectionality, Mimi Schippers’ pariah femininity, and Omi and Winant’s racial formation theory. By using

this interdisciplinary framework in reading Attack on Titan manga/anime, I demonstrate that Annie Leonhart's character represents the human struggle for agency, hope, and courage in the face of oppressive systems and in the brink of humanity's doom posed by Titans.

Rishi Antoo

History, ERC

Mentored By Professor Kwai Ng

First Amendment Speech in the Digital Age

This paper seeks to review the two cases Moody v. Netchoice, LLC (2021) and Netchoice, LLC v. Paxton (2022) in the context of evolving definitions of “protected speech” under the First Amendment. The Supreme Court has long stressed that “[e]ach medium of expression must be assessed for First Amendment purposes by standards suited to it, for each may present its own problems." Southeastern Promotions, Ltd. v. Conrad, (1975). Furthermore, it is also understood that private corporations are entities with protected First Amendment rights. As it applies to platforms like TikTok, Instagram, and Twitter, the First Amendment requires a close reinterpretation for our digital age. My paper will be split into three parts: 1) Giving a description of how First Amendment “protected speech” has evolved through case precedent. This is key to understanding its relevance to the NetChoice cases. (2) Summarizing the NetChoice cases, explaining the opinions, and describing the differing levels of First Amendment scrutiny applied in both. (3) Resolving the disagreement between the Fifth and Eleventh United States Courts of Appeals by discussing a likely First Amendment definition the Supreme Court will reach in NetChoice. The final section will conclude by discussing the relevance of these cases and the Supreme Court’s future decision.

Elizabeth Barsegyan

Psychology, Warren

Mentored By Dr. Omar Mesarwi

Time Restricted Eating in Sleep Apnea (TERESA) Trials

Obstructive sleep apnea (OSA) is a highly prevalent respiratory disorder characterized by partial or complete collapse of the airway during sleep, resulting in reduced oxygen levels and poor sleep quality. OSA is associated with a variety of metabolic disorders including impaired fasting glucose, insulin resistance, type 2 diabetes mellitus, hypertension, atherosclerosis, and dyslipidemia. The first-line treatment for OSA is nasal continuous positive airway pressure (CPAP), which, though highly effective in treating OSA, has not been shown to improve metabolic health in OSA. Time restricted eating (TRE), whereby the daily window for caloric intake is modestly reduced, improves body weight and glucose homeostasis in humans, and also is shown to improve glucose and lipid metabolism in rodents. Preclinical data from the Mesarwi lab have shown that TRE can improve fasting glucose and glucose tolerance in a mouse model of OSA, through improvements in pancreatic beta cell function. These effects appear to be more profound in an OSA model than in normal rodents. However, the effects of TRE in human subjects with OSA have not been demonstrated. In this presentation, we discuss the rationale and design of an ongoing clinical trial, in which patients with moderate to severe OSA are randomized to TRE or standard eating, with outcomes including several important metabolic health parameters (serum glycated hemoglobin, lipids, blood pressure, and glucose levels measured by continuous glucose monitor). We hypothesize that TRE will improve each of these parameters, and that no significant change will be observed in patients randomized to standard eating.

Patrick Begg

Sociology, Muir

Mentored By Professor Michel Estefan

Within the Lines: DEI Impact on the Conception of Whiteness

Conception of race and racial identity have undergone dramatic shifts over the course of history, with various social boundaries creating definitions for each racial and ethnic identity. History has shown various attempts at enforcing inequalities, which have

become a focal point in discussion of required DEI courses to address the ignorance of racial inequality. Whiteness has been a larger point of contention, causing incongruent salience, voting patterns, and various levels of ignorance on concepts such as white privilege. With increasing conversations regarding race, we have seen a shifting understanding of what race is and the boundaries that define racial identities, including whiteness. Using qualitative interviews, I seek to understand how DEI courses are affecting the conception of whiteness from the perspective of white and bi-racial white students. Using theories such as ethnoracialization, dominant ethnic group theory, and theory of racial ignorance, I posit that DEI course have decreased racial ignorance focusing more on aspects of white privilege. Boundaries as a result has shifted to incorporate those that may be considered racially ambiguous as being white due to their potential for receiving white privilege. This establishes a view that may undermine racial diversity in social contexts because they consider people with "adjacent privilege" as white.

Varsha Beldona

Molecular and Cell Biology, ERC

Mentored By Dr. Wei Ying, Associate Professor

A crosstalk between macrophages and adipocyte precursors that contributes to a healthy adipose tissue expansion

Obesity is a critical risk factor for metabolic diseases such as insulin resistance and type 2 diabetes mellitus. During obesity, excess energy is stored in adipocytes, causing white adipose tissue (WAT) expansion that can occur through hypertrophy and hyperplasia. The mechanism by which the WAT expands is a critical determinant of insulin resistance. Hypertrophy is considered an unhealthy method of WAT expansion, associated with inflammation and insulin resistance. While hyperplasia leads to more numerous and smaller adipocytes due to adipogenesis and lower levels of tissue inflammation and fibrosis. Thus, the proportion between hypertrophic expansion and hyperplasia is essential for metabolic health. This suggests that hyperplasia stimulation could promote healthy WAT expansion, protecting against obesity-associated comorbidities, including insulin resistance. In this study, we explored the crosstalk between two cell types that might be involved in hyperplasia: adipocyte precursor cells (APCs) and adipose tissue macrophages (ATMs). It is known that the ability of APCs to undergo adipogenesis is essential for hyperplasia and our group has shown that miR-690 is enriched in anti-inflammatory macrophages and can act as an insulin-sensitizer and anti-

inflammatory molecule through a mechanism involving NAD+ metabolism. We, using both in vitro and in vivo studies, found that miR-690 influenced adipose tissue expansion by its effects on APC maintenance. Our results showed that miR-690 secretion by ATMs is critical for adipogenesis in APCs, allowing a healthy WAT expansion and metabolic improvement due to miR-690 actions on NAD+ metabolism. With that, this study will help create a new therapeutic approach to obesity and its metabolic complications, highlighting a yet not described crosstalk between ATMs and APCs and the effect of miR-690 on promoting a healthier adipose tissue expansion.

Amoolya Chandrabhatta

Molecular and Cell Biology, Warren

Mentored By Maria Carolina Marchetto, Assistant Professor

Human Stem Cell Model for AUTS2 Syndrome: Implications for Neurodevelopment

The AUTS2 gene is implicated in a variety of neurodevelopmental disorders, including autism spectrum disorder, intellectual disability disorder, and dyslexia. While the mechanisms are still being elucidated, previous studies have shown that AUTS2 plays a role in neurodevelopment. The purpose of the experiment was to determine how gene edits to the AUTS2 gene in human neural progenitor cells could lead to differences in protein expression. Using CRISPR-Cas9, two different gRNAs were used to target two different areas of the gene (exon 9 and exon 12). Western blot analysis was employed to quantitatively assess the influence of targeting different exons of the AUTS2 gene and protein expression levels. To examine the effects of gene editing, the edited cells were compared to three different control cell lines on the Western blot to determine differences in AUTS2 expression across samples, showing a knockdown in AUTS2 expression.

Connie Chang

Math-Computer Science and Cognitive Science (Machine Learning and Neural Computation), ERC

Mentored By Assistant Professor Michael Davidson

Geodata: Empowering Renewable Energy Exploration in China with Python Geospatial Analysis

China's ambitious renewable energy targets demand accurate regional planning. Leveraging geodata, a Python library tailored for advanced geospatial analysis, this study aims to streamline the process by creating standardized capacity factor profiles for China provinces. By integrating diverse datasets covering solar power, wind speed, and topographical features, our approach offers a comprehensive insight into the renewable energy potential across regions. This study underscores geodata's role in advancing sustainable development through efficient regional planning.

Jeffrey Chen

Mechanical Engineering, ERC

Mentored By Nikolay A. Atanasov

Python Robotics: Developing a Learning and Testing Platform for Robot Navigation

The complexity of robot navigation poses a significant learning curve for newcomers in robotics. This project aims to bridge the knowledge gap by developing an interactive online platform that demonstrates robotics algorithms to those who are new to robotics. Our work aims to provide an accessible toolbox that simplifies the learning, implementation, and testing of robotic algorithms in a 3D physics-based simulator. This platform integrates tutorials on key algorithms, their source code, and corresponding visualization in a centralized website. Leveraging the PyBullet physics engine for realistic simulation and Google Colab for interactive user features, our website facilitates a hands-on learning experience in robot localization, mapping, motion planning, and motion control. The algorithms demonstrated on our website include particle filtering, occupancy grid mapping, A* planning, and PID control. We strive to make the concepts required to understand and implement the algorithms accessible to a broad audience and foster technical skills development among a larger group of robotics enthusiasts.

Jingyi Chen

Political Science - Data Analytics, Marshall

Mentored By Weijing Lu, PhD

Domestic Abuse and Women's Legal Consciousness: Cases From Magazines and Newspapers During the 1930s in China

This research delves into legal consciousness and women's agency during the early 1930s in China. In 1931, the Nationalist government implemented the Civil Code of the Republic of China, which granted women important legal rights, such as expanded property ownership and marriage autonomy, which was absent in the Qing era. Notably, the Code unprecedentedly allowed individuals to be granted divorce by the courts on the grounds of intolerable domestic abuse. Despite limitations in the effectiveness of the law in protecting the rights of women experiencing domestic violence and other structural constraints, some women sought available resources to resist the injustices and improve their situations. Through archival research and in-depth qualitative analysis of legal inquiries made by individuals to periodicals from 1932 to 1935, this study reveals how women analyzed their circumstances and strategically leveraged their familial and social networks and free legal consultation to subtly resist and alter their historical conditions. By contextualizing the findings within the sociopolitical and legal landscapes of the era, this research provides insights into the complexities of Chinese women's history. It challenges traditional narratives of women being passive victims of oppression, illustrating their active agency in navigating their situations. Also, it sheds light on the life experiences of ordinary women in Chinese history, which have been frequently overlooked, suggesting valuable untapped primary sources for future studies in this area.

Belinda Chiu

Biology with a Specialization in Bioinformatics, Eigth

Mentored By Gerald Morris, Associate Professor

High-throughput testing of T cell alloreactivity at the clonal level

Due to proprietary information this abstract has been redacted.

Oren Ciolli

Data Science and Math-Economics, Revelle

Mentored By Professor Julie Berry Cullen

A Tale of Two Cities: The Effects of Upzoning on Local Rent

In this paper, I examine the effects of re-zoning urban land (specifically to allow construction of multifamily housing) on rent at the zip code level across Portland, OR and San Jose, CA. I first deduce the proportion of each zip code which was rezoned between 2015 and 2021, and use this as one of the independent variables in a multivariate regression on the change in rent from 2015 to 2021. I also explore the impacts that these zoning changes had on neighborhood demographics. While rezoning was associated with changes in housing costs (an increase in San Jose, and a decrease in Portland), rezoning wasn't associated with significant changes in the minority share or median income of zip codes. These results could prove useful to planners and housing advocates when trying to forecast the efficacy of a zoning change on alleviating rent burden and addressing exclusionary zoning.

Izzie Cohen

Neurobiology, Sixth

Mentored By Matthew Lovett-Barron

Temporal dynamics of internal state habituation

Internal states greatly influence animal behavior and can drastically shape the nature of an organism’s reaction to a stimulus. The induction of an internal state by an external stimulus has a system-wide impact and may change the way the system (neural circuitry, physiology, etc.) reacts to subsequent stimuli. Consistent exposure to a repeating aversive stimulus has been shown to induce habituation, wherein the organism’s response to stimulation decreases in magnitude with increasing time and exposure. While this is well-documented, the influence of temporal integration of the stimuli on habituation is little known. Here, we use an acoustic startle response model for habituation to investigate the timing dynamics that produce behavioral suppression. For the ASR paradigm, we present head-tethered larval zebrafish with acoustic stimuli with varying inter-stimulus intervals (ISIs) of 90s, 5s, and 1s and measure tail response and heart rate changes. We found that increased tail angle instances correlate with stimulus onset but decrease as the stimulus

period progresses in the 5s ISI group; we also observed a consistently decreasing probability of response across the stimulus period in the 5s and 1s ISI groups but not in the 90s ISI group. Lastly, we saw that mean heart rate peaks within the stimulus period in the 5s ISI group. As we've begun conclusively validating this model, our next steps involve further investigating the underlying signaling dynamics of calcium and cAMP in neurons across various ASR conditions in order to understand the integration of stimuli across time and subsequent influence on behavior.

Kaya Cohen

Ecology, Behavior, and Evolutionary Sciences, ERC

Mentored By Dr. Simone Baumann-Pickering, PhD

A dive into blue whale acoustic behavior in Southern California from 2007 to 2020

Blue whales, Balaenoptera musculus, possess the greatest acoustic power of any animal, so it is intuitive that acoustics serve an important role in their survival. In order to better understand the social structure, migratory patterns, and distribution of these marine mammals, acoustic data has been collected in the Southern California Bight from 2007-2020. Effort collected from 2007-2017 has been assessed in previous literature. This study builds upon the long term monitoring effort, including the analysis of three more years of data. The Eastern Pacific blue whale population is known to produce A, B, and D calls, however, this study focuses on the analysis of B and D calls only. By observing the interplay and variability of these calls we can infer their behavioral context and functionality. Previous analysis has identified blue whale's progressive earlier arrival to foraging grounds during the summer months, and data from 2018-2020 is consistent with this trend. The supplemental analysis of data appears to show a spike in rates of D calls starting in 2017, however, B call rates remain stable. Although, there was a decrease in the number of D calls during 2018. Further analysis and additional acoustic effort is required to determine the driving force of this change. The evident shifts of acoustic and migratory patterns of blue whales from 2007 to 2020, in close proximity to anthropogenic impacts, highlight the importance of continuing to collect acoustic data from this region.

Christian Cortes

Clinical Psychology, Muir

Mentored By Dr. Victoria Risbrough

Post-deployment PTSD Symptoms Predict the Development of Attentional Deficits 10 Years Later

Individuals with PTSD often present with neurocognitive deficits, but little is known about how these issues interact with each other across time. Although certain neurocognitive deficits, particularly in executive function, have been associated with increased risk for PTSD, chronic PTSD symptoms may also lead to subsequent declines in neurocognition, but this possibility has yet to be explored. Here, we examined the prospective and longitudinal relationship between attentional abilities, trauma exposure, and PTSD symptoms in active-duty Marines (N = 80) before going on a combat deployment, soon after the deployment, and ~10 yrs after the deployment. We hypothesized that attentional deficits at pre-deployment would increase risk for PTSD immediately after post-deployment, and that higher PTSD immediately after post-deployment would in turn predict worse attention 10 years later. PTSD symptoms were operationalized as total scores on the Clinician Administered PTSD scale for DSM-5 (CAPS-5) while attentional abilities were operationalized as mean reaction time (RT) on the continuous performance task (CPT). Hierarchical regression models were used to determine whether CPT mean RT predicted changes in CAPS scores and whether CAPS scores predicted changes in CPT mean RT. Higher CAPS-5 scores immediately post-deployment significantly predicted longer CPT mean RT at 10-year follow-up ($\beta = 0.41$, $p < .001$), controlling for CAPS-5 scores post-deployment. In contrast, higher CAPS-5 scores at pre-deployment did not predict CPT performance immediately post-deployment and CPT performance at immediate post-deployment were not predictive of CAPS-5 scores at either timepoint (ps > .088). Veterans with heightened PTSD symptoms in the intermediate aftermath of deployment may be at increased risk for declines in neurocognition later in life.

Saloni Dangre

Molecular and Cell Biology, Seventh

Mentored By Dr. Douglas Bartlett

Isolating Anaerobic, Extremophilic Microbes from Western Australia Transient Lakes

The Western Australia Transient Lakes (WATL) represent some of the most extreme environments on Earth. Some of these lakes contain the pH and salinity limits of life and yet are also home to a diverse range of largely unexplored microbial life. They are also some of the best modern terrestrial analogs to past environments on Mars. This project aims to gain a deeper understanding of microbial life in the WATL through (1) isolating, (2) culturing, and (3) characterizing novel strains of anaerobic extremophiles. Studying novel microbes in WATL can give us insight into the mechanisms for survival in high pH and saline environments that may allow life outside Earth's current habitability window.

Anaerobic pore water from target WATL lakes of high salinity and low pH was collected and inoculated into four types of growth media. The enrichments were then assessed for growth, diluted, and sequenced. Samples with high quality 16S sequences were diluted to extinction for 6 rounds and then inoculated into Hungate roll tubes to obtain colony isolates. Through this process, one novel species in a new genus (Dethiothermispora halolimnus) was characterized, and another novel strain (SD5) is currently being characterized. Additionally, three environmental strains (Anaeromonas frigoriresistens, Halanaerobium alcaliphilum, and Paraliobacillus quinghaiensis) were isolated and made into frozen stocks.

Tyler Diep

Human Biology, Sixth

Mentored By Binhai Zheng

Assessing the impact of DLK/LZK deletion in injured corticospinal motor neurons

Due to proprietary information this abstract has been redacted.

Maureen Dinata

Neurobiology, Revelle

Mentored By Kim Dore

Easy and Affordable Way of Labeling Dendrites in Fixed Brain Slices with the Lipophilic Carbocyanine Dye DiI

Dendritic spines are neuronal membrane protrusions that contain the post-synaptic side of synapses, the connections between neurons. A number of neurological disorders are characterized by altered dendritic spines; including Alzheimer's disease (AD). One of the first signs of AD and the best biomarker for the disease is the loss of synapses. In our lab, we are interested in understanding the molecular mechanisms underlying synaptic loss, therefore analyzing spine density and morphology is important. We chose to utilize the lipophilic carbocyanine dye 1,1' -dioctadecyl-3,3,3',3' -tetramethylindocarcocyanine perchlorate (DiI) to stain individual neurons in brain slices of APP/PS1 mice, an AD mouse model. We are staining brain slices of different thicknesses (50μm, 200μm, 400μm) and freshness (acute slices, slices stored in cryo solution) in different age groups to characterize and optimize this staining method. This DiI staining method requires the slices to be fixed in 4% PFA, incubated in DiI solution for 2 days, counterstained with DAPI, then finally mounted on a coverslip with Fluoromount G. Other methods, like golgi staining or intracellular dye injection require much more handling time and experience to master. This method is simple and easy and also allows the labeling of multiple cells at once. We hope that our findings will contribute to other research needs as an easy to implement analysis tool since a lot of other neurological disorders such as schizophrenia and autism spectrum disorder involve the alteration of dendritic spines as well.

Ding Ding

Public Health, Seventh

Mentored By Dr. Rebecca Fielding-Miller, Associate Professor

An analysis of baseline data and the implementation process of the I-SHIP-US study: Understanding self-compassion disparities among UCSD undergraduate students

Mental health has declined among college students post-covid. Stigma and lack of comprehensive resources drive higher rates of mental health challenges in queer students

and survivors of sexual trauma, often resulting in self-blame and feelings of isolation. However, practicing self-compassion is strongly linked to psychological well-being and is an essential tool for building resiliency and combating self-blame. Our research aims to understand self-compassion across student groups to inform tailored interventions. We worked with a student advisory board to recruit students to participate in a randomized control trial of a mindfulness sexual health app to increase self-compassion among undergraduate students at UCSD. We analyzed the survey data using Student's t-test and evaluated the implementation process as part of a multi-national implementation science case study. Study participants' average self-compassion score was 2.78. Student survivors of sexual trauma ($\bar{x}$=2.72) report lower self-compassion than non-survivors ($\bar{x}$=2.80), with a significantly higher overidentification score (p=.008). Queer students ($\bar{x}$=2.70) report lower self-compassion than straight students ($\bar{x}$=2.90). Implementation analysis revealed low engagement with the app. We will continue assessing app engagement and post-intervention effects on self-compassion. There is emerging evidence on the buffering effect of self-compassion building against the negative mental health outcomes in the aftermath of sexual violence. Future qualitative research is needed to guide medically accurate, empowerment-oriented mindfulness sex education on campus, as well as to better tailor it for queer students and survivors of sexual trauma.

Annie Do

Human Biology B.S., Sixth

Mentored By Dr. Weg M. Ongkeko, MD, PhD

tRNA-Derived Fragments as Post-Transcriptional Regulators of Oncogenes and Tumor Suppressor Genes in Papillary Thyroid Carcinoma

tRNA-derived fragments (tRFs) are a relatively novel class of small non-coding RNA that has been implicated in the pathogenesis of certain cancers. It has been proposed that tRFs act as post-transcriptional regulators of mRNA by binding to complementary regions of the transcript and recruiting proteins that cleave the mRNA. Accordingly, this project identifies tRFs that are differentially expressed between papillary thyroid carcinoma (PTC) tissue samples (n=511) and normal tissue samples (n=59). We found 22 tRFs to be differentially expressed between these groups, then identified dysregulated tRFs that have anticorrelated expression with upregulated oncogenes (OG) and downregulated tumor suppressor genes (TSG). Notably, upregulation of AsnGTT 3'-tRF correlated to lower expression of tumor suppressor genes FAT4, FBLN2, LRP1B, HNF1A, and PTPRD. Conversely, downregulation of GlyCCC 5'-tRF and GlnCTG 5'-

tRF correlated to upregulation of the oncogenes MET and MACC1. Binding affinity analysis further revealed that tRFs can bind to OG and TSG transcripts with sufficient complementarity to induce cleavage, supporting the hypothesis that tRFs mechanistically regulate cancer pathogenesis by promoting the degradation of mRNA transcripts. Overall, this study aims to elucidate the role of tRFs in papillary thyroid carcinoma by analyzing their potential to regulate genes that are critical to disease progression.

Hannah Drake

Ethnic Studies & History, Marshall

Mentored By John D. Blanco, Associate Professor

Depictions of Philippine Monstrosity in Literature and Film

My specific research question is, “What do 21st century media depictions of monstrosity show about folklore, urbanization, and the history of the Philippines during its independence period?” During the post-war independence period, many rural farmers flocked to urban cities like Manila. With them, they brought their folkloric monster stories, resulting in a surge in the spread of these stories. I really want to learn more about this time period and the role sharing folklore played in nation and community building. I also want to see how 21st media interpreted these stories and how they have changed over time, along with what that shows us about Filipino culture and society! As for how I plan to answer my question, I’m planning to read and analyze the ethnographic accounts of monster stories written by the Mother of Philippine Folklore, Damiana L. Eugenio, and her students like Maximo D. Ramos! I want to read through these stories and see the similarities between them, along with what the common archetypal story of a certain monster is like. Accompanying the ethnographic readings, I’d like to look at Filipino monster media in the 21st century! I’m still deciding on my sites of analysis, but I’m thinking about a variety of shows and movies that feature aswang in some way like Trese (2021), Yanggaw (2008) and Patient X (2009).

Seven Dunn

Physics, with Specialization in Astrophysics, Seventh

Mentored By Dr. Karin Sandstrom

GBT Search for High Latitude "CO-Dark" Molecular Gas

We present initial results from a Green bank Telescope (GBT) survey for the 18cm Hydroxyl (OH) lines towards three clouds in the Galactic Halo: Camelopardalis, Ursa Major, and the Polaris Flare. We use OH and neutral atomic Hydrogen (HI) to trace the composition and amount of gas within these clouds in the interstellar medium (ISM). OH has been shown to be a good tracer of molecular gas in diffuse clouds, particularly phases of the ISM that cannot be measured by our conventional tracer of CO. HI will trace the atomic phase of the gas. In combination of these two tracers, we will be able to understand how much gas is in these high latitude clouds in total (atomic and molecular combined). Observing significant OH where we do not detect CO implies the existence of "CO-Dark" gas, as both molecules expect to coincide with molecular hydrogen. In comparing our OH and CO findings by fitting the spectra to Gaussian functions, we hope to discover previously unknown molecular gas. By quantifying the amount of "CO-Dark" gas, we will learn how much molecular gas in the Galactic Halo is not accounted for by CO surveys alone. In the future, we plan to derive a correction that could apply to all molecular clouds in the Galactic Halo, depending on their CO content. In addition, the amount of molecular gas in these clouds could inform us about the amount of stars these clouds could create when the gas eventually accretes onto the disk.

Allison Ea

Microbiology, ERC

Mentored By Hiutung Chu, PhD

Bacteroides fragilis adaptation to oxygen during inflammation and infections

Bacteroides fragilis is a prominent human gut commensal traditionally classified as an obligate anaerobe, yet is able to tolerate oxygen exposure. B. fragilis is also one of the most commonly isolated anaerobes from human infections. Reactive oxygen species (ROS), such as peroxides, are naturally occurring molecules produced by host immune cells that can damage bacterial DNA and drive bacterial killing. This leads to the following questions: Are strains isolated from oxygenated environments of extraintestinal

infections more likely to evolve resistance to ROS than commensal strains? What genes are targeted for adaptive mutations? How does variance in strain adaptation help us better understand the role of B. fragilis in human health? These questions were experimentally tested in vitro with a selection of B. fragilis strains isolated from intestinal and extraintestinal sites. These strains were exposed to different concentrations of tert-butyl H2O2, a stable, organic peroxide, to determine the resistance of B. fragilis strains to ROS. Resistant bacteria colonies were re-exposed to tert-butyl H2O2 over several generations until resistance plateaued. The parent and tert-butyl H2O2 adapted strains were sequenced to identify mutations that occurred over time that may be involved in H2O2 tolerance. Our data supports that B. fragilis strains isolated from oxygenated environments are better adapted to tert-butyl peroxide than strains isolated from the healthy human gut and evolved resistance in fewer generations. Additionally, sequencing data reveals mutations near transport proteins involved in polysaccharide utilization in evolved bacteria, possibly suggesting differences in metabolism of parent and evolved bacteria.

Sophia Echeverria

Neurobiology, Revelle

Mentored By Christina J. Sigurdson, DVM, PhD

Comparison of Aβ plaque burden, pTau levels, and glutamatergic receptor levels in frontal cortex of AD patients

Synaptic dysfunction and loss are major correlates of cognitive decline in Alzheimer's (AD) and related dementias like prion disease. Our laboratory has shown that in occipital cortex samples of patients with sporadic Creutzfeldt-Jakob disease, the glutamatergic receptor mGluR5 is significantly decreased. In AD patients, mGluR5 levels measured via positron emission tomography negatively correlated with cognitive performance. However, how mGluR5 levels correlate with Aβ plaque burden and phosphorylated-Tau (pTau) levels is poorly understood. We hypothesize that mGluR5 levels would negatively correlate with Aβ plaque burden and pTau levels. To test this hypothesis, we obtained frontal cortex samples from age-matched AD (n=9) and control patients (n=10). Using immunohistochemistry to stain for Aβ oligomers and pTau, we determine plaque burden by quantifying the number and size (diameter) of the plaques and area cover by pTau in the white and gray matter of tissue slides. Using immunoblotting techniques, we will determine the levels of mGluR5 in these samples. The results show that AD patients have significantly more and larger plaques than the control patients in the grey matter.

Surprisingly, control brains had more plaques in the white matter compared to AD patients. Of note, the number of plaques on both groups was significantly lower than in the grey matter. Next, we will determine the level of mGluR5 in these samples, and determine how mGluR5 levels correlate to these pathological markers.

Pansée ElGhayati

Cognitive and Behavioral neuroscience, Revelle

Mentored By Dr. Lisa Stowers

Investigating the Interplay Between the Vomeronasal Organ and Main Olfactory Epithelium in Mice

Animals rely on sensory input from multiple sensory systems in order to synthesize information from their environment and make decisions accordingly. This is particularly important in the context of the mouse olfactory system. Mice have two olfactory systems; a main olfactory system (MOS) which works similarly to that of a human, and a vomeronasal olfactory system (VOS) which is thought to be primarily for mating and social behavior. Previous literature hypothesizes that the VNO's functionality is contingent upon the proper operation of the MOS. In this research, we aimed to investigate this hypothesis by selectively ablating the main olfactory epithelium (MOE) in mice while preserving the integrity of neurons in the VNO. Through behavioral assays and neural activity analysis, we examine the VNO's ability to detect and respond to natural stimuli, in the absence of the MOE. Our findings provide insight into how the absence of the MOE affects a mouse's tendency to sample stimuli in addition to the ability of the VNO to chemically detect stimuli. These preliminary results could challenge the currently established literature on the interplay between the VNO and MOS and contribute to a deeper understanding of underlying mechanisms for olfactory processing.

Blake Estefan

Bioengineering, Revelle

Mentored By Dr. Karsten Zengler, Professor (PhD)

Next-generation Genome-scale Model of the Pathogenic Bacterium Staphylococcus aureus

Due to proprietary information this abstract has been redacted.

Zara Fearns

Psychology / Clinical Psychology, Seventh

Mentored By Dr. Leslie Carver

Infant sensitivity to causal associations generated by a moving visual object

Everyday perceptual experiences include dynamic objects that move and give rise to expected sounds upon collision with physical environments. In this study, we look to explore if early sensitivities to anticipated sounds are affected by higher-level cognitive understandings of causality, as opposed to responses to low-level aspects of the stimulus, such as a change in direction. In a moderated online study, we are comparing two groups of thirty-two infants as they view stimuli featuring a moving 2-D ball. In the audio-visual group, collision generated an expected sound, which either occurred simultaneously upon physical contact between the ball and a barrier (audio-visual; AV-synchronous), or came slightly before contact (AV-asynchronous). In the color-changing group, collision generated a novel state change to the object in the form of a color change which either occurred simultaneously upon contact (visual-color-changing; Vcc-synchronous) or came slightly before contact (visual-color-changing; Vcc-asynchronous). Data collection is ongoing. Using offline behavioral coding of recorded looking time, we predict that on average, infants in the AV group will look longer toward asynchronous trials compared to synchronous ones while infants in the color changing group will look longer towards synchronous trials compared to asynchronous ones. A preference toward asynchrony in the AV group would demonstrate that infants have expectations regarding the temporal alignment of visual and auditory properties of physical events, while a preference for synchrony in the color changing group would align with previous research that suggests infants show a bias toward synchronous events when learning about their properties.

Dylan Fernandez

Neurobiolgy, Revelle

Mentored By Dr. Eric Zorilla

The Role Infralimbic Kappa Opioid Receptors Play in stress-induced ethanol reinstatement

Due to proprietary information this abstract has been redacted.

Kyra Fetter

Bioengineering: Bioinformatics, Warren

Mentored By Dr. Ferhat Ay

Loop Catalog: a comprehensive database of uniformly processed human and mouse HiChIP datasets curated from the literature

The human genome, if stretched out, would span approximately two meters linear distance. To fit inside a cellular nucleus, chromatin folds in an intricate, non-random manner. Chromatin conformation studies increasingly recognize the 3D architecture of chromatin as a mediator of genome regulation via long-range DNA-DNA interactions. The Hi-C assay combines DNA-DNA proximity-based ligation and high-throughput sequencing, capturing pairs of genetic loci genome-wide in close contact in 3D-space. The HiChIP assay integrates immunoprecipitation with Hi-C methodology, enabling exploration of interactions among genes and regulatory elements, like promoters and enhancers, through loop-calling. Existing databases, including Chromloops and HiChIPdb, fall short in offering stringent quality control measures and employing robust loop-calling approaches. To tackle these challenges, we developed Loop Catalog, the largest online database of HiChIP loop calls, encompassing 739 human and 281 mouse HiChIP samples from 155 publications and over 100 cell types within blood, skin, kidney, and brain, among others. We developed a systematic pipeline that downloads raw HiChIP sequencing data, aligns reads, detects peaks, identifies loops, and assigns quality control metrics. The catalog additionally provides four analysis modules: SNP-to-gene linking for post-GWAS analyses, enrichment of transcription factor binding motifs in loop anchors, enrichment of interacting motif pairs, and community structure detection

from loops using graph-based modeling. As a demonstration of the utility of Loop Catalog, we uncovered surprising enrichment of zinc finger proteins such as ZNF460 in highly conserved loop anchors across diverse cell types. Loop Catalog constitutes a critical resource for the fields of gene regulation and genome organization.

Sarah Flores

Bioengineering: Bioinformatics, Warren

Mentored By Dr. Kay Tye

Investigating the Role of Shared Trauma on Fear-Related Behavior

When faced with a perceived threat, rodents, among other animals, can exhibit behaviors such as flight, urination, or freezing, which signals distress and enact defense behaviors for group survival. Research in mice has modeled fear-related behavior through different mechanisms such as social buffering, which is thought as a mechanism that can mitigate the perception and reaction to adverse experiences through the presence of a conspecific. However, there is a lack of research studying traumatic experiences in a social context, and how the social context of trauma affects future behavior. To investigate this, we will measure the difference in fear-related behavior, such as freezing, before and after experiencing stress administered through 15 uncued, unconditioned footshocks. Mice will be randomly paired within cages to experience footshock for the social aspect of the shared trauma. This investigation will take place over three days, with each day being respectively, a baseline day of fear-related behaviors, adverse footshock stimulus, and a post-measurement of fear-related behaviors. Future work will investigate the role of brain regions, such as the anterior cingulate cortex, in mediating social affiliation after shared trauma.

Marie Joe Franci

Pharmacological Chemistry, Muir

Mentored By Anjan Debnath

Pitavastatin and Isavuconazonium Effect on AcMa Cysts

Acanthamoeba Keratitis, caused by the parasite Acanthamoeba, is a prevalent eye infection resulting in visual impairment or blindness. Treatment is challenging due to the

parasite's ability to transition from a trophozoite active state into a cyst dormant stage under unsuitable environmental conditions. This research aims to assess the efficacy of the compounds Pitavastatin and Isavuconazonium, alone or combined, against the Ma strain of Acanthamoeba in its cyst stage, while comparing their effectiveness to the standard treatment, PHMB. Respectively, 0.5% DMSO and 0.04% PHMB were used as positive and negative controls. Pitavastatin and Isavuconazonium were tested at various concentrations alone, (40mM and 20mM Pitavastatin and 20mM and 10mM Isavuconazonium), and combined (40mM Pitavastatin + 10mM Isavuconazonium, 40mM Pitavastatin + 20mM Isavuconazonium, 20mM Pitavastatin + 20 mM Isavuconazonium, 20 mM Pitavastatin + 10 mM Isavuconazonium). Compounds were added to wells containing AcMa cysts. After a 48-hours incubation period, cyst media was replaced with PYG trophozoite media. Microscopic observations for 7 days were used to determine the results with trophozoite formation indicating and persistence of cysts indicating cell death. Controls worked as expected with trophozoites forming in DMSO on day 1 and cysts persisting in PHMB for 7 Days. Pitavastatin alone was unsuccessful in killing cyst cells as trophozoites formed on day 1 at all concentrations. Isavuconazonium alone or combined with Pitavastatin was successful at all concentrations with cysts persisting and only few trophozoites forming on day 7. Although Isavuconazonium was effective, PHMB remains better against cyst cells.

Pranava Gande

Mathematics, Warren

Mentored By Associate Professor

The microbiome in castration-resistant prostate cancer

Prostate cancer is the second-leading cause of death in males in the United States. Though prostate cancers are typically low-risk, there is a subset of patients in which these cancers metastasize. In this advanced state, tumors typically display a resistance to the standard treatment of chemical castration. This project explores the human microbiome's role in the acquisition of castration-resistance in metastatic prostate cancer. RNA-sequencing from bone (n=159) and lymph node (n=92) metastatic sites were obtained from dbGaP. These sequence were mapped these to bacterial sequences using the Pathoscope 2.0 software to estimate the abundance of each species in each sample. To assess community-wide dysbiosis, microbial diversity was associated to the expression of known biomarkers of castration-resistance from the literature, including AR, PI3K, and AKT among others. Then, dysbiosis of individual species was measured by comparing

the abundance of each species between high-expression and low-expression cohorts of the AR gene using the Kruskal-Wallis test. Following this, the correlation between the abundance of each species and the expression of the biomarkers was calculated with Spearman's correlation test. Lastly, Gene Set Enrichment Analysis was used to demonstrate correlations between microbiome dysbiosis and the AR signaling pathway, PI3K-AKT pathway and endocrine resistance pathway, which have been implicated in the acquisition of castration-resistance.

Kameron Gano

Computer Engineering, Revelle

Mentored By Dr. Gert Cauwenberghs & Dr. Margot Wagner

EigenMarkov Diffusion: Stochastic Spectral Markov Diffusion using Random Walk Eigenmode Decomposition

The diffusion of charge across synapses is the brain's primary mode of information transfer. A fundamental problem in the fields of computational neuroscience and neuromorphic computing is modeling this phenomenon faithfully and efficiently. However, methods of modeling synaptic diffusion struggle to balance complexity and biological plausibility. To this end, we present a scalable, biologically plausible model of synaptic diffusion, Stochastic Spectral Markov Diffusion using Random Walk Eigenmode Decomposition (EigenMarkov), for neuromorphic computing. EigenMarkov models this complex biophysical process by transforming the problem of random walk diffusion from the spatial domain into the spectral domain by way of eigenmode decomposition, where the number of spatial locations initially matches the number of eigenmodes. In the spectral domain, each eigenmode is modeled as a multi-state Markov system in which a particle can exit, enter, or remain in its current state, each with a certain probability. Moreover, since eigenmode decomposition is a robust dimensionality reduction technique, it may not be essential to use all eigenmodes to capture the dynamics of the diffusion. Thus, in order to implement synaptic diffusion into neuromorphic systems, only the current state of a particle and the most significant eigenmodes are needed as opposed to the kinetics of every individual particle. This reduces the complexity involved in modeling diffusion, promising more capable and efficient neuromorphic computing systems. Ultimately, this opens up the opportunity to explore the broader impact of synapse-level electrochemical interactions on broader brain function.

Trinity Gao

Cognitive Science with Specialization in Neuroscience, Seventh

Mentored By Lara Rangel, Assistant Professor

The temporal relationship between hippocampal oscillations in dentate gyrus during learning and recall

The hippocampus plays a crucial role in learning and memory, with the dentate gyrus (DG) being key for associating environmental cues with specific outcomes. The DG is hypothesized to facilitate this ability by generating unique spatiotemporal activation patterns within its neuronal population for similar experiences. However, how the distinct neural representations are produced and utilized is still yet to be discovered. The significance of the interaction between granule cells, mossy cells, and interneurons within the DG is debated. The functionality of DG during the learning versus recall stage of memory processes is also controversial. The proposed project aims to explore how the DG coordinates temporally during the learning and recall phases of a spatial-reward association task in a fan-shaped maze. Specifically, it focuses on understanding the relationship between the timing of oscillations within the DG's molecular layer, granular cell layer, and hilus throughout these phases. We want to characterize current sources and sinks across the layers and understand how stereotyped rhythms in the local field arise from the flow of currents across layers. By analyzing how the temporal coordination between the dentate gyrus cell layers changes across different task phases, we could answer long-standing debates regarding how the DG circuitry functions during learning and recall. This insight will contribute to resolving longstanding questions about DG circuitry's role in learning and recall, offering the potential for developing targeted treatments for memory disorders.

Jacquelyn Garabedian

Cognitive Behavioral Neuroscience and Clinical Psychology, Muir

Mentored By Andrea Chiba, Principal Investigator

Neediness, co-distress, and helping behavior in rats

Helping behavior is a crucial part of human prosocial dynamics. Studying the factors that increase helping behavior, as well as inhibit it, may help us understand why some people are more likely to help others or gain more access to help from others. Rats are highly social and exhibit prosocial behavior, including helping behavior, and therefore are an ideal species to use in research on propensity to help others. The present study will analyze how a free rat responds behaviorally to a trapped rat in need and how behavioral markers of distress, exploration, and hypervigilance may impact the likelihood of helping.

Ananya Giri

Ecology, Behavior, and Evolution, Revelle

Mentored By Dr Jonathan Shurin

Does local adaptation alter microbiome response to environmental warming?

This study investigates the potential influence of local adaptation on the effects of environmental warming on gut microbiomes and predator-prey interactions in natural ecosystems. Focusing on Tui Chub fish populations from cold and warm habitats in the Sierra Nevada mountains, a reciprocal transplant experiment was conducted at the Sierra Nevada Aquatic Research Laboratory. Mesocosm tanks with varying temperatures were utilized, and fish from warm and cool habitats were introduced to assess their impact on predator-prey dynamics and microbiome composition. Results indicate consistent temperature differences between warm and cold sites throughout the experiment, and warm tanks consistently maintained higher temperatures than cold tanks. It was observed that fish drove strong trophic cascades, with higher chlorophyll-a concentrations in tanks with fish compared to fishless controls. However, warming uniformly depressed the strength of these cascades across all fish populations, suggesting limited local adaptation to warming among Tui Chub from warm habitats. Further investigation, including DNA sequencing of microbiomes, is under way to examine the differential effects of warming across fish populations. This research could offer valuable insights into the potential role

of local adaptation in moderating the impacts of environmental warming on species interactions and ecosystem functioning, contributing to our understanding of ecosystem responses to climate change.

Yige Gong

Biology-bioinformatics, Revelle

Mentored By Karsten Zengler

Ecological Niche Characterization of a Bacillus Isolate through Metabolic and Gene Expression Analysis

The investigation of complex interactions within a soil microbiome is instrumental for enhancing agricultural practices by elucidating microbial contributions to soil fertility and plant health. This project aims to acquire an in-depth characterization of a soil isolate belonging to the Bacillus genus, a common soil bacterial group. We first reconstructed a Model of Metabolism and Gene Expression (ME-model) from the Bacillus isolate's genome-scale metabolic model (M-model) through a semi-automated pipeline. Then, we experimented with different carbon sources, nitrogen sources, and oxygen availability to find out the optimal nutritional combinations that maximize biomass and 16 important antimicrobial compounds. In addition to a deeper understanding of its potential for agricultural and industrial uses, this detailed profiling of this isolate rendered by such a computational model also informs future studies of the complex interactions that define its native soil microbiome.

Daniel Gurholt

General Biology, Marshall

Mentored By Dr. Maripat Corr

Nucleic Acid Sensing Receptors and Sex Differences in a Murine Arthritis Model

The innate immune system interacts with the adaptive immune system in initiating and perpetuating autoimmunity. The Toll-like receptors (TLR) are key in the innate immune system and include TLR7 and TLR9, which sense ssRNA and CpG DNA respectively in the endosome. To assess the roles of these TLRs in autoimmune arthritis we utilized the K/BxN serum transfer model. Serum transfer into wild type mice confers paw

inflammation and lasting allodynia. Tlr7-/-, Tlr9-/- and Tlr7.Tlr9-/- mice were injected with K/BxN serum and the paw swelling was serially measured with a caliper and withdrawal threshold tested by von Frey fibers. In Tlr7-/- and Tlr9-/- mice there was reduced allodynia in both males and females; however, the doubly deficient mice (Tlr7.Tlr9-/-) had markedly reduced allodynia throughout the entire time course. Interestingly, in the Tlr7.Tlr9-/- mice the females had little if any paw swelling unlike the males ($F(13, 182) = 11.56$ two-way ANOVA, $P<0.001$. These results demonstrated that there were sex differences in the development of arthritis and specific TLRs played critical roles in developing allodynia associated with inflammation. Understanding sex differences in the development and symptoms of arthritis could lead to further refined therapeutic decision making.

Andjela (Angela) Gushiken

Political Science (Int'l Relations) & Communication, Seventh

Mentored By Elana Zilberg

Hawai'i: Cultural Rejuvination and Expanded Autonomies

Native Hawaiians have faced historical marginalization and displacement, which has observed suppression of cultural values and indigenous identity. Neocolonial and settler-colonial modalities exist under the pretenses of extractive tourism and capitalistic-led development, which in turn overrides preexisting conditions of indigenous values and traditions. An increase in community-led development and grassroot organizing attempt to address self-determination through decentralized autonomous movements from the bottom up. These movements aim to preserve Native Hawaiian autonomy in various forms intended to preserve, restore, and rejuvenate traditional and cultural practices. The gradual reversion of indigenous methodologies, reaps benefits consisting of increased environmental sustainability, ecological preservation, mitigating effects of climate change, and empowering indigenous community members to exercise their traditional and customary rights. These movements are exemplified by ahupua'a (land division from mountain to sea) restoration efforts on behalf of the community and non-profit organizations, that seek the replenishment and proper stewardship of Hawai'is water and land (re)sources. Former resort Coco Palms is an example of this polarization between capitalistic-led development and local community desires, which observes the struggle of acknowledging indigenous historical and cultural significance and entangles itself within local and state affairs. The future of Hawai'i glimmers ahead, as local community groups

and indigenous groups rise and attempt to restore and maintain the 'Aina for current and future generations.

Omar Halawa

Biology w/ Specialization in Bioinformatics, Muir

Mentored By Jill P. Mesirov, Ph.D.

Network-enhanced Gene Set Refinement: A data-driven approach to improving gene sets for enrichment analysis

Analysis of RNA sequencing data provides valuable insight into biological pathway activity through measuring gene expression levels. Gene set enrichment analysis (GSEA) is a standard method for identifying pathway activation in gene expression data. This is achieved by testing whether genes from annotated gene sets are coordinately up-regulated or down-regulated in one class of samples relative to another. However, some gene sets may lack context-specific coordinate regulation due to manual curation or derivation from highly specific biological contexts. This leads to noise, causing suboptimal GSEA scores. Motivated by this, the Mesirov Lab has developed gene set refinement (GSR), a method to build more specific and sensitive gene sets. GSR uses non-negative matrix factorization to identify co-regulated components of an input gene set while filtering out noise. However, because refined sets are derived from an input gene set, they may be incomplete if relevant genes are missing from the original. We have implemented a network propagation-based framework that expands upon GSR gene set inputs. The approach utilizes a heat diffusion algorithm to identify other similar genes in a protein-protein interaction network by propagating signals (“heat”) from the original gene set. This results in more complete refinement. We have applied this method to gene sets representing the activity of receptor tyrosine kinases (RTKs), common cancer drug targets, and observed more sensitive and specific GSEA scores. These findings not only provide new, data-driven clues into the functional roles of genes in pathways but ultimately improve GSR results by yielding more complete gene sets.

Kaye Han

Psychology and Cognitive Science, Seventh

Mentored By Dr. Adena Schachner

Dance begins early in infancy, even in a representative sample of U.S. infants

Dance is a universal human behavior and a crucial component of human musicality. When and how does the motivation and tendency to move to music develop? Kim & Schachner (2023) found that most infants produce recognizable dance within the first year of life, but this work tested a non-representative sample that likely over-represented highly-musical, high-income families. Here, we test a representative sample (n = 312) of U.S. parents of infants aged 0-24 months, recruited via CloudResearch. Parents were surveyed regarding their child's current and earliest dance behavior, their musical background, and musical experiences at home, including secondary measures of the extent to which infants moved to music. We find that dance begins early in infancy, even in this representative sample. Within the first year of life, most infants produce recognizable dance behavior (80% by 11.3m), comparable to that of Kim & Schachner (80% by 10.4m). 74% of participants report that their infants dance, again comparable to the 76.6% reported in Kim & Schachner (2023). When added to a model predicting infants' movement to music from their age, demographic variables did not predict additional variance, but parent musicality did. Infants with highly musical parents began dancing slightly earlier, though with a small effect (Mean age=7.42 months for third quartile of parent musicality scores; M=8.46m in first quartile). Thus, these findings suggest that movement to music in the form of dance develops early in infancy and generalizes across a representative U.S. sample, requiring relatively little enculturation.

Sarah Hasheem

Clinical Psychology, Sixth

Mentored By Sharon L. Nichols, Ph.D.

Exploring the Influence of Childhood Adversity and Cannabis Use on Cognitive Flexibility in Individuals with Behaviorally Acquired HIV

The study aims to explore the relationship between childhood adversity, cannabis use, and cognitive flexibility within individuals living with behaviorally acquired HIV. We will investigate how higher levels of adverse childhood experiences (ACEs) and regular

cannabis use may affect emotional and behavioral difficulties, as well as cognitive flexibility, in this population. Additionally, we assess whether moderate cannabis use can mitigate the negative effects of childhood adversity and HIV for individuals living with HIV, considering the anti-inflammatory properties of cannabis. Participants will be categorized based on ACEs levels and cannabis use patterns into four groups with high and low ACEs and high and low cannabis use. Measures will include the Adverse Childhood Experiences (ACEs) Questionnaire for ACES; the Customary Drinking and Drug Use Record (CDDR) and Timeline Follow-Back (TLFB) for cannabis use; the Delis-Kaplan Executive Function System (DKEFS) Trail Making Test and Color-Word Interference Test for cognitive flexibility; and the ASEBA Adult Self-Report for emotional and behavioral symptoms, focusing on internalizing and externalizing problems across various life domains. Preliminary findings will guide further research directions. Group differences in cognitive flexibility and emotional and behavioral difficulties will be analyzed using ANOVA, with post-hoc tests for pairwise comparisons. Mediation analysis will assess how cognitive flexibility mediates the relationship between childhood adversity, cannabis use, and emotional/behavioral symptoms. Understanding the interplay between childhood adversity, cannabis use, cognitive flexibility, and emotional and behavioral symptoms in individuals living with behaviorally acquired HIV is crucial for developing tailored effective interventions to address their unique needs in this population.

Ayad Hawa

B.S. in Joint Mathematics-Economics (EN28), Revelle

Mentored By David Arnold | Assistant Teaching Professor (LPSOE), Co-Director of Instruction

The Impact of Right-to-Work Laws on Labor Productivity

This paper seeks to identify the causal effect of right-to-work laws on labor productivity using a fixed-effects difference-in-differences analysis that compares neighboring counties between control and treatment states from the years 2010 to 2021. Combined with a review of the literature on the impact of right-to-work laws on wages, this paper shall conclude whether right-to-work laws enhance or inhibit rent-seeking activity among firms and unions.

Somalea Hayward

Sociology, Seventh

Mentored By Professor Kevin Lewis

Negotiating Masculinity and the Female Gaze: Men's Presentation of Self in their Tinder Profiles

Dating apps are quickly becoming the most popular way for people to meet romantic/ sexual partners. Examining how men present themselves, specifically how the performance of gender is mediated with presenting a desirable image of oneself, in their dating app profiles is essential for understanding the gendered norms and practices of contemporary dating. Previous research suggests that gender inequalities and the performance of toxic masculinities persist in online dating, but that men's dating app profiles may serve as a site where gendered power is subverted. It is unclear, however, what men's performance of gender in this space looks like. Through an observation study of heterosexual cismen's Tinder profiles, I conducted a content analysis of 100 profiles to examine men's performance of gender in this space. The findings suggest that there are some men who subvert hegemonic masculinity in their profiles, however, the majority of men do enact hegemonic masculinity. Of these men, there are those who maintain a desirable image of themselves within their presentation of masculinity and there are those who perform a more toxic version of masculinity and thus present themselves as less amiable and likely, less desirable.

Veronica Hernandez

Psychology With a Specialization in Clinical Psychology, Muir

Mentored By Dr. Emilie Reas

RSI vs. NODDI: A head-to-head comparisons of two diffusion MRI analysis techniques

Diffusion MRI (dMRI) has been shown to be sensitive to microstructural changes that the brain undergoes especially related to pathology such as Alzheimer's (AD), Mild Cognitive Impairment (MCI), and other processes associated with aging. Different imaging techniques such as Restriction Spectrum Imaging (RSI) and Neurite Orientation Dispersion and Density Imaging (NODDI) have been developed to process and analyze dMRI data and have proven to be useful in diagnostic and research settings in terms of age related brain pathology. Despite the usefulness of both methods, it remains unclear whether RSI or NODDI is more sensitive to microstructural changes, and whether one

method would be more efficient to use to study age related brain pathology. This project compares imaging results obtained using either RSI and NODDI measures to assess the sensitivity of both measures to microstructural brain changes and correlations between these techniques and variables relevant to age related brain pathology including age and memory.

Emily Huang

Mechanical Engineering, Sixth

Mentored By Michael Tolley

Volumetric Control System for Fluidic Soft Robots

Obtaining accurate data and emulating biological forms is vital to the various soft robotic experiments. One way to facilitate this data collection and simulation is through a volumetric control device. In this project, we designed a system that can precisely control the amount of fluid being exerted into soft robotic actuators. By modifying the design of an existing fluidic control system to include easily accessible parts, we produced an affordable and precise system for characterizing and controlling soft robots.

Sophia Jaberi Vivar

General Biology, Warren

Mentored By Dr. Shiri Gur-Cohen

Unveiling the Role of the Lymphatic Niche in Guiding Stem Cell Fate Decisions During Tissue Regeneration

Due to proprietary information this abstract has been redacted.

Monica Jensen

Neurobiology, Revelle

Mentored By Dr. Nicola J. Allen, Principal Investigator

MoleculeX reduces amyloid burden and improves hippocampal dependent spatial learning in the APP/PS1 model of Alzheimer's Disease

Alzheimer's Disease (AD) is a neurodegenerative disorder characterized by accumulation of amyloid plaques. Plaques precede synaptic dysfunction, which is followed by intraneuronal neurofibrillary tangle formation, cell death and learning and memory impairments. Historically research in AD has focused on the neurons, but recent works have shown that glial cells contribute to the feed-forward processes that lead to neurodegeneration. Astrocytes are a type of glial cell that have essential roles in regulating neuronal synapse formation, function, and stabilization. An important mechanism by which astrocytes perform these functions is by secreting a variety of proteins that act at the synapse. Importantly, astrocytes take on a reactive phenotype in AD, characterized by up-regulation of the glial fibrillary acidic protein (Gfap), up-regulation of neurotoxic cytokines and down-regulation of pro-synaptogenic proteins. The secreted protein, MoleculeX, was shown to be down-regulated in reactive astrocytes near amyloid plaques. MoleculeX is also known to have roles in synapse formation during cortical development and stabilization of dendritic spines in the hippocampus. Therefore, we hypothesized that overexpressing MoleculeX in astrocytes in AD could improve outcomes. To study this, we utilized the APP/PS1 mouse model of AD that has plaque formation. APP/PS1 mice were injected with virus to overexpress MoleculeX at 6 months and collected at 9 months. We found that MoleculeX overexpression improved spatial learning, attenuated GFAP reactivity and decreased amyloid plaque burden. Quantification of synaptic density is ongoing. Overall, these findings demonstrate that overexpression of MoleculeX in AD may be a promising avenue to attenuate neurodegeneration.

Isabelle Jeuris

Marine Biology, Sixth

Mentored By Dr. Simone Baumann-Pickering

Blue, fin, and humpback whale spatio-temporal presence in the Southern California Bight during the 2014-2015 marine heatwave

The years 2014-2015 were characterized by anomalous sea surface temperature fluctuations along the coast of Southern California leading to weakened upwelling and nutrient depletion. This phenomenon prompted baleen whales, including blue (Balaenoptera musculus), fin (Balaenoptera physalus), and humpback whales (Megaptera novaeangliae), to alter their spatio-temporal distributions in response to prey availability. Long term monitoring programs like the California Cooperative Oceanic Fisheries Investigations (CalCOFI) conduct quarterly visual and acoustic surveys to study the distribution of these species in the Southern California Bight (SCB). Here, analysis of CalCOFI acoustic recordings provide insight into patterns of spatio-temporal presence observed during the 2014-2015 marine heatwave and are compared to analysis from previous years. Prior research suggests that visual presence of blue, fin, and humpback whales in the SCB is associated with the El Niño Southern Oscillation (ENSO) and distribution shifts may have occurred during the 2014-2015 heatwave. Our results corroborate and extend these findings revealing low blue whale presence during the years leading up to the heatwave and during the years 2014 and 2015, increased fin whale presence during the winter of 2015 but low during spring and fall compared to previous years, and stable humpback whale acoustic presence throughout the 2014-2015 heatwave years, with a rise in the winter of 2015. Combined, these results highlight how visual and acoustic methods can be used to understand the spatio-temporal presence of large baleen whales in a biologically important feeding area, aiding in future predictions of distribution changes as the SCB continues to tropicalize.

Neal Jha

Biochemistry, Seventh

Mentored By Jared W. Young, Ph.D.

Acute nicotine vapor normalizes sensorimotor gating and locomotor activity deficits in a rat model of HIV-associated neurocognitive impairment

Despite the success of antiretroviral therapy (ART) in prolonging life expectancy of people with HIV (PWH), chronic HIV-associated neurocognitive impairment (NCI) persists. Nicotine, the primary active ingredient of tobacco smoke, improves cognition. The elevated prevalence of smoking nicotine among PWH may relate to self-medication and underscores the need to delineate its impact on cognition-related behaviors. In this study, we sought to elucidate the directional effects of acute nicotine vapor exposure on translatable measures of sensorimotor gating, as measured by prepulse inhibition (PPI), and exploratory behavior using a rat model of HIV-associated NCI. Male and female HIV-1 transgenic (HIV-1Tg) and F344 control rats (n=57) were acutely exposed to nicotine or vehicle vapor, tested for PPI, then assessed in the behavioral pattern monitor (BPM). We replicated observed PPI deficits in HIV-1Tg rats relative to F344 controls at lower prepulse intensities [$F(1,53)=5.992$, $p=0.018$], as seen in PWH. Importantly, nicotine attenuated such deficits ($p=0.329$) compared to vehicle ($p=0.019$). In the BPM, motor activity deficits were observed in HIV-1Tg rats [counts: $F(1,49)=4.159$, $p=0.047$], and nicotine increased such activity [counts: [$F(1,49)=12.682$, $p<0.001$] and specific exploration [rears: $F(1,49)=5.048$, $p=0.028$] in all rats. Thus, these data support potential beneficial effects of acute nicotine vapor in HIV-associated NCI deficits (PPI), in support of the self-medication hypothesis. Nicotine vapor also remediated the hypoactivity of HIV1-Tg rats, although main effects were observed in both genotypes. Therefore, acute nicotine may be beneficial for treating HIV-associated NCI. Future studies should determine the long-term effects of nicotine vapor on similar and other HIV-affected behaviors.

Amber Jiang

Psychology, Cognitive Science, Seventh

Mentored By Victor Ferreira

Reaching for the unknown: sentence production under uncertainty

Speakers often operate under uncertain environments. In such situations, speakers utilize available information to prioritize probable message components in their utterance plan so they can begin speaking sooner. This study aimed to understand how top-down semantic cues play a part of utterance planning when speakers are faced with message uncertainty. In a 1x3 within-subjects design, we compared the measured word-by-word latencies in a novel, image-based sentence elicitation typing task. Stimuli consisted of 'a man' grabbing a target item concealed by a black box. Stimuli differed in whether a congruent, incongruent, or absent visual cue occurs in the scene, constructed into 72 critical trial dyads. We hypothesized that when a cue is congruent to its target, speakers will use it to make a prediction that they will incorporate into their utterance plan. A correct prediction given a congruent cue would result in a shorter word-latency at the target object compared to no cue or an incongruent cue. Data from 48 UCSD students were collected in person. These data were Helmert coded into two groups (A: means of absent vs. incongruent & congruent cue conditions; B: means of incongruent vs. congruent cue conditions) which regressed target latency in a mixed effects model. Group B, but not Group A, significantly predicted trial performance (beta = 0.09, p = 0.004), where participants were 58ms faster to type the target object in the congruent condition. Thus, merely having a cue does not predict an increase in performance, but a congruent cue facilitates significantly faster performance.

Brett Johnson

Cognitive and Behavioral Neuroscience, Revelle

Mentored By Christina Gremel, PhD

Recruitment of Endocannabinoids During Goal-Directed Behavior in Alcohol Exposed Mice

Alcohol has been shown to induce long lasting deficits in executive functioning processes such as goal directed behavior. One circuit involved in goal-directed behavior is the orbital frontal cortex (OFC) to dorsal medial striatum (DMS) circuit. Previous ex-vivo

slice physiology work demonstrates that mice exposed to alcohol showed disruption in the excitatory transmission between OFC and the direct pathway of the striatum due to increased recruitment of endocannabinoids (eCBs). The temporal dynamics of eCB recruitment and how alcohol alters these dynamics are unclear. I am contributing to the lab by determining which eCB, 2-AG or AEA, is contributing to the alcohol-induced differences we have observed. I used novel genetic tools to monitor eCB recruitment during in vivo goal-directed behavior. At the same time, I pharmacologically blocked the production of 2-AG or AEA to observe changes in eCB recruitment during their behavior. Changes in eCB signaling can tell us which eCB is responsible for the alcohol induced differences. We expect 2-AG to be the main eCB involved in these changes as prior literature shows it is strongly implicated in alcohol induced changes at these synapses. Our preliminary results show that pharmacologically inhibiting the production of 2-AG and AEA affect the eCB signaling in alcohol-exposed mice and control mice differently. Future work needs to be done to determine the contributing eCBs to goal-directed control and aberrant signaling following chronic alcohol exposure. Targeting neural mechanisms such as the eCB system can help us provide better therapeutic treatments for alcohol use disorder.

Samuel Kahn

General Biology, Marshall

Mentored By Dr. Diana Hargreaves

Evaluating Perineuronal Net Maturity in the Auditory Cortex of Fragile X Syndrome Mice with Suppression of Astrocyte Signaling

Due to proprietary information this abstract has been redacted.

Fnu Kalkin

Computer Engineering, Mathematics, Revelle

Mentored By Dr Sarah T. Gille

Predicting Argo Float Trajectories with a Neural Network to Improve Sampling Efficiency

The Argo array consists of approximately 3800 profiling floats that autonomously observe the ocean. Every 10 days these floats sample the ocean from 2000 meters to the surface and transmit their collected data. Argo floats can measure temperature, salinity, nitrate, oxygen, chlorophyll, and pH. Floats play a critical role in assessing temperature and carbon cycle changes in the global ocean. To save power, Argo floats only control their motion in the vertical direction by changing their buoyancy and otherwise drift with ocean currents; this lack of horizontal propulsion can make it difficult to construct evenly distributed arrays with these floats and the resulting sampling distribution can substantially oversample or undersample different regions of the ocean. To improve Argo array efficiency, we present a neural network method to predict the trajectories of individual floats. We estimate the future distribution of the entire Argo array in an attempt to quantify how evenly the ocean will be measured. We format input data in a coordinate system relative to each float and use data that are germane to the structure of ocean currents: sea surface height, bottom bathymetry, and the density structure of the ocean. The dimensionality of a temperature and salinity climatology is reduced through EOF analysis and the dimensionality of surrounding sea surface height and bathymetry is reduced using along-gradient and across-gradient filtering before training the neural network. Then, we train the neural network with a subset of the Argo dataset and run the model on its complement, comparing the results to previous Argo trajectory prediction methods to test the neural network's predictive skill.

Kyle Kan

Math/Econ, ERC

Mentored By Professor Melissa Famulari (Teaching Professor (SLSOE), VC of Undergraduate Studies)

High School Social Capital and College Applications: The Case of California

A defining feature of the "American Dream" is economic mobility, i.e., that children growing up in low socio-economic status (SES) households have a significant probability of becoming high SES adults. Chetty et al. (2018) show that economic mobility varies substantially across geographic areas. Using data from Facebook on 21 billion friendships from 2022, Chetty and coauthors created three measures of social capital: economic connectedness, volunteerism and social cohesion. In two papers published in Nature, Chetty et al. (2022) provide evidence that the "social capital," and particularly the economic connectedness, of an area is highly correlated with an area's economic mobility. We add to this research by merging the Chetty social capital data for high schools to detailed high school characteristics from the University of California's Office of the President (UCOP). The UCOP data report two outcomes that are likely correlated with social capital and economic mobility: the numbers of students that apply to and are accepted by the top public research system in the state, the University of California (UC). We find that all three measures of social capital are highly correlated with the number of UC applicants and UC admits from the high school (HS). We show that social capital is strongly positively correlated with average SAT scores and the HS's rank in the state and negatively correlated with the percent of free and reduced meals at the high school. When predicting UC applicants using standard HS variables, we find that no social capital measure improves the prediction.

Elizabeth Kao

Cognitive Science spec. Machine Learning and Neural Computation, ERC

Mentored By Professor Mary ET Boyle

Exploring the Relationship Between Gender Bias and Semantic Sensitivity in ChatGPT's Responses

Artificial intelligence (AI) is an increasingly inextricable component of learning settings. ChatGPT and similar systems provide a range of help, causing worries about possible biased responses produced by AI. This study explores the impact of syntax on ChatGPT's responses and the degree to which it generates responses containing unconscious bias and prejudice related to gender identity. Previous studies have found that ChatGPT curates extremely biased responses, but how this problem may be mitigated remains unclear. This study extends earlier investigations to pinpoint changes in ChatGPT's bias over time. By categorizing prompts based on specific trends and characteristics, I examined ChatGPT's sensitivity to semantic variations. The data illustrated that nonbiased conversations often included qualifying statements and stemmed from specifically

worded prompts. Other biased responses persisted especially when presented with a narrative structure and word gradients suggesting limitations of ChatGPT's understanding of nuanced language. This research emphasizes the importance of user language choice in shaping responses in order to mitigate bias, providing broader insight into how users can use AI more mindfully and responsibly.

Haritha Karthikeyan

General Biology, Muir

Mentored By Kim Dore, Assistant Professor

Investigating a Mutation in the Depalmitoylating Enzyme ABHD17a that is Protective Against Alzheimer's disease

In neurodegenerative diseases such as Alzheimer's disease (AD), accumulation of toxic proteins can cause synaptic changes leading to the exacerbation of disease states over time. In our lab, we are interested in the role of the scaffolding protein PSD-95, which was shown to be decreased in AD patients. PSD-95 requires palmitoylation to remain at synapses, a post-translational modification facilitating the association of proteins with membranes. We are currently interested in the PSD-95 depalmitoylating enzyme ABHD17a, and a newly identified mutation in this protein that was found to be protective against AD. Specifically, this mutation results in a Valine-to-Glycine change at residue 38, and a genomic study comparing AD patients with age-matched controls, resulted in significantly later AD diagnoses. Because this mutation had such a big impact on humans, we want to investigate the molecular mechanisms behind how mutant ABHD17a affects its targets. Currently, we are searching for human carriers using PCR to amplify a fragment in ABHD17a DNA surrounding the mutation using genomic DNA samples from UCSD's ADRC Brain Bank. After optimizing PCR conditions, we now consistently obtain a band at the desired base-pair length. Following gel extraction, we have been analyzing sequencing data to identify carriers and non-carriers. As this mutation has a frequency of 1%, we will genotype around 300-500 samples in total to obtain 3-7 carriers. Ultimately, as mutations protective from AD are quite rare, we would like to characterize the molecular mechanisms behind this mutation in order to better understand AD pathophysiology and develop effective therapeutics.

Chalach Kasemtantikul

Physics, Warren

Mentored By Dr. Brian Maple

An Investigation into an Emerging Topological Kondo Insulator UFe4P12.

UFe4P12, a material postulated as a topological Kondo insulator, is examined for its unique interplay of ferromagnetism and semiconducting behavior, which are key in advancing condensed matter physics and technology. This research employs Hall effect measurements on laser-cut, gold-sputtered nanochips to assess electronic transport properties, crucial for understanding charge dynamics. Complementing these are specific heat analyses via Quantum Design's PPMS, which elucidate the low-temperature electron-phonon interactions and signal phase transitions indicative of the material's complex internal structure. Notably, nitrogen vacancy (NV) center magnetometry, integrated into the Dynacool system, will detect magnetic phase transitions and potential superconductivity under varied conditions, including extreme pressures and millikelvin temperatures. The synthesis of these investigative techniques aims to delineate UFe4P12's electronic and magnetic properties, potentially confirming its TKI phase. This exploration is pivotal for the development of quantum devices that exploit the material's error-resistant qubits and enhanced data processing, with significant implications for spintronics and quantum computing. The results are expected to deepen the theoretical understanding of strongly correlated electron systems and pave the way for innovative applications, positioning UFe4P12 at the vanguard of novel electronic and magnetic materials research.

Katya Kazulina

Neurobiology, Muir

Mentored By Shiri Gur-Cohen, Ph.D, Assistant Professor

Sexually Dimorphic Niche Organization Dictates Mammary Gland Development

Due to proprietary information this abstract has been redacted.

Tamar Khaled

Biochemistry, Marshall

Mentored By Dr Omar Mesarwi

Time Restricted Eating and Sleep Apnea (TERESA) Clinical Trial

Obstructive sleep apnea (OSA) is a highly prevalent respiratory disorder characterized by partial or complete collapse of the airway during sleep, resulting in reduced oxygen levels and poor sleep quality. OSA is associated with a variety of metabolic disorders including impaired fasting glucose, insulin resistance, type 2 diabetes mellitus, hypertension, atherosclerosis, and dyslipidemia. The first-line treatment for OSA is nasal continuous positive airway pressure (CPAP), which, though highly effective in treating OSA, has not been shown to improve metabolic health in OSA. Time restricted eating (TRE), whereby the daily window for caloric intake is modestly reduced, improves body weight and glucose homeostasis in humans, and also is shown to improve glucose and lipid metabolism in rodents. Preclinical data from the Mesarwi lab have shown that TRE can improve fasting glucose and glucose tolerance in a mouse model of OSA, through improvements in pancreatic beta cell function. These effects appear to be more profound in an OSA model than in normal rodents. However, the effects of TRE in human subjects with OSA have not been demonstrated. In this presentation, we discuss the rationale and design of an ongoing clinical trial, in which patients with moderate to severe OSA are randomized to TRE or standard eating, with outcomes including several important metabolic health parameters (serum glycated hemoglobin, lipids, blood pressure, and glucose levels measured by continuous glucose monitor). We hypothesize that TRE will improve each of these parameters, and that no significant change will be observed in patients randomized to standard eating.

Ibrahim Khan

General Biology, Warren

Mentored By Kenta Asahina, PhD

Using a Two-Choice Assay to Investigate Yeast Preference in Hugin-Mutant Drosophila

Due to proprietary information this abstract has been redacted.

Eesa Khan

Mechanical Engineering, Sixth

Mentored By Professor Mike Tolley

Shape Sensing for Soft Robots Driven by Ionic Fluid

Soft robotic systems leverage compliance in various components, like grippers, to enable new and enhanced functionality in comparison to traditional robotic systems. However, accurately sensing the shape of compliant components with integrated sensors remains a challenge for fluidically driven soft robots. In this work, we addressed this challenge by leveraging the conductive properties of a saline solution to act as both the working medium and sensing medium for a soft robotic gripper. By integrating electrodes into various points of the gripper, we created a gripper that can be connected to a microcontroller to collect resistance measurements between each electrode pair. We then use these measurements to determine the shape of the gripper using physics-based and machine learned models. With improved shape sensing capabilities, soft robotic grippers can be used for a broad range of applications, from pick-and-place operations that require dexterity and precision to manipulation tasks that use sensing to identify objects.

Jerick Kim

Neurobiology, Revelle

Mentored By Nathan Shaner, PhD

Directed evolution of novel genetically encoded pH indicators to sense acid secretion

The hydrogen voltage-gated channel (HVCN1) is a voltage-gated proton channel that spans the cell membrane and plays important roles in pH regulation and phagocytosis in macrophages, microglia, and other immune cell types. Studies have probed the relative expression level of HVCN1 across cell types, but its precise physiological roles, particularly concerning neuroinflammation and neurodegeneration, remain poorly understood. Our project aims to develop a genetically encoded pH sensor capable of localizing the opening of the HVCN1 channel to provide a fast optical readout of the local pH changes mediated by this channel. We are developing a circularly-permuted pH sensor to insert into an extracellular loop between two of the channel's transmembrane helices, which previous research in the lab identified as a suitable insertion site for fluorescent tags. This new pH sensor uses a new fluorescent protein recently developed in

the lab and uniquely increases in yellow fluorescence when pH becomes acidic, unlike most fluorescent protein-based pH sensors. Here, I report the results of our trails of the sensor in vitro and fused to HVCN1 and expressed in Rat Basophilic Leukemia cells (RBL cells), which display a mast cell-like phenotype suited for the study of allergies, using confocal or widefield imaging to assess the pH sensor's localization and behavior.

Mia Koga

International Business, Marshall

Mentored By Dr. Munseob Lee

South Korea's Aging Demographic

South Korea has been facing a demographic crisis characterized by rapid population aging and declining fertility rates. This problem is projected to worsen with its greatest impacts hitting in the 2050s. This study investigates the drivers contributing to South Korea's demographic decline and the ensuing economic consequences, including a lag in productivity and a shrinking labor force. By analyzing demographic trends and societal factors, the research aims to propose intervention strategies to mitigate its impact on the economy. By comparing the aging problems in South Korea and Japan, we can draw insights from successful initiatives in Japan and apply them to South Korea. A promising solution in Japan has been the implementation of technology advancements such as telemedicine and elder care robots; this study advocates for similar approaches in South Korea. Through cross-country comparisons and an examination of the effectiveness of technology-driven solutions, the study highlights the potential for leveraging technological innovations to address the challenges posed by demographic aging. By emphasizing the urgency of proactive measures, this research contributes insights on demographic challenges, and offers actionable recommendations for policymakers in South Korea and beyond.

Adi Krishnamoorthy

Mathematics-Computer Science, Sixth

Mentored By Paul Siegel

Coding Theory for DNA Storage: Synthesis, Retention, and Reconstruction

Due to proprietary information this abstract has been redacted.

Girish Krishnan

Electrical Engineering, Sixth

Mentored By Professor Nikolay Atanasov

Python Robotics: Developing a Learning and Testing Platform for Robot Navigation

The complexity of robot navigation poses a significant learning curve for newcomers in robotics. This project aims to bridge the knowledge gap by developing an interactive online platform that demonstrates robotics algorithms to those who are new to robotics. Our work aims to provide an accessible toolbox that simplifies the learning, implementation, and testing of robotic algorithms in a 3D physics-based simulator. This platform integrates tutorials on key algorithms, their source code, and corresponding visualization in a centralized website. Leveraging the PyBullet physics engine for realistic simulation and Google Colab for interactive user features, our website facilitates a hands-on learning experience in robot localization, mapping, motion planning, and motion control. The algorithms demonstrated on our website include particle filtering, occupancy grid mapping, A* planning, and PID control. We strive to make the concepts required to understand and implement the algorithms accessible to a broad audience and foster technical skills development among a larger group of robotics enthusiasts.

Lucas Kuhnau

Cognitive and Behavioral Neuroscience, Muir

Mentored By Timothy Gentner, Professor

The Neuroscience of Vocal Flexibility: Mapping Auditory-Motor Dynamics in Songbirds

Due to proprietary information this abstract has been redacted.

Lee Le

Neurobiology, Revelle

Mentored By Dr. Karl Wahlin

Muller Cell Reprogramming for Retinal Regeneration Research

I will be transfecting iPSCs stem cells with plasmid constructs containing the Cre-loxP system, genotype these stem cells to verify the transfection of required genetic material, maintain, and differentiate these stem cells into retinal organoids. The purpose of the Cre-loxP plasmid construct is to introduce this system to Muller cells, through the tagging of the Cre-loxP genes with Muller-specific genes like GLAST or RLBP1. Once integrated, the goal is to conditionally turn on the fluorescence protein mChilada in Muller cells of retinal organoids treated with tamoxifen, which is capable of activating the Cre-loxP system through the Cre-ERT2 fusion protein.

Zaira Leal

Biological Anthropology, ERC

Mentored By Amy L. Non

Did preterm birth rates shift by nativity among Hispanic women in the United States during the COVID-19 pandemic?

Despite chronic exposure to stressors, Hispanic women in the United States (U.S.) typically have lower than expected preterm birth (PTB) rates.This counterintuitive outcome is known as the Hispanic Paradox. The COVID-19 pandemic resulted in

devastating hospitalization and unemployment rates, particularly among Hispanic communities. We hypothesized that foreign born Hispanic women (FBHW) experienced higher levels of pandemic induced stress resulting in an increase of PTB rates. We explored PTB data among Hispanics from the National Center for Health Statistics natality files containing all registered U.S. births from 2016 to 2021. We compared singleton live preterm births to Hispanic women, restricted to the months of April-June to control for seasonal fluctuations, and plotted expected versus predicted PTB rates over time. We found PTB rates of FBHW have been increasing faster than for US-born Hispanic Women (USBW). During the early pandemic, PTB rates significantly decreased for all Hispanic women relative to 2019(OR=0.9607, $p<0.001$). However, only among FBHW was this decrease significantly below the predicted value (outside of the 95% confidence interval), adjusting for trends since 2016. In 2021, PTB rates increased again for all groups but remained below predicted rates for FBHW, indicating a lasting effect of the pandemic. Finally, we found that the PTB rates dropped significantly among spontaneous but less among induced births, implying a reduction of stress potentially resulting from an increase of time spent at home with extended family, and a loss of labor-intensive jobs, rather than changes in hospital policies or prenatal care.

Annette Lee

Global Health, Seventh

Mentored By Dr. Amy Non

Missed Indicators, Overmedicalization, or Other Perspectives Explaining Reduction in PTB rates during early COVID-19, A Mixed Methods Study

A significant decrease in preterm births was observed in many higher-income countries during the first few months of the COVID-19 lockdown. From analyzing the CDC natality data in U.S. between 2016-2021 on preterm birth rates, induced vs spontaneous birth trends, fetal deaths, and rate of prenatal care, there was a greater reduction in induced/iatrogenic compared to spontaneous preterm births paired with an observed decrease in fetal deaths and prenatal care in the United States. This unexpected finding raised speculation that the reduction was influenced by drastic changes in delivery and prenatal care. To get more insights, fifteen semi-structured interviews were conducted to receive input from clinicians working during the COVID-19 pandemic, and most providers did not notice a significant reduction in preterm births. When provided with the trends, many clinicians hypothesized that the decrease in in-person visits led to missed indicators surrounding pre-eclampsia and/or gestational hypertension disorders,

influencing the national reduction in preterm births. However, speculations about a previous overmedicalization of pregnancy, supported by the observed reduction of fetal deaths, also arose, giving insight into how the reduction of iatrogenic preterm birth inductions and prenatal/delivery interventions may have benefited health outcomes. This "double-edged sword" perspective delivers insights and discussion on the risk tolerance of society regarding pregnancy and the current U.S. maternal/fetal healthcare structure in impacting birth outcomes.

Kaitlin Lee

Cognitive Science — Specialization in Language and Culture, Marshall

Mentored By Dr. Sarah Creel

Children's Perceptions of Gender Ambiguity in Voices

Due to proprietary information this abstract has been redacted.

Kendra Lee

Marine Biology, Seventh

Mentored By Lisa Levin, Emeritus

The characterization of macroinvertebrate communities inhabiting hard substrates at southern California methane seeps

Once believed to be barren and devoid of life, the deep sea is now acknowledged for its intricate ecosystems, abundant with unique and complex life forms. Methane seeps are one of these distinct deep-sea ecosystems, characterized by the release of methane and other hydrocarbons and recognized for hosting diverse invertebrate communities. Our research objectives encompassed assessing macroinvertebrate density, community composition, and diversity across six southern California methane seeps. We also explored the impact of ocean depth and oxygen availability on these communities. Our hypothesis posits that seeps that occur in the oxygen minimum zone (4050-1000 m) – a region in the water column characterized by low oxygen availability – will likely exhibit reduced density and biodiversity. As only a limited number of species would be adapted to such conditions, we anticipate to find unique dominant species highly tolerant to low oxygen across the sites located within the OMZ. The goals of this study are (1) to

characterize the macroinvertebrate community inhabiting hard substrates at methane seeps in southern California; (2) to identify changes in macrofauna abundance and biodiversity and community composition across different seep sites; (3) to observe the relationship between ocean depth, oxygen availability, and temperature and biological communities of methane seeps; (4) to assess the relationship between density and species diversity and substrate size (rock surface area).

Kieli Leon

Speculative Design, Seventh

Mentored By Professor Christena Turner

The Mischaracterization of the Gyaru: Subculture as a Form of Social Protest in Japan

The widespread characterization of "gyaru" is highly negative and a reductionist stereotype that paints women who are a part of the subculture as shallow and materialistic. In response to this prevailing narrative, I offer a long overdue thorough explanation of the subculture's origins and insight into the feminist roots of "gyaru". Through a linguistic and historical analysis surrounding society's reaction to "modern Japanese women", I aim to prove that the demonization of the gyaru subculture is not an isolated incident, but rather a part of a larger, ongoing trend. I will examine the gyaru subculture's birth as a pushback against societal expectations of women in Japan, and how the subculture has evolved, both in the eyes of the general public, as well as the many different styles that have come to be. I will discuss how the perception of youth engagement with certain subcultures like gyaru has been altered from the reality of gyaru, and who benefits from this alteration. I argue that the Gyaru subculture is a feminist pushback against Japanese societal expectations of women, and has been wrongly demonized by the media because of its feminist nature of demanding autonomy.

Mary Li

Bioengineering - Biotechnology, Warren

Mentored By Lingyan Shi, Assistant Professor

Fasting Induced Lipid Metabolic Changes in Drosophila Intestines During Aging

Intermittent fasting (IF) has been shown to confer health and lifespan benefits in various model organisms, yet the underlying mechanisms, particularly concerning lipid metabolism, remain to be fully elucidated. In this study, we explore the effects of two IF regimens on lipid metabolism and lifespan extension in Drosophila melanogaster. Flies were subjected to either a 4-day fasting followed by 3-day refeeding cycle or a 3-day fasting followed by a single day of refeeding, until they reached 20 days of age, after which they were fed normally. Our results demonstrate that both IF protocols significantly enhanced lifespan and lipid metabolism in treated flies compared to control groups. Specifically, treated flies exhibited an increased lifespan and elevated levels of lipid metabolites, indicating an enhanced metabolic efficiency. These findings suggest that IF induces metabolic adaptations that contribute to longevity, potentially through mechanisms that involve the modulation of lipid metabolism. Furthermore, our study highlights the flexibility of IF schedules in promoting lifespan, offering insights into the temporal dynamics of dietary interventions on aging. This work contributes to our understanding of how nutrient sensing and metabolic pathways intersect to influence aging and suggests that modulating dietary patterns could be a viable strategy to enhance healthspan and lifespan in higher organisms.

Yongce Li

Data Science and Math, Seventh

Mentored By Dr. Lily Weng

SNIP: Machine Unlearning via Selective Neuron-wise Interpretable Pruning

Large Language models (LLMs) have revolutionized the field of natural language processing with their remarkable performance across various applications. However, they suffer from issues related to untruthfulness and toxicity. With evolving data regulations, machine unlearning (MU) is becoming increasingly important to remove undesired outputs of LLMs, such as harmful, manipulated, or outdated information. This paper introduces a machine unlearning method specifically designed for LLMs. We present

Selective Neuron-wise Interpretable Pruning (SNIP), a machine unlearning method for LLMs, which is retrain-free and interpretable. SNIP selectively remove feed-forward layer neurons based on the relative importance of their neuron explanations on a targeted downstream task. To the best of our knowledge, SNIP is the first interpretable MU approach based on neuron concepts, which helps us understand and remove what have been learned in LLMs.

Jacky Liang

Political Science: International Relations, Seventh

Mentored By David A. Lake, Distinguished Professor

Why Do Populist Republicans Oppose Supporting Ukraine?

Why have populist Republicans ceased supporting Ukraine in its conflict against Russia? As the second anniversary of Russia's invasion of Ukraine approaches, a decline in willingness to continue supporting Ukraine among Western countries has been widely observed. Populism is often cited as a contributing factor to this growing reluctance, but the specific reasons behind populism's opposition to supporting Ukraine remain largely unexplored. Previous research on populism and its impact on international relations has primarily focused on Europe and Latin America, with such trends in the US receiving less exploration. Using voting records from the House, I employ regression analysis to address the theoretical gap in understanding this widely observed phenomenon. My analysis confirms a prevalent disinclination among populist Republicans to fund Ukraine. My research proposes and tests four potential factors. Firstly, I argue that the populist right in the US consistently opposes foreign aid more than their mainstream counterparts, regardless of the type of assistance or the recipient countries. Secondly, I examine whether the pro-Putin sentiments, associated with the populist right as identified in previous research in Europe, contribute to the particular dislike of funding Ukraine among populist Republicans. Thirdly, I explore the possibility that populist Republicans raise opposition merely for the sake of opposition, as a political signaling strategy. Lastly, I investigate the opportunistic tendencies of populists, wherein they are more inclined to support the stronger and winning party.

Jason Liu

Physics with Specialization in Astrophysics, Warren

Mentored By Karin Sandstrom, Associate Professor

Ionization of Polycyclic Aromatic Hydrocarbons around HII regions in the nearby galaxy M33

Polycyclic aromatic hydrocarbons (PAH) molecules, which have a composition of carbon and hydrogen, dominate the mid-infrared emission features on the spectrum of the interstellar medium (ISM). With their large cross-section, PAHs control the ionization balance in the neutral ISM, which sets the conditions to form molecular gas, the fuel for star formation. By examining the ionization state of the PAHs, we explore the behavior of the PAHs in the HII regions in the galaxy M33. The ionization state of the PAHs is traced by the ratios of their emission intensity between the 7.7 um and the 11.3 um vibrational bands, where 7.7 um band and 11.3 um band measures the ionized and neutral PAHs respectively. We determine the center and the radius of the HII regions by using the Hα emission map of M33. By making radial profiles with bin size of 2 arcsec from the centers of the HII regions, we examine the ionization state of the PAHs within the HII regions. We find that 83 of our HII regions have more ionized PAHs within the 2 arcsec aperture around the center of the HII regions, and 115 of our HII regions have more neutral PAHs in their centers. We find that regions with more neutral PAHs tend to have larger radii and higher intensity in Hα emission than the regions with more ionized PAHs.

Angela Liu

Cognitive Behavioral Neuroscience, Sixth

Mentored By Gedeon Deák, PhD

Investigating the effect of using infant's name, object name, and attention language on the success of a joint attention episode between caregivers and infants.

I am investigating how usage of specific language by infants' caregivers, paired with pointing gestures and/or gaze-direction cues, impacts joint attention bids between caregivers and infants. Joint attention episodes in infant-caregiver interactions can occur when a caregiver attracts the infant's attention, then directs their attention towards a target, so that both are attending to the same target. Caregivers might use various different cues to achieve this, including both verbal and nonverbal cues. When looking at

these two general categories of cues, I'm curious how the frequency of bids with combined verbal and non verbal cues compared to non verbal bids changes with age. To then consider the different weighted effects of specific content types used in language (e.g. object name, attention-directing words), paired with non verbal cues, I want to analyze the correlation between different combinations of content types used in caregiver speech and whether or not the infant successfully attended to the same target. In addition, I will examine how these variables are correlated with the duration of infant-caregiver shared attention – a variable that has been associated with infant learning. I hope to develop a model that considers and compares the effectiveness of these variables in attempting to engage an infant in joint attention. I believe these results will contribute to a better understanding of how attention-sharing unfolds in infant-caregiver interactions and how infants learn to associate certain cues and words with expectations in social interactions.

Angela Liu

Bioengineering, Warren

Mentored By Robert Sah, MD, ScD

Biaxial Tensile Testing Apparatus for Small Soft Tissue Samples

The mechanical properties of connective tissues change with maturation, aging, and disease. The biaxial tensile properties of small tissue samples are often of interest. The objective of this study is to design a method and device that allows uniaxial and biaxial stretch of small tissue samples that can be used to determine biaxial tensile properties. The method used resin-printed templates to guide the cutting of cross-shaped test coupons. These are attached via metal pin fixtures that allow application of displacement and measurement of load. Tensile properties are then determined as the slope of linear regression fits of stress vs. strain profile. With this apparatus, the tensile properties of various tissues such as cartilage, meniscus, tendon, ligament, intervertebral disk, skin, and fascia should all be feasible. Ongoing studies are finalizing the application of the device and method.

Juliana Loaiza

Environmental Systems, EBE, Muir

Mentored By Dr. Lisa Levin

Methane Seep Depth and Benthic Invertebrates

This research will investigate the impact of water depth and oxygen levels on benthic macrofaunal communities in seep sediments of southern California, aiming to enhance understanding of extreme environments and their adaptation by unique organisms. The study hypothesizes that deep seeps with lower oxygen and higher pressure will exhibit lower macrofaunal density, while shallower seeps with higher oxygen levels will have higher density. The research examines samples collected from 6 seep sites via submersible in 2023 at depths ranging from 459 to 1019m. Sediments were sampled by pushcore, sieved in the laboratory, with invertebrates removed and identified by microscopy, and subject to statistical analysis using R for patterns in abundance, composition, distribution, and activity. The discussion will interpret implications for the broader field of conservation, highlight the importance of the findings for deep-sea research, and suggest avenues for future research.

Audrey Lopez

Communication, Warren

Mentored By Erin Hill, Ph.D

Part of That World: Dispelling the Magic of the Disney College Program and Disney's Working Conditions in the U.S.

This research examines Disney's demanding working environment through the lens of theme park employees and Disney College Program participants at Disneyland and Disney World. Utilizing related literature and an analysis of Disney's branding strategies, this study focuses on the relationship between Disney Employee's positive perception of their job and Disney's purposely constructed image. The phenomenon of the "Disney Bubble" plays a prominent role in how the study distinguishes the connection between Disney Employees and their job. The analysis of key events in the Walt Disney Company's history as well as Karl Marx's definition of Exploitation will reinforce the notion of Disney's unfit working conditions. This argument is also supported by Interviews, Surveys, and Digital Ethnography, which aim to identify the challenges that

Disney Employees face in their positions. The overall purpose of this research is to challenge the positive perception of Disney's working environment by questioning their labor practices and highlighting the voices of Cast Members.

Alan Lopez

Psychology B.S., Revelle

Mentored By Dr. Celeste Pilegard

Using Gestures to Signal a Causal Lesson Structure: Effects on Meaningful Learning

The role of gestures in instruction has been extensively studied given their unique capacity to communicate visual information. Previous research suggests that learners benefit from an instructor's gestures when they signal the underlying compare-and-contrast structure of a lesson, similar to the organizational benefits of tables. This study tests whether this effect can be replicated for a lesson with a cause-and-effect structure. Participants will be randomly assigned to watch either an experimental video lesson in which an instructor uses linking gestures (i.e. gestures that move from one representation on a diagram to another to signify a cause-and-effect relationship) or a control video lesson in which only prosodic gestures are used. After the lesson, participants will answer transfer questions measuring their ability to make connections, apply knowledge to new situations, and assess problems in the causal system as an indication of their meaningful learning. We hypothesize that, in response to the difficult transfer questions, subjects who see linking gestures in the presence of a visual aid will generate more novel answers that engage with the material more. This would suggest that linking gestures, through the emphasis of cause-and-effect relationships present in the instructor's verbal message, improve meaningful learning by cueing lesson structures and facilitating the organization of knowledge in the learner's mind. If we do not see differences in transfer performance between the two groups, then we would conclude that our hypothesis is unsupported in that the effect of structure-signaling gestures on meaningful learning is not replicable for causal lesson structures.

Linda Lou

Cognitive Science - MLNC, ERC

Mentored By Eric Zorrilla, PhD, Adjunct/Neurosciences

TRAPping Ensembles for Predator Stress

Chronic stress globally impacts human behavior and health. While the striatum and prefrontal cortex are implicated in neurobiological responses to stress, regional ensemble differences therein between acute vs. repeated psychosocial stress are unknown.A behaviorally-validated model of predator stress where TRAP2-Ai9 mice (n=9-21/group) received 4-hydroxytamoxifen (4OHT; 40mg/kg) or vehicle after acute (1st) or repeated (10th) exposure to predator stress (odorous rat bedding) was used. Controls received clean bedding. Activated, CreER-expressing neurons during 4-hydroxytamoxifen injections undergo recombination, permanently expressing tdTomato fluorescent reporters. Eighteen days after the 10th, mice received a final (11th) exposure and were euthanized. Brain slices were imaged under an LSM710 confocal microscope. Activated cells at sacrifice (green Fos immunofluorescence) vs. after acute (1st) or repeated (10th) stress (TRAPped red tdTomato) were counted, and Fos-tdTomato co-localization was assessed using ImageJ. In the dorsomedial striatum (DMS) and anterior cingulate (aCg), more TRAPped cells were tdTomato-positive after the 1st than 10th exposure to both conditions, indicating a Time effect. Greater neuronal activation occurred after the 10th stress exposure compared to control, displaying a Stress effect. In the aCg, Fos-positive cells from the 11th, separate re-exposure co-localized more with tdTomato-positive ensembles TRAPped after one acute exposure than ten repeated exposures. Cellular activation in the DMS and aCg habituated after repeated exposure to both stimuli, predominantly in controls, with stress evoking a greater response than control conditions. Unexpected predator stress induced the greatest response, indicated by ensembles after the 1st exposure having the greatest activation and most colocalization to a separate re-exposure.

Sidney Ma

Cognitive Science, Muir

Mentored By Sean Trott

Using GPT to Reconstruct Human Response Distributions in Social Science Research

In recent studies, researchers have started using GPT, a large language model, as a stand-in for human participants in various social science studies, yielding surprisingly accurate results. This finding is attributed to GPT's training – because GPT is trained on trillions of words, its responses reflect a vast range of human opinions, closely matching "typical" human reactions. However, this research largely focuses on comparing the mean responses between humans and GPT, leaving a gap in understanding the variance and whole distribution of responses. Recognizing this, our project will involve using multiple GPT instances to simulate multiple participants. By comparing statistical measures such as variance, skewness, and the overall shape of distributions between human and GPT-generated data, we aim to test whether multiple GPTs can accurately replicate human response distributions. This could potentially validate the use of GPT as a substitute for human subjects in certain research contexts, or highlight areas where GPT's responses diverge from that of humans, offering insights into the capabilities and limitations of using AI in social science research.

Cameron Manard

Psychology with a Specialization in Social Psychology, Marshall

Mentored By Dr. Leslie J. Carver

Reward Anticipation to Social and Nonsocial Dynamic Stimuli in Preschool-Age Children With and Without Autism Spectrum Disorders

Autism Spectrum Disorder (ASD) is associated with deficits in social communication. The social motivation hypothesis suggests that the foundation of autism is a lack of motivation towards building and maintaining social connections. Alternative hypotheses suggest nonsocial deficits cause social situations to become aversive over time. To test these hypotheses, we use EEG to measure stimulus preceding negativity (SPN). SPN is an EEG component that measures the expectation of a stimulus. Prior research shows that 6-to 8-year-olds without autism have a larger SPN when expecting social versus nonsocial stimuli while 6-to 8-year-olds with autism show no difference in SPN when

comparing social with nonsocial stimuli. In a previous study, neurotypical 3-to 4-year-olds produced results consistent with older neurotypical children. Participants were shown a colored X or square followed by videos of female faces smiling (social) or of a toy car rolling down a ramp (nonsocial). The SPN is generated during this interval. Our study hopes to use similar methods in children with and without ASD and compare the results to 6-to 8-year-olds. The social motivation hypothesis predicts that 3-to 4-year-olds with ASD would have results similar to the 6-to 8-year-olds with ASD. Conversely, the alternative hypotheses would predict that 3- to 4-year-olds with ASD would have results similar to the neurotypical 3- to 4-year-olds.

Avel Mandap

General Biology, ERC

Mentored By Dr. Karl Wahlin

Human retinal photoreceptor cell neurons produced by transcription factor mediated reprogramming

Retinal degenerative disease in humans related to dysfunction in parts of the eye such as photoreceptor cells is a significant factor that contributes to loss of eyesight. Studying human stem cell derived organoids is a useful method for understanding how to combat retinal degenerative disease as systems for retinal repair like endogenous regeneration have not yet been fully developed. To explore photoreceptor cells (PCs) further, transcription factors (TFs) involved in the origination of PCs were combined into inducible gene cassettes and inserted into human pluripotent stem cells (PSCs) with the expectation that these cells would differentiate into PCs. We propose that a combination of PC expressing TFs CRX, NRL, LHX4, and OTX2 lead to PC-like induced neurons (PC-iNs) and hypothesize that these PC-iNs will display properties comparable to PCs such as electrophysiological and transcriptional profile similarities. We believe that understanding the set of TFs associated with PC differentiation will be useful for creating methods of eye regeneration and cell replacement.

Hannah Manoochehri

General Biology, Muir

Mentored By Dr. Marianna Alperin

Effect of Delivery and Lactation on the Pelvic Floor Muscle Stem Cells in the Early Postpartum Period

Pelvic floor muscle (PFM) recovery after childbirth is essential for the preservation of pelvic floor function and for the prevention of pelvic floor disorders. Unfortunately, pelvic floor function may never fully recover after childbirth. Muscle stem cells (MuSC) are responsible for muscle regeneration. Low estrogen levels, induced by delivery and perpetuated by lactation, have been shown to reduce MuSC functionality. This prompts us to investigate whether lactation impacts the ability of MuSCs to regenerate pelvic floor muscles after birth injury. To address our scientific question, a validated rat model was used. Animals were randomly assigned to lactating versus non-lactating groups and were assessed at multiple time points after vaginal delivery: 1, 5, 7, and 21 days postpartum (PP). Another group of animals underwent simulated birth injury (SBI) at the moment of delivery. Regeneration was assessed at 7 and 21 days PP. The pelvic floor muscle pubocaudalis (PCa), and a non-pelvic muscle control (tibialis anterior, TA) were harvested and frozen. MuSC proliferation significantly increased after delivery in non-lactating animals at PP7, compared to late pregnant (LP) and early PP timepoints in both PCa and TA. An increase in proliferation was not observed in the lactating animals. In animals that underwent SBI during parturition, we observed a reduction in MuSC number in the lactating condition, while proliferative ability was not impacted. These findings indicate that PFM stem cells proliferate early PP following vaginal delivery, and that lactation inhibits proliferation. However, when injury occurs during delivery the detrimental effect of lactation on MuSCs behavior subsides.

Gabriela Marcial

Environmental Systems: Ecology, Behavior, Evolution, Revelle

Mentored By Dr. Julian Shroeder

Plant stress hormone signal transduction

Due to proprietary information this abstract has been redacted.

Navíl Martínez

Visual Arts Media, Muir

Mentored By Dino Dinco, Professor and Mentor

El Topito

My project, El Topito, is an experimental Western film and photographic series about a Mexican American transgender man named Vaquero. My goal when producing the film was to deconstruct the classic male Western story through the eyes of a transgender man. As he traverses the arid expanse of the desert, Vaquero feels the heavy burden of his past actions weighing him down and grapples with their impact on his life and those around him. The vast emptiness of the desert mirrors the emptiness he feels inside and the false belief of what a man should be as he struggles to come to terms with what he's lost because of his exigency to find manhood. I, Navíl Martínez, will be the leading role in my film. I will shoot this film to make it part of a studio installation. I have not been someone to admire Western films, nor have I shot any; still, I believe there are an array of messages and conceptual ideas I can explore through Westerns when it comes to masculinity, gender expression, and what is culturally accepted to be a man, more specifically, what type of man is accepted in Mexican culture.

Rachel McChesney

Political Science, Warren

Mentored By Karen Ferree, PhD

Wrongful Arrest Theory: Justice For Individuals With Diabetes In Criminal Law Procedure

This paper discusses the vulnerability of individuals with diabetes concerning arrest procedures in criminal law. It analyzes the wrongful arrest theory as a device for individuals with disabilities to bring claims against law enforcement when their rights under Title II of the Americans with Disabilities Act (ADA) are violated. Individuals with diabetes constitute more than 10% of the United States population, meaning that many individuals are at risk for police misconduct because of their disability. The symptoms that come about with having diabetes, such as fruity-smelling breath and loss

of coordination, can be mistaken for illegal activity leading to a wrongful arrest. No case involving ADA Title II violation claims against law enforcement relying on the wrongful arrest theory has been brought by an individual with diabetes. This paper explores the possibility of its potential success. To accomplish this, this paper first defines disability under the law, including diabetes. It then conducts a thorough analysis of the wrongful arrest theory in various case studies consisting of non-diabetic and diabetic plaintiffs. In a final case study, I apply the wrongful arrest theory to a case hypothetically to illustrate the plaintiff's potential success if he were to claim a wrongful arrest. Lastly, I explore some of the theory's limitations. I hope that my findings will emphasize the lack of discourse surrounding individuals with diabetes in disability law and encourage further research and education on the wrongful arrest theory as a successful claim against Title II violations committed by law enforcement.

Ian McNellis

Biology with specialization in Bioinformatics, Revelle

Mentored By Heidi Cook-Andersen, MD, PhD

Mechanisms Driving the Primed-To-Naive Transition in Human Embryonic Stem Cells

Recent research suggests that human pluripotent stem cells (hPSCs) exist in naive or primed states, where naive hPSCs have more developmental potential than primed hPSCs. Naive cells can more easily differentiate into extraembryonic cell lineages, especially trophectoderm, which makes them invaluable for embryo research. Despite corresponding to an earlier developmental stage, several methods exist to derive naive hPSCs from the commonly cultured primed hPSCs, however, the mechanisms driving this conversion are not comprehensively understood. Our objectives are to optimize the conversion process by introducing gene expression-regulating small molecules and growth factors, and to ultimately investigate these mechanisms through RNA sequencing analyses. Using the PXGL-reset procedure as the base method, we will introduce different concentrations of IM-12, SB590885, WH4–023, Y27632, Activin A, BIRB0796, and CGP77675, which are small molecules and factors with a positive impact on naive conversion. We will assess the effectiveness of the transition processes by performing flow cytometry to test for naive hPSC markers. Promising combinations will later be included in single-cell RNA sequencing experiments. Concurrently, bioinformatics tools will be applied to analyze previously published single-cell gene expression profiles of human embryos, naive hPSCs and trophectoderm cells, creating references for comparison. Using the PXGL-reset procedure, we have been able to

produce naive hPSCs with approximately 70% double-positivity in SUSD2 and CD75, albeit with limited stability. These efforts will help develop a reliable method of primed-to-naive conversion. This will support future research in modeling trophectoderm cells and in investigating factors that cause embryo implantation failure.

David Melendez-Perdomo

Biochemistry, Muir

Mentored By Dr. Lisa Stowers

Investigating the Interplay Between the Vomeronasal Organ and Main Olfactory Epithelium in Mice

Animals rely on sensory input from multiple sensory systems in order to synthesize information from their environment and make decisions accordingly. This is particularly important in the context of the mouse olfactory system. Mice have two olfactory systems; a main olfactory system (MOS) which works similarly to that of a human, and a vomeronasal olfactory system (VOS) which is thought to be primarily for mating and social behavior. Previous literature hypothesizes that the VNO's functionality is contingent upon the proper operation of the MOS. In this research, we aimed to investigate this hypothesis by selectively ablating the main olfactory epithelium (MOE) in mice while preserving the integrity of neurons in the VNO. Through behavioral assays and neural activity analysis, we examine the VNO's ability to detect and respond to natural stimuli, in the absence of the MOE. Our findings provide insight into how the absence of the MOE affects a mouse's tendency to sample stimuli in addition to the ability of the VNO to chemically detect stimuli. These preliminary results could challenge the currently established literature on the interplay between the VNO and MOS and contribute to a deeper understanding of underlying mechanisms for olfactory processing.

Lilyan Mendez

Biochemistry, ERC

Mentored By Melinda Owens, Assistant Teaching Professor

Effect of a Chemistry Learning Intervention on Introductory Biology Students' Sense of Belonging in Biology

Chemistry concepts are foundational to introductory biology courses, but students often struggle with them. If inequities exist in student comfort with these topics, it might have persistent effect throughout their education. In a large introductory biology course at a public R1 university taught by four different instructors, we designed and assessed a targeted chemistry intervention to determine its effect on student attitudes. First, we analyzed instructor midterms to determine what proportion of the points directly or indirectly require chemistry knowledge. Second, we used an open-ended survey question to probe students about how experience learning chemistry topics affected their identities as biologists. Responses were analyzed through thematic analysis. We found that a substantial proportion of points for each instructor's exams required chemistry knowledge, confirming that knowledge of these topics is important for student success in introductory biology. We also found that both pre- and post-intervention, positive course experiences with chemistry were often associated with a positive impact on student identity in biology, whereas negative course experiences were often associated with negative impacts. This finding held across instructors and student demographic categories. We hope that this study sheds light on how struggles with chemistry can affect student biology identity.

Annabelle Min

Math-Comptuer Science, Revelle

Mentored By Michael Davidson, Assistant Professor

A plan for just renewable energy transition in India with geospatial analysis

With India's ambitious promise to pursue carbon neutrality in 2070, it demands large-scale renewable energy transition from fossil fuels. However, planning for high-penetration futures of renewable energy sources must consider its unique political constraints, socio-economic features, availability of labor, economic hardship, and air quality that will impact the transition. In this paper, we analyze the wind and solar energy

capacity factor throughout India in district level, deployment potential, and levelized cost of renewable energy for meeting 2030 and 2050 renewable energy targets. We take into consideration co-locating renewable energy in the sites of three different scenarios: high incumbent coal industries, high economic hardship areas, and high air polluted areas. We demonstrate that some states are unable to meet low-carbon renewable energy requirements in 2050 in high incumbency regions, high polluted regions, lower income regions alone, while many other states can easily prioritize political economy with minimal impacts on costs and capacity factors. We analyze the three above scenarios and propose potential policy pathways to consider in energy transition.

Srivatsava Missula

Math-Economics, Seventh

Mentored By Dr. Julianne Cullen

Determinants of Differential Growth Paths in India

The differential performances and economic outcomes of the Indian states have long been an area of interest for economists and policymakers, particularly in the contexts of regional divergence, the inverse relationship between resource abundance and growth, and the influences of different sectors. We examine regional divergence in income across states for the period 2004/05–2019/20 and endogenously estimate convergence clubs with the novel method developed by Phillips and Sul (2007). Within these clubs, we analyze the effects of natural resource use and the varying degrees of contribution from different sectors. Our use of contemporary data provides specific insight into the determinants of steady- state outcomes in the twenty-first century. We find that the convergence clubs are largely determined by current economic prosperity and infrastructure, and while lower-income clubs are associated with higher resource use, increased resource exploitation does not improve a region’s relative economic position. Further, agricultural gains do not contribute significantly to club outcomes (nor, instrumentally, to long-term growth), whereas growth in manufacturing can contribute to long-term growth at similar levels to services growth, in spite of the latter’s relative dominance.

Judy Mohamad

Mechanical Engineering, Warren

Mentored By Dr. Sylvia Herbert

Drone Obstacle Avoidance using Control Barrier Value Functions

The advancement of autonomous robots depends on the ability to compute safe and optimal trajectories online. Many methods achieve safe navigation, but many are computationally expensive and hence infeasible for online implementation due to the curse of dimensionality. Safe navigation online can be achieved using safety filters based on Control Barrier Functions (CBFs), which constrain a system's optimal control policy to stay within a known safe set. Computation of the CBF is often too time-consuming to be implemented online, hence we start with a pre-computed overly conservative and/or unsafe CBF and iteratively improve it online using dynamic programming-based reachability analysis known as Hamilton-Jacobi (HJ) reachability. The goal of this work is to build upon previous work by changing the dynamics model to avoid obstacles in the horizontal direction as well as the vertical, testing if the algorithm works under wind disturbances, and implementing the algorithm on a more realistic simulated quadcopter.

Celeste Morales

Molecular and Cell Biology, Marshall

Mentored By Dr. Kim Dore

Inhibiting PSD-95 Depalmitoylation as a Potential Approach to Promote Synaptic Resilience Against Alzheimer's Disease

Vital in its role as a neuronal scaffolding protein, PSD-95 is involved in regulating synaptic plasticity and stabilizing dendritic spines. Previous research has shown that increasing PSD-95 has been correlated with increases in dendritic spine densities, while also being found to have protective effects against beta-amyloid and recover behavioral impairments seen in 9-10 months old Alzheimer's disease model mice (APP/PS1). Given this, we have focused on studying its palmitoylation, a post-translational modification facilitating the association of proteins with membranes, and that is reversible via depalmitoylation. Using a biochemical assay and Western Blotting, we compared palmitoylation levels in Wild Type (WT) and APP/PS1 mice through quantifying PSD-95 that have been palmitoylated at zero cysteine sites, indicating no palmitoylation, or one or

two cysteine sites, indicating palmitoylation. In finding that palmitoylation levels are reduced for female APP/PS1 mice in comparison to female WT mice, we treated mice with Palmostatin B towards inhibiting PSD-95 depalmitoylating enzyme (ABHD17), in turn increasing palmitoylation of PSD-95. However, palmitoylation levels were not reduced in APP/PS1 male mice, and no effects of Palmostatin B were observed. Further research is needed to understand the basis of this sex difference. Through this work, we are aiming to further study the potential of targeting PSD-95 palmitoylation in seeking therapies that aim to increase synaptic resilience against Alzheimer's Disease.

Melia Movsesian

Human Biology, Marshall

Mentored By Nicola Allen, PhD

Characterization of astrocyte proteins alterations in Alzheimer's disease mouse models

Alzheimer's disease (AD), a neurodegenerative condition, is characterized by the accumulation of amyloid plaques in the brain, leading to progressive cognitive decline and memory loss. Astrocytes specifically play a crucial role in forming, maturing, and maintaining synapses. In AD, astrocytes undergo reactive changes marked by alterations in morphology, such as increased GFAP expression, especially in areas surrounding amyloid plaques. Research from our lab has indicated reduced expression of a specific candidate astrocyte protein, known to regulate synapse maturation in mouse models of amyloidosis and several independent human studies, suggesting the protein’s potential role in disease pathology. We aim to validate its downregulation in AD using different techniques, and further understand which subtype of astrocytes exhibit protein downregulation in AD mouse models. Single molecule RNA fluorescence in situ hybridization (smFISH), done through RNAscope technology, is a precise technique used to visualize and quantify RNA astrocyte protein single molecules. CellProfiler is a software used for image analysis to extract quantitative data. In our study, we utilized RNAscope technology combined with immunohistochemistry (IHC) to detect and quantify specific astrocyte protein mRNA expression levels in astrocytes surrounding amyloid plaques in β-Amyloid APP-PS1 mouse model. CellProfiler was then used to analyze the resulting images. My research revealed that the specific candidate astrocyte protein does experience downregulation within astrocytes, specifically those found around amyloid plaques. By studying how astrocytes and their proteins change in AD, we may uncover key insights and potentially pave the way for more effective therapies to help those affected by this condition.

Affaan Mustafa

Math - Computer Science + Business Economics, Revelle

Mentored By Dr. Anya Samek, Associate Professor of Economics and Strategy

Discovering Market Manipulation Through Social Media Sentiment Analysis in Microcap Cryptocurrencies

This research delves into the effects of social media sentiment, with a primary focus on platforms such as Reddit and Twitter, on financial markets, specifically emphasizing the influence on microcapcryptocurrencies. The study begins with a literature review, highlighting key events such as the collective investment in heavily shorted stocks by Reddit users in 2021, an event that significantly altered the financial landscape. The research then narrows its focus to investigate the correlation between social media sentiment and price volatility in the microcap cryptocurrency markets, those defined as having a market cap under 1 million USD. This approach allows for a more controlled study, minimizing the influence of confounding variables and paving the way for causal inference.The exploration of strategies leveraged by cryptocurrency developers, including artificially-induced hype, underscores the potential for market manipulation. By applying existing analysis methods and statistical tools, this research seeks to demonstrate a link between price fluctuations in these microcap digital assets and the sentiment of the Reddit community. The findings indicate that societal and technological advancements are driving a new era in the financial sector. However, the research concludes by emphasizing the need for caution, as the impact of social media sentiment on financial markets is complex and multifaceted, and potentially subject to manipulation.

Arlene Grace Nagtalon

Molecular & Cell Biology + Community Research, Education, and Well-Being (C.R.E.W. - individual major), Revelle

Mentored By Dr. Angela Booker

Unity - A Board Game: A Study in Gamified Changemaking

The ramifications of the COVID-19 pandemic disrupted normalcy in community building in various spheres, leaving individuals questioning and re-evaluating how to create positive change during a time driven by social upheaval. Consequently, research displayed that deficiencies in social cohesion led to unpreparedness when combating pre-existing and exacerbated injustices, leading to increased multigenerational burnout, cynicism, and anxiety. This study highlights how and why board games are ideal environments where community building can thrive through amending knowledge gaps, learning beneficial mindfulness techniques, and adapting a civically-engaged mindset. Through exposure to scenarios focusing on diversity, equity, inclusion, and belonging (DEIB) efforts inspired by the Social Justice Standards, addressing power dynamics, obtaining diverse perspectives, and understanding the influence of unconventional learning tools is achievable through Unity, a new board game. This design-based study involved playtest sessions conducted with three participant groups: high school students, undergraduate students, and industry professionals. Unity was utilized to observe evolving attitudes towards changemaking with participants selected by a sample of convenience. Semi-structured interviews and field notes recording game play observations offered insights into how players applied skills to real-life events. Analysis of the responses demonstrated that board games offer a valuable space for players to foster collective autonomy and control of their futures. Findings indicate that board games provide friendly, effective simulations for players to facilitate meaningful discussions while being introduced to controversial issues in a digestible manner. Actions made during gameplay can translate into concrete actions to keep players inspired, empowered, and motivated to see themselves as changemakers.

George Nakoud

Mechanical Engineering with a Specialization in Controls and Robotics, Sixth

Mentored By Michael T. Tolley (Associate Professor)

Development of a Robust Waterproof Enclosure for Hydraulically-Actuated Underwater Soft Robots

Soft robotics, characterized by their composition of compliant materials, are transforming the way machines interact within uncertain environments. Soft robots perform tasks with a level of adaptability and safety previously unattainable in traditional rigid robots. This advancement opens up new possibilities across various fields, particularly in underwater exploration and monitoring. A key component of underwater soft robots is their waterproofing technology, which plays a crucial role in their durability and reliability. This project focuses on the development of a robust waterproof enclosure to house the control system of hydraulically-actuated underwater soft robots. The design of the enclosure prioritizes a modular interior to support part versatility and ease of maintenance. The outer shell is designed with interlocking features, facilitating the integration of multiple units while ensuring a watertight seal. The enclosure is fabricated using 3D printing processes, allowing for a high degree of customization and rapid prototyping. The enclosure was iteratively designed and pressure tested to quantify the water protection. This enclosure can shield the electronics for 1 meter depths when submerged, which corresponds to an ingress protection code of IP X7. The design of this waterproof enclosure is robust and well documented allowing for a wider community of researchers to develop and test their own waterproof enclosures. This work aims to lower the barrier of entry for controlling underwater soft robots, which can accelerate the pace of discovery and technological advancement in underwater soft robots.

Saisha Nandamuri

Cognitive Science, Warren

Mentored By Victoria Ojeda, PhD, MPH

Service Learning for Medical Students in Laser Medicine

A service learning program typically involves partnerships with community-based organizations, outreach to target populations, education through didactics, and interaction with patients. Moreover, it entails synthesizing findings and presenting to a broader

audience, while also ensuring continuity of the service-learning program by handing off to the next generation of medical students, thereby contributing to the advancement of medical education. {Sabo, 2015} Service learning can take various forms, including direct involvement with providing services, indirect support by providing assistance to the team, or advocacy-driven activities undertaken by students. It encompasses phases of investigation, preparation, action, reflection, and demonstration of knowledge. Throughout this process, students actively engage and take ownership of their own learning, honing their awareness and project management skills, develop new clinical skills and may address the comprehensive health needs of the community. The aim of our service learning program, Clean Slate free tattoo removal clinic, is to develop a comprehensive clinic-based training program for medical students, focusing on providing them with hands-on experience in the laser clinic. This initiative serves multiple purposes, including offering students the chance to participate in community service within fields they may be interested in particularly in laser medicine and dermatology, while also exposing them to the healthcare and social needs of justice-involved adults transitioning back into the community. The program allows long term participation from the students where peer to peer learning is fostered and experienced medical students can mentor younger medical students. Lastly, our goal is to standardize the training of our medical students to ensure high quality patient care.

Robert Nasanbat

Neurobiology, Eigth

Mentored By Stanley Lo - Teaching Professor

Teaching Towards Justice and Equity: Integrating Sociopolitical Frameworks into STEM and Life Sciences Education

The article will address one of the goals of the special issue by providing an overview of EIAJ-focused frameworks from the social sciences and provide an argument for the adoption of these frameworks in life sciences education. We will begin by describing the need for the implementation of such frameworks in science, technology, engineering, and mathematics (STEM) education, followed by why this need is imperative to address in life sciences education. We will explore what research towards EIAJ in life sciences education consists of by describing the ontological approach necessary to support and implement the goals of such approaches that empower students through the ownership of content learning and interrogation of majoritized perspectives that have led to the prioritization of a western-centered perspective of learning. To support the

implementation of such approaches, we will provide an overview of different frameworks such as critical race theory, queer theory, funds of knowledge, community cultural wealth, culturally responsive pedagogy, and others that have widespread impact and representation in the literature. Furthermore, we will identify current studies as exemplars that can demonstrate how these approaches can be utilized in practice. We will then conclude our article with a list of research opportunities that can be explored in relation to EIAJ-focused frameworks in life sciences education. These opportunities will build on current work that has examined issues of equity within STEM and life sciences education and will extend the focus on explicitly addressing issues of equity in terms of structural inequities and systematic racism rather than solely focusing on equity as representation.

David Ngan

Neurobiology, Seventh

Mentored By Matthew Lovett-Barron, Assistant Professor

Timescale of odor-driven persistent internal states in zebrafish

Internal states, such as fear and hunger, have the ability to greatly influence behavior and physiology over long timescales, which can be caused by salient environmental cues or physiological needs, and are commonly persistent (long-lasting), pleiotropic (parallel effects on multiple processes), and scalable (graded intensity). Dynamic internal states allow animals to adapt their neural function and behavior to changing circumstances, but their underlying neural mechanisms are poorly understood. Previous work in the lab has discovered that a persistent, fear-like state can be induced in larval zebrafish by a brief exposure to the odor cadaverine – a diamine byproduct of decaying fish. This state is characterized by a persistently elevated heart rate for >10 minutes after a one-minute, high-concentration cadaverine exposure, in contrast to a transiently elevated heart rate (~2 minutes) for low-concentration cadaverine or high salinity. Furthermore, preliminary data has shown a diminished motor response to visual-motion stimuli after brief exposure to high-concentration cadaverine. In this study, we have investigated the timescales of heart rate increases to multiple cadaverine exposures. During a 45-minute behavior, we briefly exposed head-tethered larval zebrafish to the same concentration of cadaverine twice, with 20-minutes between pulses. We found similar effects of high-concentration cadaverine during both stimuli, indicating that the physiological component of this fear-like state lasts ≤20 minutes. We are now investigating whether the effects of this state on visuomotor suppression follow a similar timescale, which can provide insight into the neural mechanisms producing fear-like states and its effects on the brain and body.

Megan Ngo

Biology, Marshall

Mentored By Weg M. Ongkeko, MD, PhD Associate Professor

tRNA-Derived Fragments as Post-Transcriptional Regulators of Oncogenes and Tumor Suppressor Genes in Papillary Thyroid Carcinoma

tRNA-derived fragments (tRFs) are a relatively novel class of small non-coding RNA that has been implicated in the pathogenesis of certain cancers. It has been proposed that tRFs act as post-transcriptional regulators of mRNA by binding to complementary regions of the transcript and recruiting proteins that cleave the mRNA. Accordingly, this project identifies tRFs that are differentially expressed between papillary thyroid carcinoma (PTC) tissue samples (n=511) and normal tissue samples (n=59). We found 22 tRFs to be differentially expressed between these groups, then identified dysregulated tRFs that have anticorrelated expression with upregulated oncogenes (OG) and downregulated tumor suppressor genes (TSG). Notably, upregulation of AsnGTT 3'-tRF correlated to lower expression of tumor suppressor genes FAT4, FBLN2, LRP1B, HNF1A, and PTPRD. Conversely, downregulation of GlyCCC 5'-tRF and GlnCTG 5'-tRF correlated to upregulation of the oncogenes MET and MACC1. Binding affinity analysis further revealed that tRFs can bind to OG and TSG transcripts with sufficient complementarity to induce cleavage, supporting the hypothesis that tRFs mechanistically regulate cancer pathogenesis by promoting the degradation of mRNA transcripts. Overall, this study aims to elucidate the role of tRFs in papillary thyroid carcinoma by analyzing their potential to regulate genes that are critical to disease progression.

Allyson Nguyen

General Biology, Marshall

Mentored By Dr. Eric Zorrilla

TRAPping Ensembles for Predator Stress

Chronic stress globally impacts human behavior and health. While the striatum and prefrontal cortex are implicated in neurobiological responses to stress, regional ensemble differences therein between acute vs. repeated psychosocial stress are unknown. A behaviorally-validated model of predator stress where TRAP2-Ai9 mice (n=9-21/group) received 4-hydroxytamoxifen (4OHT; 40mg/kg) or vehicle after acute (1st) or repeated (10th) exposure to predator stress (odorous rat bedding) was used. Controls received clean bedding. Activated, CreER-expressing neurons during 4-hydroxytamoxifen injections undergo recombination, permanently expressing tdTomato fluorescent reporters. Eighteen days after the 10th, mice received a final (11th) exposure and were euthanized. Brain slices were imaged under an LSM710 confocal microscope. Activated cells at sacrifice (green Fos immunofluorescence) vs. after acute (1st) or repeated (10th) stress (TRAPped red tdTomato) were counted, and Fos-tdTomato co-localization was assessed using ImageJ. The dorsomedial striatum (DMS) and anterior cingulate (aCg) had more tdTomato-positive TRAPped cells after the 1st than 10th exposure to both conditions, indicating a Time effect. Greater neuronal activation occurred after the 10th stress exposure compared to control, displaying a Stress effect. In the aCg, Fos-positive cells from the 11th, separate re-exposure co-localized more with tdTomato-positive ensembles TRAPped after one acute exposure than ten repeated exposures. Cellular activation in the DMS and aCg habituated after repeated exposure to both stimuli, predominantly in controls, with stress evoking a greater response than control conditions. Unexpected stress induced the greatest response, indicated by ensembles after the 1st exposure having the greatest activation and most co-localization to a separate re-exposure.

Daniel Nguyen

Biology with Specialization in Bioinformatics, Sixth

Mentored By Nathan Shaner, Associate Adjunct Professor

Engineering bioluminescent calcium indicators for imaging neurons

Genetically encoded calcium indicators (GECI) are proteins that are designed to bind to calcium ions and emit light (typically fluorescence), which enables the visualization of calcium concentrations in the cell. Various GECIs have been created, offering a selection of options tailored for diverse biological and medical purposes, including neuroscience and drug discovery. In particular, research in the Shaner lab led to the recent development of a GECI known as "CaBLAM," a high-contrast monomeric bioluminescent indicator that emits green light when exposed to elevated Ca2+ concentrations in living cells. Bioluminescence imaging holds advantages over fluorescence for imaging in situations where excitation light cannot be easily supplied (e.g., deep tissues, intact animals, etc.) or where excitation light would perturb the system being observed (e.g., photosensitive cells, nocturnal behavior, circadian cycles, etc.). CaBLAM operates through a mechanism involving calmodulin. Changes in calmodulin conformation induced by the binding of calcium ions trigger the reassembly of a fragmented luciferase protein. However, current iterations of the tool have been characterized by insufficient brightness for advanced applications such as live-animal brain imaging. My primary goal in this project is to make improvements in CaBLAM's bioluminescent intensity while maintaining its favorable calcium response and high contrast. Ultimately, improving the brightness by ~10-fold relative to the original CaBLAM variant will narrow the performance difference between these new bioluminescent GECIs and well-established fluorescent GECIs such as the GCaMP family.

Nam Nguyen

Human Biology, Warren

Mentored By Stanley Lo and Teaching Professor

Teaching Towards Justice and Equity: Integrating Sociopolitical Frameworks into STEM and Life Sciences Education

The article will address one of the goals of the special issue by providing an overview of EIAJ-focused frameworks from the social sciences and provide an argument for the

adoption of these frameworks in life sciences education. We will begin by describing the need for the implementation of such frameworks in science, technology, engineering, and mathematics (STEM) education, followed by why this need is imperative to address in life sciences education. We will explore what research towards EIAJ in life sciences education consists of by describing the ontological approach necessary to support and implement the goals of such approaches that empower students through the ownership of content learning and interrogation of majoritized perspectives that have led to the prioritization of a western-centered perspective of learning. To support the implementation of such approaches, we will provide an overview of different frameworks such as critical race theory, queer theory, funds of knowledge, community cultural wealth, culturally responsive pedagogy, and others that have widespread impact and representation in the literature.Furthermore, we will identify current studies as exemplars that can demonstrate how these approaches can be utilized in practice. We will then conclude our article with a list of research opportunities that can be explored in relation to EIAJ-focused frameworks in life sciences education. These opportunities will build on current work that has examined issues of equity within STEM and life sciences education and will extend the focus on explicitly addressing issues of equity in terms of structural inequities and systematic racism rather than solely focusing on equity as representation.

Laura Noronha

Human Biology, Muir

Mentored By Dr. Nicola J. Allen

Dysregulated Cholesterol Metabolism in Alzheimer's Disease Astrocytes

Astrocytes, non-neuronal glial cells in the brain, play critical roles in blood brain barrier function, synapse development, and lipid metabolism. Alzheimer's Disease (AD) is a neurodegenerative disorder, associated with build-up of amyloid protein and tau tangles in neurons. Alterations to astrocyte function have been implicated in AD. Previous analyses from our lab revealed significant alterations in the gene and protein expression of AD iPSC-induced astrocytes (iPSC-iAs) and age-matched control astrocytes. Specifically, dysregulated cholesterol metabolism and increased production of proinflammatory molecules were observed in AD astrocytes. Thus, we hypothesize that changes in cholesterol trafficking in astrocytes may promote an inflammatory state. To test this, we pharmacologically targeted a candidate pathway involved in cholesterol metabolism and measured expression of cholesterol metabolic genes and proinflammatory molecules using quantitative PCR. This manipulation resulted in

decreased gene expression of proinflammatory cytokines in AD astrocytes. These experiments provide insight into how cholesterol dysregulation and inflammation may be targeted to rescue these AD phenotypes.

Sara Northup

Psychology with a specialization in clinical psychology, Marshall

Mentored By Dr. Jessica Bomyea

Comparing Brain Volume and Cortical Thickness in Individuals with PTSD only and PTSD with Comorbid Major Depressive Disorder

Major Depressive Disorder (MDD) frequently co-occurs with Post-Traumatic Stress Disorder (PTSD) in Veterans; Among Individuals diagnosed with PTSD, 53% are also diagnosed with MDD. Independently, PTSD and MDD are associated with elevated rates of suicide, healthcare utilization, and treatment resistance, with poorer outcomes when comorbid. PTSD and MDD have been individually linked with alterations in brain volume (BV) and cortical thickness (CT), yet the impact of comorbidity remains unexplored. The present study investigates structural differences in Veterans with PTSD, with and without MDD. We hypothesized that individuals with MDD would have reduced BV and CT in 5 ROIs: medial orbitofrontal cortex (mOFC), rostral anterior cingulate cortex (rACC), rostral middle frontal cortex (rMFC), hippocampus, and amygdala. Veterans with PTSD (N=112) completed clinical interviews and magnetic resonance imaging. Structural data was processed through FreeSurfer software. A univariate analysis of variance was conducted, with global and regional BV and CT serving as the dependent variable - controlling for sex, age, total intracranial volume, and study group. Correction for multiple comparisons, False Discovery Rate (FDR), was applied ($p<0.05$). Only the rACC displayed a significant difference in BV between comorbidity group ($F1,5=1.824$, $p=0.018$, $\eta2=0.017$), however, the finding did not survive FDR correction. Increased rACC BV in the PTSD+MDD group may imply heightened emotional reactivity, requiring more activation in the rACC to downregulate emotions. CT did not significantly differ by group ($p>.153$). These findings suggest difficulty in structurally differentiating PTSD and PTSD+MDD; larger samples, broader regional analyses, and focusing on disorder-specific symptoms may clarify unique effects.

Maya Ordonez

Communication, Seventh

Mentored By Andrew deWaard

How Does Spotify Make You Feel?

Spotify, a leading streaming platform, utilizes algorithms to recommend music specific to individual users, shaping their listening experiences. Leveraging cutting-edge technology like artificial intelligence in features such as AI DJ and the Daylist, Spotify delivers personalized recommendations by analyzing users' behavioral and emotional data. While this personalized curation enhances user satisfaction, the potential implications of habit tracking and emotional manipulation remain unclear. This study administered online surveys to college students at the University of California, San Diego over eight weeks and conducted open-ended interviews to investigate how surveillance and habit tracking impact Spotify users' listening habits and emotional well-being. Participants revealed music's influence on identity formation and emotional expression, noting the personal significance of song selection and playlist curation. Despite the platform's surveillance measures, users exhibited neutral attitudes toward the subject. Certain music recommendations were associated with negative mood outcomes, highlighting the complex interplay between technology, user autonomy, and emotional well-being in the digital music landscape.

Veda Palaparty

General Biology, Sixth

Mentored By Dr. Karl Wahlin, Associate Professor

Developing an Approach for Adeno-Associated Viral Vector Mediated Cellular Reprogramming

Due to proprietary information this abstract has been redacted.

Emily Pan

Bioengineering: Biotechnology, Sixth

Mentored By Dr. Prashant Mali

BioID Approach to Study the Protein Interactome in the ADAR Protein

Due to proprietary information this abstract has been redacted.

Esther Park

Physics, Marshall

Mentored By Karin Sandstrom, Professor and Researcher

The Relationship between Star Formation Rate and Stellar Mass Resolved with Nearby Galaxies

The large and distant scale of nearby galaxies makes it nearly impossible to count individual stars. A reliable method of understanding star formation and stellar mass is by analyzing the intensity of far ultraviolet (FUV), near ultraviolet (NUV), near infrared and mid - infrared (IRs) emitted by dust that has absorbed star light in local galaxies. Recently formed populations have stars that produce UV light. That light can be absorbed by dust and re-radiated in IR, so to accurately measure the star formation rate in local galaxies, both UV and IR is necessary. We analyze 9317 multiwavelength images from NASA's space telescopes, Galaxy Evolution Explorer (GALEX) and Wide-field Infrared Survey Explorer (WISE), to understand the patterns of star formation and stellar mass based on deprojected radial profiles of local galaxies. We compare the results to galaxy-integrated measurements from the "z=0 Multiwavelength Galaxy Synthesis" (Z0MGS) (Leroy, et. al., 2019). With these findings, we hope to further investigate the nature of star formation in galaxies.

Aatash Pestonjamasp

Computer Engineering, Warren

Mentored By Dr. Edward Wang

Postable Spirometry: User-Assembled Vortex Whistle Spirometer

3D printed vortex whistles have been shown to be an accessible alternative to clinical spirometers, the most common pulmonary function test to assess lung health. While more accessible than the current standard, the question remains of how to get the whistles to users for their own personal use. The novelty of this presentation is the proposal and

demonstration of our idea of making the vortex whistle out of a postcard so it can be simply mailed to users. This paper demonstrates the potential for a spirometer system to be mass-deployed in the form of a postcard. The results demonstrate that the use of oilboard does not compromise the performance of the device, and can thus serve as a mass-screening tool. As such, we show that Postable Spirometry can serve as a truly ubiquitous pulmonary function testing solution. This work inspires the larger vision that other smartphone accessories or attachments can also be constructed out of paper, creating a fleet of Postables. Postables will enable the wide scale deployment of ubiquitous smartphone accessories.

Sela Peters

Molecular and Cell Biology, Seventh

Mentored By Dr. Joseph Pogliano

Selecting phage with protein defecting in nuclear trafficking using cas13

Phages of the recently discovered chimallivirus family form a nucleus-like replication compartment (phage nucleus) during infection that separates the phage's genome from the host cytoplasm. Within the nucleus, genetic replication occurs; however, macromolecules don't freely diffuse across the nuclear shell; therefore, mRNA and proteins for transcription and DNA replication need transport machinery. Separating phage DNA from the host's cytoplasm protects the phage from DNA-targeting defense systems such as Cas9. Here, I used targeted mutant selection with RNA-targeting Cas13a to determine function of two conserved genes in Pseudomonas chimallivirus PhiKZ, gp69(PicA) and gp70(talieboy), that are implicated in trafficking macromolecules across the nuclear shell. Since the nucleus prevents Cas9 and other direct mutagenesis tools from accessing the genome, other methods are necessary. Cas13 circumvents these challenges by targeting phages' mRNA. Expressing Cas13 with a specific guide RNA restricts phage when the targeted gene is present. Phages with mutations in the targeted region escape, allowing clonal mutant populations isolation. In gp69, mutants isolated had only single nucleotide polymorphisms (SNP), while gp70 SNPs and in-frame deletions were isolated depending on the targeting region. No frameshift or non-sense mutations were detected across isolated mutants, suggesting these genes are essential. However, targeting non-essential gene PhuZ, all mutants isolated contained insertions and deletions with early termination or complete gene loss. Further studies with these mutant phages can provide a more detailed understanding of the functions of these conserved genes.

Kimberly Pham

Joint Mathematics-Economics, Revelle

Mentored By Dr. Melissa Famulari

High School Social Capital and College Applications: The Case of California

A defining feature of the "American Dream" is economic mobility, i.e., that children growing up in low socio-economic status (SES) households have a significant probability of becoming high SES adults. Chetty et al. (2018) show that economic mobility varies substantially across geographic areas. Using data from Facebook on 21 billion friendships from 2022, Chetty and coauthors created three measures of social capital: economic connectedness, volunteerism and social cohesion. In two papers published in Nature, Chetty et al. (2022) provide evidence that the "social capital," and particularly the economic connectedness, of an area is highly correlated with an area's economic mobility. We add to this research by merging the Chetty social capital data for high schools to detailed high school characteristics from the University of California's Office of the President (UCOP). The UCOP data report two outcomes that are likely correlated with social capital and economic mobility: the numbers of students that apply to and are accepted by the top public research system in the state, the University of California (UC). We find that all three measures of social capital are highly correlated with the number of UC applicants and UC admits from the high school (HS). We show that social capital is strongly positively correlated with average SAT scores and the HS's rank in the state and negatively correlated with the percent of free and reduced meals at the high school. When predicting UC applicants using standard HS variables, we find that no social capital measure improves the prediction.

Ryan Phan

Mollecular and Cell Biology, Sixth

Mentored By Professor Dr. Corr

Type I interferon receptors modulate sex differences in murine arthritis

In humans the prevalence of rheumatoid arthritis (RA) in males and females is 1:3. In order to study influential factors in disease development and progression mouse models are useful and we utilize the K/BxN serum transfer model. We hypothesized that type 1 interferon receptors (IFNAR1) influence pain-like behavior in this model. To test this theory we used the K/BxN serum transfer model with C57BL/6 wild type (WT), and type I interferon receptor knockout (Ifnar -/-) mice of both sexes. Ifnar1-/- mice were compared to WT mice for clinical inflammation in ankle swelling using a caliper and mechanical allodynia in withdrawal thresholds by the von Frey method over a 28 day time course. The female Ifnar1-/- mice had more ankle swelling than WT males and females and male Ifnar1-/- mice [$F(3,29)$; $p<0.0001$ two-way ANOVA]. The withdrawal thresholds were similar within strain. Both the Ifnar1-/- male and females had a minimal change in withdrawal threshold from baseline and were significantly different than the WT mice over the time course [$F(3,67.18)$, $p<0.0001$ two-way ANOVA]. These results indicate that type 1 interferon receptors play a critical role in the onset of inflammation induced allodynia and regulate the level of paw swelling differently in male and female mice. Sex differences in some but not all inflammation related symptoms in the Ifnar1-/- mice may relate to sex differences in the response to therapeutic agents that target the type I interferon pathway currently in clinical use.

Bella Pipke

Communication, Revelle

Mentored By Caroline Jack, PhD

Growing Pains: Navigating Eating Disorder Content in Digital Girlhood Spaces

This thesis aims to analyze the behavior of girls on Eating Disorder Twitter as well as the various girlhood niches that exist in this community through the usage of Sandra Harding's idea of Standpoint Theory. Other scholars typically write about young girls and women with eating disorders through a positivist perspective, sometimes placing the blame of modern-day eating disorder culture on these girls. Similarly, on social media,

the eating disorder community (ED-Twitter) is oftentimes disliked by other users for promoting eating disorders. I argue that these young girls are not solely to blame for eating disorder culture though they may be perpetuating these ideas. Rather the blame should be shifted to the platforms that group eating disorder content with other "girlhood niches" and therefore share this content to other girls online. In addition, I believe these girls should be discussed through Feminist Standpoint Theory, which prioritizes the perspective of the community you are writing about, as these are real young women struggling with a serious disorder. By using Standpoint Theory, I will also examine if ED-Twitter users are reflective or deflective in their behavior and thoughts towards their eating disorders, themselves, and others. Through studying this complicated phenomenon, we can learn more about the personal experiences of girls and young women, whose problems are often considered frivolous and unimportant.

Sirasit Prayotamornkul

Bioengineering, Revelle

Mentored By Dr. Lingyan Shi

Subcellular Imaging of Lipid Metabolic Dynamics Reveals the Anti-Aging Effects of Metformin

Aging entails the gradual decline of physiological functions, accompanied by changes in lipid metabolism. The intricate nature of these lipid metabolism alterations adds complexity to investigating the roles lipids play in the aging process. Metformin, a biguanide drug prescribed for type 2 diabetes mellitus, exhibits anti-aging effects by inhibiting enzymes in the mitochondrial respiratory complex I, leading to the phosphorylation of AMP-activated protein kinase (AMPK). Despite metformin's widespread use, its potential for retarding aging remains insufficiently explored, especially at the subcellular level. In a groundbreaking approach, we utilized a multimodal optical imaging system that integrates deuterium oxide (D2O)-probed stimulated Raman scattering (DO-SRS) and two-photon excitation fluorescence (2PEF) microscopies. This non-invasive method allows for the visualization spatiotemporal dynamics of lipid metabolism and optical redox status in the fat body tissues of metformin-treated Drosophila. Our observations revealed a significant extension of fly lifespan with metformin, accompanied by a reduction in de novo lipogenesis through the upregulation of autophagy and fatty acid oxidation. Metformin not only protected flies from oxidative stress but also influenced lipid saturation in lipid droplets. For the first time, our innovative label-free molecular multimodal imaging technique enables the in

situ study of metabolic activity, providing insights into the mechanism linking metformin's anti-aging effects to its regulation of lipid metabolism.

Julie Qian

Cell and Molecular Biology, Muir

Mentored By Olivier George

Cocaine Activated CeA CRF Neurons in Modulating Cocaine Response and Cocaine Self-Administration

Due to proprietary information this abstract has been redacted.

Sahana Rangarajan

Bioinformatics, ERC

Mentored By Dr. Joseph Pogliano

Role of gp173 in Early Jumbo Phage Infection

Bacteriophage (phages), viruses that infect bacteria, are ubiquitous in nature and show promise for the treatment of antibiotic resistant infections. Nucleus-forming phages (chimalliviruses) are a recently identified family of phage who encapsulate their genome in a nucleus-like replication compartment . The mechanism of this nucleus-based replication strategy is still poorly understood. Over the course of the past 2 billion years, viruses have developed mechanisms to arm themselves against host cell defenses. One of these defense mechanisms is the chimallivirus nucleus-like compartment. Particularly, the phage nuclear shell excludes many proteins including DNA-targeting phage defense proteins, while importing the proteins necessary for replication and transcription. Here I seek to understand the role of a conserved essential intrinsically disordered chimallivirus protein (Goslar gp173) that is hypothesized to mediate selective trafficking across the nuclear shell. Specifically, I will use Cas13-based CRISPRi-ART knockdown of gp173 and complementation with truncated versions of gp173 to determine the regions of gp173 that are essential for function. I will use serial dilution plaque assays (spot titers) and live cell fluorescence microscopy to assay phage infection, to both understand how each complementation construct affects phage replication and if infection is stalled, where in the infection cycle it is stalled. I will also perform purified protein binding experiments to

determine which regions interact with the nuclear shell. These experiments will provide information on which regions of gp173 are necessary for function and potentially provide constructs with partial defects that can be used to later study macromolecular trafficking across the shell.

Shishir Ravipati

Neurobiology, Sixth

Mentored By Dr. Shelley Halpain

Characterization of ER F-actin in the somatodendritic compartment of hippocampal neurons

Filamentous actin (F-actin) is a cytoskeletal protein that is highly concentrated in dendritic spines compared to the dendritic shaft of a neuron. However, when undergoing NMDA-induced ischemic type of stress, F-actin disassembles in the dendritic spines and reassemble within the dendritic shaft, a pro-survival mechanism known as actinification. Actinification is dependent on the actin nucleating protein inverted formin-2 (INF2), which can be both cytosolic and endoplasmic reticulum (ER) -resident. Therefore, here we decided to investigate ER F-actin in the neuronal somatodendritic compartment using novel fluorescent genetic tools. Our findings show that in control conditions not all hippocampal neurons have detectable ER F-actin in the proximal region of their dendrites and that ER-Factin displays different dynamic behavior in different subcompartments.

Shanti Reed

Cognitive & Behavioral Neuroscience, Warren

Mentored By Dr. Julian I. Schroeder

Stomatal Analysis of a CO2 Sensing Protein Phosphatase in Arabidopsis

Due to proprietary information this abstract has been redacted.

Angeles Rios

Marine Biology, Muir

Mentored By Dr. Simone Baumann-Pickering

Exploring Baird's beaked whale presence in the North Pacific through long-term passive acoustic monitoring

Baird's beaked whale is the largest member of the family Ziphiidae, known for their deep foraging dives and elusive nature. Despite their large size, Baird's beaked whale spends limited time at the surface, making it challenging to rely on visual surveys to investigate their spatio-temporal distribution. However, they produce a unique echolocation click when searching for prey that has been used to identify their presence near underwater recording sites. This study used passive acoustic data collected with High Frequency Acoustic Recording Packages (HARPs) located in the California Current Ecosystem, the Olympic Coast National Marine Sanctuary, and the Gulf of Alaska. Using custom built MATLAB software, Baird's beaked whale echolocation clicks were automatically detected, clustered based on spectral and temporal properties, and manually reviewed. Time series of Baird's beaked whale presence were generated at six recording locations, spanning ten years. This study suggests seasonal shifts in the distribution of Baird's beaked whale in the Eastern North Pacific. Off the coast of central California, acoustic presence is greatest during the spring, summer, and early fall. In the Gulf of Alaska, presence is greatest during the winter, suggesting a latitudinal seasonal migration. This work will contribute to researcher and policymakers' understanding of Baird's beaked whales' spatio-temporal distribution and may yield further insights into their population dynamics and broader ecological role.

Aleksandra Ristova-Sanyal

Political Science / International Relations, ERC

Mentored By Philip Roeder, PhD

Deferred Gratification: Evaluating the Impact of EU Accession Delay on North Macedonian Support

This thesis examines the impact of the European Union's delays in initiating EU accession negotiations for North Macedonia. This delay came despite the continuous European Commission's recommendation to start the negotiation process. The study

reveals a gradual decline in Macedonian support for EU integration between 2007 and 2022. Key findings indicate a rise in both nationalism and doubts about the economic benefits of EU membership, contributing to a strengthening opposition to EU membership and a growing reluctance among Macedonians to express definitive opinions on EU membership. The research demonstrates that identity and expectations of economic benefits remain critical predictors of public attitudes towards EU membership, with utilitarian factors influencing people's attitudes on membership more than identity. Despite this, there has been a shift towards a stronger identification with Macedonia rather than the EU, primarily driven by an increase in nationalists who do not expect economic benefits from EU membership. This group's growing skepticism, particularly as the population ages, suggests a deepening resistance to EU integration, highlighting the risk of growing nationalism impeding North Macedonia's journey towards EU membership.

Carina Rocha

Neurobiology, Revelle

Mentored By Stephanie Cherqui, PhD

Role Of Microglia

Alzheimer’s disease (AD) affects 3-5% of individuals over 65, leading to memory loss, motor impairment, and neuronal decline. Amyloid-beta plaque accumulation in the brain exacerbates AD progression, causing neuroinflammation and cell death. Hematopoietic stem and progenitor cells (HSPCs) are multipotent cells that can develop into a variety of blood cells including monocytes which differentiate into tissue resident macrophages and microglia. Systemic wild-type HSPCs transplantation is a form of therapy for AD phenotype mice to prevent microglia inflammation. Our previous study demonstrates that microglia undergo morphological changes in response to irritation, resulting in larger cell bodies and reduction in both the number and lengths of dendrites. This morphology prevents microglia from effectively clearing out any debris and communicating with neurons, further contributing to AD pathogenesis. Further investigating the structural alterations in microglia among AD mice and AD mice transplanted with healthy HSPCs (AD/WT HSPC). In my study, we used an AD mouse model (5XFAD), isolated brain, and perform sucrose gradient and OCT embedding. The samples are then cryosectioned and immuno-fluorescently stained for Iba, a marker for microglia. The tissues were then imaged and quantified using ImagePro. Our data shows a significant difference between the microglia in AD mice and AD/WT HSPC. Microglia in AD mice exhibit shorter

dendrites and inflamed cell bodies, whereas AD/WT HSPC mice show longer, defined dendrites resembling a healthy state. Understanding these microglia structural changes can illuminate AD pathogenesis mechanisms and potentially mitigate neuroinflammation.

Joseph Romero

Neurobiology, Revelle

Mentored By Dr. Nicola Allen

Lipid metabolic dysregulation in patient-derived Alzheimer's disease astrocytes

Astrocytes are highly abundant glial cells in the mammalian brain that regulate neuronal and synaptic functions in many ways. These specialized glial cells maintain ion homeostasis, regulate the formation, function and plasticity of synapses, and provide structural and metabolic support. For example, astrocytes synthesize lipids such as cholesterol that can then be metabolized by neurons. Peripheral lipids do not cross the blood brain barrier, so brain lipids are synthesized de novo by astrocytes and other glial cells. Both cholesterol metabolic dysregulation and changes in astrocyte gene expression profiles are evident in neurodegenerative diseases, such as Alzheimer’s Disease (AD). AD is one of the most debilitating neurodegenerative diseases marked by neurofibrillary tangles and neuritic plaques. Lipid dysregulation including accumulation of lipids such as cholesterol in the brain are also hallmarks of AD. Previous studies from our lab identified lipid, and specifically cholesterol, metabolic dysregulation in human stem-cell derived astrocytes from individuals with sporadic AD. To follow-up on these initial findings, we are now pharmacologically manipulating parts of cholesterol metabolism to ask if we can rescue AD-associated phenotypes such as inflammation and intracellular lipid accumulation. These experiments will help us gain insight on cholesterol metabolism in the neurodegenerative state, thus providing a deeper understanding of metabolic dysregulation and its consequences.

Rob Ethan Santiago

Psychology (B.S.), Philosophy (B.A.), ERC

Mentored By Dr. Adena Schachner

Children's reasoning about how social factors shape where others put possessions

The physical world can convey social information. For example, a person's possessions can signal their preferences and social identity. Here we examine children's reasoning about how social factors shape where others store their possessions, and how this joint physical-social reasoning develops. In a pre-registered study, we tested 4- to 7-year-old children (N=72) and adults (N=72), asking if they made systematic predictions about where an owner will keep their object based on (a) whether the owner likes the object, and (b) whether competitors covet it. Participants chose between two possible locations: a hard-to-reach high shelf, and an easily-accessible low shelf. As predicted, we found a significant interaction (ps<.001): Children and adults expected owners to keep liked objects on a high shelf when there was competition (i.e., when others wanted it), but on a low shelf when there was no competition. By contrast, disliked objects were not expected to be kept on a high shelf when there was competition, nor on a low shelf when there was no competition, suggesting that children's and adults' interpretations of competition depend on objects' value to their owners (Fig. 1). These findings provide evidence that from preschool age, children can use social factors to reason about people's interactions with physical objects and can integrate information about object value and potential competition to form expectations for where others' will place their property.

Nicola Schmelzer

Psychology, Muir

Mentored By Dr. Leslie Carver

Joint attention cues for social encoding in infants with a familial history of autism

Joint attention (JA) is the triadic interaction between two social partners and an object of interest. In studies with typically developing infants, JA improves infant encoding of the target object (e.g. Thiele et al., 2021). Reduced engagement in JA is a stable marker of Autism Spectrum Disorder (ASD) (Charman, 2003), but it is unknown if ASD is also associated with changes in the impact of JA on infant learning. Here, we tested infant object encoding in the presence or absence of JA, collecting data from a population of 9-

12-month-old infants (current N = 25, target N = 75) with increased likelihood of ASD diagnosis due to family history. In each trial, participants saw an object and one or two person(s) on screen. The person(s) always looks at the object, sometimes also producing JA cues toward the participant or toward one another and sometimes not engaging in JA. In a test phase, participants then saw the target object paired on screen with a novel object; we calculated the proportion of time participants looked to the familiar vs. novel object in each test phase as a measure of encoding. In contrast to prior work, there was no significant main effect of JA on encoding scores ($F(1, 308) = 0.91$, $p = 0.34$). We also did not observe a significant interaction between the presence of JA and JA type (direct vs. observed; $F(1, 308) = 0.01$, $p = 0.92$). The full sample will be compared to data from an infant population without an ASD family history (N = 75, already collected).

Elsa Schmidt

Public Health, Sixth

Mentored By Dr. Rebecca Fielding-Miller, Associate Professor

An analysis of baseline data and the implementation process of the I-SHIP-US study: Understanding self-compassion disparities among UCSD undergraduate students

Mental health has declined among college students post-covid. Stigma and lack of comprehensive resources drive higher rates of mental health challenges in queer students and survivors of sexual trauma, often resulting in self-blame and feelings of isolation. However, practicing self-compassion is strongly linked to psychological well-being and is an essential tool for building resiliency and combating self-blame. Our research aims to understand self-compassion across student groups to inform tailored interventions. We worked with a student advisory board to recruit students to participate in a randomized control trial of a mindfulness sexual health app to increase self-compassion among undergraduate students at UCSD. We analyzed the survey data using Student’s t-test and evaluated the implementation process as part of a multi-national implementation science case study. Study participants' average self-compassion score was 2.78. Student survivors of sexual trauma ($\bar{x}$=2.72) report lower self-compassion than non-survivors ($\bar{x}$=2.80), with a significantly higher overidentification score (p=.008). Queer students ($\bar{x}$=2.70) report lower self-compassion than straight students ($\bar{x}$=2.90). Implementation analysis revealed low engagement with the app. We will continue assessing app engagement and post-intervention effects on self-compassion. There is emerging evidence on the buffering effect of self-compassion building against the negative mental health outcomes in the aftermath of sexual violence. Future qualitative research is needed to guide

medically accurate, empowerment-oriented mindfulness sex education on campus, as well as to better tailor it for queer students and survivors of sexual trauma.

Antara Sengupta

Cognitive Science w/ Specialization in Machine Learning, Revelle

Mentored By Dr. Andrea Chiba

LIGHT Hypnotherapy Treatment for Physician Burnout Alleviation

Physician burnout is a rampant crisis in the U.S., worsening after COVID-19. This results from a work-life imbalance, strenuous working conditions, and the physician's neglect of their own needs. Light-Induced Guided Healing Therapy (LIGHT) is a self-protocol that implements a hybrid of hypnosis and guided imagery to promote self-efficacy. By activating imagination, LIGHT boosts resilience and fosters self-compassion. We aim to identify if LIGHT hypnotherapy can increase resilience to stressors and reduce burnout within healthcare workers. Reduced burnout and depression can be assessed biologically and behaviorally. Frontal alpha asymmetry (FAA) in the brain has been linked with reduced anxiety and depression. Heart rate variability (HRV) reflects the relationship between sympathetic and parasympathetic engagement of the autonomic nervous system (ANS). Increased parasympathetic regulation can reflect a state of decreased arousal, supporting a calmer body and mind. We collected EEG, ECG, and survey data from the first, middle and last sessions of healthcare participants receiving 5-8 weeks of LIGHT treatment. Preliminary analysis through Python and Matlab showed a significant shift from right to left frontal brain dominance, potentially indicating higher levels of positive affectivity. Elevated HRV above baseline was observed, implying increased activation of the parasympathetic nervous system. Behavioral data displayed a significant decrease in burnout and increase in self-compassion. These results indicate a transition from self-preservation to self-efficacy and support an initiative to improve the physician burnout crisis. Incorporating meditation and self-care can potentially improve both the well-being of healthcare providers, and the overall effective function of the healthcare system.

Shivani Sharma

Human Developmental Sciences, ERC

Mentored By Dr. Cheryl Anderson

Diabetes Risk Perceptions for South Asian College Students

In the United States, South Asian communities have a significantly higher prevalence rate of Type 2 diabetes compared to other populations. In a previous study, South Asian age-adjusted diabetes prevalence was 23% compared to whites (6%), African Americans (18%), Latinos (17%), and Chinese Americans (13%). The objective of this research is to explore perceptions and health behaviors related to diabetes among South Asian young adults. An online survey was developed and 193 South Asian students at UC San Diego were recruited through social media over 12 days. Descriptive analysis was performed to describe variables related to diabetes health behaviors and perceptions. In this sample, 80% reported moderate knowledge of risk factors and 72% of protective factors. Sixty-seven percent (67%) reported exercising over 3 days/week. Among those who don't exercise, 38% reported a high likelihood of developing diabetes. Over 70% don't frequently check carbohydrate or fat contents; about 50% don't frequently check sugar contents. Over 25% eat excess amounts of white rice. Additionally, 68% have at least one diabetic grandparent, and 31% with a diabetic extended family member. Furthermore, 71% believe that South Asians are more likely to develop diabetes than other races. Most students who reported unhealthier exercise and dietary habits showed a stronger perceived likelihood of developing diabetes, suggesting that culturally appropriate strategies are needed to educate South Asians. Since exercise, diet, and family history are important factors for diabetes risk, this study shows the increased need for awareness to prevent the early onset of Type 2 diabetes.

Zhihui Sheng

Psychology, Sixth

Mentored By Dr. Celeste Pilegard

Investigating Individual Differences in the Effectiveness of Causal Reasoning Diagram Training

How can instructors support students in evaluating causal claims made from scientific evidence, and what individual differences influence the effect of training? This study

investigates the impact of the generative diagramming task on college students' causal reasoning ability, accounting for individual differences in Need for Cognition and Science Identity. All participants completed a lesson plan on causal reasoning and were randomly assigned to one of three activities: rereading the lesson plan, a text-based exercise, or a generative diagramming exercise. Participants' causal reasoning ability was then assessed by a 17-question quiz asking them to evaluate the legitimacy of claims made from scientific evidence provided. At the end of the study, participants also completed a Need for Cognition scale and a Science Identity scale that aim to captured the individual differences.

Alina Siddiqui

Neurobiology, Revelle

Mentored By Dr. Timothy Gentner

The Neuroscience of Vocal Flexibility: Exploring The Relationship Between Auditory-Motor Neuronal Dynamics During Song in the European Starling

Due to proprietary information this abstract has been redacted.

Serena Spada

Business Psychology, Seventh

Mentored By Gail Heyman

Exploring Preferences Between Overcoming and Removing Obstacles in Children's Stories

Stories about overcoming obstacles can boost children’s motivation and achievement, but can also increase blame towards individuals who fail to improve. An alternative obstacle story to reduce blame is about removing obstacles. However, an open question is the extent to which people prefer to read each of these obstacles stories to children—the present study’s focus. In Study 1 (n = 123 U.S. college students) participants read two stories about a disadvantaged group in the US, while in Study 2 (n = 204 U.S. college students) participants read one: 1) in the overcoming obstacles story, a child takes three buses daily to attend a better school and 2) in the removing obstacles story, a child’s under-resourced school receives an increase in funds. Both result in the child having

access to greater academic opportunities and becoming a surgeon. Study 1 demonstrated a robust preference to read children the overcoming obstacles rather than the removing obstacles story ($t(122)=8.27$, $p<0.001$), regardless of the target child's identity and study design characteristics. Study 2 revealed that although a preview of each story does not significantly influence participant's beliefs on values like motivation or control, it can significantly increase their support for anti-poverty interventions ($t(194.28)=-2.2907$, $p<0.05$). These findings have implications for understanding the stories people prefer to socialize children with and potential variables driving this preference. Our future research will explore the actual tradeoffs of reading each type of story through their effects on listeners' beliefs.

Megha Srivatsa

Molecular and Cell Biology, Warren

Mentored By Dr. Sara Gianella Weibel

Impact of Gender Affirming Hormone Therapy on HIV Reservoirs and Inflammation in Transgender Women

Transgender women (TW) are at increased risk for HIV acquisition but are significantly understudied. We investigated how initiating feminizing gender affirming hormone therapy (GAHT) impacts HIV reservoir size and activity, and inflammation. TW with HIV starting estradiol-based GAHT were recruited at two clinics in San Diego, CA and Houston, TX. Participants were on antiretroviral therapy (ART) and had suppressed HIV-1 RNA during the study. Blood and plasma were collected prior to starting GAHT and longitudinally, six times over 18 months post GAHT initiation. Samples from cisgender men (CM) with HIV were matched by age, CD4+ T cell count, duration of HIV infection, and time on ART. Estradiol and testosterone were measured by ELISA, cell-associated HIV RNA and HIV DNA were measured by ddPCR, and 41 cytokines and chemokines were measured by Luminex. A total of 22 TW were enrolled. Nine were lost to follow-up, including one suicide, one homicide, and two imprisonments. A total of 77 samples from TW and 79 samples from CM controls were analyzed. Overall, TW had higher HIV DNA levels, with faster decline in 2-LTR DNA after initiating GAHT compared to CM, suggesting estradiol may inhibit residual HIV replication. Using our cytokine and chemokine dataset we generated a PLS-DA model to accurately predict gender group, with an error rate of 10%. TW also had unique immune signatures, which might impact HIV disease outcomes and comorbidities. Our study demonstrates challenges associated

with recruiting and studying this impacted population, emphasizing the need for trauma-informed care and study initiatives.

Isabelle Stad

Business Economics, Warren

Mentored By Alain JJ Cohen

Hiroshima Mon Amour, Freud's Dream Theory in Flashbacks

In her essay, Isabelle applies Freud's dream theory to "Hiroshima Mon Amour," a French cinematic masterpiece. The film features a scandalous juxtaposition between the bombing of Hiroshima and the personal trauma of a French woman. Hiroshima Mon Amour's complex narrative is characterized by flashbacks through which the protagonist's trauma is slowly revealed. Isabelle's research explores the concepts of condensation and displacement present in the woman's flashbacks.

Binyamin Stivi

Aerospace Engineering, Seventh

Mentored By Assistant Professor Aaron Rosengren

Long-Term Orbital Predictions of Cislunar Satellites Using Ephemeris-Quality N-Body Codes

This project leverages the state-of-the-art Solar-System N-Body integrators, adapting them to be highly parallelizable for the efficient propagation of the state dynamics, to recover the decadal orbital evolutions of cislunar satellites in the space-object catalog.

Anita Sun

Sociology, Muir

Mentored By Dr. Kevin Lewis, Faculty

Telling Right From Wrong: Exiting the Alt-Right Pipeline

The rise of populism and right-wing politics in younger adults is unique and distinct from previous generations due to younger generations' access to social media platforms. Previous research provides evidence that there exists an alt-right pipeline, namely referring to the rise of the alternative or radical right. This alt-right pipeline is a series of increasingly extreme right-wing political content hosted on social media platforms. While past studies have adeptly demonstrated how and why people become radicalized through the alt-right pipeline, there remains a gap in research on how and why people exit the alt-right pipeline. By using a role exit theoretical approach, this paper illustrates the different social reasons why people leave the alt-right pipeline through interview and media analysis methods. I found that the most common reasons for leaving the alt-right pipeline were receiving empirical peer-reviewed information from trustworthy sources.

Rachel Survilas

Marine Biology, Sixth

Mentored By Dr. Lisa Levin

Characterizing faunal methane dependence on the Southern California continental margin

Due to proprietary information this abstract has been redacted.

Emma Tai

Clinical Psychology, Sixth

Mentored By Adena Schachner

Children’s reasoning about the reality of Augmented Reality content

Children can increasingly access Augmented Reality (AR) technologies, which embed interactive virtual entities into the physical world. How do children understand a world augmented by AR technology? Focusing on AR live video content (i.e., live video with AR filters that alter real-world content), we aim to investigate (1) How do children judge the reality status of AR objects? And (2) Do they exhibit information-seeking behaviors to make reality status judgments about AR? In a within-subject design, 3-to 6-year-old children are asked to judge which image they see on two live videos is the real one in the physical world. In the control condition, both videos have no AR filter (i.e., the videos function like mirrors that reflect the real world). In the experimental condition, one of the two videos has no AR filter, but the other has an AR filter that replaces a real-world image. The order of conditions is fixed, where the control condition is always tested first. We will explore a developmental change in children's response to and understanding of AR.

Annie Tang

Cognitive Psychology, Seventh

Mentored By Dr. Celeste Pilegard

Understanding expertise and spatial contiguity in multimedia learning through eye movements

The spatial contiguity principle of multimedia learning suggests that people learn better when a lesson's corresponding text and images are close to each other, rather than far away. Previous research has demonstrated that while spatial contiguity improves learning in low-knowledge learners, its effectiveness is reduced for experts. Since eye movement can be utilized as a process measure for learning, this study uses eye tracking to investigate the effects of spatial contiguity and expertise on eye movements and learning outcomes. The study is a mixed-subject design, with spatial contiguity as the within-subject variable, and expertise as the between-subject variable. In the study, participants' eye movements are tracked while they view two engineering lessons: one spatially contiguous (text close to diagram), and one non-spatially contiguous (text far from diagram). The dependent variables of this study are retention and transfer test scores and number of integrative eye movements (eye movements that transition between text and image). We hypothesize that experts will outperform novices on the learning tests due to their prior knowledge of the topics; in addition, spatial contiguity will benefit the learning outcomes of novices more so than that of experts. We also predict that the influence of spatial contiguity on integrative saccades will depend on learner expertise. The results of

this research will provide theoretical understanding of how learners at different levels of expertise process multimedia information and practical insight into how multimedia lessons can be best designed for learners at different levels of expertise.

Farhad Taraporevala

Physics, Sixth

Mentored By Professor M. Brian Maple

Designing and Implementing an Adiabatic Demagnetization Refrigerator

The Adiabatic Demagnetization Refrigerator (ADR) is a device used to cool samples at around 5 Kelvin down to temperatures in the milli-Kelvin range using an external magnetic field. The device uses a paramagnetic salt, in this case Chromium (III) Potassium Sulfate Dodecahydrate, KCr(SO4)2(H2O)12, which, when placed in a 3 Tesla or higher external magnetic field, has all its spins line up. Then, when the field is dropped, the salt will take thermal energy away from the environment to restore its paramagnetic phase, causing the sample to cool. This ADR can be used to cheaply improve the lowest temperature the lab is capable of reaching, and allow us to study materials at extremely low temperatures. In this project I have designed, 3-D printed, and tested various prototypes of the ADR. Currently, the latest version of the ADR is capable of dropping the temperature from 1.8 K to an estimated 0.8 K using a four point resistance measurement to estimate temperature. The next phase of the project is constructing wire coils to take alternating current magnetic susceptibility measurements. These coils will allow for observing transitions such as the superconductivity transition in samples, which will help with verifying temperature of the ADR.

Nayana Tellakula

General Biology, ERC

Mentored By Dr. William B. Kristan, Distinguished Professor Emeritus

Planarian Amputation and Regeneration Modify Behavioral Responses

Planarian flatworms can regenerate any portion of their body that is removed by their own behavior, by injury, or by surgical amputation at any location along their body. Intact planarians exhibit three distinct behaviors when stimulated with UV light at

different body regions: turning (head), elongation (middle), and contraction (tail). Along the animal, the shift in response from turning to elongation occurs at a specific location, about one-third of the way back from the head. The animals were divided into 10 regions plus the tail. I found that surgical amputation causes the front third of the back portion of the animal to behave like the normal “head end”; i.e., stimulating this region elicits turning. I then surgically amputated the animal at different locations along the animal and found that the turn-inducing region shifts forward along the animal as the head end regenerates over 8 days. These results mean that a region which, in intact animals, produces one response (elongation) to stimulation can switch to produce turning after amputation, then switches back to elongation as the anterior region regenerates.

Nat Terry

Physics, Revelle

Mentored By Professor Richard Averitt

Terahertz Characterization of Correlated Materials

Understanding and controlling the properties of correlated materials is a grand challenge in material physics. This challenge arises from the need to disentangle the microscopic electronic interactions that enable the emergence of novel and functional electronic properties ranging from magnetism to superconductivity. In order to understand and harness these interactions to optimize their functional properties, we require a detailed experimental characterization. To this end, we employ the techniques of ultrafast optics to generate short laser pulses at terahertz frequencies. Terahertz pulses are well-suited for characterizing the electronic properties of quantum materials as this is the appropriate energy scale for a host of excitations including carrier transport and lattice vibrations. Moreover, these pulses allow us to perform time-resolved spectroscopy in order to understand how different degrees-of-freedom (i.e., charge, spin, and lattice) couple or interact in a given material. Using pump-probe optical spectroscopy,we have measured the electronic response of thin films that exhibit an insulator-to-metal (IMT) phase transition. Our goal is to understand the dynamics of the (IMT) in these materials as a function of temperature and photoexcitation density. We are also characterizing silicon-based metastructures, with a view towards integrating IMT materials to create devices that harness the massive conductivity changes that occur in these materials when photoexcited. In summary, we are exploring the electronic landscape of these materials using light. This provides insight into the microscopic phenomena that govern their

properties while also giving insight into how we can manipulate and control the electronic response.

Sylvia To

Biochemistry, Marshall

Mentored By Nathan Shaner, Ph.D.

Optimizing a Unique Fluorescent Protein for Recording Biochemical Activity

Chimeric antigen receptor (CAR) T-cell therapy is an emerging cancer treatment that has shown high efficacy for blood cancers such as leukemia, but has been less successful for treating solid tumors. The limitations of CAR T-cells include “exhaustion,” which leads to dysfunctionality in treating solid tumors over long time periods. Ca2+ signaling is closely linked to activation of the tumor-targeting CAR, and observation of Ca2+ signaling over time in CAR T-cells is expected to provide useful insights into the factors that promote or mitigate exhaustion. However, T-cells are highly mobile, making long-term imaging and tracking of large populations of CAR T-cells using traditional Ca2+ indicators impractical. By optimizing a photomaturable optical reporter for Ca2+ (ORCa), we plan to study long-term Ca2+ signaling activity in CAR T-cells targeting solid tumors, providing new insights into the process of exhaustion and ultimately enhancing CAR T-cell therapeutic efficiency. Using directed evolution methods, we are engineering the fusion of a sensitive photomaturable fluorescent protein (PMFP) to a luciferase and to a bioluminescent calcium sensor. Following exposure to blue light (~480 nm), PMFP displays the unique property of irreversible maturation from a green fluorescent form to a far-red form, with high sensitivity, making it an ideal recorder of bioluminescent probe activity. PMFP-based ORCas will quantify and record Ca2+ signaling events and allow us to correlate this information with other markers of CAR T-cell exhaustion.

Marissa Todesco

Cognitive and Behavioral Neuroscience, Revelle

Mentored By Dr. Timothy Gentner

The Neuroscience of Vocal Flexibility: Exploring The Relationship Between Auditory-Motor Neuronal Dynamics During Song in the European Starling

Due to proprietary information this abstract has been redacted.

Lu Tong

Economics/ Critical Gender Studies, Revelle

Mentored By Julie Cullen, PhD

Assessing Wage Disparities: A Comparative Analysis of H1B Workers and U.S. Citizens in the Trump Era and COVID-19 Pandemic

This study investigates the growing wage disparities between H-1B visa holders and U.S. citizens following the policy changes initiated after the 2017 election of President Trump. Extending beyond traditional wage disparity research which often focuses on gender, race, and education, this research zeroes in on the impact of citizenship status. In a climate of debate over whether H-1B workers are undercompensated, acting as low-cost labor affecting the salaries of U.S. citizens, or overcompensated due to prevailing wage regulations, this paper specifically probes the influence of President Trump's administration's policies, including travel bans and suspensions in H-1B visa issuance. Utilizing Difference-in-Differences (DiD) methodology, the results reveal a significant escalation in the wage gap post-2017, in tandem with alterations in the skill set of H-1B applicants. Additionally, the analysis takes into account the changes during the pandemic, shedding light on the evolving nature of wage disparities amidst shifts in immigration and labor policies.

Riley Torgerson

Communication, ERC

Mentored By Akosua Boateng

Youth Mental Health Outcomes of Gender Confirmation Surgery Legislation

This project seeks to investigate if there is a relation between transphobic legislation and suicidal thoughts and actions in youth. It compares Idaho and Florida, two of the nineteen states in the United States that have recently created societal and legal restrictions against providing adequate care to youth seeking gender affirmation surgeries, to states like California and New York, that have incorporated laws of protection for youth gender confirmation surgeries and are known as “safe havens”. The project uses legislation, data on suicidality, and existing research to compare states with opposing approaches on medical and legal support for not only the LGBTQIA+ community but specifically youth seeking transitional medical care. The first part of the project investigates each state’s existing affecting the LGBTQIA+ community and notes any recent legislation supporting or denying access to transitional medical care. Next, it compares rates of suicidal idealizations and actions in youth and investigates the reasoning behind that in each of the four states. This project concludes by considering whether there is a measurable relation between suicide rates in states with opposing laws on gender- confirmation medical care in youth.

Casey Toy

Visual arts-Media, Seventh

Mentored By Dino Dinco

Rising

"Rising" aims to capture digital collage work that is contemplative with nostalgia and inner awareness. This work focuses on Toy's visceral feelings towards femininity, navigating the passage of space and time, growth, and fading away someday.

Dominic Tran

Structural Engineering, Marshall

Mentored By Georgios Tsampras

Preliminary Experimental Research Studies for the Development of a 3D-Printed Friction-Based Force Limiting Connection for Buildings

This research focuses on analyzing the capabilities of 3D-printed carbon fiber reinforced thermoplastics (CFRTP) in place of conventional structural materials such as timber, aluminum, and steel within friction-based force limiting connections for buildings. While structural plastics have been in use for decades, 3D-printing of structural materials is relatively new. The benefit of utilizing printed CFRTP is its lightweight yet high tensile strength, cost free complexity, reduced waste, and optimizability. These benefits improve three major areas of the product: installation, production, and structural efficiency. As a proof of concept, we begin by modeling a small scale prototype of a translational friction damper with a composite friction plate contacting an aluminum interface. The composite and aluminum components are computer numerical controlled (CNC) milled, while the remaining components are 3D printed using Polylactic Acid (PLA) material that is not filled with reinforcing fibers. The assembly goes through four ramping sinusoidal motions of varied maximum displacement and speed while the normal force, friction force, and displacement are recorded. The small scale prototype of only 10% infill density exceeds expectations: resulting in stable cyclic friction force with magnitude 1kN of friction force at either slow speeds or small displacements. The small scale prototype is the first step toward the development of 3D-printed CFRTP in friction-based force limiting connections for buildings. In the future, we hope to take advantage of generative design and incorporate finite element analysis to optimize the interior geometry as we move on to full scale experimental tests with CFRTP.

Jason Tuermer-Lee

NanoEngineering & Molecular Synthesis, Sixth

Mentored By Prof. Darren J. Lipomi

Synthesis of PEDOT:PSS Brushes Grafted from Gold Using ATRP for Increased Electrochemical and Mechanical Stability

We report PEDOT:PSS brushes grafted from gold using surface-initiated atom-transfer radical polymerization (SI-ATRP) which demonstrate significantly enhanced mechanical stability against sonication and electrochemical cycling compared to spin-coated analogues as well as lower impedances than bare gold at frequencies from 0.1 to 10^5 Hz. These results suggest SI-ATRP PEDOT:PSS to be a promising candidate for use in microelectrodes for neural activity recording. Spin-coated, electrodeposited, and drop-cast PEDOT:PSS have already been shown to reduce impedance and improve

biocompatibility of microelectrodes, but the lack of strong chemical bonds of the physisorbed polymer film to the metal leads to disintegration under required operational stresses including cyclic mechanical loads, abrasion, and electrochemical cycling. Rather than modifying the metal electrode or introducing cross-linkers or other additives to improve the stability of the polymer film, this work chemically tethers the polymer to the surface, offering a simple, scalable solution for functional bioelectronic interfaces.

Manuel Vasconcelos

Cognitive and Behavioral Neuroscience, Marshall

Mentored By Dr. Kay Tye

Assessing the pharmacobehavioral space of psychoactive substances

Psychedelic drugs have been shown to modify emotional processing in humans. Specifically, when dosage and context are controlled they have been shown to increase positive mood while decreasing reactivity to negative emotional stimuli. However, the precise mechanism through which psychedelics mediate these changes in emotional processing remain unknown. To begin disentangling the contributions of context versus individual differences in response variability to psychedelics, we are examining the transitions between behavioral motifs. We decided to employ a novel unsupervised machine learning system to extract this information. Keypoint MoSeq has been developed to integrate motion sequencing data, such as that produced by Social Leap Estimates Animal Poses (SLEAP), for downstream analysis of body language or ‘syllables’ occurring before or after discrete behaviors. Our lab has collected various behavioral recordings of mice on ketamine, psilocybin and saline. Utilizing these recordings and Keypoint MoSeq we have developed a ‘Drug Experience’ model. This model will facilitate statistical analysis aimed at better understanding the transitions between discrete behavioral motifs. This model can also be built upon using behavioral videos from other psychoactive drugs to build a repository of distinct drug related behavior.

Izabella Vasquez

Cognitive Science- Neuroscience, ERC

Mentored By Melinda Owens, Assistant Teaching Professor

Effect of a Chemistry Learning Intervention on Introductory Biology Students' Sense of Belonging in Biology.

Chemistry concepts are foundational to introductory biology courses, but students often struggle with them. If inequities exist in student comfort with these topics, it might have persistent effect throughout their education. In a large introductory biology course at a public R1 university taught by four different instructors, we designed and assessed a targeted chemistry intervention to determine its effect on student attitudes. First, we analyzed instructor midterms to determine what proportion of the points directly or indirectly require chemistry knowledge. Second, we used an open-ended survey question to probe students about how experience learning chemistry topics affected their identities as biologists. Responses were analyzed through thematic analysis. We found that a substantial proportion of points for each instructor's exams required chemistry knowledge, confirming that knowledge of these topics is important for student success in introductory biology. We also found that both pre- and post-intervention, positive course experiences with chemistry were often associated with a positive impact on student identity in biology, whereas negative course experiences were often associated with negative impacts. This finding held across instructors and student demographic categories. We hope that this study sheds light on how struggles with chemistry can affect student biology identity.

Benjamin Wagar

International Studies - International Business, Revelle

Mentored By Professor Munseob Lee

Effects of Adult Education and Training on Korean Wages

Increasingly, countries are realizing that education does not stop at the classroom but is part of a lifelong process. Workers are incentivized to further develop their workplace skills and knowledge resulting in workers are embracing this outside the workplace as well. This paper is a statistical analysis of data from the 2012 to 2016 OECD Survey of Adult Skills comparing the effect of job-related and non-job-related adult education and

training (AET) on the wages of workers from select OECD countries with a particular emphasis on South Korea. Additional research concerning the methodology of government involvement and support for both AET and worker incentives to participate is included to provide context. It is hypothesized that job-related AET will have a positive effect on workers' wages, with a greater effect from countries that provide more worker support, while non-job-related AET will have no to minimal effect on wages.

Hou Wan

Data Science, Muir

Mentored By Lily Weng

CLIP Dissect Automatic Evaluation

Dissecting neural networks is a modern approach in the field of Interpretable and Explainable AI used to understand the inner workings of deep neural networks by examining the functionality of individual neurons. It typically involves techniques to automatically associate neurons with specific concepts or features, providing insights into how the network processes information. CLIP-Dissect (Oikarinen etal, 2023), a novel method, stands out for its capability to automatically label internal neurons with concepts, leveraging multimodal vision/language models such as CLIP. The output of CLIP-Dissect entails the labeling of individual neurons with associated concepts, elucidating the network's functioning. In the CLIP-Dissect paper, quantitative evaluation for neuron labels has been done in terms of final layer neuron evaluations due to having access to the neuron ground truths, however, this is not possible for unlabeled hidden neurons which require qualitative observations. In this study we introduce a way to replicate this style of evaluation automatically and quantitatively. To do this, we utilize 3 different approaches of observing activating images and their labels. We find in this study that utilizing pretrained and benchmarked models to do this task is an effective method to conduct qualitative assessment of neuron dissections. The methods used are prompting a VQA (BLIP-2), and using OpenCLIP embedding similarities as means of evaluation. Notably, BLIP-2 demonstrated a high alignment with human evaluations, achieving a similarity score of 0.809, surpassing the OpenCLIP methods which recorded 0.768 and 0.776 respectively.

Tianyu Wang

Psychology, Revelle

Mentored By Christina Gremel, Associate Professor

Dopamine Modulation of Hunger State in Orbital Frontal Cortex-Dorsal Medial Striatum

Previous research by Groove et al demonstrated that dopamine release in the Ventral Tegmental Area (VTA) increases after ingestion of food and water. It shows that the midbrain dopaminergic system tracts internal states of hunger, thirst, and satiety. VTA sends various dopamine projections into other regions of the brain, including the frontal cortex and the striatum. Orbital frontal cortex (OFC) and its projection to the Dorsal Medial Striatum (DMS) is suggested to play a role in outcome evaluation and goal-directed behavior. We hypothesized that OFC-DMS dopaminergic neurons will also encode information on internal states based on their connection to VTA and its functionality. In this research, we tried to explore the OFC-DMS activity in the post-consumption stage in hungry mice.

Lucy Wang

Human Biology and Cognitive Science with a Specialization in Neuroscience, Marshall

Mentored By Lara Rangel, Assistant Professor

The temporal relationship between hippocampal oscillations in dentate gyrus during learning and recall

The hippocampus plays a crucial role in learning and memory, with the dentate gyrus (DG) being key for associating environmental cues with specific outcomes. The DG is hypothesized to facilitate this ability by generating unique spatiotemporal activation patterns within its neuronal population for similar experiences. However, how the distinct neural representations are produced and utilized is still yet to be discovered. The significance of the interaction between granule cells, mossy cells, and interneurons within the DG is debated. The functionality of DG during the learning versus recall stage of memory processes is also controversial. The proposed project aims to explore how the DG coordinates temporally during the learning and recall phases of a spatial-reward association task in a fan-shaped maze. Specifically, it focuses on understanding the relationship between the timing of oscillations within the DG's molecular layer, granular cell layer, and hilus throughout these phases. We want to characterize current sources and sinks across the layers and understand how stereotyped rhythms in the local field arise from the flow of currents across layers. By analyzing how the temporal coordination

between the dentate gyrus cell layers changes across different task phases, we could answer long-standing debates regarding how the DG circuitry functions during learning and recall. This insight will contribute to resolving longstanding questions about DG circuitry's role in learning and recall, offering the potential for developing targeted treatments for memory disorders.

Troy Weldon

Ecology, Behavior, and Evolution, Muir

Mentored By Dr. Jonathan Shurin

Integrating DNA Metabarcoding and Conventional Biomonitoring Techniques to Unravel the Impacts of Climate Change on Zooplankton Communities in the Sierra Nevadas

Alpine lakes and their associated ecological communities face unprecedented challenges due to the pervasive impacts of climate change. To effectively address these challenges, it is crucial to accurately understand how communities respond to climatic variability and the underlying mechanisms governing such changes. Conventional biological monitoring strategies, while exhibiting some advantages, are time-consuming and susceptible to human error. In light of these limitations, there is a critical need for the implementation of modern biomonitoring techniques such as DNA metabarcoding. Previous research indicates that DNA metabarcoding surpasses conventional methods in identifying low-abundance taxa and cryptic species, while maintaining a strong correlation with traditional approaches in assessing the abundance and spatial distribution of common species. I propose DNA metabarcoding be used in conjunction with traditional morphological identification to provide faster and more accurate characterization of the diversity, structure, and dynamics of biological communities in aquatic environments. As part of a thirteen-year climate monitoring initiative within Yosemite National Park, I will conduct DNA metabarcoding on zooplankton assemblages from twenty-one individual lakes. I will then compare the data obtained using traditional community characterization methods with data from the metabarcoding approach to validate the accuracy and effectiveness of DNA metabarcoding. The incorporation of DNA metabarcoding into the ongoing long-term monitoring project is a pivotal new development that will amplify researchers' ability to identify the presence of invasive species, characterize climate-induced range shifts, and assess changes in biodiversity over time and space.

Ruby Wen

Chemistry, ERC

Mentored By Yitzhak Tor, Distinguished Professor

Unraveling Local Chirality in Nucleic Acids via Fluorescence-Detected Circular Dichroism

The ability to monitor changes in local conformations of RNA at a single-base resolution is important for understanding sequence-based molecular processes. This project aims to explore Fluorescence-Detected Circular Dichroism's (FDCD) potential as a biophysical tool to investigate local conformation in RNA with site-specifically incorporated fluorescence nucleoside analog. Thienoguanosine, an emissive guanosine analog was incorporated into dinucleoside monophosphates and RNA oligomers via chemical and enzymatic methods, respectively. The resulting dimer and oligmers were then purified and were subjected to photophysical characterizations. The result shows that FDCD is extremely sensitive to local sequence, and has the potential to shed light on base-stacking heterogeneity.

Daisy West

Public Health, Revelle

Mentored By Dr. Fielding-Miller

Stories of Care: Community-engaged action research to address caregiver burn-out in socially vulnerable communities

Parents and child caregivers have experienced prolonged, chronic stress from the impacts of the COVID-19 pandemic. Stories of Care examines the difficulties of navigating childcare using a narrative inquiry approach to develop potential solutions. We conducted 8 storytelling workshop focus groups in English, Spanish and 1 interview in Vietnamese to develop stories for how families access and identify support. Three story summaries were created from logic models to perform a thematic analysis of childcare, burnout, and potential intervention. People often rely on mutual aid while avoiding institutional resources due to the hurdles of navigating complex systems. Key themes include transportation, childcare career professionalization, cultural competency, resource navigation, and having the time and expendable income to spend with family. The findings will be shared with stakeholders, including advocates, providers, and policymakers, to identify actionable and feasible improvements through pile-sorts and

rank orders. We will share these results in a final workshop with parents/caregivers to ensure stakeholder findings meet the target populations' needs. Our findings are consistent with the literature that parents will rely on and benefit from communal support systems when they cannot rely on institutional resources. Also consistent is that parents prioritize inclusive and flexible childcare options to support their families' overall well-being post COVID-19. More research is needed to identify feasible and effective pathways in supporting families post COVID-19.

Linisa Williams

Clinical Psychology, Seventh

Mentored By Victoria Risbrough

Neural Markers Associated With The Effect of Working Memory Training on Fear Extinction

Due to proprietary information this abstract has been redacted.

Yuxin Wu

Molecular Cell Biology, Seventh

Mentored By Dr. Omar Mesarwi

Time-Restricted Eating on Sleep Apnea

Obstructive sleep apnea (OSA) is a highly prevalent respiratory disorder characterized by partial or complete collapse of the airway during sleep, resulting in reduced oxygen levels and poor sleep quality. OSA is associated with a variety of metabolic disorders including impaired fasting glucose, insulin resistance, type 2 diabetes mellitus, hypertension, atherosclerosis, and dyslipidemia. The first-line treatment for OSA is nasal continuous positive airway pressure (CPAP), which, though highly effective in treating OSA, has not been shown to improve metabolic health in OSA. Time restricted eating (TRE), whereby the daily window for caloric intake is modestly reduced, improves body weight and glucose homeostasis in humans, and also is shown to improve glucose and lipid metabolism in rodents. Preclinical data from the Mesarwi lab have shown that TRE can improve fasting glucose and glucose tolerance in a mouse model of OSA, through improvements in pancreatic beta cell function. These effects appear to be more profound

in an OSA model than in normal rodents. However, the effects of TRE in human subjects with OSA have not been demonstrated. In this presentation, we discuss the rationale and design of an ongoing clinical trial, in which patients with moderate to severe OSA are randomized to TRE or standard eating, with outcomes including several important metabolic health parameters (serum glycated hemoglobin, lipids, blood pressure, and glucose levels measured by continuous glucose monitor). We hypothesize that TRE will improve each of these parameters, and that no significant change will be observed in patients randomized to standard eating.

Simona Wu

Bioengineering - bioinformatics, Muir

Mentored By Dr. Lingyan Shi

Neural Network Based Automatic hyperspectral metabolic imaging Analysis for Studying Aging and Diseases

Hyperspectral imaging is a powerful tool for studying metabolic activities, enabling the detailed visualization of newly synthesized substances, such as proteins and lipid droplets. Despite its capabilities, the bare-eye interpretation of these images is limited, and we still need to provide statistically significant conclusions or accurately represent the true intensities of signals for research purposes. In order to achieve this step with high accuracy and high efficiency, I have developed a neural network-based program for the comprehensive analysis of hyperspectral images. This program automates several critical tasks:

1. Spectra Fitting: It effectively eliminates background noise and aligns spectra to their correct positions, ensuring data accuracy and reliability.

2. Signal Detection: By analyzing each pixel of the hyperspectral image, the program identifies biologically significant spectral peaks, allowing researchers to precisely quantify and visualize specific biological components and their concentrations.

This program not only streamlines the analytical process but also enhances the depth and accuracy of metabolic studies. By simply uploading a hyperspectral image into the program, researchers can obtain detailed analyses without additional manual intervention, facilitating a more efficient and insightful exploration of cellular metabolic activities.

Emily Xu

Cognitive Science, Linguistics, Revelle

Mentored By Dr. Douglas A Nitz

CA1 and subiculum object-centered encoding of self-location in landmark-based navigation

This study investigates the mechanisms of landmark-based navigation, focusing on the encoding of self-location relative to landmarks within the CA1 region and subiculum of the rat hippocampus. Despite extensive research on spatial memory and navigation, the specific process by which rats encode their location relative to objects in complex tasks remains poorly understood. Previous studies have identified the medial and lateral entorhinal cortices' roles in allocentric and egocentric spatial representations, respectively. Moreover, landmark-vector cells in the CA1 and cue-responsive neurons in the subiculum suggest differentiated roles in object and self-location encoding. However, the integration of these spatial representations, particularly in object-centered navigation tasks, has not been thoroughly explored. Our research employs a carefully designed square maze task, where rats navigate towards a reward in proximity to a landmark array, with varied entry points and landmark locations to dissociate world-centered, egocentric, and object-centered frames of reference. Employing twelve tetrodes for simultaneous electrophysiological recordings in the CA1 and subiculum, we analyze the neuronal activity in relation to behavioral variables. This approach allows for a detailed examination of how spatial relationships among the self, landmarks, and the environment are encoded. Our hypothesis posits that rats form an object-centered representation of self-location, facilitating landmark-based navigation. The findings of this study aim to deepen our understanding of spatial memory and navigation by elucidating the neural mechanisms underlying object-centered encoding of self-location.

Tomosuke Yamaguchi

Neurobiology, Seventh

Mentored By Dr. Matthew Shtrahman

Clinical Applications of Two-Photon Microscopy

Dysfunctional neurons cause a variety of neurological diseases including Alzheimer’s, epilepsy, and cancer. Therefore, studying how neurons interact with each other is crucial to understanding the causes and possible treatments of brain disorders. However, current

research techniques to study neuron interactions rely on models, and methods to study the human brain, such as fMRI do not have single-neuron resolution. While these techniques provide key insights into how human neurons may become diseased and dysfunctional, the ability to study single-neuron interactions in a living human subject is needed to confirm and further our current understanding. One highly effective method to study single-neuron dynamics in live specimens is an optical approach called two-photon microscopy. In general, microscopy works by using light to excite electrons in fluorescent proteins within cells of interest. When excited, the proteins give off light, which can be detected by a camera. Typically used to image brains of live mice, two-photon uniquely uses a pulsed beam with longer wavelengths of light, enabling deeper, higher resolution imaging, and reducing out of focus areas. In this project, our aim is to build a two-photon microscope that can image the neurons of a living patient who is undergoing a surgical procedure called a temporal lobe lobectomy. In this procedure, the temporal lobe of the brain is revealed and excised to relieve severe cases of epilepsy. Crucially, this provides an opportunity to image the temporal lobe prior to being excised and enables study of single-neuron interactions in a living human brain.

Sahiti Yenumula

Human Biology, Revelle

Mentored By Dr. David Vera

Assessing Pineal Gland as a Biomarker for Neuroinflammation through Tilmanocept Labeling following Blast-induced Traumatic Brain Injury

Due to proprietary information this abstract has been redacted.

Clara Yi

Cognitive Science, Revelle

Mentored By Kay Tye, PhD

Neuromodulated mixture of experts: A prefrontal cortex inspired architecture for lifelong learning

Lifelong learning is the ability to learn and retain knowledge of multiple tasks without catastrophic forgetting, switch between them seamlessly and use old knowledge to

facilitate more efficient learning of new tasks. Despite recent advances in artificial intelligence, this problem still hasn't been solved efficiently, with most solutions focused on network expansion (Rusu et al. 2016, Vecoven et al. 2020), a costly mechanism. We have devised a novel modular deep learning network architecture called Neuromodulated Mixture of Experts (NeMoE) inspired by the prefrontal cortex that utilizes the distributed learning framework of the classical Mixture of Experts model and the context-dependent signal-to-noise ratio mediating capabilities of neuromodulators like dopamine (Vander Weele et al. 2018, Tsuda et al. 2020). To test the model, we developed a multi-context foraging task where mice are presented with different environmental contexts indicated by ambient lighting – each context is paired with a high/low cost and a high/low reward. We found that mice learn context-specific behavioral strategies and that context is predictable from behavioral features. We used deep reinforcement learning to train NeMoE on the task and found that the model converges to the same policy as real mice, displaying bio-mimicry. Lastly, we recorded neural activity from the medial prefrontal cortex (mPFC) and were able to identify ensembles of neurons that have context-specific signal profiles and found that context is decodable from neural activity. These findings suggest that neuromodulation-driven flexibility can enable models to perform lifelong learning and such "experts" can be found in mPFC ensembles.

Millie You

General Biology, Revelle

Mentored By Joseph Pogliano

Characterization of Novel Jumbo Bacteriophage WinchesterEllie

Bacteriophages or "phages" are bacteria-infecting viruses that number more than 10^31, making them the most abundant biological entities on the planet. A salient application of this bacteria-killing resource is phage therapy, which focuses on using bacteriophages to treat bacterial infections. Finding and characterizing phages that can infect a wide range of bacterial hosts is of great importance. In this project, I will investigate the host range, receptor, and structural filament of the newly-discovered jumbo bacteriophage WinchesterEllie, isolated from UCSD campus wastewater. To determine its host range, I will use spot titers to test its infectivity against different bacterial species and observe these infections with fluorescence microscopy. I will then determine WinchesterEllie's targeted host receptor by sequencing bacterial mutants resistant to infection by this phage. Finally, I have observed that WinchesterEllie produces a filament in the host cell during infection. However, its genome does not contain a phage tubulin homolog (PhuZ),

which has been the only characterized filament produced by jumbo bacteriophage thus far. I will investigate the filament encoded by WinchesterEllie through biochemical means: first with mass spectrometry to determine which protein is the most likely to make a filament-like structure during its infection, then with GFP microscopy to observe the filament organization throughout infection. Understanding the specific mechanisms used by WinchesterEllie can benefit our understanding of the diversity in phage replication mechanisms, which can aid efforts to use them for phage therapy.

Lauren Younk

Social Psychology, Sixth

Mentored By Dr Matthew J Irwin

Temporary Solutions Don't Fix Permanent Problems: How Affirmative and Enthusiastic Consent Undermine Consent Laws Within Universities

This article takes a deep dive into the nuanced dynamics of sexual misconduct reporting on university campuses, shedding light on critical flaws in the incorporation of consent into policy frameworks. This is accomplished through an in-depth examination of the historical context of sexual assault-based legislation, dissecting the multiple definitions of consent, such as affirmative and enthusiastic consent, commenting on rulings in prior cases, and studying the shortcomings of the legal framework. Through a proactive stance, the article takes a prescriptive approach by proposing a legislative review aimed at addressing these issues head-on, emphasizing the desperate need for comprehensive definitions of consent. The findings underscore the necessity of reevaluating current policies to break the cycle of underreporting and foster a safe environment for university students.

Keyi Yu

Cognitive Science Specialized in Machine Learning & Behavioral Neuroscience, Warren

Mentored By Dr. Lara Rangel, Assistant Professor

The temporal relationship between hippocampal oscillations in dentate gyrus during learning and recall

The hippocampus plays a crucial role in learning and memory, with the dentate gyrus (DG) being key for associating environmental cues with specific outcomes. The DG is hypothesized to facilitate this ability by generating unique spatiotemporal activation patterns within its neuronal population for similar experiences. However, how the distinct neural representations are produced and utilized is still yet to be discovered. The significance of the interaction between granule cells, mossy cells, and interneurons within the DG is debated. The functionality of DG during the learning versus recall stage of memory processes is also controversial. The proposed project aims to explore how the DG coordinates temporally during the learning and recall phases of a spatial-reward association task in a fan-shaped maze. Specifically, it focuses on understanding the relationship between the timing of oscillations within the DG's molecular layer, granular cell layer, and hilus throughout these phases. We want to characterize current sources and sinks across the layers and understand how stereotyped rhythms in the local field arise from the flow of currents across layers. By analyzing how the temporal coordination between the dentate gyrus cell layers changes across different task phases, we could answer long-standing debates regarding how the DG circuitry functions during learning and recall. This insight will contribute to resolving longstanding questions about DG circuitry's role in learning and recall, offering the potential for developing targeted treatments for memory disorders.

Yvonne Yu

Molecular and Cell Biology / Public Health with a Concentration in Epidemiology, Marshall

Mentored By Kathleen Fisch, PhD

Molecular Mechanism of Aspirin Resistance in Pregnancy

Aspirin, known for its anti-inflammatory properties, is a common drug to prevent various diseases. Recent studies have shown by administering aspirin to pregnant women, the risk of developing preeclampsia decreases. However, the effectiveness of utilizing aspirin can be affected by aspirin resistance, a condition in which aspirin doesn’t generate the expected anti-inflammatory and platelet response for an individual. With review articles proposing a possible association between aspirin resistance and preeclampsia incidence, there is significance in studying the two. This project compares the genotypes of associated aspirin resistance single nucleotide polymorphisms (SNPs) (identified through Illumina GSA genotyping array) on incidence of preeclampsia in aspirin-exposed individuals and with concentrations of various maternal serum biomarkers (identified

with ELISA, enzyme-linked immunoabsorbent assay). Using R and the PLINK package, the extracted genotypes were quality-controlled and identified for the associated aspirin-resistance genes. The incidence of preeclampsia by aspirin-resistant genotypes for 38 SNPs was performed using a Fisher's exact test. Rs1800469 was found to be marginally significant ($p = 0.026$, Odd's Ratio = 7.02) among individuals taking aspirin, with 65% of preeclampsia pregnancies harboring the aspirin resistance allele (genotype) compared to 20% of normotensive pregnancies. Future directions include expanding the sample size when studying the associations and performing statistical tests to compare mean maternal serum biomarker concentrations by genotype. In addition, these genotypes can be further studied to determine their molecular mechanism in aspirin sensitivity and resistance, to allow for a better understanding of the implementation of aspirin prophylaxis for preeclampsia.

Chen Zhang

Sociology & Political Science, Sixth

Mentored By Professor Dr. Christena Turner

Examining the Surge in Undocumented Chinese Immigrants at the United States' Southern Border

In the fiscal year 2023, the U.S. Customs and Border Protection (CBP) reported 24,314 encounters with undocumented Chinese immigrants at the southern border. This figure is over 11 times higher than the previous year and surpasses the total of the preceding ten years combined. My research explores this significant surge in undocumented Chinese immigrants using qualitative methods, including digital ethnography and text/oral interviews. The study aims to analyze the conditions and variables in both their aspirations and capabilities that motivated and enabled these Chinese immigrants to undertake this costly and dangerous journey through Latin America to cross the southern border into the U.S.

Emily Zhang

Bioinformatics, ERC

Mentored By Kathleen M. Fisch, Ph.D.

Characterizing the Somatic Mutational Landscape in Placentas with Preeclampsia and Maternal Vascular Malperfusion

Preeclampsia (PE) is a high risk pregnancy complication that contributes to 2-8% of pregnancies worldwide. Symptoms of PE feature the onset of hypertension with consequences of fetal growth restriction, preterm birth, and placental abruption. Maternal Vascular Malperfusion (MVM) involves placental injury with patterns of gross and histopathologic lesions and is common in pregnancies with PE. While the effects of PE on pregnancies are severe, there is currently little knowledge on the mechanisms behind the development of PE. Preliminary studies performing lineage tracing have discovered high rates of somatic mutations during the first cell cycles of placental development. We therefore aim to identify germline and somatic variants in placental samples with PE and MVM to understand their overall mutational burden and phenotypic and functional consequences in the placenta. To do this, we are analyzing whole genome sequencing data from human placentas to identify single nucleotide and small insertions/deletions in placental tissue relative to matched cord blood in order to determine how these somatic mutations contribute to placental lesions associated with MVM. We hypothesize that there are somatic mutations with higher mutational burden in samples with PE and MVM pathology than placental samples from healthy pregnancies. Our hope is that we can identify patterns of loss-of-function mutations that may reveal the molecular pathways and genetic mechanisms behind PE and other placental dysfunction.

Simon Zhang

Chemistry and Biophysics, Marshall

Mentored By Dr. Andrew Pun (Assistant Professor)

Novel Functionalized Dipyrrolonaphthyridinediones (DPND) for Efficient Triplet-Triplet Annihilation Upconversion

Over the recent decades, modern science has witnessed massive advancements aimed at harnessing and exploiting light in a variety of settings including photovoltaics for sustainable energy production. Triplet-triplet annihilation (TTA) upconversion (UC) holds the key for improving these technologies through its ability to convert incoherent lower-energy photon flux into a higher-energy light. This bimolecular process involves a sensitizer which absorbs low-energy photons and transfers that energy to an annihilator which, upon TTA, emits higher-energy light. As promising as TTA-UC is for practical implementation, little study has been conducted into the feasibility of new families of annihilators. In this study, we demonstrate the ability of dipyrrolonaphthyridinediones (DPND) to act as efficient annihilators. Moreover, by tuning and adding functional groups to a DPND core, we achieved a maximum internal upconversion quantum yield (UCQY) of 9.4% resulting in more than a 2-fold increase in UCQY compared to the commonly used annihilator, rubrene. By demonstrating the feasibility of DPND as a new family of annihilators, we provide a more effective alternative to widely used annihilators and provide a molecular engineering strategy for synthesis of novel annihilators for future research.

Lucy Zhang

Mathematics, Warren

Mentored By Jiawang Nie/Professor/Mathematics

Polynomial Optimization over Unions of Sets

This paper studies the polynomial optimization problem whose feasible set is a union of several basic closed semialgebraic sets. We propose a unified hierarchy of Moment-SOS relaxations to solve it globally. Under some assumptions, we prove the asymptotic or finite convergence of the unified hierarchy. Special properties for the univariate case are discussed. The numerical experiments demonstrate that solving this unified hierarchy takes less computational time than optimizing the objective over each individual

constraining subset separately. The application for computing (p,q)-norms of matrices is also presented.

Vicky Zhao

Clinical Psychology, Seventh

Mentored By Professor Gail Heyman

Young Children's Lie Detection: Considerations of Base Rates and Ulterior Motives

According to previous studies, even young infants are sensitive to statistics or base rates, and other studies also showed that children are sensitive to ulterior motives. We are interested in when children meet extreme situations that involve profit for themselves or others, can they recognize cheating or lying based on ulterior motives or base rates? We want to prove that children at even a young age can recognize ulterior motives, which means we want to show that ulterior motives override statistics.

Luolan Zhao

Japanese Studies, Seventh

Mentored By Christena Turner

When Japanese Cuisine Becomes World Heritage: Washoku as Social Practice and Branding of Japan

My research will focus on one of the most well-known and highly praised cuisines of the world from Japan, Washoku. Japanese cuisine was nominated and registered by UNESCO as Intangible Cultural Heritage of Humanity in 2013. I analyze the societal and cultural impacts of the registration domestically on Japan as well as the impact on Western and other East Asian societies' understanding of the nature of Washoku. In particular, my work considers the "branding" of Japan in the global market and how Washoku has played a role in boosting Japan's food culture's standing globally.

Cindy Zhong

Human Biology, ERC

Mentored By Jean Y J Wang, Ph.D

Regulation of CHK1 Expression by Replication Stress

Due to proprietary information this abstract has been redacted.

Kleo Zhou

Philosophy and Visual Art Studio, Seventh

Mentored By Dr. Alain J.-J. Cohen

Discipline and Resist

This paper presents a comparative analysis across three landmark films: Stanley Kubrick's "A Clockwork Orange" (1971), Agnès Varda's "Vagabond" (1985), and Ingmar Bergman's "Persona" (1966), through the lens of Michel Foucault's theory of micro power structures as elucidated in "Discipline and Punish". The study contends that these films, disparate in form and content, converge on a thematic nucleus: the presence of, and resistance to, pervasive power structures that govern individual behaviors and identities. The paper underscores how the protagonists of each film navigate and contest the encroachments of power mechanisms in their quest for autonomy and identity. Foucault's notion of an omnipresent, minutely exerted control provides the theoretical scaffolding for understanding the films' portrayal of resistance. In "A Clockwork Orange", Alex's engagement in ultraviolence is depicted as a form of rebellion against societal demands for conformity. "Vagabond" follows Mona's nomadic existence as a deliberate repudiation of societal expectations. "Persona" explores the interplay between Elizabet's silence and societal demands, positioning silence as a potent form of resistance against the micro power structures. The analysis delineates the distinct modes of resistance exhibited by the protagonists, ranging from overt defiance to subtle nonconformity, and assesses their implications for understanding power, identity, and resistance. It intends to offer an examination of the struggle for autonomy within the confines of disciplined societies, providing insights into the enduring relevance of Foucault's theories in contemporary discourse on power and resistance.

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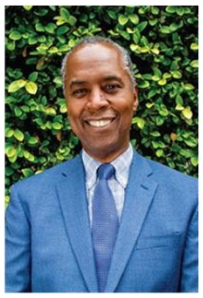

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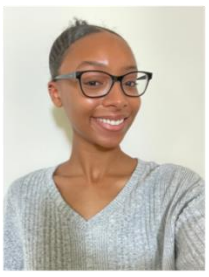

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