WHITMAN

2020 UNDERGRADUATE CONFERENCE

Humanities & Arts • Natural Sciences • Social Sciences • Mathematics

The COVID-19 pandemic has altered learning, campus life and community at Whitman in a way never experienced in the history of the college. The 22nd Whitman Undergraduate Conference is one of many major annual events canceled for the Spring 2020 term as Whitman transitions to remote learning and social distancing. Yet, as Rumi observed eight centuries ago, “Anything you lose comes round in another form.”

Think of this program, then, as a living chronicle that documents and honors the achievements of the 215 students committed to this year’s Undergraduate Conference. Appreciate the breadth of their work, from “Molecular Matters” to “Race, Identity and Autonomy” to “The Arts and Its Discontents.” Celebrate the 70 poster contributors, a record for the conference.

The Undergraduate Conference is devoted entirely to student achievement. Presenters represent every academic discipline of the college. Their projects attest to the original work that Whitman students produce through their courses of study, study abroad, independent research experiences, fellowships, scholarships, grants and internships.

WHITMAN COLLEGE

UNDERGRADUATE CONFERENCE • APRIL 7, 2020

Schedule

Tuesday, April 7, 2020

Breakfast
Reid Campus Center | 8:15 – 9 a.m.

SESSION 1
9 – 10:15 a.m.

Morning Interlude
Hall of Science Atrium | 10:15 – 10:45 a.m.

SESSION 2
10:45 a.m. – Noon

Noon Intermission & All-Campus Lunch
Reid Campus Center | Noon – 1 p.m.

POSTER SESSION
Cordiner Hall Foyer | 1 – 3 p.m.

DANCE THEATRE
Dance Studio | 2 p.m.

SESSION 3
3 – 4:15 p.m.

Afternoon Encore
Reid Campus Center | 4:15 – 5 p.m.

Music Performances

Chamber Ensembles

10:15 – 10:45 a.m. at Hall of Science Atrium (Morning Interlude)

AMY DODDS, DIRECTOR

Lera Auerbach: "Three Dances in the Old Style" (Andante)
Abby Herrick — violin
Austin Kamin — cello

Reinhold Glière: "Eight Duets for Violin and Cello" (Prelude)
Jack Fleming — violin
Bruce Mackay — cello

Florence Price: "Five Folksongs in Counterpoint"
III. "Drink to Me With Thine Own Eyes"
V. "Swing Low, Sweet Chariot"
Abby Herrick, Bethany Hermann — violin
Elsa Batten — viola
Liam Dubay — cello

Jazz Ensemble I

Noon – 1 p.m. at Reid Coffeehouse (All-Campus Lunch)

DOUG SCARBOROUGH, DIRECTOR

Daniel Leong, Morgan Rynties — alto sax
Ben Branda, Alex Lamers — tenor sax
Perth Sethapanichsakul — baritone sax
Kevin Getty, Claire McHale, James Bogley, Erik Scott — trumpet
Liam Twomey, Doug Scarborough* — trombone
Thomas Harris — euphonium
Finn Henell — bass trombone
Spencer Thulin — piano
Bennett Cooper — guitar
Marco Thompson, James O'Brien — bass
Koby Haigerty, Bornnie Kabongo — drums
Annelise Ellingboe — vocals

Jazz Ensemble II

4:15 – 5 p.m. at Reid Coffeehouse (Afternoon Encore)

GARY GEMBERLING, DIRECTOR

Will Weisz, Emma Beaver — alto sax
Ben Hickman, Jeff Wilson — tenor sax
Ethan Thomas — baritone sax
Erik Scott, Matt Hershkowitz, Katie Watkins, Leander Swan, Zac Bentz, Reza Darvish — trumpet
Oswaldo Rodriguez — trombone
Peter Schane — euphonium
Sam Weiss — piano
Bennett Cooper — guitar
Isayas Bikila, Sean Collier — bass
Jack Allard — drums
Meghan McFadden — vocals

* faculty

PANEL SCHEDULE

* moderator

BREAKFAST | 8:15–9 a.m. | Reid Campus Center

	Olin 138	Olin 129	Science 159	Science 100 Brattain Auditorium	Kimball Theatre	Reid G02
PANEL SESSION 1	**Race, Identity, Autonomy**	**CS I: Artificial Intelligence, Applied**	**Molecular Matters**	**Science & Health**	**Mythology, Antiquity, Modernity**	**Life & The Mind**
9 a.m.	Holden Gaupo	Madi Crowley Ruilong Zhuang Yiwen Xiang Andrew Yeon	Jack Taylor Nick McClellan	Scarlett He	Reeve Boyer	Michael Mehlman Allyssa Sullivan Yuwei Liu
9:15 a.m.	Georgia Seltzer		Liam Twomey Maxwell Brown	Ngan Tran	Leila Hauser	Nikki Delgado Leah Mortimer
9:30 a.m.	Ree Robson	Gavin James-Beckham Angie Mead Andrew Harvey* Isaiah Banta	Isabel Gough	Michael Wu	Eli Holliday	Samarah Uribe Mendez Cam Sipe Becca Linn
9:45 a.m.	Noah Dunn		Ethan Raffman*	Alex Hung	West Bales	Bella Blanco
10 a.m.	Liv Staryk*			Audrey Benner*	Sarah Fassio*	Bryanna Schreiber* Jessie Mano
Coaches	**Zidane Galant-LaPorte**	**Miranda LaFond**	**Bella Rivera**	**Sophie Grossman**	**Holden Gaupo**	**Ellery Shore Nelson**

MORNING INTERLUDE | 10:15–10:45 a.m. | Hall of Science Atrium

PANEL SESSION 2	**Hispanic Culture**	**CS II: The Match Game, Automated**	**Bio I: Plants & Animals**	**The Physical World**	**The Arts & Its Discontents**	**Media & Message**
10:45 a.m.	Yann Dardonville* Madi Crowley Tina Dilworth Leila Hauser Whitney Rich	Kimberly Taylor Robert Qin Charlie Schneider Buyaki Nyatichi	Perth Sethapanichsakul	Spencer Thulin	Claire Weissman	Camilla Tarpey-Schwed
11 a.m.			Emma Saas	Sihan Chen Sabrina Jones	Hope Giddings	Nick Quazzo
11:15 a.m.		Christopher Pyles Ian Hawkins* Trung Vu Isaiah Standard	Olivia Steinmetz	MJ Wilner	Natalie Flaherty	Claire Garrett* Emily Goldfarb Addison Scarff
11:30 a.m.			Calvin Lincoln	Gustavo Béjar López	Chloe Michaels	
11:45 a.m.			Silas Miller*	Henrique Ennes*	Bryn Carlson*	
Coaches	**Zidane Galant-LaPorte**	**Jamie Gold**	**Alex Brockman**	**Sophie Grossman**	**Heleana Backus**	**Jonathan Falk**

INTERMISSION AND ALL-CAMPUS LUNCH | Noon–1 p.m. | Reid Campus Center

POSTER SESSION | 1–3 p.m. | Cordiner Hall Foyer

DANCE SESSION | 2 p.m. | Dance Studio

PANEL SESSION 3	**Cultural & Community Responsibility**	**Philosophy: Tradition & Adaptation**	**Bio II: Genes & Phenotypes**	**Environment: Awareness & Impacts**	**Great Performances**	**Outdoor Engagements**
3 p.m.	Eli Baez	Sunshine Alvarez De Silva	Madeline Boyle	Alex Izbiky Blake Killingsworth	Matt Bihrle	David Lilburn
3:15 p.m.	Tori Londrigan	Andreas Guerrero	Ellen Hom	Chloe Carothers-Liske	Liam Dubay	Adam Rooney
3:30 p.m.	Mat Chapin Tricia Ferrer	Dana Walden	Jack Taylor Owen Davis-Bower Abbey Felley*	Grant Gallaher	Ronja Mokranova*	Clauds Bueermann*
3:45 p.m.	Cameron Conner	Faye Liu		Blythe Eickerman		
4 p.m.	Grace Dublin*	Mika Nevo*		Dylan Seidler*		
Coaches	**Zidane Galant-LaPorte**	**Jamie Gold**	**Alex Brockman**	**Sophie Grossman**	**Heleana Backus**	**Jonathan Falk**

AFTERNOON ENCORE | 4:15–5 p.m. | Reid Campus Center

Poster Session

1-3 p.m., Cordiner Hall

MOSES BARTON, LOUIS MOENCH, Identification of a Key Structure in Morphological Development of Neurons

Neurons, the cells of the brain, perform their normal functions through connections between each other. The process of growing connections is associated with learning, memory and general cognitive ability and is implicated as an important factor in understanding neurological disorders related to these processes. Examining videos of neurons growing in culture, we observed a structure called a lamellipodium whose appearance was associated with growth and branching. We hypothesized that this structure was a precursor to neuronal branches and predicted that it would appear at sites of future branch formation. We developed working definitions for other morphological features that also appeared to be associated with the branching process and tested whether there was a predictable sequence of events that could predict a new neuronal branch. Quantification showed that 98% of the time, new branches were preceded by lamellipodia, suggesting this could be an essential intermediate step in branch formation.
Faculty Sponsor: Ginger Withers

ESTELLA BASTIAN, Terazosin and Pgk1: Enhancing Enzyme Activity to Reduce Mitochondrial Dysfunction and Cell Death in Neurodegeneration

Energy impairment and oxidative stress are fundamental agents involved in the pathology of many diseases including Parkinson's, a neurodegenerative disease characterized by the loss of dopaminergic neurons. High levels of oxidative stress can lead to mitochondrial energy failure and ultimately cell death. Developing a therapeutic strategy that can augment glycolysis may counteract mitochondrial dysfunction and therefore prevent neuronal death. Terazosin, a widely used hypertension drug, was found to activate Pgk1, a key energy-generating enzyme in glycolysis. By activating Pgk1 and therefore increasing mitochondrial energy production, terazosin is able to prevent neuronal cell death in animal models. I performed an in vitro assay to investigate Pgk1's activity under the presence of potential activators that closely resemble terazosin in structure. Current therapies for Parkinson's treat symptoms, but terazosin may be the first to prevent the disease's progression.
Faculty Sponsor: Michael Coronado

JAMES BENT, ^{1}H-qNMR Analysis Reveals New Trends in Substrate Specificity of Benzoate Dioxygenase in *Ralstonia eutropha* B9

Biocatalysis leverages the power of enzymes to carry out complex reactions that can provide novel approaches to the synthesis of chiral molecules. *Ralstonia eutropha* B9 is a mutant soil bacterium that expresses benzoate dioxygenase (BZDO). BZDO specializes in the cis-dihydroxylation of benzoate at the 1,2 position as the first step in its metabolic degradation. The metabolites derived from this transformation have proven to be excellent chiral precursors for the synthesis of epoxyquinoid natural products, compounds which have been shown to be potent inhibitors of angiogenesis. My research uses quantitative proton nuclear magnetic resonance (^{1}H-qNMR) to characterize the activity of BZDO on new substrates of this enzyme system, allowing us to draw new conclusions concerning the effects of size and electron-withdrawing character on the rate of metabolic activity.
Faculty Sponsor: Jon Collins

MATT BIHRLE, The Plankton Paradox: Drivers of Phytoplankton Biodiversity Off the Coast of New Zealand

Phytoplankton present an ecological paradox. It is generally believed that when two species compete for the same resources one will be driven to extinction. However, aqueous environments are able to support diverse plankton populations while each species is competing for the same resources in the same environment. My study aimed to discover which environmental variable or combination of variables are the most important in influencing phytoplankton diversity across unique environments off the northeastern coast of New Zealand. Using multivariate analysis, I found that fluorescence, a proxy for whole-community productivity, is most closely correlated with diversity by genus. This finding emphasizes that community membership is dependent upon what other species are present rather than environmental variables alone. Just as in macro-communities, these microscopic communities depend heavily on interspecies relationships to maintain biodiversity.
Faculty Sponsor: Arielle Cooley

ZANE BOYER, Chemoenzymatic Synthesis of Epoxyquinoid Natural Products

Epoxyquinol A is a representative member of a group of naturally produced compounds known as epoxyquinoids. These compounds display a broad range of biological functions, including inhibition of angiogenesis (growth of new blood vessels). Angiogenesis has been linked to a number of disease states, including cancers, arthritis and inflammation. I present a novel chemoenzymatic approach to the synthesis of epoxyquinol A and related compounds. My ultimate goal is to develop the synthesis of a suite of compounds so that their biological activities may be explored.
Faculty Sponsor: Jon Collins

JESSICA BOYERS, Location of DDT on Sediment Particles

DDT (dichlorodiphenyltrichloroethane) was used in the mid-20th century as a common and popular insecticide. In the 1970s it became regulated due to its negative environmental effects on wildlife and as a probable human carcinogen.

Identified as a persistent organic pollutant (POP), DDT has a long half-life and can be detected in humans and in the environment years after use, even today. DDT and similar POPs were released in two forms, as a water-dissolved compound and as a pure solid or liquid form. My colleagues and I are using SEM-EDS (scanning electron microscopy-energy dispersive X-ray spectroscopy) to distinguish between these two forms of DDT in the environment. Our work will aid site remediation projects such as those overseen by the Environmental Protection Agency's Superfund program.
Faculty Sponsor: Frank Dunnivant

EDUARDO JULIAN CABRERA, Flowers Used for Pollen Collection and Consumption by a Flower-Generalist Bee

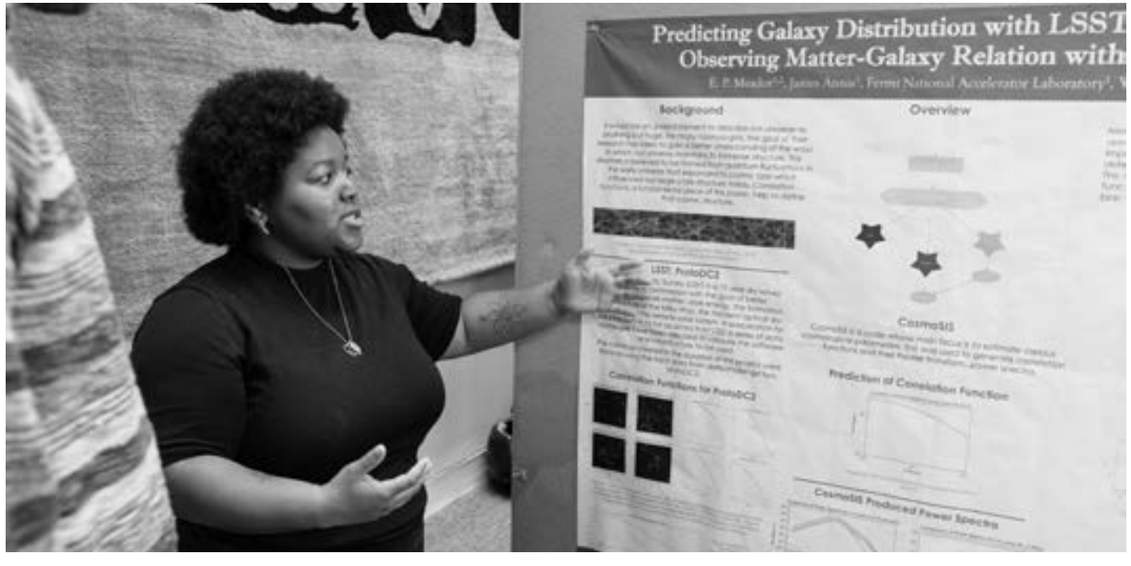
Bees are key pollinators and depend on flowers for food. *Halictus ligatus* is a flower-generalist bee that nests on Whitman's campus. My goal was to determine from what flowers adult females collect pollen, both for their nests and feeding. Females were captured on sunflowers and as they returned to their nests. I determined flower preferences by evaluating both pollen carried on special leg hairs and present in their gut; pollen was identified using light microscopy. Bees visiting sunflowers strongly preferred sunflower pollen for both collecting and feeding. In comparison, bees returning to their nests carried pollen from a few species but had consumed pollen from a larger number of species. In general, I found that *H. ligatus* females consume a greater variety of pollen than they collect and heavily use sunflower pollen when available. To support these native bees, we must maintain a diversity of flowering plants at Whitman College.
Faculty Sponsor: Heidi Dobson

ANNIE CARILLI, Thermal Stability of Enolase Mutants in Budding and Fission Yeasts and *E. coli*

Enolase is a glycolytic enzyme responsible for catalyzing the conversion of 2-phosphoglycerate to phosphoenolpyruvate. A fully-functioning version of this enzyme existed before phosphorylation evolved, which caused many to hypothesize that most phosphorylation sites in enolase would negatively regulate protein function. However, in many cases phosphorylation actually activates the protein's function. This leads to a new hypothesis: I predict that a negatively charged residue is needed in order to form and stabilize a salt bridge to allow for proper protein function in enolase. My two-part exploration first looks at the correlation between the thermal stabilities of an enolase mutant in budding yeast *(Schizosaccharomyces cerevisiae)* and the mutant's ability to form a salt bridge. In the second part I investigate how that correlation differs between enolase mutants found in *S. cerevisiae*, the fission yeast *S. pombe* and *Escherichia coli*.
Faculty Sponsor: Jon Collins

TRAVIS CRAVEN, Fine-Tuning Hormone Responses in Corn

The hormone auxin is responsible for coordinating many processes in plant life cycles crucial for growth and development. The components in plant cells that detect and respond to auxin are known and an active area of interest is in engineering these components for novel behaviors. Altering auxin-sensitive components through genetic engineering can allow researchers to manipulate growth and development in important crops such as corn. In my research, I used a simplified yeast-based system to recapitulate the corn auxin detection machinery. This method allows us to test which aspects of the biochemical machinery might be best engineered to produce different types of cellular responses to auxin. I used truncated repressor proteins to investigate the highly conserved aspects of cell signaling that affect transcriptional repression in response to the auxin signaling hormone. Knowledge gained about these truncated repressor proteins in yeast will ultimately be tested in corn plants to confirm its validity.
Faculty Sponsor: Brit Moss



BENNY JEAN CYTRYNBAUM, Evaluating the Calcium Carbonate Budget of a Coral Reef in South Caicos

The Turks and Caicos Islands in the Caribbean are home to many coral reef ecosystems. Coral reefs provide many critical ecological services to both the marine and terrestrial environments but are also under increasing threat from various human-caused stresses. As a result, monitoring the health of these ecosystems is important as a means of assessing their status and aiding conservation efforts. Given that reefs are built of calcium carbonate, this study established a calcium carbonate budget for a popular dive site in the Turks and Caicos Islands. Such an analysis allows researchers to determine if a coral system is growing (healthy) or eroding (less healthy). I found a negative budget for the site, indicating an unhealthy and eroding system. I present several ongoing practices that may have contributed to this situation, along with possible remedies. Such studies are critical in this rich but relatively unstudied area.
Faculty Sponsor: Delbert Hutchinson

MICHAEL DANIEL, Measuring the Spin of Sagittarius A* with the Event Horizon Telescope

The Event Horizon Telescope (EHT) provides the necessary angular resolution to observe nearby black holes, including the Galactic Center's Sagittarius A* (Sgr A*), closely enough to infer their spin. I examined simulated EHT observations of gas falling into Sgr A* to determine whether they can be used to measure its spin. I simulated observations of infalling gas clouds embedded in a realistic accretion disk, then used shot analysis and the power spectrum density to determine whether the orbital period of photons in the clouds could be detected, since this depends on the black hole spin. I found that both methods reveal the expected orbital period of photons and thus the spin of the black hole. Furthermore, I confirmed that results from the shot analysis and power spectrum density method are consistent. The capacity for these processes to extract spacetime information shows promise for the EHT in measuring black hole spin.
Faculty Sponsor: Andrea Dobson

HAVEN DICK-NEAL, Small Organic Acids Inhibit Semijunctive Nickel Transfer Between Ligand Complexes

Metal bioavailability is crucial for plant growth, but nearly a third of all soils are deficient due to the low solubility of many metals. Therefore, metal-ligand complexes (metals with organic compounds attached) dominate metal speciation in aqueous environments. The rate of exchange between these natural complexes controls the bioavailability. Previous research by the Boland Lab found evidence that certain low molecular weight organic acids (LMWOAs) abundant in natural soils catalyze these reactions when they follow a disjunctive pathway: one in which the ligand and metal completely dissociate before ligand exchange occurs. In this research, I hypothesize that these same LMWOAs (ethylenediamine, oxalate and glycine) will inhibit a similar reaction that follows a semijunctive pathway, which involves only partial ligand dissociation. Ongoing experiments to measure these reaction rates between pH 7-10 have found evidence that all LMWOAs studied inhibit the reaction to varying extents.
Faculty Sponsor: Nate Boland

CASEY DOE, *PIRL9* Gene Expression in *Arabidopsis thaliana* Roots and Shoots

Arabidopsis thaliana is a model plant species that has had its whole genome sequenced, leading to the discovery of many novel genes. *PIRL9* is one of a family of genes, several of which are important in pollen formation and thus plant reproduction. Previous research has suggested *PIRL9* may be active in tissues other than pollen, and I hypothesized that *PIRL9* may function in other developmental contexts. Using plant lines with *PIRL9* promoter DNA attached to the β-glucuronidase (GUS) reporter gene, which generates a blue product, I used microscopy to investigate *PIRL9* gene activity in *Arabidopsis* leaves and roots. This visual indicator of gene expression revealed that *PIRL9* expression was related to the emergence of lateral roots and to the vasculature of the cotyledons, showing a clearly delineated role in an aspect of the plant's development outside of its function in pollen formation.
Faculty Sponsor: Dan Vernon

LIAM DUBAY, Investigating the Stationarity of Sensing Noise in LISA Pathfinder Data

LISA Pathfinder (LPF), in operation early 2016 through Summer 2017, was a European Space Agency-led technology demonstration mission for space-based gravitational wave (GW) detectors such as the planned Laser Interferometer Space Antenna (LISA) mission. The spacecraft contained two free-floating test masses and an optical metrology system to measure their relative motion at unprecedented sensitivity. Due to the extreme precision needed for GW detection, robust statistical characterization of instrument noise is a critical ingredient of signal processing algorithms. GW signal processing is primarily done using spectral methods which, to date, have assumed stationary noise. This assumption does not hold true for LPF or LISA. I characterize statistical properties of non-stationary sensing noise from LPF data. In particular, I investigate time-dependent variation in the noise power spectral density in data products for measuring spacecraft recoil due to micrometeorite impacts. This work is generally applicable to the characterization of non-stationary noise.
Faculty Sponsor: Andrea Dobson

NOAH EBERLE, Identification of *Burkholderia cepacia* Virulence Factors

Burkholderia cepacia is an antibiotic-resistant, pathogenic species of gram-negative bacteria. These organisms are ubiquitous in the soil and can readily infect plants and immunocompromised humans. Infection of onion bulbs by *B. cepacia* results in "sour skin," a soft rot characterized by sunken, brown to white wounds on the scales of the onion. Because of the notable damage incurred due to infection, the virulence of *B. cepacia* is relevant to onion agriculture. Very little is known about key factors used by *B. cepacia* to cause infection of onions. My investigation aims to isolate specific genes that encode virulence factors contributing to onion infection.

My data suggest that genes encoding metabolic enzymes including aldehyde dehydrogenase, phenylacetate-CoA oxygenase/reductase and phosphotransferase are important for promoting infection in our model. Future studies will investigate the deactivation or attenuation of these virulence factors to prevent or disrupt infection of onions by *B. cepacia*.
Faculty Sponsor: Elizabeth Danka

SARA FEDERMAN, Access to Mental Health Care in Walla Walla County

In the United States, half of the 60 million individuals living with a mental health condition receive no treatment. Compared to other forms of care, mental health care remains more difficult to access for the majority of Americans. Mental health stigma, fragmented mental health care delivery systems, inadequate insurance coverage for mental health, lack of culturally competent providers and high costs are among the many barriers to care. In response to this prevalence of unmet mental health needs, Walla Walla County officials have identified increased access to mental health care as a community health goal. My qualitative study examines specific factors that limit access to mental health care in Walla Walla and how these factors vary across socio-demographic groups. Based on interviews with individuals who have sought local mental health services, my study compares costs, coverages and attitude-related barriers that limit access to mental health care in Walla Walla.
Faculty Sponsor: Tom Armstrong

LIAN GAMBLE, Assessing Directional Deficiencies in Gaze Gain in the Saccade Task Relative to Impact Location in Concussed College Athletes

In the United States, mild traumatic brain injuries (mTBI), also known as concussions, impact 3.8 million athletes annually. Concussions may be caused by head or body impact which can result in harmful biomechanical forces and brain acceleration-deceleration patterns. Unfortunately, many concussions go undiagnosed due to limited diagnostic tools. These methods rely on self-reported symptoms and lack consistent, definitive results. However, quantitative tests for oculomotor function have recently been used to identify cerebral dysfunction because oculomotor circuitry is widely distributed in the brain. Using video-oculography (VOG), gaze gain (a measure of accuracy) was shown to be a good marker for mTBI diagnosis. This research expanded on previous studies by examining the effects of concussion on combined eye-head gaze shifts in the saccade task to determine if gaze gain could localize the site of brain injury.
Faculty Sponsor: Thomas Knight

NADIA GANJOLOO, DREW CONKIN, Regiospecificity and Kinetic Measurements of Type II Hydroquinone Ring-Cleaving Dioxygenase PnpC1C2

Microbes have developed ways to introduce synthetic chemicals into their metabolic pathways as a source of energy. One such compound is p-nitrophenol, which is used in biocides, dyes and drug intermediates. P-nitrophenol is toxic, accumulating in soil and groundwater with insignificant natural degradation. PnpC1C2 is an enzyme found in the catabolic pathway of p-nitrophenol in *Pseudomonas putida* DLL-E4. This previously uncharacterized enzyme is a type II hydroquinone ring-cleaving dioxygenase, part of the larger category of ring-cleaving dioxygenases. As protein structure determines its function, regiospecificity and kinetic measurements of PnpC1C2 breaking down different substrates were taken to investigate the structure of the enzyme. The mechanistic pathway of the substrate becoming the product is dependent on the enzyme's active site. A better understanding of this mechanism sheds light into the other type II hydroquinone ring-cleaving dioxygenases.
Faculty Sponsor: Tim Machonkin

ALEX GERBER, The Effects of Solar Radiation on Bluebunch Wheatgrass

Bluebunch wheatgrass *(Pseudoroegneria spicata)* is a perennial bunchgrass native to Eastern Washington. Recently, its numbers have been on the decline. At Spring Gulch in the Wallula Gap Biological Station, bluebunch is much more common on north-facing slopes compared to south-facing slopes. The lower density of bluebunch on south-facing slopes may be due to a greater exposure to solar radiation and, in turn, higher temperatures. If this is correct, then I expect climate change will further exacerbate the decline in bluebunch populations. To test this hypothesis, my research group erected shaded plots to reduce solar radiation and temperature. I compared the germination and seedling survival of bluebunch in these shaded plots to those of unshaded control plots. If seedlings are more successful in shaded rather than unshaded plots, this suggests climate change may drive bluebunch toward extinction in the Columbia Basin.
Faculty Sponsor: Tim Parker

KACEY GODWIN, Macrocyclic Peptides for the Treatment of Multiple Myeloma

The human 20S proteasome is a complex enzyme that serves regulatory and metabolic functions by helping to break down proteins in the body. For that reason, many scientists have focused on the proteasome for cancer research by investigating therapeutic agents that can inhibit its activity. Unfortunately, many drugs that are used in a clinical setting present serious side effects such as cardiac arrest. My research works toward the goal of developing compounds that do not bind to other enzymes and thereby pose fewer health risks to patients. My molecule of study is a structural hybrid of two proteasome inhibitors: TMC-95A, a natural fungal product and carfilzomib, an FDA-approved drug for treating multiple myeloma. My research demonstrates that this peptide with a macrocyclic framework, in combination with other molecular modifications, is an effective inhibitor design.
Faculty Sponsor: Marion Götz

THOMAS HARRIS, A Data Science Approach to Signal Processing in Laser Interferometer Gravitational-Wave Observatory (LIGO) Data

The goal of the Laser Interferometer Gravitational-Wave Observatory (LIGO) detectors is to detect faint ripples in spacetime caused by the merger of massive compact objects,

like black holes and neutron stars, using a Michelson interferometer with Fabry-Pérot cavities in the 4-kilometer arms. Each detector site has ~250,000 "channels" that track the state of the interferometer, record data from optical equipment like photodiodes, monitor the physical environment through seismometers/magnetometers and more. Channel records can help us track down sources of unwanted signals that affect the calculated gravitational wave strain and interfere with searches for real gravitational waves. Automated signal processing programs such as FScan generate an overwhelming amount of information about various channels. I am creating programs to sift through these data to find unusually high long-term coherences between sets of channels and the gravitational wave strain signal. My goal is to support work onsite by identifying mystery noise sources.
Faculty Sponsor: Frederick Moore

ABBY HILL, Post-Disturbance Analysis of a Semi-Arid Plant Community

The Interior West of North America is dominated by semi-arid grassland ecosystems. Over the past century, these grasslands have experienced an increase in disturbance due to wildfire, livestock grazing and erosion, among other factors. After disturbance, it can be difficult for native perennial species to reestablish themselves, due in part to the encroachment of invasive annual grasses. To learn more about grassland communities post-disturbance, my colleagues and I simulated disturbance at seventeen sites on a north-facing slope at Spring Gulch, Washington. We examined the differences in composition and size of perennial plant species between disturbed and control plots. After four years of disturbance, perennial species composition was shown to differ between the two plot types and perennial grasses were found to be much smaller in disturbance plots. These findings suggest that grassland ecosystems take longer than four years to recuperate after disturbance.
Faculty Sponsor: Tim Parker

JACLYN HODGSON, T-Cell Receptor Immunotherapy Targeting Cancer/Testis Antigens in Pediatric Brain Tumors

T-cell immunotherapy provides a method to target cancer cells using immune cells made by the body for the purpose of preventing cancer growth. For this project, I worked to identify amino acid sequences of proteins called cancer/testis antigens, which are present on the surface of pediatric brain tumor cells. These proteins are normally found only in male germ cells; when uniquely expressed by cancer cells, they provide a promising target for immunotherapy. I hypothesized that T-cells with a receptor specific to these sequences would be able to identify and kill cells expressing those amino acids. Using synthetic peptides and patient cancer cells I was able to show that the T-cells could selectively kill cells with the corresponding amino acid sequence, indicating that this could have a potential therapeutic benefit of killing cancer cells in a patient while not damaging healthy tissues.
Faculty Sponsor: Jim Russo

BECCA HOFFMAN, Small Organic Acids Catalyze Disjunctive Ligand Exchange Reactions

Plants require various micronutrients to survive, including metals. Metals in the natural world are found in many forms that limit their bioavailability. Many metals are found bound by organic molecules called ligands. Metal bioavailability is controlled by transfer reactions between these complexes

known as ligand exchange reactions. Plants exude weak ligands that we call low molecular weight organic acids (LMWOAs). I explore the influence of these critical plant exudates on the rate of an exchange pathway by studying a model reaction: the transfer of nickel from NiNTA to CDTA in the presence of LMWOAs, where NTA and CDTA are ligands. I hypothesize that specific LMWOAs bind to the initial ligand complex in a ternary complex and increase the rate of ligand exchange by weakening the bonds between the ligand and the metal. My research will allow us to further our understanding of mechanisms of metal uptake in the environment.
Faculty Sponsor: Nate Boland

NICK JACUK, Perceived Threat to Subsistence Living Among Indigenous Communities in Southwestern Alaska

The right to a subsistence lifestyle is paramount in ensuring indigenous sovereignty as well as the physical and spiritual well-being of the Cup'ik, Yup'ik, Alutiiq and Dena'ina communities in southwestern Alaska. At the center of a perceived risk to a subsistence lifestyle are three threats: climate change, resource development and legislative authority. I take a qualitative approach in my research through interviews and evaluate the work within a framework of environmental justice in an effort to discover themes or trends that may support or reject the legitimacy of the perceived risk. Through the theoretical lens of world-systems and sociotechnical imaginaries, I represent how Alaska Native villages are seen as peripheral to the rest of the United States, which holds the position of the core. These groups and imaginaries represent the significance and intentions behind the resources within these lands and are utilized for different reasons.
Faculty Sponsor: Alissa Cordner

DAVID JOHNSON, Generating Novel eTCR T-Cells to Target Cancer

Immunotherapy is a treatment strategy that enhances the function of the immune system to fight diseases. Patient immune cells are genetically manipulated to be more effective at protecting the body against pathogens. Immunotherapies targeting cancer are being developed as drugs and proving to be tools able to extend lives. Traditional treatments for cancer include surgery, radiotherapy and chemotherapy, but the effectiveness of these treatments is limited by lack of specificity to cancer cells and by their ensuing side effects. Chimeric antigen receptors (CAR) and engineered T-cell receptors (eTCR) are immunotherapeutic molecules that specifically recognize cancer cells. When these receptors are put in patient immune cells, these cells can better recognize and kill cancerous cells. CARs have been successful at treating blood cancers, whereas eTCRs have been better at treating solid tumors. My work tests the efficacy of a novel eTCR as a possible means to enhance immune cell function.
Faculty Sponsor: Elizabeth Danka

LOA JONES, Biochar Amendment Effects on Soil Health, Plant Germination and Plant Growth

Biochar is a soil amendment, made from plant matter combusted at low temperatures, that can assist in crop nutrient availability and soil water retention. These qualities can improve plant growth and yield, important under conditions of increased soil degradation globally. Although biochar has shown great promise, the benefits are inconsistent depending on the biochar source, amount added and the crop plant. To investigate the impact of biochar on plant yield and soil health, wheat and basil plants were germinated and grown in varied amounts of solid and foliar biochar amendment. Measuring the differences in resultant height and weight of the plants as well as changes in soil hydration and pH allowed for an opportunity to gain more clarity on biochar's effects. The results of this study can be applied to biochar use in small-scale settings and specifically to the early growth of wheat and basil in greenhouse conditions.
Faculty Sponsor: Susanne Altermann

AUSTIN KAMIN, Synthesis and Characterization of Novel Heavily-Cyanated Boron Clusters

Novel compounds based on extremely stable boron clusters have a wide array of potential applications ranging from new drugs to advanced electronics. Recent computer modeling suggests that some of these polyhedral boron clusters, when appropriately modified, could function as superior electrolytes in lithium- and magnesium-ion batteries. In order to synthesize these potential new electrolytes, we need to replace the atoms on the boron clusters' vertices with cyano (C≡N) groups. However, it is only recently that chemists could attach even one cyano group to a boron cluster. My research team has successfully developed a novel method for the synthesis, isolation and characterization of a boron cluster with *twelve* cyano groups, $[B_{12}(CN)_{12}]^{2-}$, through a copper-promoted, palladium-catalyzed, cross-coupling reaction in a microwave reactor (280° C). We have also explored the synthesis and isolation of other novel heavily-cyanated boron clusters through similar synthetic methods.
Faculty Sponsor: Mark Juhasz

HARRY KELSO, Fusion For All

Fusion is what powers the sun and other stars, but how can it power our energy grid on Earth? My poster examines fusion's complicated history of technical and policy shortcomings and explores its potential for the future.
Faculty Sponsor: Kurt Hoffman

BEN LAHR, GABE ZANSBERG, Pain and Helping Behavior

Physical pain can make people more likely to help others. This phenomenon, known as the martyrdom effect, has been demonstrated experimentally, though the reasons for it remain unclear. To better understand the martyrdom effect, we investigated whether different kinds of pain (physical and social) make people more likely to help others. We hypothesize that people who experienced physical or social pain are more likely to offer help than people who did not experience pain. This research may help show how physical and social pain relate to behavior and health consequences and, furthermore, the extent to which physical pain and social pain are similar. Our results might also benefit victims of physical and psychological trauma and provide insight into ways to encourage helpfulness toward others.
Faculty Sponsor: Wally Herbranson

KATY LALIOTIS, Observing Qatar-1b Exoplanet Transits

I confirm orbital properties of the exoplanet Qatar-1b and, in so doing, demonstrate our ability to perform high-precision transit photometry for moderately bright planetary systems using a relatively small telescope at a low-elevation observing site. Qatar-1 is a magnitude 12.8 metal-rich K dwarf star in the constellation Draco. In 2011, Alsubai et al. announced the existence of a planet orbiting Qatar-1: Qatar-1b, a "hot Jupiter," has a mass slightly larger than that of Jupiter and an orbit period of 1.42 days. I observed a transit of Qatar-1b on July 26, 2019, using the 0.77-meter Hoch telescope at the Pacific Northwest Regional Observatory at Wallula Gap, Washington. Using the AstroImageJ data analysis package, I analyzed these data together with observations made by colleagues in March 2019 at Lowell Observatory in Flagstaff, Arizona, determining a planetary transit duration of 1.675 hours and a transit depth of 2.4% using the Johnson-Cousins R filter.
Faculty Sponsor: Andrea Dobson

KYLE LEVIN, Conceptions of Time and Social Stratification: A Phenomenological Approach

Time is a subject on which humans have ruminated for ages. Yet, not until the past century have sociologists taken an active interest in time. My study examines the tensions between the dominant structural view of time and the everyday micro-expressions of time management. I investigate the following question: Do conceptions of time differ in relation to a person's positionality, specifically, race, class and gender? My work is sociologically significant because it explores time not only through the interactions and consciousness of the individual but also by way of the influence of a larger structural force: hegemony. Furthermore, time has rarely been examined in the context of an individual's race and gender. I hope that these new perspectives will contribute to a broader sociological understanding of time and a consideration of how social position influences knowledge production.
Faculty Sponsor: Matthew Gougherty

SOPHIE LOVE, Species Richness, Abundance and Trophic Distribution of Mammals in Tanzania

Worldwide, the interface between humans and wildlife is increasingly fraught with conflict. The Yaeda Valley of Tanzania has implemented a multi-zone land-use plan that allocates different amounts of land for humans and wildlife. My question: How did the implementation of land-use zones influence species richness, density and trophic composition of mammals between 2015 and 2018? In order to monitor mammals through both signs and sightings, multiple 2-kilometer-long transects were walked in each zone during the short rainy season. I found mean species richness to be similar between years in all zones, with the exception of the unmanaged zone. Abundance of individuals varied widely among species, zones and years. The percent abundance of all mammals among trophic levels reflects the theoretical distributions, with the largest percentage being herbivores. I discuss the implications of these findings in terms of the land-use plan's effectiveness and insights for future wildlife management.
Faculty Sponsor: Heidi Dobson

JESSIE MANO, Influence of Ideal Affect and Group Status on Leadership Choice

What emotions do Americans look for in leaders and how does this vary between cultures that possess different emotional values? Research suggests cultural differences in "ideal affect" (affective states that people value and want to feel). European Americans and Asian Americans value excited states more than calm states compared to Hong Kong Chinese. The research team I joined at Stanford University expands on this knowledge to consider preferred emotional expression in leaders across cultures and whether preferences depend on how well the group is doing (growth vs. crisis). Three cultural groups (European Americans, Asian Americans and Hong Kong Chinese) were examined. Participants read hypothetical scenarios of businesses experiencing growth or crisis. Participants selected one of three images, each depicting a leadership candidate with a distinct emotional expression. During growth, people chose leaders that reflected their ideal affect whereas no preference for excited (vs. calm) candidates was exhibited during crisis.
Faculty Sponsor: Lauren Berger

KAIA MARTIN, Measuring Kinetics of Transition Metal Nanocrystal Formation Using Coproduct Kinetics

The optoelectronic properties of transition metal nanocrystals have a wide range of uses in many fields, including green energy, electronics and medicine. However, the formation of transition metal-chalcogenide nanocrystals is poorly understood due to the crystals' complex electronic structure. My goal is to measure the kinetics of nanocrystal formation and to figure out how the kinetics of the reaction influence the phase of the product. I found that in the conversion of copper salts and substituted thiourea to copper sulfide nanocrystals, upon diluting these reactions 1000x the absorbance spectra show an interconversion between two peaks that may correspond to a reactant and a non-nanocrystal product. Current work aims to identify these peaks using nuclear magnetic resonance spectroscopy. Identifying the peaks has the potential to expand our understanding of nanocrystal reaction kinetics, pushing us closer to our goal of controlling the phase of copper sulfide nanocrystals.
Faculty Sponsor: Mark Hendricks

AUBREY MAY, Characterizing Vine Mealybug Spread in the Napa Valley

The wine industry in the Napa Valley is increasingly threatened by the vine mealybug *(Planococcus ficus)*. This mealybug often eludes detection due to its obscured habitat under the grapevine bark. A habitat suitability model was constructed using previous mealybug data to predict mealybug presence and movement throughout the valley.

In this final portion of the project, extensive interviews and field sampling were conducted to assess the validity of the model. My team found that the model is functional, providing useful predictions of infestations. These results are intended for immediate applicability for growers. The model will allow growers across the Napa Valley to stay ahead of vine mealybug populations, prioritizing locations for selective pesticide application before infestations take hold and spread.
Faculty Sponsor: Susanne Altermann

MICHAEL MEHLMAN, High-Performance Liquid Chromatographic Method for the Detection of N-Acetyl Aspartate in Saliva

N-acetyl aspartate (NAA), a metabolic intermediate found highly concentrated in nervous tissue, serves as a useful biomarker of many neurodegenerative diseases, including but not limited to Canavan disease, dementia, schizophrenia, stroke and brain cancer, as well as brain injury. NAA quantification, however, requires expensive, instrument-intensive measurement techniques such as magnetic resonance imaging (MRI). For this reason I sought to develop a technique for quantifying NAA concentrations in human saliva, which will allow for rapid, non-invasive measurements that may serve as a diagnostic tool for nervous tissue health. Specifically, I analyzed the saliva of student athletes from a variety of sports at the beginning and end of their athletic seasons or following a head injury, using high-performance liquid chromatography. My project to quantify NAA through human saliva will help researchers develop robust and inexpensive techniques to assess alterations in brain health that can aid in the rapid diagnosis of head injury.
Faculty Sponsor: Leena Knight

ALEXANDRA MOORE, When Mitochondria Can't Breathe: Exercise Stress and Cardiac Hypoxia in Ischemic Injury Conditions

The energetic demands of the work that the heart must perform to be constantly pumping means that cardiomyocytes have a large population of mitochondria. When these essential organelles undergo changes, there are major implications for healthy heart function. After a myocardial infarction occurs, there is an onslaught of cell and tissue damage in the heart. The process of mitochondrial fission that occurs due to these hypoxic conditions results in cell death, toxin production, inflammation and reduced mitochondrial function. Although fission can be highly pathological, it has also been shown to be beneficial in another condition of oxidative stress: exercise. In this context, exercise-induced fission improves mitochondrial oxygen consumption and energy production, leading to an overall increase in exercise capacity. My project explores how this same fission process occurs during a heart attack and exercise, but with different outcomes.
Faculty Sponsor: Michael Coronado

RUDO NDAMBA, *PIRL3* Participates in the Formation of the Male Germ Unit in Pollen

The leucine-rich repeat protein (LRR) superfamily is found across all domains of life. PIRLs are a family of nine LRR-encoding genes identified in the genome of the plant *Arabidopsis*. PIRL proteins are structurally related to Ras-group LRRs, which act in animal development. Some PIRL genes function in pollen formation and male germ unit (MGU) development. To investigate possible functional redundancy between *PIRL3* and *PIRL9*, I constructed PIRL3/9 double mutants and assessed the sensitivity of mutant plants to mild heat stress, which was applied as a way of exacerbating phenotype. I used Alexander staining to quantify the percentage of viable pollen and confocal microscopy to observe irregularities in the MGU in each mutant. I found that the PIRL3/9 double mutants had higher rates of abnormal and dead pollen and also showed more significant changes in MGU morphology than *PIRL3* or *PIRL9* mutants.
Faculty Sponsors: Dan Vernon and Nancy Forsthoefel

SHARON NDAYAMBAJE, Anomalous Crystalline Cobbles on Olympic Beaches, Washington

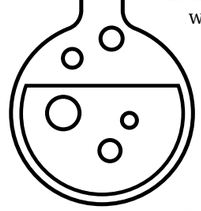
No granitic or high-grade metamorphic bedrock crops out on the Olympic Peninsula; local valley glaciers transported mostly basalt and sandstone toward the coast. However, the Cordilleran ice sheet carried crystalline clasts to the northern and eastern flanks of the Olympics. During the ancient "Salmon Springs" glaciation, the Juan de Fuca lobe of the Cordilleran ice sheet deposited limited granite and gneiss erratics as far south as La Push. How did crystalline cobbles reach Olympic beaches south of La Push? If icebergs transported these erratics, tectonic uplift and/or isostatic rebound is required because sea level was >100 meters lower during glaciations. An alternative explanation is fluvial and marine transport in the last 6,000 years (with sea level close to present height) of tree roots with crystalline rocks from the upper Columbia River system. Other possible factors include marine currents, longshore drift, waves, tsunami, kelp and shipwreck ballast.
Faculty Sponsor: Bob Carson

MIKA NEVO, Mapping and Characterization of the *tls4* Mutant in Maize Reveals Potential Role for Endocytosis in Auxin-Related Tassel Development

An understanding of reproductive development is crucial for maximizing crop yields. A powerful strategy for identifying genes that govern development is by the study of mutants with developmental defects. I sought to identify *tassel-less 4 (tls4)*, a gene required for the development of tassels, the reproductive organs in maize that produce pollen. I used genetic mapping and DNA sequencing to pinpoint a candidate gene that is involved in endocytosis. Cells of *tls4* mutant plants were found to have potential endocytosis defects, supporting my hypothesis. The phenotype of *tls4* mutants also suggests the presence of a defect in the transport of auxin, a hormone that regulates organ development. By identifying a promising candidate gene for *tls4* and suggesting a role for endocytosis in auxin-mediated reproductive development, my research expands our understanding of the auxin genetic network. This work will aid in developing maize plants with modified tassels to maximize crop production.
Faculty Sponsor: Dan Vernon

MARY NOYES, Combined Head and Eye Gaze Shift Indices as a Potential Diagnostic for Concussion

Mild traumatic brain injury (mTBI), or concussion, is a pathophysiological cascade of neurological impairments that are the result of a direct or indirect impact on the brain; as many as 20 million concussions may occur per year in the United States alone. Unfortunately, an objective diagnostic to determine concussion does not exist. Using an advanced eye tracker, I examined the effect of sport-related concussion on combined eye and head gaze (CEHG) shifts (and therefore its effect on underlying brain function coordinating these movements), testing CEHG metrics (e.g., peak gaze velocity, latency) in individuals before and after mTBI to determine whether an injured subject showed differences due to the concussion. More specifically, I tested whether comparing multivariable indices was more consistent in determining differences related to concussion than were single metric comparisons. Preliminary results support this approach, suggesting a role for gaze movement testing as a diagnostic for concussion.
Faculty Sponsor: Thomas Knight



BUYAKI NYATICHI, "Just Not Sorry": Persuasive Technology, Value Sensitive Design and Feminist Perspectives

"Just Not Sorry" is a Gmail plug-in that underlines words and phrases such as "just" and "sorry" that might undermine the sender's message. Hovering over the highlighted word(s) produces a motivational quote as a tool tip. The plug-in was developed by tech industry CEO Tami Reiss to help women hedge less and appear more confident in their emails. The app has attracted tens of thousands of users. My collaborative research project analyzed "Just Not Sorry" in three ways: as a persuasive technology—a program designed to change people's attitudes or behaviors—as a system with implications for human values and as an artifact of feminist activism. While my study reveals tensions between opposing values in feminism, it does not resolve them. It does show that persuasive technology can play a role in activism.
Faculty Sponsor: Janet Davis

THYS REYNOLDS, Concussed Athletes Show Impaired Metrics in Neurocognitive Eye Tracking Tasks

Concussion is a serious health epidemic and can result in lasting negative cognitive and somatic health effects that seriously impact quality of life. This issue is prevalent in, but not limited to, college athletes who play high-intensity contact sports. Diagnosing concussions is vital to preventing serious recurrence injuries, but many concussions go unreported. Further, many diagnostic measures are imperfect, relying on frequently inaccurate symptom surveys or computerized test batteries. One methodology that holds promise as a diagnostic tool for concussion is video-oculography. This experiment examined the effect of concussion on combined eye-head gaze movement metrics in college athletes. In particular, I asked whether mild traumatic brain injury (mTBI) causes serious impairments in a cognitively demanding eye-tracking task. Initial analysis, along with prior results, indicate that performance on more complex tasks may serve as a reliable indicator of diffuse structural impairment caused by mTBI.
Faculty Sponsor: Thomas Knight

LAUREL RICHARDSON, Leaf-Litter Arthropod Composition Relative to a Disturbance in a Tropical Cloud Forest

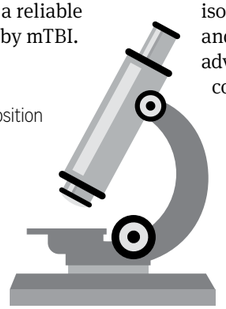
Leaf-litter arthropods play essential roles in leaf litter nutrient cycling but are understudied in the tropics. To address this gap and evaluate impacts of disturbance caused by a dirt road, I investigated the abundance and species richness of leaf-litter arthropods in a Costa Rican cloud forest at the end of the dry season. Leaf litter samples were collected on three days, at five sites along a 180-meter transect extending from the road into undisturbed forest. Arthropods, isolated using Berlese funnels, were identified to morphospecies. A total of 1,590 specimens were collected, representing 155 morphospecies. Arthropods fell into four major groups, with mites comprising the majority of specimens (~70%), followed by insects (~25%). Interestingly, abundance and species richness changed little along the transect. However, mite abundance increased multifold on the sampling day that followed rain, suggesting higher sensitivity to humidity than to distance from the human disturbance created by the road.
Faculty Sponsor: Heidi Dobson

MICHAEL RUBSAMEN, BRENNA DONOHUE, Development of a Low-Cost Plate Reader for UV-Vis-NIR Spectroscopy in an Undergraduate Laboratory

Near-infrared (NIR) spectroscopy (900-1700 nanometers) is a critical technique for analyzing many semiconducting and plasmonic nanomaterials. Plate readers are common automation tools used with spectrometers to scan many samples quickly and efficiently. To enable NIR spectroscopy to be automated, we constructed a plate reader that can be coupled with a commercially available fiber-optic vis-NIR spectrometer. The plate reader was built at low cost and occupies a small footprint, enabling its use in a wide range of teaching and research environments. A lead screw and railing are used to move the plate in an X,Y coordinate grid. To extend the spectral range into the UV, a spliced fiber allows two spectrometers to be used simultaneously, demonstrating the advantages of the modular design. This presents an opportunity to highlight the principles of green chemistry owing to the smaller sample sizes and reduced waste associated with using 96-well plates.
Faculty Sponsor: Mark Hendricks

RHEA SABLANI, Application of Paper-Based Isotachophoresis (ITP) Technology for Isolation and Detection of Exosomes

Early detection is a vital aspect of point-of-care testing because it facilitates better disease diagnosis and improved patient care. Exosomes, the extracellular vesicles which can move proteins, DNA and RNA between cells, can be used as biomarkers for early cancer diagnosis. However, current isolation methods are laborious and lack sensitivity and reliability. Paper-based analytical devices are advantageous because they enable the fabrication of cost-effective and environmentally friendly diagnostic tools. Furthermore, electrophoretic techniques can rapidly concentrate and isolate biomarkers at low physiological concentrations. This study used paper-based anionic isotachophoresis (ITP) to separate malignant cell-derived exosomes from healthy cell exosomes. The device consists of a three-dimensional printed cartridge, a nitrocellulose membrane and discontinuous buffer. Concentrated bands are analyzed by a fluorescence microscope. This research paves the way for exosome protein cargo assay in point-of-care testing and demonstrates how paper-based ITP is a viable method for detecting multiple analytes with high sensitivity.



Faculty Sponsor: Jim Russo

ALEC SALVINO, Developing Single-Domain Antibodies as Modular Immunohistochemistry Secondary Reagents

Antibody-based imaging of tumors, or immunohistochemistry (IHC), is a valuable tool for cancer diagnosis and research. In IHC, researchers target antigens on specific cells using labeled antibodies, creating images of the cells present in tissue. Single-domain antibodies (sdAb) are a unique class with the potential to improve IHC techniques. SdAbs are produced by extant members of the Camelidae (camels, llamas, alpacas) and have numerous advantages over conventional antibodies, being 1/10th the size with similar binding affinities, increased stability and solubility and facile cloning due to a simpler structure. I aim to identify sdAbs that bind to the Fc domain of mouse immunoglobulin G (IgG). Using yeast surface display, flow cytometry and DNA sequencing, colleagues and I identified 80 different sdAbs, linking their binding phenotypes and genotypes. We next characterized isotype specificities and affinities for a subset of sdAb clones. These isotype-specific sdAbs will be used as modular IHC detection reagents.
Faculty Sponsor: Thomas Knight

SOREN SANDENO, Phase Control of Copper Sulfide Nanocrystal Synthesis

Transition metal nanocrystals have an expansive list of applications ranging from solar energy conversion to cellular imaging. These applications utilize the optoelectronic properties of nanocrystals, which are influenced by their crystalline phase. However, current methods to control the phase of the crystal are few in number and poorly understood. In my research, I am attempting to understand the impacts of ligand structure and precursor conversion kinetics on the phase of copper sulfide nanocrystals and, having done so, design a dependable synthesis that results in a predictable phase. Using powder X-ray diffractometry, I have identified different phases of copper sulfide that correlate with the length of their alkylamine ligands. Currently, I am studying how precursor structure affects the final crystalline phase via experimentation with various sulfur sources.
Faculty Sponsor: Mark Hendricks

NICK SEKITS, The Striped Beaked Snake Is Really a Skaapsteker Adapted for Digging: Evidence from Cranial Morphology

The beaked snakes *(Rhamphiophis)* are large, diurnal snakes with reinforced snouts adapted for digging. The skaapstekers *(Psammophylax)* are generalist, terrestrial snakes. Both genera belong to the primarily African lamprophiid subfamily, Psammophiinae. The striped beaked snake *(Psammophylax acutus)* was originally considered a member of the genus *Rhamphiophis*. However, molecular evidence suggests that *P. acutus* is more closely related to *Psammophylax*. If this phylogenetic placement is correct, the "beak" of *P. acutus* must have evolved independently of that seen in the "true" beaked snakes. Using micro-CT scanning, I undertook a detailed study of the cranial morphology of *P. acutus* in addition to representative species of both *Psammophylax* and *Rhamphiophis* for comparison. I found that, despite its striking adaptations to fossorial life, *P. acutus* retains cranial features that reveal its true origin amongst the skaapstekers; its evolutionary history can be told not only by its genes but also by its morphology.
Faculty Sponsor: Kate Jackson

ALLIE SERACUSE, The EED Binder Modulates PRC2 Requirements in Zebrafish Embryogenesis

All of the cells in our bodies contain the same DNA, with the same genes. So what allows cells to take on specialized forms and functions? The answer is gene regulation. Gene regulatory mechanisms silence parts of the genome so that each cell will use only the parts that allow it to complete its cellular function. I studied the PRC2 complex, a key epigenetic regulator, in zebrafish during embryonic development. PRC2 is a protein complex made of several different subunits, including EED, a key component of the complex. EED binding protein, an inhibitor, restricts PRC2 activity by competing with other subunits. I observed fish with the EED binding protein throughout their development. Fish expressing the EED binding protein exhibited changes in genotype and protein expression, but few to no morphological differences were noted.
Faculty Sponsor: Dan Vernon

ELLERY SHORE NELSON, ANISSIA HUGHES, ALISSA ANTILLA, The Curious Tale of Julie and Mark Revisited: Does Sexual Arousal Inhibit Sociomoral Disgust?

Although disgust and sexual arousal may seem to be separate entities, they have a close, oppositional relationship. Evidence shows that disgust and sexual arousal are mutually inhibitory. However, the effect of sexual arousal on moral disgust is missing from psychological research. Sex involves the exchange of bodily fluids — commonly conceived as disgusting — yet people seemingly overcome disgust toward these stimuli to satisfy sexual desires. This may not be the case for everyone. Research indicates that people of certain ideologies may be more susceptible to being offended by taboo and potentially disgusting stimuli and behavior. In response, they may be more likely to condemn these acts and people who participate in them on moral grounds. Our study also considers how sociomorally conservative individuals may have more difficulty overcoming disgust as it pertains to sexual acts. We hope our results will inform the treatment of sexual dysfunction rooted in disgust.
Faculty Sponsor: Tom Armstrong

KATIE STAHL, Phage Protein Isolation for Potential Vaccine Production in *Pseudomonas aeruginosa*

Pseudomonas aeruginosa (Pa) is a gram-negative bacterium that may be found in infections of wounds and sites of inflammation. *Pa* is becoming increasingly resistant to antibiotics, leading to significant morbidity and mortality. One cause of this is the presence of filamentous Pf bacteriophage, a virus that integrates itself into the bacterial genome and subsequently affects *Pa* biofilms and, in turn, the mammalian immune response. The virus triggers an ineffective immune response, preventing the bacterial infection from being cleared. A vaccine could potentially offer a solution by clearing the virus and restoring the effectiveness of the body's immune response against the bacteria. My work begins the vaccine production process by testing a viral protein's (CoaB) ability to be isolated and used as an antigen in the vaccine.
Faculty Sponsor: Elizabeth Danka

ALI STILLER, Not a Surprise: Female Salamanders (Plethodontidae: *Aneides ferreus*) Communicate to Males During Courtship as Evidenced by Dorsal Courtship-Like Glands

The tail-straddling walk of plethodontid salamanders is a stereotypical courtship behavior that ensures spermatophore uptake by the female. Female participation during courtship has typically been described in passive terms. With the recent description of the circular tail-straddling walk in *Aneides ferreus*, it became clear that females are more actively participating in this courtship ritual. I examined the tailbase region of male and female *A. ferreus* for pheromone-producing (modified granular) glands that heretofore have been described primarily in male salamanders. I found that, while the presence of these glands is not sexually dimorphic,

the frequency is: males have a larger number of modified granular glands than females. No dorsal glands were identified on females of species that perform the linear tail-straddling walk, with the exception of *Aneides hardii*. My results suggest that females are signaling to males during the circular tail-straddling walk.
Faculty Sponsor: Kate Jackson

MAKANA STONE, Comparative Burrowing Behaviors of Hatchery and Wild Pacific Lamprey Ammocoetes

In efforts to assist the Confederated Tribes of the Umatilla Indian Reservation in determining best management practices for artificial propagation and culturing of *Entosphenus tridentatus* (Pacific lamprey), I investigated the burrowing capability of wild-type and lab-reared larvae (ammocoetes). Burrowing behavior was assessed by measuring the number of attempts to burrow, burrow time, rest time and swim time. I observed six populations of hatchery ammocoetes and one population of wild-caught ammocoetes from the Umatilla River in July 2019. I hypothesize that fish reared in standard conditions (12-16 °C, with substrate and mesh mat) will have a faster average burrow time than fish reared at room temperature (18-25 °C) or with no substrate available. I also hypothesize that wild-type fish will have a faster average burrowing time than lab-reared ammocoetes of the same size. Between lab-reared ammocoetes, I anticipate that older ammocoetes will have faster burrowing times than younger larvae.
Faculty Sponsor: Kate Jackson

ALLYSSA SULLIVAN, Identifying Virulence-Related Genes in *Burkholderia cepacia*

Burkholderia cepacia is a gram-negative bacterium known to cause sour skin disease in onions, including the sweet onions grown in the Walla Walla Valley. While the disease was first described in the 1950s, virulence factors that contribute to its pathogenesis in onions have not been identified. I sought to identify genes related to virulence by creating bacterial mutants using transposon mutagenesis and selecting mutants of interest through screening on an onion model of infection. Mutants that expressed smaller disease wounds were analyzed through bioinformatics to identify the disrupted gene. I hypothesize that these genes are involved in aspects of pathogenesis related to biosynthetic pathways, DNA repair and production of transport proteins. Understanding the genes involved in *B. cepacia* pathogenesis is the first step in developing a method of control against sour skin disease.
Faculty Sponsor: Elizabeth Danka

KIMBERLY TAYLOR, Does Household Income Matter? An Examination of an After-School Program Targeting Resilience and Academic Achievement

Resilience is the ability to thrive in the face of significant adversity. Growing up in poverty exposes children to considerable stressors and has been linked to negative academic outcomes. After-school programs that target resilience can help improve outcomes for at-risk populations. In my study, students preparing to attend an after-school program completed a 27-item resilience measure, which included contextual (community, family) and individual (self-regulation, goals) protective factors. Scores were linked with household income and academic achievement measures. I hypothesized that resilience would increase from pre-test to post-test. I also hypothesized that changes in resilience would be positively correlated with academic achievement. Finally, I examined whether certain protective factors are more important for at-risk children due to low household income. My research will improve resilience interventions and outcomes for students by providing guidance about the protective factors that programs should target.
Faculty Sponsor: Stephen Michael

WALTER TUNNELL WILSON, Insights into the Evolutionary History of Lamprophiid Snakes from Vertebral Morphology Using Computed Tomography

Understanding snake vertebrae is essential to understanding snake evolution. Molecular techniques can uncover evolutionary relationships between modern lineages, but further understanding of the extinct ancestors of living snakes comes from the fossil record, which consists primarily of vertebrae. Examining the vertebral morphology of living snakes in an evolutionary context has the potential to illuminate how similar transformations occurred in the fossil history of snakes. The Lamprophiidae is a large and diverse family of primarily African snakes whose phylogenetic relationships have only relatively recently started to be resolved through molecular phylogenetics. We examined vertebrae from 24 species representing 10 main lineages within Lamprophiidae along with four species from a different family for comparison. We used micro-computed tomography scanning to make virtual models of vertebrae and described them using a synthesis of characters used by snake paleontologists to provide insight into these previously undescribed or under-described taxa and their vertebral morphology.
Faculty Sponsor: Kate Jackson

ELIZA VAN WETTER, Every Pebble Counts: A Reconstruction of the Fluvial History of Blacktail Deer Creek, Yellowstone National Park

Blacktail Deer Creek drains the northern flank of the Washburn Range in Yellowstone National Park. This summer, I spent four weeks collecting data and measuring the size of pebbles found in this creek. My poster presents a graphic representation of the distribution of different-sized pebbles throughout the stream and a map of the stream's movement within its floodplain over the past 70 years. These data are essential to understanding whether this stream is actively moving sediment and migrating across its floodplain or whether it has remained stable throughout the Holocene. This particular stream has been an important study site for determining the degree to which the removal and reintroduction of wolves in Yellowstone National Park has affected the greater ecosystem. The debate surrounding the concept of trophic cascades has lacked data that relates directly to fluvial processes. My research will provide more context to this important issue.
Faculty Sponsor: Lyman Persico

KRISTEN WANKE, Permissive Mutations May Compensate for Fitness Defects of the Influenza Drug-Resistance Mutation via Multiple Mechanisms

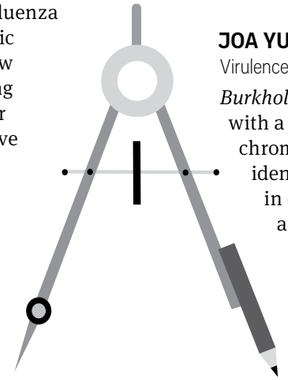
Neuraminidase (NA), a glycoprotein enzyme on the surface of the influenza virus, is the target of the antiviral drug oseltamivir (Tamiflu). The H274Y mutation in NA confers resistance to oseltamivir yet decreases viral fitness and NA expression. Permissive mutations counteract this deleteriousness, which enabled the fixation of the H274Y mutation in circulating H1N1 influenza viruses prior to the swine flu H1N1 pandemic in 2009. Several of these mutations have now fixed in the pandemic H1N1 lineage, creating the potential for re-emergence of oseltamivir resistance. I hypothesized that the permissive mutations may buffer the effects of H274Y by increasing the melting temperature (Tm) of NA. To test this, I measured the Tm of wild-type and mutant NAs. I conclude that while some permissive mutations increase the Tm of NA, others may counteract the effects of H274Y through an alternative mechanism.
Faculty Sponsor: Jim Russo

BEN WARD-DUBOIS, Defining the Role of *Escherichia coli* Outer Membrane Protein A During Invasion of Host Bladder Cells

Urinary tract infections (UTIs) affect 11% of the global population annually, with the majority of these infections affecting women. Up to 75% of UTIs are caused by bacteria known as uropathogenic *Escherichia coli* (UPEC). While many UTIs can be resolved with antibiotic treatment, antibiotic resistance can make treatment difficult. Previous research has detailed some mechanisms used by UPEC to cause infection, but a more thorough understanding may allow for the development of new treatments. UPEC outer membrane protein A (OmpA) is known to contribute to disease processes like meningitis, but its exact role in bladder infection (cystitis) has yet to be determined. OmpA has four extracellular loops that may interact with host elements and contribute to bacterial cell invasion. My research investigated the significance of the individual OmpA loops and tested a potential mechanism by which these loops activate intracellular host pathways to increase bacterial invasion and infection.
Faculty Sponsor: Elizabeth Danka

JONATHAN WILLIAMS, Investigating the Progression of Non-Alcoholic Fatty Liver Disease in Response to Dietary Fats and Sugars

Since first being described in 1980, non-alcoholic fatty liver disease (NAFLD) has become an increasingly prevalent chronic disease that is now present in approximately 30% of the world's population. NAFLD consists of a spectrum of progressive metabolic states in the liver ranging from a "fatty liver" all the way to liver inflammation and cirrhosis. Despite its global prevalence, the molecular mechanisms involved in its progression are still poorly understood. Here, I set out to explore the pathogenesis of NAFLD in response to high fructose and high fat diets. With this, I sought to gain a better understanding of an ordered time-course of molecular events during this progression. To investigate this, I treated liver cells with fructose and palmitate and measured fat accumulation, reactive oxygen species production and changes in protein expression.
Faculty Sponsor: Jim Russo



JOA YUN, Characterization of *Burkholderia cepacia* Virulence Factors

Burkholderia cepacia is a gram-negative bacterium with a large genome consisting of three different chromosomes. While this organism was first identified as a plant pathogen, causing "sour skin" in onion bulbs, it has recently been recognized as an opportunistic pathogen affecting cystic fibrosis patients. It is uncommon for bacterial pathogens to infect both plant and animal hosts. My research aims to understand this complexity by studying virulence pathways encoded by *B. cepacia*, as currently only a few genes have been identified that contribute to infection. I am characterizing mutant bacterial strains that had altered infection phenotypes in sweet onions to identify the genes and pathways that are responsible for such changes. Currently, I am interested in the enzyme aldehyde dehydrogenase and its suspected effect on infection wound size and pigmentation. Characterization of *B. cepacia* virulence factors will further our understanding of its infection pathway and consequently help prevent plant disease.
Faculty Sponsor: Elizabeth Danka

ALIE ZAGATA, Vines, Wines and Wellness: Cultural Perspectives on Health Care Through the Lens of the Walla Walla Wine Industry

Southeastern Washington is home to a burgeoning wine industry, an industry so robust that it allowed the region to ride out the national recession in 2008. The region is also home to a large community of migrant laborers whose lives are caught in the confluence of geographical seclusion and a heightened state of immigration reform. My poster presents the discrete relationships that exist between wine drinkers and wine laborers and the wine industry. I examine these relationships through the lens of health and wellness, paying careful attention to the ways in which these distinct groups perceive sickness from a sociocultural point of view.
Faculty Sponsor: Suzanne Morrissey

Session 1
9 - 10:15 a.m.

Race, Identity, Autonomy
OLIN 138
Liv Staryk, *moderator*
Zidane Galant-LaPorte, *coach*

9 a.m. HOLDEN GAUPO, Understanding Contemporary Police Killings Through Lynchings

Contemporary police killings are part of a larger culture of police violence that disproportionately results in the death of black men and boys in the United States. In the United States, black men and boys are at least 2.5 times more likely to be killed by police than white men and boys. This is no coincidence; police killings are intertwined with white supremacy and the racial structure of society. My presentation aims to highlight and better understand the racial nature and significance of contemporary police killings and therefore the racial structure of society, by exploring the question: What are the similarities and differences between lynchings of black men and contemporary police killings of black men? This comparison will focus on the acts of police killings and lynchings and their broader effect on and significance for the racialized structure of society in the United States.
Faculty Sponsor: Jack Jackson

9:15 a.m. GEORGIA SELTZER, Relational Autonomy and Sexual Rights for Individuals with Down Syndrome

What part does relational autonomy play in sexual rights for individuals with Down syndrome? Coined by Jennifer Nedelsky, "relational autonomy" refers to the idea that our inevitable interdependencies should be taken into consideration in practicing our autonomy. By asking questions about one's right to autonomy, one's ability to give consent and the dangers of grouping people together under labels, I hope to articulate what value relational autonomy holds for sexual rights. Research on autonomy for individuals with Down syndrome focuses mainly on housing and employment options while largely ignoring sexual issues. At the same time, current literature remains useful in understanding the ways in which techniques of relational autonomy may inform sexual considerations.
Faculty Sponsor: Susanne Beechey

9:30 a.m. REE ROBSON, From "Closet" To "Bubble": LGBTQ+ Experiences at Whitman

As a fairly new field, LGBTQ+ history has gaps; stories from many places remain to be collected and told. Institutions of higher education, for one, have largely been left out of accounts despite their importance for many LGBTQ+ youth as a space to explore their identity and imagine their future. With the emergence of widespread LGBTQ+ activism in the 1970s, queer issues were introduced on college and university campuses. Since then, many schools have garnered reputations as accepting and inclusive places for LGBTQ+ students. To study how communities of higher education fit into the broader, national narrative around LGBTQ+ issues and acceptance, I investigate Whitman College. Using oral histories, I unpack Whitman's transformation from a school with a handful of isolated, closeted students to the more inclusive space it is today. I discuss the challenges that arose and the paths that were available to change this small community.
Faculty Sponsor: Nina Lerman

9:45 a.m. NOAH DUNN, Flower Songs: The Nationalist Politics of Robert Schumann's "Myrthen"

At their wedding in 1840, Robert Schumann presented a gift to his wife, Clara. The gift was a song cycle, "Myrthen" ("Myrtles"), composed at the height of a nationalist movement which would culminate in the creation of the first German state. Two of the cycle's poets, Friedrich Rückert and Heinrich Heine, were vocal advocates for German nationhood. "Myrthen" also features German translations of Robert Burns, the quintessential voice of Scottish independence. My presentation analyzes selections by these poets to argue that, rather than being a benign ensemble of love songs, "Myrthen" was directly implicated in the political project of German nationalism. I posit that Heine and Rückert actively destabilize the conventional bounds of the individual self through their invocation of the natural world, an act seemingly at odds with the creation of a bounded political entity. My presentation explores the tension between these two goals.
Faculty Sponsor: Emily Jones

10 a.m. LIV STARYK, Gender and Frank Lloyd Wright's Neils House

From 2006 to 2011, my family resided in one of Frank Lloyd Wright's Usonian houses: the Henry J. and Frieda Neils House (1950) in Minneapolis. Drawing on my experience in the Neils House, supplemented by an archive on its design and construction, research on Wright's Usonian ideology and theoretical scholarship on the built environment's formation and reproduction of gender relationships, I critically analyze my connection to the Neils House and situate the house within broader sociospatial frameworks. My presentation considers the Neils House through the social, cultural and spatial construction of gender. Using Judith Butler's theories of gender as performance, I ask: How are Wright's Usonian designs, and the Neils House in

particular, stages that support and frame the performance of gender? How does the Neils House repeat or disrupt hierarchical gender relationships?
Faculty Sponsor: Matthew Reynolds

CS I: Artificial Intelligence, Applied

OLIN 129
Andrew Harvey, *moderator*
Miranda LaFond, *coach*

9 a.m. MADI CROWLEY, RUILONG ZHUANG, YIWEN XIANG, ANDREW YEON, Building an Automated Crossword Solver

How long would it take you to solve the New York Times crossword puzzle? How would you teach a computer to solve the same puzzle? Artificial intelligence (AI) is a concept in computer science that explores the extent to which we can teach computers to mimic natural human intelligence. Our research aims to utilize techniques in AI to build an automated crossword puzzle solver. Understanding and finding answers to the clues in a crossword puzzle requires broad and specific knowledge on a variety of topics, which makes it challenging for both humans and computers. While several advanced automated crossword puzzle solvers exist, none is able to surpass its human counterparts. In our presentation, we explain our approach and algorithms for filling a crossword grid given the constraints imposed by words and our process of training the computer to understand crossword clues.
Faculty Sponsors: Andy Exley and John Stratton

9:30 a.m. GAVIN JAMES-BECKHAM, ANGIE MEAD, ANDREW HARVEY, ISAIAH BANTA, Autotuners, Roll Out!

Do you want to sound like Selena Gomez? T-Pain? Almost all artists today use autotuning to some degree. Autotuners are built using an algorithm called the fast Fourier transform (FFT), a process that works similarly to the human ear, which identifies the fundamental frequencies of a sound wave in order to manipulate them without altering the speed. Our presentation will give a high-level description of the way that our ears process pitch, detail our algorithm and include a live demonstration of our user-friendly application that can help anyone sound like an A-List music star.
Faculty Sponsors: Andy Exley and John Stratton

Molecular Matters

SCIENCE 159
Ethan Raffman, *moderator*
Bella Rivera, *coach*

9 a.m. JACK TAYLOR, NICK MCCLELLAN, A Comparison of Exact Stochastic Simulation Algorithms for Chemical Reaction Networks

Exact stochastic simulation methods are a class of algorithms that can be used to model randomly occurring chemical reactions. There are many approaches to accomplishing this task, so it is hard to determine which algorithm is best suited for a particular model. In our presentation, we shall introduce the most modern exact stochastic simulation algorithms and evaluate their merits and shortcomings. Through theoretical analysis, we will identify key features of the model being simulated that affect the efficiency of the different algorithms. We will then present data that demonstrate exactly how each of the algorithms is affected by these features.
Faculty Sponsor: John Stratton

9:15 a.m. LIAM TWOMEY, MAXWELL BROWN, Enzymatic Bioremediation of Toxic Carbon Monoxide

Biochemical systems offer chemists unique opportunities to learn from the accumulated wisdom of nature. Certain organisms have evolved to produce specialized proteins which perform specific chemical reactions at much higher efficiency than possible by traditional laboratory methods. Our focus is the soil bacteria *Oligotropha carboxidovorans* that detoxifies the air as part of its metabolic process by converting toxic carbon monoxide to less toxic carbon dioxide. In particular, this process is facilitated by the molybdenum- and copper-containing enzyme carbon monoxide dehydrogenase (CODH). Because this enzyme is fragile when isolated, the metabolic intermediates of all steps are, unfortunately, difficult to observe experimentally. Hence, we seek to better understand its reaction mechanism via computational modeling of the enzymatic structure, with the intention of determining a robust approach for modeling other poorly-understood molybdenum enzymes.
Faculty Sponsor: Dalia Biswas

9:30 a.m. ISABEL GOUGH, Nickel Adsorption Rates Through DGT Techniques

The DGT or diffusive gradients in thin film technique provides information about how readily metals and other chemicals can be taken up by organisms. The rate of uptake of metal ions passing through a gel barrier gives an estimate of metal bioavailability and may reveal the pathway of metal uptake. I worked with creating different gels to vary the rate of nickel diffusion in the presence of various chelating reagents. Nickel and other trace metals are often introduced in the environment as waste from mines, smelters and paper mills. When these metals are in the environment, they become potential toxins to living organisms. Accurate models of nickel bioavailability in the environment are important to understanding its toxicity to living organisms.
Faculty Sponsor: Nate Boland

9:45 a.m. ETHAN RAFFMAN, Mystery 185: An Unexpected Acylation Reaction for Carboranes

Carboranes are small clusters of boron and carbon atoms with unusual properties due to their highly delocalized electron density. While they have potential uses in medicine and various materials, as inorganic molecules their properties are not as well understood as those of similar organic structures. Metal-catalyzed cross-coupling reactions are a potentially powerful tool to add relevant carbon-based functional groups to the clusters, but few reactions are known for the CB_{11} cluster. When my colleagues and I attempted a reaction to add a phenyl group to the cluster, we instead discovered a bizarre reaction to add an acyl (carbonyl) group to the cluster. I believe this reaction proceeds through an unusual mechanism, with a suspected anhydride intermediate formed in situ. In my presentation I describe both the process of developing this reaction and our related findings.
Faculty Sponsor: Mark Juhasz

Science and Health

SCIENCE 100
Audrey Benner, *moderator*
Sophie Grossman, *coach*

9 a.m. SCARLETT HE, Comparison of Deionization Rates of Dental Restorative Materials with Bovine Dentin

Restoration is the most prevailing procedure in dentistry today; however, it is very prone to failure. To increase the life of dental restorations, researchers and manufacturers try to mimic a tooth's natural demineralization and remineralization in the restorative materials. Although many types of restoratives exist, their ion exchange properties have never been cross-compared with real dentin. I aim to compare the fluoride and calcium exchange rates of dental restorative materials with those of bovine dentin and to determine the synthetics' demineralization and remineralization capacities. I incubated freshly-collected bovine dentin and five restorative materials in deionized water, measuring weekly for calcium and fluoride release. I found that glass ionomer has a significantly higher fluoride deionization rate than other materials. I also determined that no synthetic material releases calcium at a rate as high as bovine dentin. My findings can help dentists and patients make informed decisions when preparing treatment plans.
Faculty Sponsors: Michael Coronado and Frank Dunnivant

9:15 a.m. NGAN TRAN, Lower Dose of Nonselective Beta-Adrenergic Agonist Isoproterenol Enhances Mitochondrial Function in H9c2 Cardiomyocytes

The beta-adrenergic receptor (β-AR) signaling pathway plays an important role in regulating cellular processes and cardiac function, yet little is known about the mechanism wherein its stimulation turns from beneficial to toxic. In this study, I seek to determine the physiological point in time at which the β-AR signaling pathway becomes pathological and how mitochondria function throughout these two extents. I treated cultured H9c2 cardiomyocytes with varying doses of isoproterenol (ISO), a nonselective β-AR agonist, over time intervals ranging from 30 minutes to 24 hours and studied mitochondrial function by staining treated cells with tetramethylrhodamine. I found that at lower doses (500 nanomolar and 1 micromolar ISO) in an acute setting (30 minutes and 1 hour), β-AR-induced mitochondrial fission resulted in hyperpolarized membrane potential, indicating that β-AR signaling enhances mitochondrial function; chronic stimulation led to a depolarized membrane and thus deficiency.
Faculty Sponsor: Michael Coronado

9:30 a.m. MICHAEL WU, Development of MERS-Specific Antibodies

MERS (Middle East Respiratory Syndrome), an illness caused by a coronavirus, is easily transmitted between people in close contact. Symptoms of MERS include fever, cough and shortness of breath; the observed mortality rate is approximately 35%. MERS treatments can only attempt to relieve symptoms because there is not a MERS-specific antiviral treatment. Thus, it is crucial to develop a more effective treatment that can be used in future MERS outbreaks. Antibodies, proteins produced by our immune system, use multiple mechanisms to protect us from pathogens. My research focuses on the expression of MERS-specific antibodies and the determination of their binding affinity to virus antigens. I cloned and sequenced antibody fragments, then expressed and purified the resulting proteins. Finally, I tested the binding affinity of these antibodies to MERS antigens. My research helps to identify antibody sequences that specifically bind MERS, laying the groundwork for future clinical trials.
Faculty Sponsor: Elizabeth Danka

9:45 a.m. ALEX HUNG, Sex-Specific Mitochondrial Adaptations to Endurance Exercise

Mitochondria are a big deal in the realm of aerobic exercise. Previously thought of as static organelles, they actually undergo cycles of fission and fusion in order to generate the energy needed for a marathon runner to cross the finish line. However, while it is generally accepted that mitochondria are the powerhouses of the cell, sex-specific differences in mitochondrial dynamics during aerobic exercise are largely understudied. I provide evidence that sex-specific differences in exercise-induced mitochondrial dynamics seem to be responsible for disparities in aerobic exercise performance between males and females. My lab has shown that mitochondria isolated from mouse hearts utilize sex-specific mechanisms and adaptations in response to acute and chronic aerobic exercise.
Faculty Sponsor: Michael Coronado

10 a.m. AUDREY BENNER, Assessing Progesterone in Female Athletes to Explore its Potential in Neuroprotection

Female athletes experience the highest rate of sports-related concussions and are likely to experience more severe outcomes following trauma. Research suggests that hormonal fluctuations associated with the menstrual cycle may exacerbate recovery from head injury. To interrogate this possibility, I investigated the sex hormone progesterone to evaluate its potential neuroprotective properties. I analyzed salivary progesterone levels in female athletes at the beginning and end of their athletic

seasons and used surveys to assess cognitive ability in order to determine whether progesterone levels are correlated to cognitive deficits. I also collected post-injury saliva from athletes who had experienced a concussion during the study period. Using statistical analyses and regression models, I explored potential correlations between progesterone and cognition. My findings draw attention to female athletes who may be at especially high risk for concussions and help to inform best practices in the treatment of cognitive deficits resulting from head injury.
Faculty Sponsor: Leena Knight

Mythology, Antiquity, Modernity

KIMBALL THEATRE

Sarah Fassio, *moderator*
Holden Gaupo, *coach*

9 a.m. REEVE BOYER, Crossing the Boundary: Journey Myths in Ancient Greece

Io traveled the world to become Isis. Jason sailed the Argo to find the Golden Fleece. Odysseus wandered and endured to find home. I analyze by comparison the journey myth as a representation of how ancient Greeks saw the world and how the hero's journey depicts a broader understanding of a relationship with the divine. As the hero leaves "civilization" behind and reaches the end of the maps, what then? Beyond the edge of a map, I argue, lies a lack of knowledge, an irrationality that can be associated with the inhuman and godly. These stories provide a new window into this boundary. The myths we share comprise the warp and weft of our culture and structure how we think, yielding a view of what the world is and how we fit in it.
Faculty Sponsor: Kate Shea

9:15 a.m. LEILA HAUSER, Unraveling the Legacies: Sex, Women and Power in Ancient Greece and Rome

My presentation explores the dynamic of women and sex in ancient Greece and Rome, focusing on the power differentials of sexual encounters represented in literature and material culture. In Greek tragedies, for example, female characters discount the legitimacy of a woman's bodily rights as a parent. Canonical Roman works of literature normalize rape acts and define a woman's body and identity in terms of impossible ideals of "purity," norms through and against which Roman women carved out power for themselves. My presentation aims to promote an understanding of the relationship between sex and power, the variety of purposes served by the link between them in ancient Greece and Rome and the manifold ways in which sex and power resonate today, still asking that we unlearn them.
Faculty Sponsor: Sarah Davies

9:30 a.m. ELI HOLLIDAY, Age of the Last First Citizen: The Neronian Period

The death of Nero in 69 C.E. left a monumental power vacuum in the highest levels of Roman government and society. The Julio-Claudian dynasty had ruled Rome for nearly 100 years with little interruption. Under Julio-Claudian stewardship, Rome was transformed from a republic to an imperial dictatorship. Its system of rule — the "principate" (by law, "first citizen"; in practice, emperor) — had become such a powerful and entrenched position that it survived the cruelties of Tiberius, the purported insanity of Caligula and the tyranny of Claudius. The death of Nero marked the end of the dynasty, a potential turning point, possibly even a chance for Romans to reconstitute their government. Such reform did not take place. Instead, the system hurtled forward under a new dynasty and, sadly, the fascinating (and pertinent) Neronian period was consigned to the dustbin of history.
Faculty Sponsor: Sarah Davies

9:45 a.m. WEST BALES, Unlearning Imperial Classicism: The Power of Aesthetics in 18th Century English Estates

My presentation analyzes "classical" imagery as a power aesthetic in English estates during the 18th century. It sheds light on the ways authority was asserted via visual claims to Britain's roots in the Roman Empire. At the same time, it demonstrates how notions of the "classical" became the mode for performing virtuous refinement. Through their estates, elite Englishmen blended their civic and personal lives, thoroughly infusing classical ideals into both public and private identity. These images have become pervasive staples of British (and "Western") style and carry their message of imperial superiority in a warped appropriation of Greco-Roman "origins." What continues today to convey status and power remains rooted in white(washed) marble and columns. By asking how British elites were so successful in establishing an aesthetic of power and supremacy, we can look beyond the estates themselves and engage in what scholar Ariella Aïsha Azoulay refers to as "unlearning imperialism."
Faculty Sponsor: Sarah Davies

10 a.m. SARAH FASSIO, Collapsing Time: Memory and Monuments in Rome's Campus Martius

The physicality of a landscape and its architecture has the powerful ability to serve as a tangible source of collective memory. Such is the case with Rome's Campus Martius (or, "Field of Mars"), a space filled with monuments, temples, theaters and columns located at the city's northern edge. My research analyzes how these enduring physical structures perpetuate ideologies that influence a collectively remembered "Roman identity." To this end, the impact of Roman military culture is considered, as are traditions of public dedications and sacred rituals. By evaluating monuments existing in both the Republican and Imperial periods and in the twentieth century moving forward, a fluid perspective of time is captured, diverging from traditional historical differentiations between "antiquity" and "modernity." The Campus Martius embodies the multifaceted nature of Roman memory, stabilized and perpetuated via its monuments and topography.
Faculty Sponsor: Sarah Davies

Life and The Mind

REID G02

Bryanna Schreiber, *moderator*
Ellery Shore Nelson, *coach*

9 a.m. MICHAEL MEHLMAN, ALLYSSA SULLIVAN, YUWEI LIU, Effects of Fluoxetine in Mitigating Depression in Socially Isolated Zebra Finches

Depression, the leading cause of disability worldwide, is often associated with social isolation. To explore this relationship, we placed zebra finches *(Taeniopygia guttata)* in isolation. Like humans, zebra finches are gregarious. We examined how prolonged isolation influences levels of corticosterone, a stress hormone elevated during depression, as well as time spent singing and body weight. Birds were randomly selected to live either in a social colony or isolated cage. We examined how fluoxetine, a selective serotonin reuptake inhibitor (SSRI), potentially counters effects of isolation. SSRIs raise serotonin levels in the brain, decreasing depressive symptoms. We expected isolated birds to have higher corticosterone levels, fluctuating weight, spend less time singing in comparison with birds living in social settings and also that the administration of fluoxetine would reverse these effects. Our experiments provide insights into the development of mental illnesses in isolated individuals and explore the benefits of antidepressants.
Faculty Sponsor: Nancy Day

9:15 a.m. NIKKI DELGADO, LEAH MORTIMER, Effects of Maternal Stress on Fetal and Child Brain Development

Research has shown that elevated maternal cortisol levels, as a result of a maternal history of childhood maltreatment or life stress, can negatively impact fetal brain development. Cortisol exerts its effects via the hypothalamic pituitary adrenal (HPA) axis, which controls stress on the human body. The adverse functioning of the HPA axis can lead to many negative physical, emotional and social consequences for the developing child. Furthermore, a history of maternal childhood maltreatment can potentially affect perceived parental self-efficacy, which could negatively impact the development of neural systems in childhood, specifically due to poor parenting behavior. Our research examines the effects of elevated maternal cortisol levels on fetal HPA axis development, as well as how a maternal history of childhood maltreatment relates to perceived self-efficacy as a future parent. Thus, we hope to emphasize how maternal childhood maltreatment is a public health problem with various consequential repercussions for children.
Faculty Sponsor: Lauren Berger

9:30 a.m. SAMARAH URIBE MENDEZ, CAM SIPE, BECCA LINN, Does Classroom Diversity Matter? Racial/Ethnic Identity and School Belonging

School belonging is a critical component of adolescent development that has been linked to positive outcomes. Classroom composition can impact feelings of belonging among students. Our research examines the relationship between classroom diversity, school belonging and an individual's racial/ethnic identity. Students from three area high schools comprise our study. We hypothesize that greater diversity in the classroom helps students develop their racial/ethnic identity and that a more positive racial/ethnic identity leads to a greater sense of school belonging. Our study will provide greater understanding of the role that schools play in the well-being and academic success of ethnic/racial minority students. Our findings may better inform the decisions made in American classrooms as they grow more diverse.
Faculty Sponsor: Stephen Michael

9:45 a.m. BELLA BLANCO, Role of Facial and Contextual Cues on Racial and Ethnic Categorization of Mixed-Race Individuals

The mixed-race population is the fastest-growing racial group in the United States, but our understanding of how multiracials are perceived by others is limited. Previous research on racial categorization has focused on the dynamic interactive theory (model) of person construal, which suggests that perceptions of others involve interactions between low-level processing of facial, vocal and body cues and high-level cognitive states (social categories and stereotypes). I examine how the theory applies to categorizing mixed-race individuals. While the general process of racial categorization works quickly with monoracial faces, categorizing mixed-race faces may be more difficult due to lack of exposure to mixed-race people and the incompatibility of ambiguous faces with pre-existing racial schemas. I examine whether facial cues or contextual cues are more predictive of racial categorization of monoracial and mixed-race individuals. My study also considers how familiarity with certain ethnic minority populations may influence accuracy and confidence of categorization.
Faculty Sponsor: Lauren Berger

10 a.m. BRYANNA SCHREIBER, JESSIE MANO, The Effect of Mental Toughness and Mood on Perseverance in Athletes and Non-Athletes

Mental toughness is the psychological edge that enables people to better handle adverse situations and remain focused and in control under pressure. Research suggests that athletes who possess high levels of mental toughness exhibit more perseverance through adversity, potentially due to their ability to effectively regulate emotions in challenging situations. Our presentation is based on a study examining how mental toughness influences perseverance on a difficult task in a non-athletic setting when participants are exposed to images that induce a positive, neutral or negative mood. We measure participants' mood and mental toughness, then present images to induce the mood, examine their perseverance with a task and then measure mood and demographics. We expect those with higher mental toughness levels to persevere longer than those with lower levels, especially when in a negative mood. Our research will add to the literature by aiding in the conceptualization of mental toughness.
Faculty Sponsor: Stephen Michael

Session 2
10:45 a.m. - Noon

Hispanic Culture
OLIN 138
Yann Dardonville, *moderator*
Zidane Galant-LaPorte, *coach*

10:45 a.m. YANN DARDONVILLE, MADI CROWLEY, TINA DILWORTH, LEILA HAUSER, WHITNEY RICH, Memory, Gender, Trauma: Considering the Complexities of Hispanic Culture

Our group presentation showcases the culminating work of Whitman's Hispanic Studies majors, demonstrating the breadth of our research and highlighting the numerous connections between our projects. Hispanic Studies seniors were tasked with an original research project based on the critical analysis of an aspect of Peninsular, Latin American and/or U.S. Latinx narrative, verse, performance and/or visual culture, all examined through one or multiple theoretical lenses/methodological approaches. Collectively, these projects represent a diversity of geographic spaces (Argentina, Peru, Mexico, Spain) and a variety of historical periods (from 17th-century Baroque to the 21st century). They explore the social, political and cultural implications of various works of literature, film and theater and engage with themes of indigeneity, memory, the commodification of culture, gender identity and societal trauma. Together, they exhibit the power of literary analysis as a vehicle to understand the complexities of the Hispanic world.
Faculty Sponsor: Nico Parmley

CS II: The Match Game, Automated
OLIN 129
Ian Hawkins, *moderator*
Jamie Gold, *coach*

10:45 a.m. KIMBERLY TAYLOR, ROBERT QIN, CHARLIE SCHNEIDER, BUYAKI NYATICHI, Automating Mentor-Mentee Matching

The Whitman Mentor Program is a community service program offered through the Student Engagement Center that builds supportive mentor-mentee relationships between Whitman students and students from Walla Walla elementary schools through weekly meetings. Our project automates the mentor-mentee matching process, allowing program interns to better utilize their limited on-the-job hours. We streamlined the mentor and mentee information-entry process using Google Forms and Google Sheets. Eligibility criteria for matching mentor-mentee pairs include gender, language, transportation and availability, all of which complicate the matching process. Because of the types of these constraints, we found that eligible matches could be modeled in a bipartite graph. We wrote a modified bipartite matching algorithm to solve the problem and created a plugin that uses Google Apps Script to extract data from Google Sheets, build potential matches and formulate the best possible matching scenario.
Faculty Sponsor: John Stratton

11:15 a.m. CHRISTOPHER PYLES, IAN HAWKINS, TRUNG VU, ISAIAH STANDARD, Great Explorations: Designing an Algorithm to Have a Human Touch

Every other year, hundreds of middle school students register for the Great Explorations conference at Whitman College. This all-female event features a wide variety of STEM-related workshops. In previous years, students were assigned to their preferred workshops by hand in order to ensure equality and student satisfaction. We set out to construct an algorithm to match girls to workshops more efficiently, while still considering the same priorities. Our algorithm focuses on satisfying student preferences while also accounting for workshop capacity. Our presentation shows how we programmatically apply a personal touch while reducing the workload of our client.
Faculty Sponsor: John Stratton

Bio I: Plants and Animals
SCIENCE 159
Silas Miller, *moderator*
Alex Brockman, *coach*

10:45 a.m. PERTH SETHAPANICHSAKUL, Reconstruction and Pairing of Mamenchisaurid Dinosaur Lower Jaws from Thailand

Dinosaur fossil excavation often yields misshapen or scattered specimens that can be difficult to study. In recent years medical technology has been applied to paleontology to help work around these obstacles. Methods such as computed tomography (CT) scans are very popular for their ability to reveal the inner structure of fossils and help separate bone fragments from sediments that cannot be removed. My study aims to build on these

techniques and to apply them in forming matching pairs of existing lower jaw specimens from mamenchisaurid dinosaur remains uncovered from a single locality in northeastern Thailand. This research will contribute to an understanding of the number of individuals present at the locality and help to improve the overall reconstruction of the paleoecology of Thailand.
Faculty Sponsor: Kate Jackson

11 a.m. EMMA SAAS, Estimating Rockfish Fecundity

I investigated novel methodologies for estimating fecundity, a key biological parameter, for rockfish *(Sebastes)*. Ongoing fecundity estimates for rockfish allow fisheries researchers to build reproductive histories and estimate productivity of a given species. Every year, ocean conditions and available energy resources fluctuate, resulting in varying egg production. Fecundity estimates are important for sustainable fisheries management plans; however, the amount of time required to estimate fecundity by manually counting eggs leads to less available biological data. To improve fecundity data availability, I used an efficient auto-diametric method to develop calibration curves for estimating fecundity of three rockfish species, Rosy rockfish *(S. rosaceus)*, Yellowtail *(S. flavidus)* and Chilipepper *(S. goodei)*. Each curve used the relationship between mean egg diameter and egg density to estimate fecundity. Once a calibration curve is developed, fecundity is quickly estimated by semi-automated imaging and measurements of mean egg diameter. I found that curves must be species-specific.
Faculty Sponsor: Michael Coronado

11:15 a.m. OLIVIA STEINMETZ, Altitudinal Range Shifts of Two Species of Redstarts in the Tilarán Mountains of Costa Rica in an Age of Climate Change

The narrow elevational ranges of tropical montane species make them particularly susceptible to climate change. I replicated studies of the ranges of two cloud forest insectivorous warblers, the slate-throated redstart *(Myioborus miniatus)* and the collared redstart *(M. torquatus)*, to assess altitudinal shifts in their populations in the Monteverde cloud forest of Costa Rica. The slate-throated redstart may be replacing the collared redstart as these species move upward in elevation; the collared redstart, a highland endemic, is in danger of being pushed off the top of the mountain as a result of increasing temperatures and rising cloud banks, a defining feature of this fragile ecosystem. I found that between 1998 and 2019 the mean elevation of the slate-throated redstart rose, while in recent years the collared redstart was notably absent from the lower elevations where it was previously observed. Long-term data will help researchers better elucidate these range shifts.
Faculty Sponsor: Tim Parker

11:30 a.m. CALVIN LINCOLN, The Shadow Auxin Biosensor: Where it Glows, Plants Will Grow

The plant hormone auxin plays a key role in growth and development, activating a wide range of genes involved with functions such as responding to light and lateral root and bud formation. To detect this hormone, a biosensor was designed that glows when auxin is present, allowing researchers to quantitatively measure auxin's concentration and location in plants. However, pilot testing in yeast caused sickly cells, likely due to over-expression of the biosensor. My research focused on lowering expression to healthier levels. One approach involved re-coding the gene's DNA sequence, which resulted in healthier cells but a dim fluorescent signal. Another method, tweaking the regulatory DNA sequences preceding the gene, yielded a strong signal and maintained healthy cells. My findings suggest the latter approach could be optimized for a viable final biosensor design. Once additional components of the biosensor have been optimized in yeast, the biosensor will be implemented in plants.
Faculty Sponsor: Brit Moss

11:45 a.m. SILAS MILLER, Designing New Biological Tools to Study the Plant Hormone Auxin

Auxin is a plant hormone that is crucial for nearly every aspect of plant growth and development. Understanding how this hormone works could open new doors for agricultural scientists to maximize crop efficiency in the face of climate change and accelerating population growth. However, existing tools for studying auxin are not ideal for use in plants. I am working to help build and test a new auxin biosensor, ShadowAuxin, capable of accurately measuring auxin in live plants. The fluorescent biosensor relies on two proteins that are dark when close together but emit light when separate. Early experiments in yeast cells have shown that this phenomenon is measurable and have revealed specific aspects that require troubleshooting. Next, I will test different methods of attaching the proteins together for maximum efficiency. Ultimately, this fluorescent system will be coupled with an auxin-sensing domain to create a biosensor that reports auxin by producing light.
Faculty Sponsor: Brit Moss

The Physical World

SCIENCE 100

Henrique Ennes, *moderator*

Sophie Grossman, *coach*

10:45 a.m. SPENCER THULIN, Speckle Pattern Interferometric Studies of Guitar Top Plate Materials

Musical instrument materials play an important role in the sound quality that the instrument produces. Because these materials are often natural, instrument manufacturers judge materials not only on their type (e.g., spruce) but on qualities of the individual sample. Spruce pieces used for acoustic guitar top plates are given three different grades in industry based on qualitative assessments. In this study, I present quantitative measurements of the vibrational properties of samples of these different grades of spruce, both raw materials and finished instrument panels. These measurements were taken with a speckle pattern interferometer in the summer of 2019 and presented at the 178th Acoustical Society of America meeting in San Diego the following December.
Faculty Sponsor: Kurt Hoffman

11 a.m. SIHAN CHEN, SABRINA JONES, Modeling Solar Cell Materials

Metal halide perovskites are promising solar cell materials due to their high efficiency (as high as 22%) and much lower production cost than silicon. They are hybrid organic-inorganic materials that adopt the crystal structure of ABX_3, where A is an organic cation, B is an inorganic cation and X is a halogen anion: e.g., methylammonium lead iodide ($MAPbI_3$). Our study centered around the stability of $MAPbI_3$. We noted that light-induced ion migration can have both a beneficial and a detrimental impact on the stability of the material, as long-living carrier traps of halide defects induce defect healing while at the same time promoting bimolecular reactions of neutral iodine (I_0) to form I_2.
Faculty Sponsor: Barbara Sanborn

11:15 a.m. MJ WILNER, The Role of Pore-Fluid Pressure on the Stability and Form of Faulting of Ocean Island Volcano Flanks

Volcanoes are known to expand laterally when their flanks slip outward along faults or when they catastrophically collapse. This study of Kīlauea's south flank used a two dimensional, finite-difference model to examine the characteristics of movement and faulting in response to physical parameters including volcanic slope, sea level, frictional strength, pore-fluid pressure and magmatic intrusions. The basal layer, representing buried oceanic sediments, is likely to be weaker than the volcano itself and it was modeled with varied parameters. Models indicate that the presence of a shoreline and water trapped in the pores of the rock, which causes a high pore-fluid pressure, tend to destabilize the flank. The model produced shallow faults when both the interior of the volcano and the base had low internal friction values and high pore pressures and slip along the base occurred when the basal layer was weaker than the rest of the volcano.
Faculty Sponsor: Kirsten Nicolaysen

11:30 a.m. GUSTAVO BÉJAR LÓPEZ, The Magmatic Processes That Shaped the 1870 CE Eruption of Ceboruco Volcano, Mexico

Volcanoes draw our attention through their usually explosive surface behavior. Yet, a numerous set of processes that are not visible occur in the hidden magma bodies prior to volcanic events. These processes shape the nature of eruptions and can be interpreted with detailed analyses of the petrology and geochemistry of resulting volcanic rocks. I investigate the lavas of the 1870 CE eruption of Ceboruco, a volcano in Nayarit, Mexico, to understand which pre-eruption processes took place in this system. Bulk and mineral compositions, textural observations and phase equilibrium estimates provide us with a picture of different phenomena that took place prior to the eruption, such as magma mixing. These methods can also be applied to deduce the spatiotemporal relations of the lava flow and volcanic domes that belong to this event. Understanding these processes is important in order to enhance our preparedness toward future hazards associated with this volcano.
Faculty Sponsor: Kirsten Nicolaysen

11:45 a.m. HENRIQUE ENNES, Is Quantum Mechanics That Weird? A Study of the Classical Limit Through Atoms

Pop culture, passing through the universe of "The Avengers" and the adventures of James Bond, has used quantum mechanics to "scientify" any weird plot trend that seems implausible to the general public. Even scientists use the term "quantum weirdness" to explain why some natural behaviors

are so different from our intuition, born and raised in the realms of classical physics. Such awkwardness of the very small world has been used to suggest the very trendy argument that there are two distinct kinds of physics, depending on the scale in which the science is happening. Is such an idea true? Is quantum physics indeed so different that it requires the study of a whole new description of nature, or is there any place where it agrees with what we think it should say?
Faculty Sponsor: Barbara Sanborn

The Arts and Its Discontents

KIMBALL THEATRE
Bryn Carlson, *moderator*
Heleana Backus, *coach*

10:45 a.m. CLAIRE WEISSMAN, Mirrors of Frustration: Shakespeare's "Tempest" and Césaire's "A Tempest"

Aimé Césaire's "A Tempest" presents an inverted mirror of Shakespeare's "The Tempest." In Shakespeare's play, Caliban's and Ariel's stories lack conclusions. Caliban's story ends when he is sent to Prospero's cell; it's unclear where he proceeds after that. Ariel's story stops when Prospero says, "Be free and fare thou well," which draws no reaction. From there, Prospero pivots directly to his epilogue. Conversely, Césaire focuses on Prospero's treatment of his slaves, eventually showing us that Prospero's desire to rule over them is stronger than his desire to rule over the people of Milan. I maintain that this strategy creates frustration for the audience, which matches the frustration we should have felt (but perhaps didn't) at the egregious oversight Shakespeare makes by neglecting to provide an actual ending for Caliban and Ariel. Césaire's mirror reveals Shakespeare's gaps by making the once invisible visible.
Faculty Sponsor: Jennifer Mouat

11 a.m. HOPE GIDDINGS, Kansas City Plays Itself

Much has been made of the relationship between the city of Los Angeles and the movies that are filmed on location there. Significantly less has been made of Kansas City and its film legacy. In 1995, Robert Altman shot the eponymously titled "Kansas City" in the heart of the city's downtown. Set in the 1930s, the film explores Kansas City's seedy past through events and characters both real and imagined. As one of a handful of films both set and shot there, "Kansas City" has become an important part of the way the public understands its past and present 25 years after the film's release. My research examines the relationship between film and place through a discussion of "Kansas City" that incorporates a formal analysis of the film with ideas about the role popular culture plays in the retelling of history and the formation of public memory.
Faculty Sponsor: Lisa Uddin

11:15 a.m. NATALIE FLAHERTY, Race Through Time: Wendy Red Star's "Enit"

Concepts of time inform our sense of the world as well as the art we make and consume. In my presentation, I examine how time informs how we feel and see race in Wendy Red Star's 2010 lithograph, "Enit." I place "Enit" in conversation with the colonial renderings of Native American subjects in portraiture from the late 19th and early 20th centuries. Through line, color, textiles and subject, Red Star draws attention to time in "Enit." In doing so, she redirects and challenges colonial concepts of time, depicting Native American subjects simultaneously in the here and now and nowhere specific at all. This nuanced treatment of her subjects complicates long-standing representations of the "noble savage" and orients viewers toward a different, sensory understanding of Native American experience.
Faculty Sponsor: Lisa Uddin

11:30 a.m. CHLOE MICHAELS, The Hunger for Representation: Mexican-American Food in Paul Valadez's "Songbook"

"Selections from the Great Mexican-American Songbook" is a series of collages created by Mexican-American artist Paul Valadez that visually represent the pressures and challenges of existence as a Mexican-American in mid-20th century U.S. society. The collages juxtapose images of racial violence with popular imagery and references to music and traditional Mexican food. In my presentation, I consider how Valadez's work rewrites historical memory that has excluded (or reduced) Mexican-American experiences from its purview. I focus on Mexican cuisine as a racially charged hunger for representation that parallels a white-American hunger to consume Mexican-American food and culture. Invoking and critiquing hunger, all of it with a strong current of humor, Valadez's "Songbook" moves between the Americanization of Mexican food and the experience of racial suffering.
Faculty Sponsor: Lisa Uddin

11:45 a.m. BRYN CARLSON, Unfinished Business: Mobility and Genealogy in "Midnight's Children" and "The Satanic Verses"

My presentation focuses on the ways depictions of mobility and speed indicate ethical arguments in Salman Rushdie's "The Satanic Verses" and "Midnight's Children." I use Homi Bhabha's arguments about "double inscription" and Edward Said's arguments on contrapuntal reading to demonstrate how movement in both novels performs a resistance to stabilizing colonial force. I examine "Midnight's Children" as an account of how genealogies move. I argue that the hybridity Rushdie embraces in "The Satanic Verses" makes possible certain kinds of mobility. I define and discuss an ethic of mobility, demonstrating how Rushdie's novels indicate that mobility creates opportunities for relations. Addressing hybridity and movement as literary themes, I discuss how Rushdie's narrative techniques themselves reflect possibilities through mobility.
Faculty Sponsor: Gaurav Majumdar

Media and Message

REID G02
Claire Garrett, *moderator*
Jonathan Falk, *coach*

10:45 a.m. CAMILLA TARPEY-SCHWED, "Pride": An Ideograph

Many Americans have attended a gay Pride parade or have seen images of rainbow-themed celebrations on television. Accordingly, many individuals associate the word "pride" with a celebration. I complicate this narrative by rhetorically analyzing pride as an ideograph and situating pride in multiple historical contexts within the gay rights movement. An ideograph, in this context, is a higher-order abstraction representing collective commitment to a particular ambiguous normative goal. I argue that Pride as an ideograph has evolved to represent both the historical battles and the continuing political commitment of the LGBTQ community to equal rights and acceptance in society. The meanings associated with the Pride movement today are different from what Pride represented in the past. Today's celebrations commercialize Pride, minimizing its message and perpetuating the false narrative that the gay community has achieved all it can.
Faculty Sponsor: Kaitlyn Patia

11 a.m. NICK QUAZZO, Effects of Positive Psychology on Social Media Addiction

My presentation distills a group study examining the degree to which social media activity exacerbates the anxiety of individuals who use it. Existing research generally shows an increase in anxiety when users cannot access social media. Our study adds to this area of focus by establishing conditions for participants that reduce social media interaction. The study implements an intervention to counter the anxiety experienced by participants as a result of reduced access to social media. The study is based on previous research that demonstrates the negative effects of social media usage on an individual's self-esteem. Our intervention utilizes a method from positive psychology, a subset of psychology that has gained traction over the past few decades. If successful, our study will show that positive psychology strategies are effective in counteracting anxiety produced by engagement with social media.
Faculty Sponsor: Nancy Day

11:15 a.m. CLAIRE GARRETT, EMILY GOLDFARB, ADDISON SCARFF, Effects of Choice-Based Ads on Perceived Ad Intrusiveness and Effectiveness

Research shows that interactive advertisements are more effective than non-interactive advertisements, but the underlying mechanism remains unclear. Based on theories of control and cognitive dissonance, our study examines the relationship between ad choice (vs. no choice) and perceived ad intrusiveness and effectiveness. We hypothesize that choice-based advertising will be perceived as less intrusive and more effective than no-choice advertisements. We also hypothesize that perceived ad intrusiveness will mediate (i.e., partially explain) the relationship between choice and perceived ad effectiveness. In our study, participants watched a 12-minute video clip with either a choice-based (experimental condition) or no-choice (control condition) ad in the middle. If results support our hypotheses, our study fills a gap in advertising research and proposes a psychological mechanism to help explain the effectiveness of choice-based interactive advertisements. Our research may inform future advertising strategies, justifying the current trajectory toward increased ad interactivity while simultaneously improving user experience.
Faculty Sponsor: Lauren Berger

Session 3
3 - 4:15 p.m.

Cultural and Community Responsibility
OLIN 138
Grace Dublin, *moderator*
Zidane Galant-LaPorte, *coach*

3 p.m. ELI BAEZ, Hybrid Forms, Concepts and Solutions: Navigating Increased Western Influences on the Indonesian Traditional Textile *Ulos*

The Toba Batak sub-ethnic group in Indonesia is well-known for its weaving of the traditional textile *ulos*. At the same time that they uphold ancient Batak traditions of textile weaving, the Toba Batak people are at the nexus of a growing textile industry on national and international scales. As Western interests further influence Indonesia's economy — the textile industry in particular — Indonesian concerns about the production of *ulos* become more and more urgent to address. The concern that *ulos* will be replaced by modern, Western styles of clothing and production gives rise to a more pressing fear that weaving traditions will fade from cultural awareness entirely. In my presentation, I share the uniquely Indonesian strategies utilized by the Toba Batak people to conserve their cultural knowledge and traditional weaving practices, all while adapting to shifting trends in the textile industry in order to keep *ulos* relevant yet authentic.
Faculty Sponsor: Krista Gulbransen

3:15 p.m. TORI LONDRIGAN, Legal Responsibilities of Citizens for Solid Waste Management in Siem Reap, Cambodia

Cambodia is one of the fastest-growing economies in the world, but developing infrastructure needed to support this growth can be a challenge. One example is in the management of solid waste. Although Cambodia has established regulations for solid waste management, public participation in the private collection service, Global Action for Environment Awareness (GAEA), is low and trash is often dumped or burned in empty lots. I aim to understand how citizens' legal responsibilities for solid waste management are communicated, encouraged and enforced in Siem Reap, Cambodia's second-largest city, through the analysis of legal documents and interviews with key stakeholders (citizens, city commune leaders, GAEA representatives). Results indicate that citizen participation varies depending on efforts of their commune-level government to raise awareness and enforce the law. Recommendations inform the development of Siem Reap's 2020 waste management plan, with considerations for economic accessibility of collection services and other observed barriers to participation.
Faculty Sponsor: Heidi Dobson

3:30 p.m. MAT CHAPIN, TRICIA FERRER, Visibility of Homelessness in Seattle: A Historical Critique

Seattle residents are increasingly concerned about the visibility of homelessness in their neighborhoods. Yet, large-scale homelessness in the city is not new; nor is the rhetoric surrounding it. Our research aims to compare responses to homelessness by the middle/upper class during the Depression and in the present. We identify the effects of visible shantytowns (or "Hoovervilles") in the past to contextualize the current homelessness issue in Seattle. Comparing these eras, we critique the fight against homelessness, past and present, as a beautification campaign rather than an initiative of humanitarian aid and argue that mainstream approaches to the homelessness epidemic are fundamentally flawed. Our sources — official documents, letters and records from the Seattle Municipal Archives — contain arguments for and against the destruction of homeless encampments. Other sources include newspaper articles about Seattle's Hooverville, modern public policy, media coverage of homelessness and recent activist movements.
Faculty Sponsor: Nina Lerman

3:45 p.m. CAMERON CONNER, Creating an Inclusive Commons: Navigating Exclusion in a Community-Based Political Economy

Since Elinor Ostrom's groundbreaking text, "Governing the Commons," earned the Nobel Prize for Economics in 2009, "commons theory" has come to be an increasingly important instrument for academics and activists alike who seek to disrupt systems of capitalist dispossession and exploitation. In practice, the political economy of the "commons" is based on a belief that individuals can come together to hold in common the elements most necessary for their collective well-being. Yet, theorists of this system often ignore a central conflict: the tendency for community to be built on shared characteristics that produce prejudice, discrimination and subjugation. My presentation explores and analyzes this tension, suggesting how

the inherent reliance of the commons on the power of community also creates exclusion. My research is an attempt to better integrate equitable structures of inclusion into the commons and, in so doing, help it survive as an aspirational post-capitalist political economy.
Faculty Sponsor: Susanne Beechey

4 p.m. GRACE DUBLIN, Whitman College and the Washington State Penitentiary

The Washington State Penitentiary and Whitman College are only 2 miles apart, yet the interactions between these two cornerstones of the Walla Walla community in 130 years of co-existence are limited. Why is it that these two institutions don't interact more frequently in meaningful, mutually beneficial ways? In my presentation, I explore the historical relationship between these two institutions in order to examine the nature and the purpose of their interactions and the benefits and risks of this relationship. I also speculate about why the relationship hasn't expanded over time. Finally, I hope to illustrate the many benefits that might result from colleges and prisons creatively and thoughtfully working together in a symbiotic, less institutional way.
Faculty Sponsor: Keith Farrington

Philosophy: Tradition and Adaptation

OLIN 129

Mika Nevo, *moderator*
Jamie Gold, *coach*

3 p.m. SUNSHINE ALVAREZ DE SILVA, Could We Rest?

In "Avengers: Endgame," before risking all that he holds dear, Tony Stark is asked by Pepper Potts if he could rest if he doesn't do what he thinks is right. In Plato's "Apology," Socrates raises a potential question that he imagines the jury and audience at his trial could pose to him: Is he not ashamed of engaging in a practice that puts his life at risk? To this hypothetical question, Socrates replies that one should not consider the risk of life or death but rather if the action that one carries out is just or not, the work of a good man or a bad man. These two questions and the actions taken to address them, resonate with each other. What does this mean? Should we consider Socrates' answer as the right one? Could we rest if we didn't do the work of good people?
Faculty Sponsor: Kate Shea

3:15 p.m. ANDREAS GUERRERO, The Philosophy of Caroline of Ansbach

Caroline of Ansbach was a British monarch at the start of the 18th century. She was called the "Champion of Protestantism," worked with Robert Walpole to govern the British Empire and was praised by Voltaire. Though she never authored a philosophical treatise, she argued with Newton and Leibniz, coordinated and commented on philosophical correspondence and ruled in a manner that indicates a distinct, progressive political philosophy. She also supervised the construction of two garden exhibits that reveal her philosophical persuasions. Despite these accomplishments, Caroline's philosophy remains largely uninvestigated. Utilizing the strategy of American-Canadian philosopher Lisa Shapiro to diversify the canon, I hope to fill this gap in the history of philosophy by examining Caroline's life and deeds. My presentation is the product of collaborative research and will shed light on one of the most interesting women of the 18th century.
Faculty Sponsor: Patrick Frierson

3:30 p.m. DANA WALDEN, Miranda Fricker and Testimonial Vulnerability

Philosopher Miranda Fricker introduced the concept of testimonial injustice, or the dehumanization that occurs when a person is disbelieved and dismissed because of her identity. From this understanding of testimonial injustice, I propose in my presentation the idea of testimonial vulnerability, which can have equally devastating effects on the individual as well as the epistemic community. Vulnerability is typically defined as exposure to the possibility of harm. Testimonial vulnerability, then, can be understood as one's exposure to the possibility of epistemic or testimonial harm, with the additional possibility that the vulnerability itself can be experienced as a harm. I argue that the mere possibility of this harm is, in itself, an injustice insofar as testimonially vulnerable people are subject to silencing and exclusion from the community of knowers.
Faculty Sponsor: Rebecca Hanrahan

3:45 p.m. FAYE LIU, On Miracles, Hume and Sor Juana

David Hume, in "Of Miracles," delineates several defenses against proofs of miracles. One of his contentions is that miracles are "a violation of the laws of nature." Sor Juana's poem, "First Dream," ends with a depiction of the sun overcoming night as she awakes. (". . . the World illuminated and I awake.") The poem serves as a challenge to Hume's ideas on miracles. Taking a phenomenological approach, Sor Juana situates the shifts and movements within her dream (her unconscious). In my presentation, I explore miracles in the context of epistemology and political analysis. What does it mean to "demand the impossible?"
Faculty Sponsor: Patrick Frierson

4 p.m. MIKA NEVO, Hume and Sor Juana on Miracles and Unlikely Realities

Hume's definition of miracles establishes them as inherently impossible. He argues that any encounter with an event that is perceived to be miraculous should be rejected on the grounds that it is contradictory to logic and probability. Such an approach to events that challenge our previously held belief systems poses a serious threat to discoveries and progress. In her own search for understanding, Sor Juana repeatedly encounters things that are incomprehensible to her. Her construction of knowledge is grounded in reason but

allows the imagination to challenge presuppositions. Sor Juana's approach to the incomprehensibility of the world serves as a useful model for pursuing new knowledge. It also reminds us that our understanding of the world is constantly changing and ever expanding. Advancements to our understanding of the world depend on the ability to imagine the inconceivable.
Faculty Sponsor: Patrick Frierson

Bio II: Genes and Phenotypes

SCIENCE 159

Abbey Felley, *moderator*
Alex Brockman, *coach*

3 p.m. MADELINE BOYLE, Genetic Mechanisms of a New Phenotype in the Genus *Mimulus*

The genus *Mimulus* includes plants that produce a wide array of pigments in their flowers. Previous research has shown that some species of *Mimulus* produce similar pigments to each other yet use different mechanisms. Comparing these mechanisms may shed light on how evolution fundamentally works. *Mimulus naiandinus* produces pink flowers using the pigment anthocyanin. Prior studies identified the *Myb3a* anthocyanin gene as a prominent contributor affecting flower pigment in *M. naiandinus*. A RNAi transgene was constructed in order to knock down *Myb3a* in *M. naiandinus* and observe what effects the transgene had on pigment expression. Results suggest that *Myb3a* does significantly affect color pigmentation in the flowers of *M. naiandinus*.
Faculty Sponsor: Arielle Cooley

3:15 p.m. ELLEN HOM, Repeated Evolution of Petal Lobe Anthocyanin in *Mimulus*: Functional Tests of a Candidate Gene

Three species of Chilean *Mimulus* have independently evolved anthocyanins, pigments that cause red coloration in flower petals. This event is known as repeated evolution. I hope to determine whether *Myb5*, an anthocyanin-activating transcription factor gene, is sufficient to trigger petal pigmentation. I hypothesize that if overexpressing *Myb5* induces petal lobe anthocyanins, then *Myb5* is most likely sufficient for anthocyanin pigmentation. To this end, I have infiltrated an overexpression vector containing the *Myb5* gene into yellow-flowered *Mimulus cupreus* in order to produce transgenic seeds for study. I am also investigating two sequence variants found between genomic DNA and mRNA in *Mimulus luteus* var. *variegatus* and I have found that the variants seem to be the result of a post-transcriptional modification. Exploring the importance of these variants and repeated evolution in *Mimulus* creates an opportunity to study the molecular mechanisms of evolution.
Faculty Sponsor: Arielle Cooley

3:30 p.m. JACK TAYLOR, OWEN DAVIS-BOWER, ABBEY FELLEY, Data Analysis of Hybrid Monkeyflower Petal Images

Hybrid monkeyflowers *(Mimulus)* have yellow petals with randomly dispersed red spots. In order to better understand these spotting patterns, we utilized computer vision techniques to collect various data on images of hybrid monkeyflower petals. In our presentation, we explain our applications of Euclidean transformation estimation, enhanced correlation coefficient maximization and several other image processing techniques to identify characteristics such as vein density and to decompose clusters of overlapping spots into individual spots. We will then demonstrate the system that we designed and highlight its uses.
Faculty Sponsor: John Stratton

Environment: Awareness and Impacts

SCIENCE 100

Dylan Seidler, *moderator*
Sophie Grossman, *coach*

3 p.m. ALEX IZBIKY, BLAKE KILLINGSWORTH, Anchoring of Glacial Melt Estimates: How Malleable Are Our Beliefs About Climate Change?

Anchoring is a cognitive bias by which prior exposure to a value affects future estimates by "anchoring" an individual's estimate to the originally presented value. The anchoring effect has been found to influence decisions in a wide range of important situations, such as in buying a new home, negotiating a salary, or determining a criminal sentence. The influence of anchoring varies, depending on particular conditions. To address contradictions in prior research, we consider how the anchoring effect holds up over a time delay. We also consider how putting more thought into the anchor value impacts the degree of anchoring effect. We anticipate that our research will indicate that people can be effectively anchored even in ways that contradict their own stated belief in climate change. More broadly, our research will inform how we consume data in our everyday lives.
Faculty Sponsor: Wally Herbranson

3:15 p.m. CHLOE CAROTHERS-LISKE, Impact of Community Economic Identity on Environmental Consciousness in Urban and Rural Washington

My research examines strategies employed by culturally dominant industries in metropolitan Seattle and rural eastern Washington — technology and agriculture/hydropower, respectively — to achieve cultural significance in their communities and justify their right to pollute and otherwise impact the environment. I also explore how perception of and perspective on, environmental issues are shaped by the sociocultural dominance of a direct, land use-based industry such as agriculture, in one case and an industry — technology — generally divorced from land use in the other case. In my research, I employ a mixed methodology of content analysis and semi-structured interviews. I ask participants a variety of open-ended questions to guide our conversation and allow them the freedom to respond however they see fit.
Faculty Sponsor: Alissa Cordner

3:30 p.m. GRANT GALLAHER, Effects of Climate Change Simulations on Summertime Abundance and Ecosystem Functioning of the Red Alga *Neorhodomela oregona* in the Intertidal Zone of Sitka, Alaska

Throughout the 21st century and beyond, anthropogenic climate change will fundamentally alter our oceans and the ecological and social systems that depend on them. I seek to quantify how tide pools and their inhabitants in Sitka, Alaska will be impacted by climatic conditions predicted for the year 2100. Heat and CO_2 were artificially added to natural tide pools over a six-month period to illuminate the individual and interacting effects of these factors on intertidal biodiversity and ecosystem functioning. My analyses investigate how these manipulations impact growth cycles of the abundant red alga *Neorhodomela oregona* (Rhodomelaceae) and its relationship to ecosystem functioning through contributions to net community production and respiration. These insights will enhance efforts to make evidence-based conclusions, models and policy decisions regarding the future of our climate and planet.
Faculty Sponsor: Susanne Altermann

3:45 p.m. BLYTHE EICKERMAN, Nuclear Legacies: The Marshall Islands, Japan and Hanford

The Marshall Islands are the site of 67 nuclear tests conducted by the United States in the 1940s and 50s. This nuclear legacy connects the islands to Japan, the United States and, more specifically, Hanford, Washington. The effects of the nuclear tests are still felt by Marshall Islands communities. Minimal efforts have been made to publicize or fully document health and environmental effects as well as political and cultural implications of radioactivity on the islands. To better understand the nuclear past and present of the Marshall Islands, I conducted research that revealed impacts that are still felt to this day. I also discovered that the nuclear tests are not a stand-alone issue. In fact, the experience of displaced Marshall Islands populations is similar to that of Japanese *hibakusha* and Hanford downwinders. My research shows the importance of education about these events, all in support of anti-nuclear advocacy.
Faculty Sponsor: Shampa Biswas

4 p.m. DYLAN SEIDLER, Southern Resident Orcas and Chinook Salmon: The Importance of Historical Context in Addressing Population Crises

Southern resident orcas are a subspecies of *Orcinus orca* native to the Pacific Northwest. They rely on Chinook salmon for 80 percent of their diet. Chinook, in turn, connect southern resident orcas to the tribes of the Pacific Northwest, commercial fishermen, federal agencies and environmental organizations. These groups have very different relationships with southern residents and Chinook, thus they propose disparate solutions to the current population crisis. (Only 73 southern resident orcas remain.) My research focuses on the complex histories of Native Americans, commercial fishermen and local communities of the Pacific Northwest and how they intersect with Chinook and southern resident orcas. Southern resident orcas did not decline overnight; a combination of historical and environmental changes led to the current crisis. Therefore, any long-term solution must be one of collaboration based on thorough historical understanding.
Faculty Sponsor: Bina Arch

Great Performances

KIMBALL THEATRE

Ronja Mokranova, *moderator*
Heleana Backus, *coach*

3 p.m. MATT BIHRLE, Political Commentary Through Classical Music: Rzewski's "Winnsboro Cotton Mill Blues"

I perform Frederic Rzewski's "Winnsboro Cotton Mill Blues," a modern solo piano work based on a traditional blues of the same name. The original tune tells of the exploitative working conditions in the textile mills of North Carolina circa 1930. Conditions were hot, loud and inhumane. Entire families worked 60 hours a week, six days a week, for little pay. In this composition, Rzewski combines atonality, minimalism, blues and extended techniques to create an aural image of the mills. Mechanical rumblings in the bottom of the piano mimic the pounding of machines. The only respite from this unrelenting din comes from the voices of workers who sing a tranquil blues melody. Part of a set titled "North American Ballads," Rzewski's work takes an unflinching look at a troubling part of American history.
Faculty Sponsor: Jackie Wood

3:15 p.m. LIAM DUBAY, "Seven Sisters": Character Piece for Clarinet, Cello and Piano

"Seven Sisters," composed for clarinet, cello and piano, is a character piece that depicts the Pleiades star cluster. The opening theme, voiced by solo cello, is constructed from two related seven-tone rows that are inverted, retrograded, transposed and otherwise altered throughout the course of the piece. The ensuing material is divided into seven distinct sections, each of which represents one of the Pleiades sisters from Greek mythology. Each brief section attempts to capture the essential character of one of the sisters, incorporating melodic and rhythmic elements from the main theme in the process. The first section, representing the eldest sister, Maia, is composed only of transformations of the main tone rows. The following sections equally employ all seven pitches from the theme, but more loosely than in the first section. Before the work is performed, I will speak briefly about the compositional techniques I employed in each variation.
Faculty Sponsor: John David Earnest

3:30 p.m. RONJA MOKRANOVA, "Different Worlds": Suite for Flute, Cello and Piano

"Different Worlds," written for flute, cello and piano, comprises three movements and represents three perspectives on autism. The first movement is based on my father: a fast, rhythmically driven representation of family chaos caused by the unpredictable interactions of a father and his autistic son. A fragmented flute solo and sudden changes of meter augment the feeling of disorientation. The second movement depicts my mother and conveys pain, helplessness and hope. Lyrical themes supported by a gentle rhythmic figure in the piano characterize the opening section; an agitated middle section follows. The movement ends with a return to the lyricism of the opening. The third movement represents my brother: what the world looks like through the lens of autism. A sense of frustration is emphasized by rapid changes in dynamics and rhythmic energy. The purpose of my suite is to raise awareness of autism by sharing my family story.
Faculty Sponsor: John David Earnest

Outdoor Engagements

REID G02

Clauds Bueermann, *moderator*
Jonathan Falk, *coach*

3 p.m. DAVID LILBURN, Outdoorsyness? Who's In and Who's Out

What is outdoorsyness? What do we mean when we call someone outdoorsy? What effect does being outdoorsy have on us socially and on the world around us environmentally? My presentation attempts to answer these questions through data from interviews and surveys that I conducted for my thesis research. My research finds that, while outdoorsyness seems like a relatively straightforward measure of one's skill in the outdoors, the reality is that a multitude of seemingly unrelated factors, such as language, class and race, play vital roles in how we perceive and define outdoorsyness. My presentation calls attention to these factors and others that affect our perception of outdoorsyness. Through my research, I hope to shed light on the impact that this seemingly omnipresent identity has on our campus community.
Faculty Sponsor: Alissa Cordner

3:15 p.m. ADAM ROONEY, Study with Practice: Leadership in the Outdoors

My presentation examines leadership broadly and in the context of Whitman's Outdoors Program. The Outdoor Leadership curriculum at Whitman pairs leadership study with leadership practice to help students grow as leaders. Outdoor Leadership courses introduce students to effective leadership strategies. Two multiday backcountry trips serve as ideal opportunities to apply leadership skills learned in the classroom. They also provide the time and space for individual reflection and further learning. Multiday outdoor trips require group organization and collaboration. In the experience of a trip, everyone acts as a leader in some way. Students practice teaching, self-reflection and feedback to improve as leaders.
Faculty Sponsor: Stuart Chapin

3:30 p.m. CLAUDS BUEERMANN, Outdoor Recreation on Sacred Sites: History, Tension and Search for Agreement

My presentation focuses on research I conducted on the overlap of popular outdoor climbing sites in the Walla Walla Valley and sites deemed sacred or valuable to indigenous peoples in the region. I consider the political tension between outdoor recreation communities and indigenous communities over land use. I explore the history, cultural significance and stories of these areas for all who use them. My research will be compiled in a series of podcasts available to the community. In considering the treatment of landscapes through two perspectives—as recreational areas or as sacred spaces—I aim to foster mutual understanding across groups about how meaning and value are attached to these lands.
Faculty Sponsor: Suzanne Morrissey

Dance Theatre • *Tanztheater* (German Expressionist Dance)

2 P.M., DANCE STUDIO

Augusta Drumheller, Sophia Strabo

How is avant-garde dance at an amateur level created, performed and received? As an extension of previous performances in the tradition of *Tanztheater* ("dance theater"), Whitman students Augusta Drumheller and Sophia Strabo have created a program that explores this performance form, which grew out of the German expressionist dance movement in Weimar and Vienna. *Tanztheater* combines dance, speaking, singing, chanting, conventional theater and the use of props, sets and costumes, all in an integrated event. This event features a performance by Drumheller and Strabo followed by a presentation of research and an open discussion between performers and audience. The choreography, six months in the making, depicts relationships of memory and presence.
Faculty Sponsor: Peter de Grasse

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RESEARCH FUNDING SOURCES

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OFF-CAMPUS STUDY PROGRAMS

Eli Baez
SIT: Indonesia Arts, Religion and Social Change

Matt Bihrle
SEA Semester: The Global Ocean

Benny Jean Cytrynbaum
SFS: Turks and Caicos Marine Resource Studies

Tori Londrigan
SFS: Cambodia Conservation, Ethics and Environmental Change

Sophie Love
SFS: Tanzania Wildlife Management Studies

Laurel Richardson
CIEE: Monteverde Tropical Ecology and Conservation

Olivia Steinmetz
CIEE: Monteverde Tropical Ecology and Conservation

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UNDERGRADUATE CONFERENCE VENUES

1. **Cordiner Hall**
2. **Reid Campus Center**
   G02
3. **Hall of Science**
   100 (Brattain Auditorium)
   159
4. **Olin Hall**
   129
   138
5. **Hunter Conservatory**
   Kimball Theatre

● accessible entrance (with power door) ○ accessible entrance (without power door)

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