20TH ANNUAL WHITMAN COLLEGE UNDERGRADUATE CONFERENCE

WUC 18

Humanities & Arts · Natural Sciences · Social Sciences · Mathematics

Welcome to the 20th edition of the Whitman Undergraduate Conference. In the span of two decades, more than 3,000 students have shared their scholarship and creativity in this all-day, student-led event, a signature program of the college.

Over the course of 19 conferences, panel themes have ranged from Race and Representation to Women and Discrimination to Brain Matters to Bioenvironment to Television and Its Discontents. Poster sessions that capture student research in the natural and social sciences are a key component of each conference. This year a record 55 students are presenting posters in Cordiner Hall.

The Undergraduate Conference is an exhilaration devoted entirely to student achievement. Participants represent every academic nook and cranny of the college. The projects in this program attest to the original work that Whitman students produce in their courses of study, senior theses, internships, fellowships, grants and study abroad.

Whitman College

UNDERGRADUATE CONFERENCE APRIL 10, 2018

MUSICAL PERFORMANCES

WUC chamber ensembles
AMY DODDS, DIRECTOR

Ensemble I
Aiyana Mehta '18: "Vienna" from "Postcards from Europe"
Jack Fleming, violin
Abby Herrick, viola
Liam Dubay, cello

Ensemble II
Aleksandr Glazunov: String Quintet in A Major, Op. 39 (Scherzo)
Joshua Meling and Jack Fleming, violins
Abby Herrick, viola
Erin Cunningham and Liam Dubay, cellos

WUC jazz ensembles

Jazz Ensemble I
DOUG SCARBOROUGH, DIRECTOR
Taka Olds – alto sax
Clara Wheeler – alto sax
Daniel Leong – tenor sax
Emma Saas – tenor sax
Perth Sethapanichsakul – baritone sax
Jeffrey Gustaveson, trumpet
James Bogley, trumpet
Kevin Getty, trumpet
Claire McHale, trumpet
Aiyana Mehta, trombone
Liam Twomey, trombone
Cello Lockwood, trombone
Finn Henell, bass
Spencer Thulin, piano
Jake Barokas, guitar
James O'Brien, bass
Steven Aslin, drums
Eve Goldman, vocals

Jazz Ensemble II
GARY GEMBERLING, DIRECTOR
Ted Liu, alto and baritone sax
Alie Zagata, alto sax
Clara Wheeler, tenor sax
Scott Nonweiller, trumpet
Nate Miller, trumpet
Katie Watkins, trumpet
Eva Sullivan, trombone
Raffi Lepejian, trombone
Anna Brown, violin
Meredith Cranston, piano
Grant Simmons, piano
Suzanna Officer, piano and vocals
Cory Cogley, bass
Noah Dunn, drums
Angie Mead, drums

SCHEDULE
Tuesday, April 10, 2018

8:15 a.m.
BREAKFAST
Reid Campus Center

9–10:15 a.m.
SESSION 1

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

10:45 a.m.–Noon
SESSION 2

Noon–1 p.m.
LUNCH, ALL-CAMPUS
Reid Campus Center

1–2 p.m.
POSTER SESSION
Cordiner Hall Foyer

2–3:15 p.m.
SESSION 3

3:15–3:45 p.m.
AFTERNOON INTERMISSION
Reid Campus Center

3:45–5 p.m.
SESSION 4

		OLIN 138	OLIN 129	SCIENCE 159
S1	**SESSION 1**	**Incarceration (group panel)**	**Cat, Mouse & Mind**	**Diet & Exercise**
	9:00 AM	Kendra Winchester Lily Parker Mira Skladany*	Richard Farman Camille Anderson Riley Worthington	Nick Horst
	9:15 AM		Zach Rahmes Danica Wilbanks	Noah Cavanaugh
	9:30 AM		Bayard Blair	Bari Scott
	9:45 AM		Sarah Vesneske	Audrey Benner, Abbey Dias*
	10:00 AM		Katie Davie Gokay Abaci Anneka Sonstroem*	
	Coaches	**Mary Tabb**	**Emily Krank**	**Nikki Delgado**
S2	**SESSION 2**	**Women & Norms**	**Institutions & Protocol**	**Genes, Cells, Germs**
	10:45 AM	Rachel Loe	Liz Chenok	Kuenzang Om
	11:00 AM	Kaitie Dong	Mary Tabb	Jeanette Schwensen
	11:15 AM	Elle Pollock	Logan Schmidt	Amanda Mercer
	11:30 AM	Sabrina Salkind	Conor Scanlon Daniel Charlton*	Robin Rounthwaite
	11:45 AM	Meg Weisselberg*		Annie Richardson*
	Coaches	**Anne Elise Kopta**	**Marlene Anderson**	**Megan Waldau**
S3	**SESSION 3**	**Syrian War (group panel)**	**Children & Family**	**Chemical Matters**
	2:00 PM	James Baker Rhiann Robson Henry Honzel Tess Francavilla*	Mia Letterie	Jessica Luong
	2:15 PM		Emily Johnson Lexi Davirro	Deepraj Pawar Samuel Erickson
	2:30 PM		Rachel Leiter	William Mendelsohn
	2:45 PM		Hannah Bashevkin*	Brad Kline
	3:00 PM			Ashley Person*
	Coaches	**Helena Platt**	**Danica Wilbanks**	**Evan Romasco-Kelly**
S4	**SESSION 4**	**Whitman & Education**	**Language, Culture, Critique**	**Physics & Infinity**
	3:45 PM	Caroline Bauwens	Megan Hearst	Kaitlin Harrison Brian Wu
	4:00 PM	Megumi Rierson	Jane Kern	Gabe Juul
	4:15 PM	Zan McPherson	David Lilburn	Olivia Gilbert*
	4:30 PM	Grace Fritzke*	Zuhra Amini*	
	4:45 PM			
	Coaches	**Megan Waldau**	**Erick Franklund**	**Ben Freedman**

PANEL SCHEDULE

SCIENCE 100 BRATTAIN AUDITORIUM	KIMBALL THEATRE	REID G02
Vaccine (group panel)	**Rilke**	**Gender & Behavior**
Natalie Thiel Maddy Maker Jenna Gilbert Taylor Salaguinto Brahm Coler*	Olivia Gilbert Paige Dempsey Nolan Bishop Maxx Fidalgo*	Zach Collins
		Hailey Mount
		Emily Bauer
		Alaina Jacobsen*
Segun Sodipo	**Izzy Sherwood-Reid**	**Aly Counsell**
Geologic Discovery	**Modern/Postmodern**	**International Issues**
Sela Patterson	Peter Feehan	Brooke Terkovich
Jessie Bersson	Natalie Godfrey	Chris Meabe*
Silas Morgan	Sage Malecki	
Sarah Strozyk Mckenzie Elliott	Elise Feider*	
Sarah Dunn*		
Daniel Pailthorp	**Erick Franklund**	**Ben Freedman**
Land & Sea	**Music Studies**	
Lizzi Wong	Austin Kamin	
Juliana Ozur	Andy Bainton	
Kaeley Pilichowski	Madison Wray	
Margaret Miller-Bartley	Signe Lindquist*	
Devin Reese*		
Segun Sodipo	**Anne Elise Kopta**	
Enviromental Studies	**Great Performances**	
Kathleen Daly-Jensen Kristina Jackson Tristan Cates	Dan Lovato	
Evan Romasco-Kelly	Robby Boyer	
Maddy Poehlein	Cory Cogley	
Elizabeth Greenfield*	Hunter Dunn	
	Gabe Merrill-Steskal*	
Emily Krank	**Izzy Sherwood-Reid**	

* moderator

POSTER SESSION
1-2p.m., Cordiner Hall

NIKKI ANTENUCCI, MOLLY EVERED, KAILEAH AKKER, *Closing the Gap: Impact of Parental Warmth on Children's Social Competence*
Children living in poverty are more likely than their wealthy peers to experience social rejection. Some interventionists have attempted to close this gap by focusing on teaching children social skills. Another possible point of intervention lies within families. Parental warmth has been linked to children's social competence in past psychological research; it may be that parental warmth moderates the relationship between socioeconomic status and social competence. Our study was designed to explore whether parental warmth might be able to close the socioeconomic gap in social rejection. To investigate these questions, 6- to 9-year-old children and their parents were recruited from the greater Walla Walla area to participate in this multi-method study. Parents and children completed measures of parental practices and children's social competence. The implications include intervention strategies that target children's social and emotional learning skills, parents' parenting practices and social policies.
Faculty Sponsor: Erin Pahlke

CATHERINE BARTON, *What Are Those Tiny Insects by the Railroad Tracks? Pollen Collecting and Feeding by a Native Sweat Bee on Whitman's Campus*
Recent studies show that in solitary bees the adult female regularly feeds on pollen. No data are available for semi-social bees. We investigated pollen feeding and pollen collecting by females of the widely-distributed socially polymorphic sweat bee *Halictus rubicundus*, focusing on a population nesting on the Whitman campus. Bees were collected during their summer flight season in 2016 and 2017. Specimens were dissected to remove pollen from the digestive tract, and externally-collected pollen was scraped off of their legs. All pollen was identified to plant species using a reference pollen collection of nearby plants. Individual females varied widely in plant species used as pollen sources to meet their own nutritional needs and to provision their nests. Patterns in pollen use also varied across the summer. The generalist foraging strategy of this bee species helps explain its high success and wide distribution given ongoing alterations and fragmentation of native habitat.
Faculty Sponsor: Heidi Dobson

CATHLEEN BELIVEAU, *Bactericidal Permeability Increasing Protein and Autoimmunity in Cystic Fibrosis Patients*
Bactericidal permeability increasing protein (BPI) is an important antimicrobial compound used in the human immune response against gram-negative bacteria. An autoimmune response against BPI in cystic fibrosis patients has been previously shown to be associated with worsening disease progression. My study investigates the relationship between an autoimmune response against BPI and infection by the gram-negative bacteria *Pseudomonas aeruginosa*. Presence of antibodies against BPI can interfere with neutrophil-mediated killing of *P. aeruginosa*, and therefore autoreactivity to BPI can serve as a possible marker of disease progression and a potential therapeutic target in cystic fibrosis patients.
Faculty Sponsor: Susanne Altermann

LEO BEREZ, *Fullerene Energy Structure Modification*
Endohedral fullerenes can be doped with a range of metals and non-metals. We created erbium-doped C60 to observe how modifying the C60 cage changes the emission behavior of the enclosed atom. We also developed a method of producing soluble fullerenes and observed their spectra.
Faculty Sponsor: Kurt Hoffman

ANNALISE BOND, *Ketogenic Diet Influences on Insulin Receptor Expression in the Caudal Hippocampus*
The ketogenic diet (KD) has long been used to treat epilepsy when traditional methods fail. However, the mechanism of action is not well understood. Previous work has shown a decreased expression of insulin receptors in parts of the hypothalamus, entorhinal cortex and dentate gyrus as a result of this treatment. To add to this research, we tested insulin receptor expression in the Caudal CA3 of the hippocampus in rats fed normal chow and rats fed the KD. Using a color deconvolution and subtraction method of analysis on ImageJ, we found no significant difference in this region or in other regions of the brain. However, we did find a trend of decreased insulin receptor expression that was unique to the caudal region of the hippocampus.
Faculty Sponsor: Leena Knight

SHANTI BORLING, *Acoustical Impedance Measurement and Modeling of Horns*
The primary aim of our research was to explore the acoustical properties of simple horns made from hardware store materials. The project included experimental and theoretical components. The experimental component involved fabricating a rudimentary acoustical impedance sensor and measuring the impedance of the tubes we constructed. The theoretical component involved modeling these tubes and numerically solving the impedance equations utilizing Mathematica. We present comparisons of the modeling work to the measured data.
Faculty Sponsor: Kurt Hoffman

EMILY BOWEN, *A Reverse Genetics Approach to Understanding the Function of PIN Proteins in Maize Auxin Transport*
Just as humans need hormones to do weird things like grow armpit

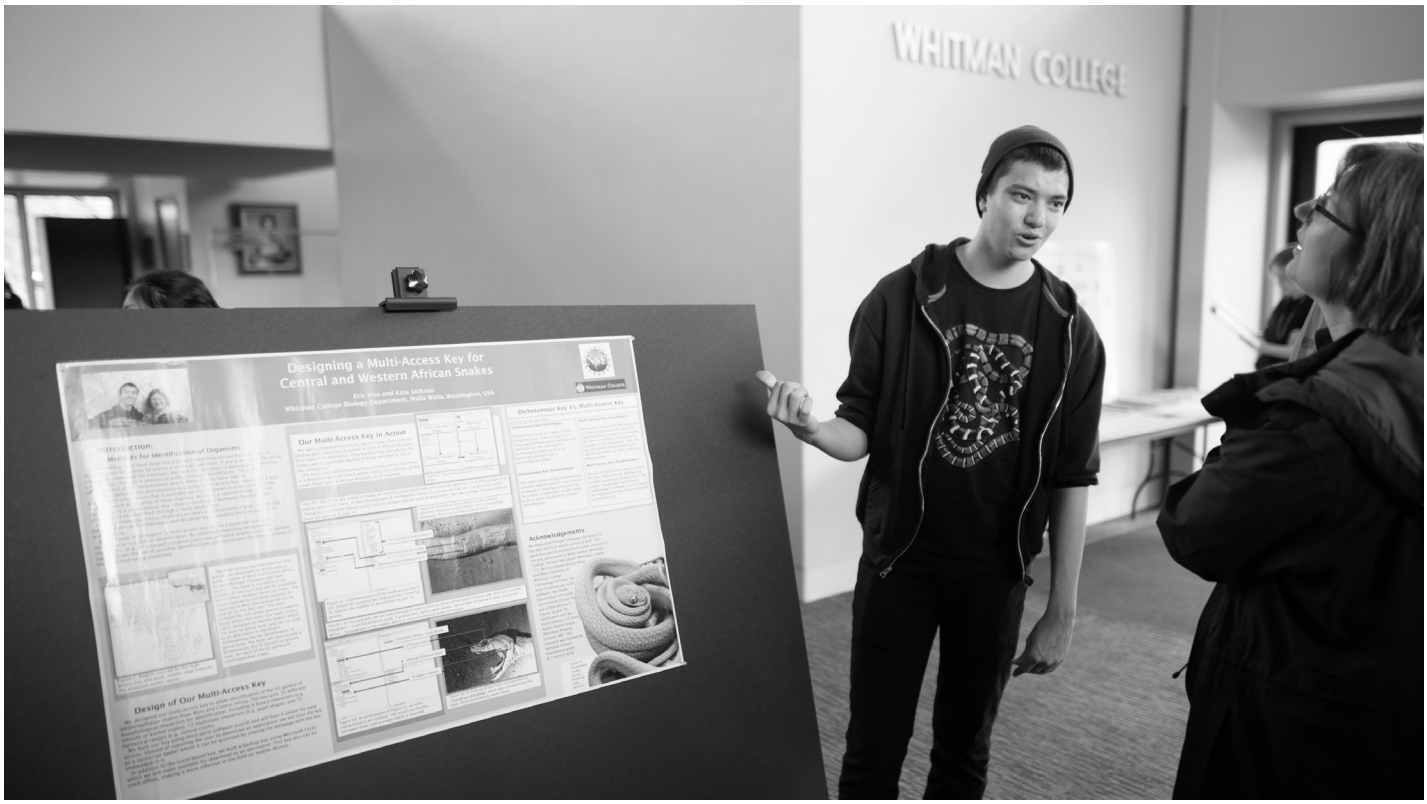

REASING SEX-ED ACCESSIBILITY AT LINCOLN HIGH SCHOOL

hair, deepen their voice and develop acne all over their face, plants also require hormones for their growth and development. While plants get to miss out on all the fun stuff like menstrual cycles, mood swings and pimples, they do experience growth spurts and have to develop male and female parts. One plant hormone, auxin, is vital for cell growth and development. Importantly, auxin needs help getting transported to where it needs to go. Auxin transporter proteins help pass auxin across cell membranes and direct it toward the tips of shoots and roots to promote elongation and branching. Two versions of auxin transporter proteins in Zea mays (maize) were studied in my project. It's important to study and better understand the auxin signaling-system in plants like corn because of the possible implications for agricultural advancement and crop improvement.
Faculty Sponsor: Brit Moss

KRISTIN BRADY, *Components of Radio Observations of the August 21, 2017 Solar Eclipse*
Solar eclipses provide excellent opportunities to study the corona, the sun's outer atmosphere, which is otherwise overpowered by the light emitted from the photosphere. The Pisgah Astronomical Research Institute (PARI) in Rosman, N.C. was in the path of totality for the solar eclipse on August 21, 2017. PARI has four radio telescopes: two with dish diameters of 26 meters, one measuring 12 meters and another measuring 4.6 meters. Prior to the eclipse, I tested new 1420 MHz receivers that allowed us to observe neutral hydrogen by the 21-cm spectral line. Observations of the sun during the eclipse were made to investigate the presence and location of neutral hydrogen in the corona. I assisted in equipping the telescopes with the 1420 MHz receivers and developed an observation plan for the instruments for use during the 2017 eclipse.
Faculty Sponsor: Andrea Dobson

ALEX BRETTMANN, *Geochemistry and Mineralogy of Miocene Concretions*
We conducted geochemical and mineralogical analyses of concretions in marine shale of the Miocene Astoria Formation in northwestern Oregon. These concretions have three distinct layers that differ in thickness, color and grain size. The first layer is a rust-colored outer rim or "crust" 0.5 – 1 cm thick (maybe due to weathering). Beneath is a gray middle layer, or "mantle," ranging in thickness from 2-5 cm. The brownish innermost portion, or "core," ranges in thickness from 1-3 cm. In contrast to the clay-sized particles of the crust and mantle, the core is sandy. Cross-sections of the elongate cores range from square to circular. Generally, the core is the most resistant to weathering and abrasion, suggesting that the core differs from the mantle and crust geochemically and mineralogically.
Faculty Sponsor: Pride Abongwa, Bob Carson

LINDSEY BRODECK, *Community Bee-Flower Interactions in the Water-Wise Garden*
Washington state has at least 600 native bee species, but there are few community studies of bees in eastern Washington. To document bee fauna on the Whitman College campus, we collected bees visiting the native plants in the Water-Wise Garden during the summers of 2016 and 2017, and recorded their flower-visiting patterns across day and season. Bee visitation varied widely by plant species, with certain flowers attracting much greater numbers of bees than others. Bee activity on flowers was most concentrated during the first half of the day. These findings show that native landscaping on the Whitman College campus supports a measurable population of wild native bees and suggests that, through targeted plantings, we can promote and enhance habitat for currently decreasing native pollinators.
Faculty Sponsor: Heidi Dobson



NOAH CAVANAUGH, *Politics and Morality: The Effect of Political Ideology on Moral Decision-Making*
According to Lane and Sulikowski (2017), political orientation is related to the frequency with which a person relies on either emotional/intuitive or logically reasoned processes when making moral judgments. My study is designed to build on this idea, focusing on the differences in moral decision-making between liberal and conservative people. Participants were first given the Cognitive Reflection Test (CRT) to assess their intuitive/fast System 1 processing and rational/slow System 2 processing abilities. Reaction times were collected when participants made decisions on personal moral dilemmas. For cognitive load (total mental effort used by working memory) trials, participants held a complex dot pattern in mind, and no load was applied in the baseline trials. I predicted that liberals would respond slower than conservatives in the load condition, and that there would be no significant difference between reaction times in the no-load condition.
Faculty Sponsor: Matthew Prull

KAYLA CHANG, *Comparing Injury Response Pathways in Regenerative and Non-Regenerative Mammalian Tissue to Identify Mechanisms that Enable Regeneration*
Like most mammals, humans fail to regenerate many tissues. One barrier to regeneration is the formation of scar tissue. The African spiny mouse, *Acomys*, is unusual in that it does not form scar tissue, and can regrow many tissues, offering a mammalian model to study regeneration. To provide clues into the molecular events that enable new tissue growth, my research compared *Acomys* with mice that do not show the same regenerative capacity. Blood coagulation is one of the first events after injury, so we tested how cells respond to thrombin, an enzyme involved in coagulation. Our screen analyzed proteins involved in cell growth, differentiation, proliferation and scar tissue formation. Only one, Sox-9, was significantly increased in *Acomys* after thrombin treatment. This work might reveal important divergences in regeneration potential among mammals and offers a new approach to identify treatments that stimulate tissue growth.
Faculty Sponsor: Ginger Withers

DANIEL CHARLTON, *Effects of HIV-1 Tat W11A Substitution on the Expression, Transactivation and Encapsidation of Tat in Exosomes*
Across the globe, 37 million individuals are infected with HIV/AIDS. Although Clade B is the best studied strain of HIV-1, Clade C infects the largest population worldwide. This study focused on the HIV-1 Tat protein, which is an essential transcriptional regulator of HIV-1 replication and is secreted out of HIV-1 infected cells as a free protein. Tat can be taken up by nearby unaffected bystander cells and has been shown to be neurovirulent and induce synaptodendritic injury. In this study, we examined if the W11 residue in Tat from HIV-1 Clade B and HIV-1 Clade C played a significant role in Tat expression, Tat transactivation and the encapsidation of Tat in exosomes. Our results suggest that the W11 residue in Tat-B may be required for encapsidation in exosomes, and therefore that this W11 residue may affect the ability of HIV-1 Tat to reach its target cells.
Faculty Sponsor: Jim Russo

JASPER CRUSBERG, *Deficits in Vestibular Ocular Reflex as a Result of Mild Traumatic Brain Injury*
Sport-related concussions are an example of mild traumatic brain injury, or mTBI, that affects millions of athletes every year. There is still a great deal of information that remains unknown regarding sport-related concussions. One of the most prevalent problems is the lack of understanding in effectively and efficiently diagnosing them. If a concussion goes undiagnosed or the athlete returns to play before recovery, the athlete is vulnerable to serious long-term neurological damage. Our study aims to develop a definitive method of diagnosing concussions. It included video-oculography, with a saccade and antisaccade task, to measure combined eye and head gaze shifts. We analyzed the differences in VOR gain between concussed subjects and non-concussed subjects to determine if concussed subjects had a deficiency of the VOR after sustaining a concussion. We hypothesized that VOR gain would be lower post-concussion and that we could use this as a tool for diagnosing concussions.
Faculty Sponsor: Thomas Knight

SHELBY CUTTER, *Pre-Restoration Survey of the Hutchison Reach on the Walla Walla River*
In summer 2017, I worked on a pre-restoration survey of a reach of the south fork of the Walla Walla River. The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) are restoring sections of the Walla Walla River to enhance aquatic habitat. Pre- and post-restoration surveys are important to determine if the restoration achieved its purpose, which in this case is to provide habitat for anadromous fish such as steelhead. The river has been straightened and pushed to the south side of the valley floor over the past century. The river now has high velocity, which causes channel bed material to be large. Both factors diminish fish-spawning habitat. The proposed restoration will add more channels, which will provide more high-quality fish habitat.
Faculty Sponsor: Lyman Persico

KATIE DAVIDSON, *Gonad and Sexual Phase Response to Environmental Stressors in Puget Sound Populations of the Olympia Oyster Ostrea lurida*
The Olympia oyster (*Ostrea lurida*) is the only oyster native to the western coast of Canada and the United States. Historically, the Olympia oyster played major ecologic and economic roles in the Pacific Northwest. With increasing global temperatures and decreasing seawater pH, implementation of oyster restoration is compromised. My study examines the gonad tissue of Olympia oysters that originate from four populations in Puget Sound. The oysters were experimentally exposed to temperature and pH stressors. Examination of oyster population sex ratios and stages of maturation under these environmental stressors gives insight into the populations that may be most resistant to climate change. This information could inform long-term restoration efforts and facilitate successful breeding of aquaculture.
Faculty Sponsor: Susanne Altermann

CAROLINE DICKEY, *Using Geochemical Analysis to Investigate Akuugan Village Sites in the Aleutian Islands, Alaska*
The Islands of Four Mountains (IFM) lie in the eastern Aleutians, a volcanic island archipelago off the southwestern peninsula of Alaska. These islands began and remain a place of environmental hazard, with threats of volcanoes, debris flows and tsunamis, yet the Akuugun, a population native to the island chain, lived here for thousands of years. Using geochemical analysis, we investigated

amounts of carbon, nitrogen and phosphorus in soil layers to better understand times of human occupation and environmental hazard. For example, an increase in phosphorus might indicate the presence of humans by their food (primarily bone remains) by leaving chemical traces of phosphorus within a layer. Understanding their history through interdisciplinary research helps bring the Akuugun story of resilience in the face of environmental challenges to light and provides insight into the transformations of the IFM environment.
Faculty Sponsor: Kirsten Nicolaysen

MIRA ENGEL, *Eye-tracking Study of the Acquisition and Extinction of Attentional Bias for Danger Cues*
Fear is a basic emotion that helps us respond adaptively in dangerous situations. Fearfulness in humans exists on a spectrum, with anxiety disorders that involve too much fear at one extreme, and externalizing disorders (e.g., psychopathy) that involve too little fear at the other extreme. Pavlovian fear conditioning research may provide insight into the origins of disorders characterized by abnormal fear levels. In this research, conditioned fear-responding tends to be measured through autonomic arousal. However, recent research has found conditioned fear-responding at the level of attention, with an "attentional bias" developing for stimuli associated with threats. My study incorporates eye-tracking to examine how fear-learning alters attention allocation to conditioned stimuli at both early and late stages of processing. In addition, we examine how anxiety sensitivity and fearlessness influence the learning of attentional biases for conditioned fear stimuli.
Faculty Sponsor: Tom Armstrong

MEGHAN FELDMAN, *Detecting Nonlocal Correlated Errors: Bob Gets Caught Faking a Bell-Inequality Violation*
Alice and Bob want to share information securely using a quantum key derived from a pair of entangled photons. Using this key, their information would be nearly impossible to steal. This key is only secure, though, if the two photons are truly entangled. Checking that the photons violate a Bell inequality would seem to indicate that they are entangled, but under certain circumstances, the Bell inequality can be falsely violated, meaning that the photons appear to be entangled when they actually are not. This would result in the encryption not being secure. However, our experiments show that state-preparation-and-measurement (SPAM) tomography can determine if a Bell inequality is falsely violated, allowing someone to verify the security of their quantum key.
Faculty Sponsor: Mark Beck

JENNA GILBERT, *Differential Gene Expression of Porcine Enterocytes Treated with hLZ Transgenic Goat Milk*
My research involved data analysis to identify how exposure to milk with varying levels of lysozyme affects gene expression in enterocytes. Previous studies reveal that milk with higher levels of lysozyme reduces symptoms of E. coli gastrointestinal infection in pigs in addition to inducing morphological changes to the small intestine. I analyzed RNA-sequencing data to discover differentially expressed genetic pathways between enterocytes treated with milk of varying levels of lysozyme. Looking into these genetic pathways may provide insight into the phenotypic variation noted in in-vivo studies. My research has implications for gastrointestinal health because it considers how adjusted levels of lysozyme could serve as a dietary supplement that might reduce the risk of gastrointestinal infection or relieve symptoms of inflammatory bowel disease.
Faculty Sponsor: Ryan Arvidson

MAX HANSON, *Targeting NK Cell Activation Against Tumors with IL-15 Genetically Engineered Macrophages*
What if we could avoid the harmful side effects that come with chemotherapy and radiation, and were able to train our bodies to be better suited to fight off cancerous cells? Immunotherapy is a form of cancer research that aims to accomplish this very task. By training the body's immune cells to better recognize and attack cancer cells through genetic engineering, immunotherapy seeks to revolutionize cancer treatment. Over the past two summers, I have worked in the lab of Dr. Courtney Crane at the Seattle Children's Research Institute to develop macrophages that will enhance immune response. The goal of this research is to provide new tools for stimulating the anti-tumor immune response in cancer patients.
Faculty Sponsor: Chris Wallace

ANDREW HARVEY, *A Prototype Mobile Application to Guide Speech Rehearsal*
Our summer research culminated in the creation of a prototype mobile application designed to guide users through speech rehearsal techniques and strategies. We began with background research in the areas of persuasive technologies, user-centered design and public speaking. To design our app, we employed user-centered design processes such as storyboarding and paper prototyping. From there, we created a functional prototype of our Android app using Thunkable, a web-based platform that allowed us to easily prototype our app without having to learn all of the nuances of Android development. Once our prototype was completed, we conducted two rounds of user studies and observed as users made their way through the app. By the end of the summer we had reached the limits of Thunkable. Next steps include an implementation in the Android framework and development of a natural language processing (NLP) back end.
Faculty Sponsor: Janet Davis

JANELLE HEITMEIER, *Population and Orientation Analysis of Europa's Single and Double Ridges*
Europa, one of Jupiter's moons, is an icy satellite with a liquid water ocean under its crust. This makes Europa a prime candidate for life beyond Earth. One barrier to determination is the lack of data for Europa: less than 11 percent of the surface has been imaged at a high resolution. Much current analysis focuses on a few, very high-resolution images rather than on the entire, imaged surface. This imagery reveals that Europa's most ubiquitous features are linear single and double ridges that crisscross the surface of the moon. However, we do not yet have a concrete understanding of their formation mechanism. In my study, I map single and double ridges along transects at varying latitudes. By analyzing the population and orientation of each feature type, I hope to identify the extent to which ridge formation is correlated to latitude, as expected if ridges are formed by tidal forces.
Faculty Sponsor: Nick Bader, Andrea Dobson

ERIN HENNESSEY, *Pressure Adaptations in Gelatinous Deep Sea Organisms*
Trimethylamine oxide (TMAO), the source of marine fishy odor, has been shown to act as a protein stabilizer that counteracts the effects of hydrostatic pressure in deep-sea fishes and crustaceans. We analyzed TMAO with respect to depth and taxon in common but poorly studied gelatinous animals: Ctenophores (comb-jellies) and the Cnidarian classes Hydrozoa (hydromedusae jellyfish stages) plus Scyphozoa (true jellyfish). Traditionally thought to be closely related to Cnidaria, Ctenophores have recently become controversial in terms of evolutionary origin. We hypothesized that, as in fishes, TMAO levels in these animals increase with depth. This was true in Scyphozoa, but not in Ctenophora and Hydrozoa. However, both Cnidarian groups had moderate to high levels of TMAO, while Ctenophores had little to none. These results may add support for the recent hypothesis that Ctenophora are the sister taxa to all other animals.
Faculty Sponsor: Paul Yancey

GREG HOF, *Role of the CB11 Cluster in Reaction Catalysis*
CB11H12-, a stable negatively charged cluster composed of carbon, boron and hydrogen, has been investigated as a starting material for the synthesis of new, high-performance catalysts for chemical reactions. Most catalytic activity is carried out by molecules with positive charges. A counterbalancing negative charge is required for stability, but for most molecules the negative charges are localized and can attach to molecules with positive charges, reducing their catalytic activity. The CB11 cluster has a unique bonding framework that distributes the negative charge over many atoms, giving a positively charged molecule no convenient place to attach. As a result, the positively charged molecule is weakly held and much more chemically available to catalyze reactions. Some catalytic species already studied include derivatives of lithium, silicon, gold, silver and other metal ions, paired with a number of derivatives of the CB11 cluster.
Faculty Sponsor: Mark Juhasz

BRADEN HUSSEY, *Review of the Current State of Organophosphate Insecticides*
About 60 years ago, newly discovered synthetic organic nerve poisons killed almost any pest, anywhere. Few organic and botanical insecticides available earlier were joined by hundreds of synthetic organics. This became the turning point for pest control. Pests of agriculture and public health in developed countries were adequately controlled and nearly eradicated. With years of development, a succession of organic compounds led research toward heavily phosphorylated compounds known today as organophosphates (OP). This revolutionary class of pest controlling agents functions primarily through irreversible inhibition of Acetylcholinesterase (AChE). Exposure results in overstimulation of muscarinic receptors, which induces "cholinergic syndrome." Detectable exposure leads to a series of health complications, with extensive research suggesting major complications in developing brains. Early discovery of AChE inhibition led to development of insecticides and nerve agents. The primary target for OPs remains AChE. However, underlying mechanisms remain an area of great interest.
Faculty Sponsor: Frank Dunnivant

ALICE KESLER, *Similarities and Differences Between Mammography Screening Programs in Europe, Canada and the U.S.*
Breast cancer is the most prevalent cancer in women. Since 1975, countries have begun to implement initiatives to reduce breast cancer mortality rates. Most countries in Europe have implemented organized screening programs that follow European quality assurance guidelines to standardize breast cancer screening procedures. Similar to European countries, the U.S. and Canada have screening programs with their own sets of guidelines. Studies from PubMed were used to evaluate the screening programs in this review. A timeline of screening program implementation dates, a map of differences between screening programs in Europe and a graph of participation rates was created. Very little variation was found in guideline adherence, and program participation was found in European and North American countries. To reduce mortality rates, it is essential for more countries to implement the standardized guidelines as well as provide patient education.
Faculty Sponsor: Chris Wallace

CHANEL KNIGHT, *Using High-Temperature Growth Conditions to Investigate PIRL Gene Functions in Arabidopsis thaliana*
Plant Intracellular Ras-group LRR (PIRL) genes are a family of nine genes discovered in the Arabidopsis thaliana genome sequence. The goal of this research was to investigate if the PIRL3, PIRL7, and PIRL9 genes are involved in pollen development and organization by analyzing the phenotypic effects of higher temperature on the pollen of plants harboring PIRL3, PIRL7, and PIRL9 knockout mutations. We predicted that the PIRL mutants would be more susceptible to heat, and that these heat treatments would augment their mutant phenotypes. Wild-type and PIRL3, PIRL7 and PIRL9 knockout mutant plants were grown in both standard (22° day, 16° night) and high-temperature conditions (30° day, 16° night). We used Alexander staining to screen for viable and inviable pollen, and used confocal microscopy to analyze the nuclear DNA and the exine (outer) layer. We found that the heat treatment did affect the phenotypes of the PIRL mutant plants.
Faculty Sponsor: Dan Vernon, Nancy Forsthoefel

KAIA KNUTSEN, *Effects of Sport-Related Concussion on Head-Free Antisaccade Task Metrics*
Currently, there is no diagnostic test that can detect concussion in all cases. Symptoms of sport-related concussions are prevalent and dangerous. Accordingly, we used the antisaccade task (a visuomotor task where subjects focus their gaze away from a stimulus) to analyze differences in five metrics between preseason and post-concussion. Our methods are unique in that we use a head-free paradigm, which is more natural and gives the subject a larger range of motion. We analyzed data from three concussed Whitman women soccer players this year and three controls, along with data from three concussed players from 2015. We hope that our research will uncover a tool that can be used to better diagnose concussion, indicate return-to-play guidelines and potentially locate damaged areas of the brain after concussion. Preliminary results indicate a consistently changed gaze peak velocity post-concussion on the antisaccade task.
Faculty Sponsor: Thomas Knight

SONYA KUZMINSKI, *Interplant Proximity as a Limiting Factor: Understanding the Competitive Dynamic of Bluebunch Wheatgrass at Wallula Gap*
On the arid hillsides of Wallula Gap, an interesting pattern emerges: abundant but relatively small bluebunch wheatgrass (*Pseudoroegneria spicata*) plants grow in close proximity on the moist and favorable north-facing hillside, while larger, higher seed-producing individuals grow sparsely on the harsh, dry conditions of the south-facing hillside. To understand why the larger plants grow more successfully on the less favorable hillside, we measured the distances between plants from transects on both slopes. Gathering these data allows us to assess the relationship between plant size and proximity, and the importance of competition as a factor limiting north-facing plant growth. Further expanding our knowledge of this competitive dynamic provides information that is useful in understanding the shifts grasslands experience in the face of major ecological challenges such as climate change.
Faculty Sponsor: Tim Parker

KIRK LANGE, *An Efficient, Configurable System for Simulating Delay Differential Equations*
It is no secret that specially designed tools by their very nature outperform tools designed to be jacks-of-all-trades. Software is no exception, as simulation engineers are constantly faced with the dilemma between configurability and efficiency. Our research goal was to determine whether we could create a configurable delay differential equations simulator that would match the performance of hard-coded simulators. Instead of a one-size-fits-all approach where all users run the same executable file for each of their different models, our code re-compiles itself, generating a unique executable optimized specifically for that model. Although our project stemmed from Colgate University's gene regulation network simulator, the software we have written is better thought of as a general framework. Instead of being restricted to a particular field, our simulation is applicable to a wide range of phenomena in both the natural and social sciences.
Faculty Sponsor: John Stratton

CAIT MAZZOLENI, RACHAEL HAGGEN, *Tephra as a Marker for Dune Migration*
The Potholes Dunes were blanketed by Mount St. Helens ash in May 1980. Measurement of the distance between the arc of the 1980 ash and the arc of the current slip face allows determination of the migration rate of many of the parabolic dunes. Among 15 dunes, the migration distances range from 11 to 40 m, with a mean of 27 m (or 0.8 m/yr). The parabolic dunes have also partially buried a forest of Russian olive trees. The trees began growing in this desert after the water table rose when nearby O'Sullivan Dam was completed in 1949. Some of the olive trees, many about 15 m tall, are almost completely buried by the dunes, suggesting a minimum advance of 22 m (0.3 m/yr).
Faculty Sponsor: Bob Carson

ABBY MOLLOY, *Sensory Modalities Used in Predator Avoidance by Frugivorous and Nectarivorous Bats*
Predator detection and avoidance are important behaviors that dictate the success of animal species. Frugivorous and nectarivorous bats play key roles in tropical ecosystems as seed dispersal agents and pollinators, but little is known about how they identify the presence of predators. I investigated the use of vision, echolocation and olfaction by frugivorous and nectarivorous bats in Monteverde (Costa Rica) in detecting predators while feeding. Nectar and fruit feeder stations with various cues (clay model snake and odors in leaves from viper cage) were set up in an indoor flight cage. Based on the number of visits and quantity of nectar consumed, nectarivorous bats avoided feeders with visual or olfactory predatory cues; fruit bats appeared to rely more heavily on olfaction than on vision or echolocation for predator avoidance. These findings suggest that the bats use the same sensory modalities to detect predators as they do to locate food.
Faculty Sponsor: Heidi Dobson

HALEY MOMANY, *The Role of a Pseudomonas syringae Flagella Biosynthesis Protein in Host Plant Recognition and Pathogen Virulence*
Plants can detect a bacterial infection through recognition of the bacteria's flagella. The bacteria have to race against the plant in order to start their infection process before they are identified. This often involves building a Type III secretion system (T3SS), which enables bacteria, particularly *Pseudomonas syringae*, to inject effector proteins into plant cells. The T3SS is regulated by a multitude of genes. However, the exact role that these genes play in virulence during the host/pathogen interaction is unknown. In our research, we aimed at characterizing the flagella biosynthesis protein encoded by the flhf gene. Using motility and virulence tests, we determined that the mutated flhf gene led to decreased growth of *P. syringae*. However, the virulence was not impacted through this mutation. Understanding the role these genes play is relevant to growing healthy crop plants and feeding our growing population.
Faculty Sponsor: Dan Vernon

KEIFER NACE, *History of Two Landslide-Dammed Lakes in the Central Oregon Coast Range*
My study examines the role of fire in lake formation in two landslide-dammed lakes in the Central Oregon Coast Range. Fires are the most common type of natural disturbance and affect even the wettest landscapes. Fire behavior is largely governed by climatic conditions, and climate models estimate increasingly fire-conducive conditions in the coming decade. Macroscopic charcoal analysis, loss-on-ignition and magnetic susceptibility were used to determine and compare fire history and geomorphic change between the lakes. There is not enough evidence to conclude that the landslides were induced by fire; however, evidence of previous fires was found. Additionally, most fire events occurred earlier in the record, which may demonstrate the presence of fire suppression. Despite the wet climate of the Oregon Coast Range, fire suppression has allowed the thickening of forests. In the event of future fire-conducive conditions, these dense forests could burn severely, making the landscape more susceptible to landslides.
Faculty Sponsor: Lyman Persico

LUCAS NAPOLITANO, *Variable Stars in M53*
We present early results of a search to find variable stars in the globular cluster M53. Data was collected over a four-day span in April 2017. The list of detected variable stars is compared to the Clement catalogue of variable stars. Of the 70 variable stars we detected, 19 are newly discovered. The remaining 51 were detected in previous studies.
Faculty Sponsor: Nathaniel Paust

LAURINDA NYARKO, *Inorganic Model Complexes Potential for Hydrogen Gas Production*
The molybdenum-copper complex at the active site of a soil bacteria is responsible for the oxidation of carbon monoxide into carbon dioxide, while also splitting water into protons and electrons. This process is analogous to the industrial water-gas shift reaction used for hydrogen gas production. While the industrial process requires elevated temperatures and pressures, this reaction occurs under ambient conditions at the reaction center of the enzyme. The structural basis for reactivity by the enzyme is still not well understood. Based on theoretical work performed by our research group, we are designing and synthesizing a class of synthetic models that have the potential to convert carbon monoxide while generating hydrogen gas in the process.
Faculty Sponsor: Dalia Rokhsana

CHARLIE RALSTON, *Crystallization of the Salicylic Acid Receptor NPR3*
Salicylic Acid (SA) is a key hormone in plant defenses. The SA receptor NPR3 is currently under intense study because it is thought that through genetic modifications NPR3 could more effectively protect citrus plants against pathogens. The key to understanding the function of NPR3 is to determine its three-dimensional structure. The Zheng Lab utilizes X-ray crystallography, the most effective method for determining protein

structure but one that requires crystallizing protein, which can be very difficult to accomplish. Using two different cloning systems, we induced the production of protein in both E. coli and insect cloning systems. After purification, pure protein was added to nearly one thousand different conditions in crystallization trays. Our results showed that in all of the conditions there was either no change or the protein separated out of the solution as a precipitate.
Faculty Sponsor: Douglas Juers

JULIAN REED, *Applications of Boron Clusters in Liquid Crystal Synthesis*
My presentation reviews existing literature on the use of boron clusters in liquid crystals. Liquid crystalline substances are usually composed of long, thin carbon-based (organic) molecules and have applications in electronic display technology and chromatography. Many compounds with liquid crystalline phases contain rigid substituent groups. The rigidity of inorganic boron clusters and their ability to form linear compounds by attaching groups to atoms on opposite ends of the cluster make them an intriguing starting point for the synthesis of new liquid crystalline materials. Work conducted on the synthesis and properties of boron cluster-based liquid crystals in comparison with organic cyclohexane- or benzene-based analogues is discussed. In addition, new derivatives of a specific boron cluster, CB11H12-, are presented, with an evaluation of their potential as precursors for new liquid crystals.
Faculty Sponsor: Mark Juhasz

CHRIS RUMBAUGH, *Rare Earth Spectroscopy*
Spectroscopic experiments were performed on rare earth chelates and powders. The goal of the experiments was to witness the energy transfer between atoms in a lattice structure. To sense the transfer between atoms, specific wavelengths of light were used to excite the sample, and the emitted wavelengths were measured. In doing so, we determined which atoms absorbed the light and which atoms emitted it. With known absorption and emission spectra of various atoms, we deduced that energy transfer between atoms was occurring.
Faculty Sponsor: Kurt Hoffman

TAYLOR SALAGUINTO, *Nectar and Pollen Foraging by Bees on Bindweed Flowers in Greece*
All bees depend on flowers for sustenance, with each flower typically visited by multiple bee species. Conversely, flower specialization in bees allows for efficient foraging of floral food rewards, namely pollen and nectar. To investigate how bees partition shared floral resources, I studied visitation patterns on flowers of morning glory *Convolvulus arvensis* by two bee species, one specialist and one generalist, and measured nectar and pollen availability across the day. Flowers produced the most nectar and pollen in the morning, and quantities gradually decreased thereafter. Ambient temperature as well as bee visitation rates correlated with nectar volume and pollen weight. The two bee species had temporally separate foraging niches, with the generalist visiting flowers later in the morning than the specialist, and they displayed different foraging behaviors. These sympatric bee populations have evolved foraging ecologies that allow them to coexist and obtain food from the same plant species.
Faculty Sponsor: Heidi Dobson

LINDSAY SCHWARTZ, *The Effect of Xylitol in Combination with Other Drugs on the Susceptibility of Bacteria that Cause Sinusitis*
Sinusitis is a bacterial infection in and around the nasal cavities with serious consequences if not treated. Normally, sinusitis is treated with Xylitol, but there has been suspicion that instead of killing the bacteria, Xylitol just prevents it from growing. I studied *in-vitro* first- and second-line antimicrobials mixed with and without Xylitol. First, I looked at the antimicrobial susceptibilities of each of the five most common bacterial species that cause sinusitis. This helped me determine which bacterium had the highest resistance to each drug. The second step in my study was to combine those drugs with Xylitol in order to determine whether Xylitol had an additive or synergistic benefit in my assays. My results showed that the wide range of bacteria was most resistant to the drug Ciproflaxin and when mixed with Xylitol, the drugs containing Amoxicillin were inferior to all other drugs tested.
Faculty Sponsor: Dan Vernon

WILL SELMAN, *Insulin Receptor Concentrations Within the Hippocampal CA1 Sub Region: Effects of the Ketogenic Diet on CNS Structures*
The ketogenic diet has for some time been successfully used in many cases of intractable epilepsy, where patients fail to see results with the use of anti-epileptic drugs. However, the mechanism of its success is still unknown. Due to the diet's characteristic reduction of insulin within the bloodstream, as well as the high concentrations of insulin receptors within certain brain regions, some propose a long-term reduction of insulin, leading to a resultant decrease in insulin receptors at work. In my project, I explored this hypothesized mechanism by performing image analysis on coronal sections from rats that were fed either a control diet or a ketogenic diet. These sections had been immunohistochemically stained for a presence of the receptors and were digitally imaged and analyzed using the NIH's software ImageJ.
Faculty Sponsor: Leena Knight

TARA STAHLECKER, *Dating Dust*
An east-west oriented drainage basin in the upper elevations of the eastern Mojave Desert provides the opportunity to study aspect controls on slope geomorphology and causes of sediment accumulation on hillslopes. North-facing slopes have less exposed bedrock and more perennial grasses than south-facing slopes. I used optically stimulated luminescence (OSL) to date when dust accumulates in soils. Ages from three different size fractions indicate that dust is translocated down over 1.5 meters into the soil profile. The ages of dust indicate two periods of dust deposition in the early Holocene and the latest Pleistocene. Accumulation of coarse bedrock must have occurred prior to deposition of dust in the cooler late Pleistocene.
Faculty Sponsor: Lyman Persico

ANNIE STEFANIDES, *Crystallization Efforts of a Hydroquinone Ring-Cleaving Dioxygenase, PcpA*
Pollutants such as wood preservatives and pesticides introduce highly chlorinated, intractable aromatic compounds into the environment, but only a few soil bacteria are able to degrade these compounds. One such bacterium is *Sphingobium chlorophenolicum*, which contains the enzyme

2,6-dichlorohydroquinone 1,2-dioxygenase, (PcpA). PcpA is a ring-cleaving dioxygenase that resembles a class of Fe(II)-dependent enzymes called extradiol dioxygenases (EDO) yet differs from this family due to its unique specificity for chlorinated compounds. One approach to better understand substrate specificity in PcpA is to determine the enzyme's structure by growing crystals that can be analyzed by X-ray crystallography. We hope to improve on the current purification method and crystallization conditions of PcpA in order to grow usable crystals. Reproducing and improving on the current structure would aid in the overall goal of illuminating why some resilient pollutants are broken down naturally, and potentially how these degradation pathways can be engineered in other bacteria.
Faculty Sponsor: Tim Machonkin

ALYSSA TAYLOR, *Comparisons of Herbivorous and Carnivorous Finfish Abundances Inside and Outside Admiral Cockburn Land and Sea National Park, South Caicos*
I compared abundances of herbivorous and carnivorous finfish inside and outside a no-take, marine-protected area in the Turks and Caicos Islands (about 500 miles south of Miami, Fla.). I assessed the effectiveness of the marine-protected area and the health of the island's marine environment, in part because there is a lack of studies published on finfish abundances despite the island's economic dependence on finfish resources. Underwater visual observations were employed using scuba and snorkel to record finfish abundances at 12 sites inside and outside the protected area. The data showed significantly more herbivorous finfish inside the marine protected area but no significant difference in carnivores' abundances, suggesting that the protection has been beneficial to herbivores but not to carnivores. Also, herbivorous finfish were more abundant than carnivorous finfish overall. Lower abundances of herbivores outside the marine-protected area could be attributed to algal growth.
Faculty Sponsor: Susanne Altermann

OLIVIA THOMSON, *Using Combined Eye and Head Gaze Shift Metrics in the Saccade Task to Assess Sport-Related Concussions*
Mild traumatic brain injury (mTBI), or concussion, affects 1.6 to 3.8 million athletes in the U.S. annually (Langlois et al. 2006). This number is likely an underestimate, however, as many concussions go undiagnosed due to the lack of definitive clinical diagnostics. Differences in saccades (rapid eye movements) occur following concussion, but this has only been shown with the subject's head restrained. We, therefore, allowed subjects to move their heads for a more natural behavioral assay and examined combined eye head gaze (CEHG) shifts using video oculography. We measured CEGH shift metrics (gaze latency, gaze peak velocity, primary gaze gain and gaze number of steps) during the saccade task before and after sport-related concussion and found several differences. Our goals are to use eye-head metrics as a diagnostic for concussion, determine when athletes can return to play after sustaining a concussion and localize the site of brain injury.
Faculty Sponsor: Thomas Knight

KAI TSUBOTA, *Effects of Blood Plasma on In-vitro Blood Brain Barrier*
HIV patients are now able to live longer and healthier lives due to advances in treatment. A cure is not yet available, and virally suppressed individuals can experience HIV-associated complications. HIV enters the brain early in infection and can remain hidden there despite otherwise successful treatment. As a well-protected organ, the brain is difficult to access with medication. This inaccessibility is due to the blood brain barrier (BBB), a structure that facilitates the passage of substances in and out of the brain. Disruption of the BBB has been related to neurological complications in HIV patients. My study investigates the possible disruptive effects of blood plasma on the BBB using a model that mimics the properties of the BBB found within the body. A greater understanding of BBB disruption may contribute to improving quality of life for long-term HIV survivors.
Faculty Sponsor: Susanne Altermann

KATRINA UMBAUGH, MARTA PICOTO, *Effects of Substance Use by Young Adults on Mental Health Factors*
Our research addresses the role that marijuana, alcohol and tobacco play in relation to mental health such as anxiety, depression, body image perception and self-esteem for Whitman students. Previous research has linked substance use to symptoms of mental disorders (e.g., eating disorders, anxiety-related disorders, mood disorders). Our research looked to replicate these findings and fill in gaps related to the association between self-esteem, body image and substance use. The study provides an update to some of the information gathered from the Whitman Lifestyle Survey of 2015. We surveyed Whitman students through Qualtrics to assess their substance use habits as well as self-reported results regarding their levels of anxiety, depression, body image perception and self-esteem. Our findings can inform Whitman College about current lifestyles of students; provide information about the general mental health of students; and be compared to similar research at larger universities.
Faculty Sponsor: Tom Armstrong

CLARA WHEELER, *Quantification of Wastewater in the Willamette and Susquehanna Rivers with Caffeine*
The Willamette and Susquehanna are well-populated rivers. In this study, we attempted to find the percentage of wastewater in these two rivers. We also examined how the amount of wastewater increases as the number of cities discharging into the rivers increases. We used caffeine to measure the amount of human wastewater in rivers, since it is safe to assume that all caffeine present comes from human wastewater and does not degrade quickly. **Faculty Sponsor: Frank Dunnivant**

TAYLOR WILKE, *Quantifying Carotenoid Pigment in Chilean Monkeyflowers*
Carotenoids are pigments that create the bright red, yellow and orange colors we observe in many plants. After crossing two species of Chilean monkeyflowers, *Mimulus cupreus* (a deep yellow with red spots) and *Mimulus luteus var. variegatus* (a pale cream with purple spots), varying levels of carotenoid pigment were observed in flowers of the F2 generation. But what causes this variation? Is the trait genetic, and if so, what is its genetic basis? To investigate further, hundreds of F2 flowers were collected and photographed, and a method was developed to quantify their carotenoid pigment across a variety of lighting conditions. My results suggest that carotenoid intensity is a highly genetically controlled trait, and that many loci are likely at play.
Faculty Sponsor: Arielle Cooley

SESSION 1
9-10:15a.m.

INCARCERATION (group panel)
OLIN 138
Mira Skladany, moderator
Mary Tabb, coach

KENDRA WINCHESTER, LILY PARKER, MIRA SKLADANY, *Rhetoric of Incarceration: Exploring the Communication Divides Between Washington State Penitentiary, Whitman College and Walla Walla, 9:00 a.m.*
What is the relationship between community and prison? We explore this question through a rhetorical lens. Walla Walla is home to Washington State Penitentiary and Whitman, but engagement between these three groups is infrequent and incomplete. In our panel, we discuss this relationship and its effects on understanding incarceration and the potential for group engagement. We present four perspectives: an interview with a man currently incarcerated at WSP, an interview with a high school student, a discussion of how criminality is presented in the media with a focus on the case of O.J. Simpson and the findings of a Whitman thesis that examines a first-person narrative of solitary confinement. We hope to encourage conversations at Whitman about the ways we discuss prison as academics and community members, and how we can include voices of incarcerated people in conversations about mass incarceration.
Faculty Sponsor: Heather Hayes

CAT, MOUSE AND MIND
OLIN 129
Anneka Sonstroem, moderator
Emily Krank, coach

RICHARD FARMAN, CAMILLE ANDERSON, RILEY WORTHINGTON, *Motion Planning: Cat and Mouse, 9:00 a.m.*
In the first Computer Science capstone project at Whitman College, we explore the latest research in path-finding behavior for artificial intelligence agents. Looking at a simulation of a cat-and-mouse chase, what behavior will result in the optimal behavior of the mice agents in ensuring their survival? Should the mice cooperate and work together, or is individualistic self-preservation a better strategy? In our presentation, we explain the philosophy and methodology behind our simulation and report on our findings.
Faculty Sponsor: Andy Exley

ZACH RAHMES, DANICA WILBANKS, *"I'm Not Racist!": White Fragility and Mindset Theories of Racism, 9:15 a.m.*
DiAngelo's theory of white fragility describes white people's tendency to react with anger, guilt or avoidance when faced with issues of race. White fragility is an enormous obstacle to progressive social change. Mindset theory has been employed to reduce some common white fragility reactions. Dweck's mindset theory suggests that people's mindsets about a trait being fixed or malleable influences their likelihood to attempt difficult tasks related to that trait. Research has shown that whites who view prejudice as unchangeable display more white fragility than whites who believe one can work to reduce prejudice. Previous studies have investigated the relation between racism mindsets and engagement with racial stressors. Our study focuses on a model for the overarching theory of white fragility that encompasses all reactions. The goal of this research is to reduce white fragility by changing the way white people conceptualize racism and to enable engagement with issues of race.
Faculty Sponsor: Erin Pahlke

BAYARD BLAIR, *Behavioral Trends of Pigeons on an Iterative Hawk-Dove Game, 9:30 a.m.*
Explore the world of animal cognition through game theory! Previous research has shown that pigeons and other non-human animals can learn to perform optimally on certain complex statistical decision-making tasks, sometimes even better than humans. In my research, pigeons perform an iterative hawk-dove game, which is based on game theory and similar to the classic prisoner's dilemma in that the outcome is based on the player's decision as well as that of a competitor. Pigeons choose between two responses, an aggressive "hawk" behavior that produces highly variable outcomes and a passive "dove" behavior that produces lower-variance outcomes. Results are compared to the optimal Evolutionary Stable Strategy (ESS) that involves a specific mixture of hawk and dove choices and maximizes favorable outcomes. I explore the results of this study, what optimal behavior in pigeons means and what this means to our views of cognition and behavioral plasticity.
Faculty Sponsor: Wally Herbranson

SARAH VESNESKE, *The Role of Extended Cognition in STEM Research, 9:45 a.m.*
To what extent can we have knowledge of something? For many contemporary philosophers, knowledge attribution is given by assigning "credit for true belief" to the agent. In cases where scientific knowledge is gained through the use of technological resources, credit for the true belief seems to lie not entirely in the human agent. By examining several case studies and drawing from Andy Clark's theories in *Supersizing*

the Mind, I discuss how, instead of viewing technology as a tool for our cognition to use, we can view our scientific resources as an extended part of our own human cognition. In this way, the credit lies in the agent, and we can have confidence that the true beliefs resulting from our research xare actually things that we know.
Faculty Sponsor: Patrick Frierson

KATIE DAVIE, GOKAY ABACI, ANNEKA SONSTROEM, *Blink and You'll Miss it: Dopamine, Blink Rate and Reward, 10:00 a.m.*
A large body of research indicates that dopamine is critical for motivation to pursue rewards and learning from rewarding outcomes. However, methodological limitations in measuring dopamine in the human midbrain have made such findings difficult to verify in humans. Researchers have proposed eye blink rate as a novel indirect indicator of midbrain dopamine levels. Our study investigates the effect of dopamine on various reward-related tasks (behavioral measures of motivation, learning and attention, as well as a self-report measure of depressive symptoms) using eye blink rate as a proxy for midbrain dopamine. We expect that blink rate (and thus dopamine levels) will be positively correlated with effort expenditure for a reward and attentional biases towards positive images, and negatively correlated with loss-avoiding behavior and depressive tendencies. These findings could help develop an easy, non-invasive measure of dopamine levels and contribute to research on reward-related disorders such as depression.
Faculty Sponsor: Tom Armstrong

DIET AND EXERCISE
SCIENCE 159
Abbey Dias, moderator
Nikki Delgado, coach

NICK HORST, *Characterizing the Role of Mitochondrial Dynamics in Skeletal and Cardiac Muscle During Exercise, 9:00 a.m.*
Exercise is an adaptive process that allows improvement in strength, aerobic capacity and disease prevention. We investigated the capacity of mitochondria to adapt to exercise and hypothesize that mitochondria respond in a dynamic-morphologic manner through fusion and fission. Our study shows that mitochondrial fission can occur in the heart during exercise and is associated with enhanced exercise capacity. We analyze the mechanisms regulating mitochondrial morphology not only in the heart but also in skeletal muscle. Preliminary data demonstrates our ability to mimic exercise conditions by stimulating the β1 adrenergic receptor (β1-AR) in vitro, and we show that skeletal muscle and cardiac muscle respond differently to exercise-related signaling. Specifically, β1-AR stimulation in skeletal muscle undergoes mitofusion, while cardiac muscle undergoes mitofission. Our study aims to determine the crucial differences and similarities in exercise adaptation between the skeletal muscle and the heart through differential regulation of mitochondrial dynamics.
Faculty Sponsor: Michael Coronado

NOAH CAVANAUGH, *An Addict's Guide to Overdoing It, 9:15 a.m.*
In my presentation, I address and analyze a personal struggle: working out too much and the negative effects it has on my body and mind. "Overdoing it" -- that compulsive desire or need to overwork the body or mind -- is present in all aspects of life: work, hobbies, sports, home life. "Everything in moderation, including moderation," Oscar Wilde famously said. I share a few suggestions about how to avoid burnout and, in so doing, live a full, more energized life. I also explore ways to change the broader paradigm from overdoing it to a life of balance in order to accomplish the goals we have for ourselves.
Faculty Sponsor: Jen Cedeno

BARI SCOTT, *Farm to School in the Context of Back-to-the-Land Movements, 9:30 a.m.*
In 2010, the U.S. Department of Agriculture implemented the Farm to School Grant Program in response to two areas of public concern: rising obesity rates among children and increased industrialization of the American food system. The grant program seeks to address these concerns by by funding school gardens, cooking lessons and school field trips to local farms. Farm-to-school programs promote the idea that eating locally is environmentally sustainable, can improve individual health, strengthen community and stimulate economic development. My presentation examines core farm-to-school values and contextualizes these programs in relation to previous agrarian trends commonly known as back-to-the-land movements.
Faculty Sponsor: Chas McKhann

AUDREY BENNER, ABBEY DIAS, *The SOS Cookbook Project, 9:45 a.m.*
SOS Health Services offers free care to underinsured and uninsured patients in the Walla Walla Valley and surrounding areas. Many of these patients struggle with health-related issues that can be easily mitigated by a change in diet; however, the low incomes of many patients make mitigation a difficult task. In the Spring of 2017, I and Neha Naidoo '17 received the Ben Rabinowitz Award to develop a cookbook that would provide the tools for patients to manage their health through home cooking. Our project was designed to bring together the Whitman and greater Walla Walla communities through compassionate healthcare. The cookbook was completed in collaboration with students, local nutritionists, clinic doctors and other clinic volunteers, and distributed free of cost in March 2018 at the SOS clinic.
Faculty Sponsor: Kimberly Mueller

VACCINE (group panel)
SCIENCE 100
Brahm Coler, moderator
Segun Sodipo, coach

NATALIE THIEL, MADDY MAKER, JENNA GILBERT, TAYLOR SALAGUINTO, BRAHM COLER *Vaccine Hesitancy, Acceptance and Confidence, 9:00 a.m.*
Vaccine hesitancy can be attributed to numerous factors within a community. These include a lack of confidence in vaccine

efficacy/safety as well as complacency developed from believing that vaccines are not necessary or as easily accessible as they actually are. In our presentation, we share and discuss the results of our research on vaccine hesitancy and vaccine confidence in an attempt to better understand the perceptions that Whitman students have about vaccines. We also explore topics of religious and philosophical exemptions, herd immunity and the role of media in contributing to current immunization rates. Data that informs our presentation was gathered via a campus survey and interviews with faculty and Health Center staff. Following our discussion of vaccine perceptions, we also share current immunization resources available to students.
Faculty Sponsor: Jim Russo

RILKE (group panel)
KIMBALL THEATRE
Maxx Fidalgo, moderator
Izzy Sherwood-Reid, coach

OLIVIA GILBERT, PAIGE DEMPSEY, NOLAN BISHOP, MAXX FIDALGO *Interpretations of Rilke's Duino Elegies, 9:00 a.m.*
The Duino Elegies is a collection of 10 elegiac poems written by Austrian-Bohemian poet Rainier Maria Rilke (1875-1926). Produced from the start of the 20th century, during the so-called "language crisis," through the first World War, these poems engage with themes arising from experiences of Western modernity. Throughout the collection, questions arise about God and the divine in a secularizing society; the failure of translation and language; and the threat of capitalist mass production to mankind's relationship with things and each other. In our presentation we share portions of our final presentations for the course "Rilke's Duino Elegies," devoted to this remarkable collection of poetry. Our projects span a broad landscape of intellectual territory, yet each is in some way a reflection of our semester-long engagement with the elegies and the myriad ways the collected poems can be interpreted in the 21st century.
Faculty Sponsor: Julia Ireland, Emily Jones

GENDER AND BEHAVIOR
REID G02
Alaina Jacobsen, moderator
Aly Counsell, coach

ZACH COLLINS, *Underlying Concerns Behind Conservative Christians' Arguments Against Marriage Equality, 9:00 a.m.*
My presentation focuses on three interconnected areas of thought, primarily the concept of religious freedom, along with constitutional law and the social issue of gay marriage to frame the issue. I analyze the sphere of current Christian conservative thought in relation to religious freedom, specifically the arguments that surround court cases which have determined the fate of gay marriage within the American

judicial system. Through my analysis, I attempt to bring to light the religious influences behind these complex arguments and relate these positions to how American and religious identity is conceptualized by conservative Christian thinkers. By analyzing the legal arguments behind denial of marriage services for LGBT individuals, I aim to uncover the more relevant reasons behind this opposition rather than the surface-level bigotry that can be attributed to these ideas.
Faculty Sponsor: Courtney Fitzsimmons

HAILEY MOUNT, *Engendering the Refugee: How Victim Rhetoric Is Mobilized in UNHCR Response to the Syrian War, 9:15 a.m.*
My research question: How has the mobilization of gender rhetoric within the U.N. Refugee Agency's response to the Syrian refugee crisis impacted the effectiveness of international responses? In my presentation, I argue that the depiction of women as "vulnerable" and "victims" within U.N. response to the Syrian refugee crisis, particularly within the Regional Refugee Response and Resilience Plan (3RP), has led to policy shifts that encourage humanitarian rather than political solutions. I provide a brief background of the Syrian war and current refugee crisis and then discuss how gender has been mobilized in refugee discourse. I share two pieces of in-text evidence from the 3RP, a UNHCR sponsored document, that prove the mobilization of gender rhetoric inextricably linking women and characteristics of vulnerability. I conclude by suggesting that policymakers should return to developing political solutions in conjunction with humanitarian aid.
Faculty Sponsor: Shampa Biswas

EMILY BAUER, *But Does Sex Matter?: A Critical Look at BDSM and Asexuality, 9:30 a.m.*
BDSM is an umbrella acronym for certain kinds of behavior involving bondage and discipline, dominance and submission, and/or sadism and masochism between consenting adults. In its translation to mainstream media through free, accessible pornography and *Fifty Shades of Grey*, BDSM has been represented as separate from key concepts such as negotiation, consent, safewords, and aftercare. The consumption of these materials has led to the normalization and sexualization of unsafe practices. I propose that we can combat these unsafe practices without persecuting the BDSM for the occurrence of such in the name of BDSM. My research focuses in particular on asexual practitioners and non-sexual scenes as a possible insight to breaking the presumed link between sex and BDSM, and allowing for a larger conversation about consent.
Faculty Sponsor: Suzanne Morrissey

ALAINA JACOBSEN, *Now You See Me, Now You Don't: Gender Performativity and Blindness Among College-Aged Individuals, 9:45 a.m.*
In the past several decades, disability studies and gender studies have been combined to consider gender roles and expectations in the face of normative ideas around ability. Within this combination, blindness is left relatively unconsidered. My presentation focuses on the ways in which being blind or visually impaired affects gender formation and performance among college-aged individuals. I use interviews conducted with blind and visually impaired people (ages 18-28) to analyze how they understand their gender and its implications within the context of blindness. Questions I consider are: How are blind and visually impaired people expected to perform gender, and what happens when they don't perform accordingly? Is there a difference in gender performance, or ease of gender performance, when someone is born blind, as opposed to when someone develops sight impairment later in life? I address these and other themes as referenced by interview participants.
Faculty Sponsor: Suzanne Morrissey

SESSION 2
10:45a.m.-Noon

WOMEN AND NORMS
OLIN 138
Meg Weisselberg, moderator
Anne Elise Kopta, coach

RACHEL LOE, *The Terrifying, Inescapable . . . New Woman?, 10:45 a.m.*
Modernity and progress permeated British society in the final decades of the 19th century, and were accompanied by deviations from conservative Victorian respectability. The New Woman was a media phenomenon, a stereotype of the young woman who embraced modernity, attaining higher levels of education, running errands unattended and riding bicycles. Images and descriptions of the New Woman varied greatly. Different versions showed her to be a masculine monstrosity, a sex-crazed harlot, a pseudo-intellectual student or one of many other personalities. The dangerous and progressive yet iconic character was a media sensation. But why was the New Woman so diverse in print, and how did she become so popular among the conservative Victorian public? It was because the New Woman was salacious, fear-inducing, flexible and, ultimately, marketable.
Faculty Sponsor: David Schmitz

KAITIE DONG, *International Women's Labor Movements, 11:00 a.m.*
How do we imagine international women's labor movements? How should we examine international women's labor movements? Western feminists have historically challenged the dominant conception of work by arguing that women's household work should be paid labor and recognized equally as "real" work. My presentation unpacks arguments from Western feminist labor movements and examines when those arguments become problematic. I propose that, in addition to the Western feminist arguments for labor rights and freedom, we must use an international, intersectional and anti-colonial lens. My presentation advocates for decolonizing hegemonic knowledge by generously considering and critically thinking about alternative notions of women's labor and seeing the world. The way we perceive others and the world determines how we act.
Faculty Sponsor: Matthew Bost

ELLE POLLOCK, *Female Beauty Norms as Reflected Through Instagram Photographers, 11:15 a.m.*
Restrictive beauty norms as reflected through the media have shaped women's ideology since the 1900s. With the shift from traditional media, including television, radio and magazines, to the age of social platforms, mediums that influence dominant ideology in contemporary society shift as well. It's important to be conscious of the ways in which dominant beauty ideals are reflected, and thus perpetuated, through our exposure to imagery on social media. In my presentation, I focus on two popular portrait photographers on Instagram, Samuel Elkins (samuelelkins) and Brandon Woelfel (@brandonwoelfel). I analyze how their images add to the discussion of beauty, how the definition of beauty impacts society, and what implications these issues may have on women in dominant culture today.
Faculty Sponsor: Heather Hayes

SABRINA SALKIND, *Burgers, Bananas and Blow Jobs: A Rhetorical Deconstruction of Sexualized Food Advertisements, 11:30 a.m.*
In my presentation, I examine the link between patriarchal power, sexualization of women's bodies and the oppression of non-human animals found in food advertisements produced by Burger King and People for the Ethical Treatment of Animals (PETA). Applying concepts from Carol Adam's book, *The Sexual Politics of Meat*, I argue that Burger King links patriarchal power to the consumption of meat to promote their brand and maintain hegemonic masculinity. Moreover, I argue that PETA employs the same rhetoric in order to resignify the connotation of vegetarianism as "feminine" and enhance its credibility in the mainstream. In both cases, the use of sexualized and phallocentric rhetoric further enforces patriarchal ideologies.
Faculty Sponsor: Heather Hayes

MEG WEISSELBERG, *Street Harassment: Social Tool for Men's Dominance, 11:45 a.m.*
Street harassment describes uninvited objectifying remarks and actions performed by men toward women with whom they are not acquainted in a public setting. The phenomenon functions as a social, patriarchal tool. Though the objectification of women has existed for centuries, street harassment has only recently emerged as a focus of elite, academic canons. Given its scholarly infancy, street harassment constitutes modern controversial discussion. On a fundamental level, there are challenges to street harassment's legitimate existence. This is connected to a second debate regarding the vocabulary we use to name and define street harassment. Is "street harassment" itself an adequate term to describe these intrusive experiences? Critiques include the following: 1. "street harassment" suggests such experiences happen only on streets, and 2. taken at face value comments like "Hi, beautiful" deceptively seem not to qualify as forms of harassment. I address these controversies through an analysis of empirical data.
Faculty Sponsor: Helen Kim

INSTITUTIONS AND PROTOCOL

OLIN 129
Daniel Charlton, moderator
Marlene Anderson, coach

LIZ CHENOK, *Performative Differences in the "Soft" Total Institution of Summer Camp, 10:45 am.*
Every summer thousands of residential camps operate across the country. Each one offers unique, positive experiences for children and staff alike. These camps become havens and safe spaces in which identity formation is salient. Literature suggests numerous benefits of summer camps, including community-building, enriched social skills and positive self-identity. At the same time, the camps function as institutions with their own administrative protocol, social scripts and group norms. The theoretical concept of a "total institution," developed in discussions about prisons and asylums, applies to groups of people, separated from society, participating in a formally administered protocol for daily living. My presentation analyzes ways that residential summer camps may be considered total (or nearly total) institutions, and, as such, how camping staff perform differently in this context.
Faculty Sponsor: Helen Kim

MARY TABB, *More Than Recidivism: 'Super-Utilizers' in Walla Walla County's Correctional Facility, 11:00 a.m.*
Walla Walla County Jail averages a daily population of 90 individuals; many are booked there several times a year. Individuals who are booked into correctional facilities four or more times in a year, labeled "super-utilizers," often suffer from co-occurring mental health and substance-abuse problems as well as other issues relating to their inability to integrate into the larger community. My presentation focuses on "super-utilizers" in Walla Walla County Jail and examines why these individuals continuously come into contact with the local criminal justice system. While most research on incarceration focuses on persons inside America's prisons, I focus on recidivism at the county level and analyze what the trend indicates about "super-utilizers" and the national jail system.
Faculty Sponsor: Keith Farrington

LOGAN SCHMIDT, *Comparative Proportionality Review: Arbitrariness, Capriciousness and the Green River Killer, 11:15 a.m.*
The reinstatement of capital punishment in the United States in 1976 consequently engaged the country in one of the most crucial debates in decades. My presentation examines numerous cases at the state and national level that either comply with or disregard the reforms laid out in *Furman v. Georgia*. Washington state's adoption in 1981 of comparative proportionality review – a procedure that promises to provide non-arbitrary, non-discriminatory, fair death sentences – is problematized 20 years later with the case of Gary Ridgway, the infamous "Green River Killer." The Ridgway case set a precarious precedent for cases that followed; ergo, the adequacy of the safeguard adopted by Washington state to prevent arbitrary and capricious administration has failed. Ridgway's case, among other failures of comparative proportionality review analyzed in my presentation, indicates that neither said procedure nor the death penalty can be conducted fairly and non-arbitrarily.
Faculty Sponsor: Heather Hayes

CONOR SCANLON, DANIEL CHARLTON, *20th Century Access to 21st Century Care: The State of Medical and Dental Treatment Behind Bars, 11:30 a.m.*
The United States incarcerates more individuals -- 2.4 million -- than does any other country in the world. Medical and dental care provided to these individuals is often sub-par. Although a 1988 United Nations resolution requires all countries to provide medical treatment free of charge, the vast majority of states in America require steep co-payments for care. Our presentation explores the intricate issues associated with navigating the medical system in jails and prisons in the U.S. It also addresses issues of mental health and diet. We examine current systems and propose tangible solutions which would ensure that all incarcerated individuals are provided access to medical care, regardless of their socioeconomic background.
Faculty Sponsor: Heather Hayes

GENES, CELLS, GERMS

SCIENCE 159
Annie Richardson, moderator
Megan Waldau, coach

KUENZANG OM, *Novel Splice Variant for New Phenotype: Petal Pigment Evolution in Mimulus, 10:45 a.m.*
Anthocyanin pigment produces the red-to-blue color often seen in flowers and is important in the diversity of flowers. We investigated the genes that code for anthocyanin pigmentation in the petal lobe of a Chilean monkey flower species, *Mimulus luteus var. variegatus* (Mlv). Previous work suggested that one splice variant of the *Myb*5 gene, *Myb*5Ex1-2-4 is involved in pigmentation in the petal lobe in Mlv. We investigated the necessity and sufficiency of *Myb*5Ex1-2-4 by silencing the gene in plants with petal anthocyanin and expressing the gene in plants without petal anthocyanin, respectively. We have observed that the *Myb*5Ex1-2-4 splice variant is necessary for the production of purple pigment in the petal lobe. We intend to test the sufficiency of *Myb*5Ex1-2-4 and test the other splice variant *Myb*5Ex1-2-3 using the same method. Our work helps to understand the molecular mechanisms involved in the evolution of traits.
Faculty Sponsor: Arielle Cooley

JEANETTE SCHWENSEN, *Solving Atomic Structures of I-OnuI Homing Endonuclease Variants for Improved Engineering of Onu to Prevent the Pathogenicity of Cholera, 11:00 a.m.*
Wouldn't it be great if we could cut cancer and other horrible diseases out of our lives? Homing endonucleases are DNA targeting and cutting enzymes that induce double stranded breaks in the host's DNA, resulting in specific targeted gene modification. We were interested in 15 different engineered variants of I-OnuI, a homing endonuclease, and determined their crystal structures using X-ray crystallography and computer modeling. This data has been used to aid in the engineering process of other variants of Onu, such as OnuP4, to recognize and

cut non-native target sites. We targeted the ctxA gene in the CTX bacteriophage that codes for the A subunit of the cholera toxin protein that is responsible for the pathogenicity of *Vibrio Cholerae*. Homing endonucleases will continue to be studied for their extensive use in targeted gene therapy and genetic manipulation in order to combat some of the world's major diseases.
Faculty Sponsor: Douglas Juers

AMANDA MERCER, *Evolution of Antibiotic Resistance in Surrogate Pathogens Bacillus anthracis Sterne and Yersinia pestis KIM6 and KIM10, 11:15 a.m.*
The dramatic increase in the number of bacterial pathogens acquiring antimicrobial resistance and multidrug resistance (MDR) threatens our nation's health and security, especially when they are intentionally used as biological warfare agents. The acquisition of MDR, through natural or artificial means, greatly reduces the efficacy of our already diminished array of antimicrobial treatments. To mitigate the potential threat of MDR in pathogens, we generated and studied non-pathogenic MDR surrogates using the bacteria *Bacillus anthracis* (causative agent of anthrax) and *Yersinia pestis* (causative agent of the plague). Bacteria were subjected to selective pressures on plates containing high concentrations of specific antibiotics. Resistant mutants were isolated and used for subsequent selection rounds on other antibiotics. Understanding the genomic evolution towards MDR by sequencing the associated mutations will offer significant insight into the mechanisms of MDR. Our surrogates will also be used to test various novel drug designs.
Faculty Sponsor: Kendra Golden

ROBIN ROUNTHWAITE, *Molecular Tug-of-War: Investigating Error Correction in Chromosomal Segregation During Cell Division, 11:30 a.m.*
During cell division, each daughter cell needs to receive exactly one copy of each chromosome. Errors during chromosomal segregation are associated with cancer. To detect whether each pair of chromosomes is properly attached for segregation, a molecular tug-of-war occurs between chromosomal attachments. If the chromosomes are correctly attached and are being pulled apart, the tension is detected and segregation is permitted. Otherwise, the chromosomes need to detach and try again. Aurora B Kinase plays an essential role in the process of detecting incorrect attachments. I employed approaches from biochemistry and computational genetics to investigate regulatory targets of Aurora B Kinase. I determined relative importance between certain regulatory targets in proteins involved with chromosomal attachment, constructed a computational tool for detecting novel regulatory targets and found evidence for a model of Aurora B Kinase behavior that may demand a new interpretation for how error correction in chromosomal segregation occurs.
Faculty Sponsor: Brit Moss

ANNIE RICHARDSON, *Distinct Cell Signatures in Pan-Cancer Analysis of Cancer with Oncogene MYC Mutations, 11:45 a.m.*
The master regulator gene MYC controls the expression of about 15 percent of the human genome, and when mutated, can contribute to the progression of cancer by causing unregulated cell proliferation. However, little is known specifically about the systemic patterns and effects that mutated MYC may have on a cancer cell. Using data from the Cancer Genome Atlas, I analyzed sets of genes that are more highly expressed in cancer tissues with mutated MYC across 33 different cancer types. I found two distinct cellular gene expression signatures. This information could be useful in the future to help find potential therapeutic drug targets and to further understand the cellular mechanisms behind MYC-driven cancer.
Faculty Sponsor: Dan Vernon

GEOLOGIC DISCOVERY
SCIENCE 100
Sarah Dunn, moderator
Daniel Pailthorp, coach

SELA PATTERSON, *Last Day on Earth: Investigations into the Indirect Evidence for Mode of Death of Multi-Species Bone Concentrations, 10:45 a.m.*
The fossil record for the late Pleistocene in eastern Washington consists primarily of small mammals, including a variety of rodents. Fossils belonging to different taxonomic groups are found closely associated in the collection sites. Rodents are not known for inter-species socialization, thus their association in death is odd. Preliminary work from Rensberger, Barnosky and Spencer (1984) showed that many of the bones and teeth display a pattern of chemical etching, seeming to result from exposure to gastric acids during short-duration residence in the gut of predators. My study uses a collection of small mammal fossils from about 50,000 to 7,000 years ago to determine if there is a statistical correlation between fossil occurrences and etching. This would inform the question of why multi-species accumulations of fossils are common, suggesting that they are primarily the result of predator ingestion and excretion of the remains as pellets or scat.
Faculty Sponsor: Pat Spencer

JESSIE BERSSON, *Explosive to Effusive Transition in Caribbean Volcanism, 11:00 a.m.*
On Dominica, an island in the Lesser Antilles arc, the oscillation between explosive and effusive volcanic activity provides an opportunity to investigate how magma systems evolve. My study focused on the evolution of the Wotten Waven caldera, which produced the voluminous Roseau Ignimbrite Group and the subsequent Micotrin lava dome. This shift in volcanic expression is analogous to, but at larger scale than, the resurgent lava dome extruded at Mount St. Helens between 2004 and 2008, coming 24 years after the explosive, ash-producing eruption. My study investigated how the temperature, pressure and meltwater content of the magma evolved. Constraining the conditions of caldera evolution at Wotten Waven illuminates the transition from explosive to effusive volcanic activity and informs the volcanic hazards Dominica is subject to as one of the most volcanically active islands in the Caribbean.
Faculty Sponsor: Kirsten Nicolaysen

SILAS MORGAN, *'Volcanic Influence' in Vineyard Soils of the Columbia Basin, 11:15 a.m.*
Wine literature sometimes describes the grapes of the Columbia Basin as containing a "volcanic influence" from the underlying volcanic basalt bedrock. This suggestion ignores the unusual soils of the Columbia Basin, which are characterized by basalt bedrock overlain by granitic sediments from a different source. In our study, we asked if there is any significant contribution of the underlying volcanic material to the vineyard soils of the Columbia Basin. Using dozens of soil samples from vineyards across the Columbia Basin, we measured bulk element abundances (via portable X-ray fluorescence) and common mineral constituents (via X-ray diffraction). We did not find minerals characteristic of basalt in the vineyard soils. We conclude that grapevines in Columbia Basin vineyards only interact with underlying basalt bedrock in areas where soils are thinner than the root depth of the vines.
Faculty Sponsor: Nick Bader

SARAH STROZYK, MCKENZIE ELLIOTT, *Secrets Buried in the Loess, 11:30 a.m.*
The Palouse region of southeastern Washington consists of a thick accumulation of wind-transported silt called loess. Unlike typical soils that gradually erode away, loess accumulates over time, preserving older deposits underneath younger ones. This preservation of ancient sediments makes loess sequences potentially useful tools for reconstructing ancient environments. One promising technique for reconstructing climate change is the magnetic susceptibility of the sediments. This inexpensive technique has been successfully applied to loess sequences in other sites around the globe. However, the paleoenvironmental interpretation of magnetic susceptibility is site-specific. Our research focused on a well-studied loess-paleosol sequence in the Palouse loess near Clyde, Wash. We measured magnetic susceptibility and a variety of related parameters along a depth profile in an effort to determine what drives magnetic susceptibility in the Palouse to find out whether magnetic susceptibility can be used as a climate indicator.
Faculty Sponsor: Nick Bader

SARAH DUNN, *Mapping and Modeling Hillslopes in the Mojave, 11:45 a.m.*
With the advent of accessible UAVs (drones), three-dimensional landscape models can be constructed using the photogrammetric technique Structure from Motion. Even in arid regions, however, vegetation gets in the way of analyzing underlying slopes. I compare multiple techniques for removing vegetation from a point cloud of a ~ 2 km² basin in the eastern Mojave Desert. The bare-earth model, paired with surficial geologic maps, allows me to quantify relationships between slope characteristics and geomorphic process. Correlation between aspect (north- versus south-facing), slope gradient and amounts of exposed bedrock suggest that south-facing slopes have crossed a threshold in response to climatic shifts. This has implications for predicting how hillslopes in arid regions respond to climatic changes, past and future.
Faculty Sponsor: Lyman Persico

MODERN/POSTMODERN
KIMBALL THEATRE
Elise Feider, moderator
Erick Franklund, coach

PETER FEEHAN, *Space and Time in Postmodern Literature: An Examination of the Rejection of Bakhtin's Chronotopes, 10:45 a.m.*
With his declaration that time and space are merely different facets of each other, with time being the fourth dimension of space, Albert Einstein issued in a new era of cosmic understanding, not only for science but also for knowledge as a multi-disciplinary endeavor. Mikhail Bakhtin adapted this concept of space-time unity to examine literature, categorizing literary works by the way they portray the chronotope (literally, "time space"). The different forms of the chronotope identified by Bakhtin adequately cover literature from antiquity to the modern but fail to reconcile space-time as portrayed in postmodern works. My presentation will illustrate, through Zadie Smith's *White Teeth* and Tom Stoppard's *Arcadia*, the postmodern subversion of regimented forms of space and time and, subsequently, of the restrictions that narrative trajectories connected with them entail, allowing the works to go places Bakhtin and readers would be hard-pressed to imagine.
Faculty Sponsor: Sharon Alker

NATALIE GODFREY, *The Power of Presence: Marina Abramović's The Artist Is Present (2010) as Invitation to Dwell in Public Feeling, 11:00 a.m.*
Neoliberalism privatizes social problems by separating the individual from the collective. This extends to human expressions of feeling. As a result, the neoliberal state captures potentially collective expressions of feeling as individual sentiments, effectively stifling the possibility of collective political expression. This process is represented and sustained by what I term "the feelings industry." To better understand how the feelings industry functions and to explore features of a space where it might be resisted, I turn to a performance by artist Marina Abramović. I argue that Abramović's *The Artist is Present* (2010) produces a space with vast potential for collective expression of affect; it serves as a constructed invitation to dwell in public feeling. Through the experience of collective presence, bodies within this space may resist neoliberal privatization of feeling.
Faculty Sponsor: Matthew Bost

SAGE MALECKI, *The Psychological Effects of the Transparency of Glass Through the Lens of Philip Johnson's Glass House, 11:15 a.m.*
My work examines how glass produces feelings of vulnerability and anxiety along with a way to communicate with its surroundings through its transparency. Using Philip Johnson's Glass House, an example of modernist architecture that employs glass as its main material, I explore how identity can be altered in a space that enhances the qualities of performance and idealization. I consider Jimmy Robert's *Imitation of Lives*, a production that explores the intersection between architecture, visibility, black representation and identity as a way to emphasize those feelings the glass creates. The production utilizes the idea of looking and being looked at, as well as the reflective properties of glass, to make a statement about the transformations that can occur in a transparent space. My project aims to analyze the application of glass in modernist architecture and how it has changed over time as glass technology has advanced.
Faculty Sponsor: Lisa Uddin

ELISE FEIDER, *Charles and Ray Eames: Postmodern Modernists?, 11:30 a.m.*
My presentation explores the question of whether darlings of the mid-century modern movement, designers Charles and Ray Eames, conform to the readily available dichotomies of art historical epistemology. I situate my presentation in an analysis of the Eames' home, which appears hypermodern from the exterior but distinctly unmodern or postmodern from the interior. In discussing the Eames' home, I illustrate the limitations of art historical work that seeks to categorize, delineate and associate artists and designers within one period and one artistic movement. In my research, I have sought not how best to historize Charles and Ray Eames but rather how to offer a nuanced history of their design work that avoids the foreclosure of alternative narratives. Can the modernist canon be meaningfully expanded (or rather disbanded) to understand Charles and Ray Eames outside the confines of "modern" and "postmodern"?
Faculty Sponsor: Lisa Uddin

INTERNATIONAL ISSUES
REID G02
Chris Meabe, moderator
Ben Freedman, coach

BROOKE TERKOVICH, *Intercultural Healthcare in Chile, 10:45 a.m.*
The emergence of Chile as a multicultural country with an intercultural healthcare system is relatively recent, beginning in the 1990s. Chile is one of the few countries in the world with an intercultural healthcare system. However, the indigenous community in the country criticizes the system for discriminating against traditional doctors, and for the belief among conventional doctors that traditional medicine is inferior. My presentation focuses on the perspectives of traditional healers with regard to the intercultural healthcare system and the impacts of the system on the indigenous community. I draw on interviews with members of the Putre community, traditional Aymara healthcare workers of the Putre Clinic and a questionnaire shared with patients during Putre Clinic's medical rounds. Despite its critics, the community of Putre considers the intercultural healthcare system beneficial to the community and reflective of their community's beliefs.
Faculty Sponsor: Chris Wallace

CHRIS MEABE, *Faith in Peace: Peacemaking from Town to Town in Liberia, 11:00 a.m.*
The Liberian civil war devastated a nation already divided

by its unique history as an American colony in Africa. In this conflict, Liberians attempted to create peace on local and national levels through a wide variety of methods. In my presentation, I discuss my research on the peacekeeping efforts of individual towns, a subject entirely neglected in current literature on the subject. Towns made individual peace agreements with generals in the war, exchanging religious services for the promise of peace. My research relies on oral history sources collected over the phone and on a research trip to a Liberian community in Minneapolis.
Faculty Sponsor: Jacqueline Woodfork

SESSION 3
2-3:15p.m.

SYRIAN WAR (group panel)
OLIN 138
Tess Francavilla, moderator
Helena Platt, coach

JAMES BAKER, RHIANN ROBSON, HENRY HONZEL, TESS FRANCAVILLA, *The Syrian War: A Historical and Global Conflict, 2:00 p.m.*
The Syrian civil war, initially sparked in 2011 by a series of anti-regime protests, continues to tear apart the country. As of 2016, an estimated 470,000 Syrians have died in the conflict. Entire cities have been reduced to rubble, and more than half of the population has been displaced. Mainstream media covers the violence extensively, and social media is saturated with graphic images and accounts of suffering, death and destruction. The narrow and often biased scope of media coverage diminishes the complexity of the conflict, limiting perceptions of audiences worldwide. Our presentation explores Syrian history and society, and analyzes how the Syrian conflict has progressed from a civil war to a global crisis. We intend to present a deeper and more nuanced understanding of both the historical and global context of the Syrian war.
Faculty Sponsor: Elyse Semerdjian

CHILDREN AND FAMILY
OLIN 129
Hannah Bashevkin, moderator
Danica Wilbanks, coach

MIA LETTERIE, *Psychopathological and Caregiving Correlates of Mind Perception in Parents, 2:00 p.m.*
The behaviors in which primary caregivers engage are some of the most crucial factors of infant development. I examined the potential for a parent's perception of infant's capabilities (mind perception) to influence the parenting behaviors in which they engage. The aim of my research is to extend previous studies of mind perception on young children, examine the impact of negative emotions (e.g., depression) and determine the association between mind perception of infants and caregiving behaviors. Parents rated images of individuals on 20 dimensions of agency (e.g., memory or awareness) and experience (e.g., hunger or joy). All parents completed a survey to assess various symptoms of depression. Furthermore, caregiving behaviors were assessed using the Alabama Parenting Questionnaire (preschool edition). Analysis focuses on the connection between parents' mind perceptions of infants and correlated behaviors and is discussed within the existing frameworks of perception, depression and caregiving behaviors.
Faculty Sponsor: Matthew Prull

EMILY JOHNSON, LEXI DAVIRRO, *The Effects of Mindfulness on Hostile Attribution Bias in Adolescents, 2:15 p.m.*
Some adolescents misinterpret intentions of others as malicious, which can lead to a hostile response to an otherwise neutral situation. The goal of our research was to reduce these biases. Research suggests mindfulness can reduce hostile attribution bias and can increase nonjudgmental awareness to the present moment. Mindfulness may help by influencing individuals' levels of reappraisal and attentional control. We implemented a mindfulness program at Lincoln High School. Students completed measures of mindfulness, reappraisal, attentional control and hostile attribution bias as a pre-test and post-test. In between the pre- and post-tests, students completed a two-week long intervention comprising a seven-minute daily meditation. At the end of every meditation, participants completed a short measure to determine how they responded to the meditation. We hope our results influence how meditation can be used within a high school curriculum to reduce students' hostile tendencies.
Faculty Sponsor: Erin Pahlke

RACHEL LEITER, *Behind the Stigma: An Investigation of Stereotypes and Reactions Toward Disabled Children and Adults, 2:30 p.m.*
There is much research on how to remedy and rehabilitate people with disabilities but scant research on how to address the stigma experienced by these individuals. According to the behavioral immune system theory, people with disabilities elicit disgust because their physical traits are falsely identified as markers of contagious disease. According to the stereotype content model, people with disabilities are seen as low in warmth and low in competence, which in turn evokes disgust. To determine the reason behind disability stigma we showed participants images of children and adults with and without disabilities and measured their reactions using self-report scales and eye-tracking. We hypothesized that participants would show a disgust reaction toward adults with disabilities, but not toward children, because the perceived warmth of childhood acts as a protective factor against stigma. The implications of these findings point to new ways to combat disability stigma.
Faculty Sponsor: Tom Armstrong

HANNAH BASHEVKIN, *Game Material: The Culture of Families and the Family of Cults, 2:45 p.m.*
I analyze how Synanon, a residential drug rehabilitation organization established in 1958 in Santa Monica, Calif., affected the family dynamics of its members. Particular emphasis is placed on the children within these families. Synanon enforced the separation of parents and their children, forcing a recognition of Synanon as one's primary family. The organization maintained control of members using a variety of group-therapy tactics. I assess how estrangement from one's nuclear family and other elements of the Synanon experience affected existing family relationships, and how the children of these families developed as a result of these experiences, individually and within their nuclear families, and how these effects may have followed these children into their adult lives. This study of child development in an alternative community environment and the relationships of these children to their nuclear family members provides valuable information about unconventional family dynamics and structure more generally.
Faculty Sponsor: Keith Farrington

CHEMICAL MATTERS
SCIENCE 159
Ashley Person, moderator
Evan Romasco-Kelly, coach

JESSICA LUONG, *Cell Rupture Techniques in Diatom Carotenoid Extraction, 2:00 p.m.*
Carotenoids are organic pigments found in plants and algae and can be extracted for use in health supplements. Ongoing research shows that numerous health benefits are found in naturally-occurring carotenoids fucoxanthin and chlorophyll. In my research, I used different organic solvents as well as physical cell-rupture techniques, including bead milling and hand grinding, to extract fucoxanthin and chlorophyll found in diatoms. Diatoms are unicellular microalgae that are aquatic, photosynthetic and encased in a silica cell wall. The qualitative extraction efficiency of these carotenoids was determined using thin layer chromatography and quantified using mass spectrometry. Extracting these pigments led to better control of product color and understanding of health benefits in carotenoids.
Faculty Sponsor: Mark Juhasz

DEEPRAJ PAWAR, SAMUEL ERICKSON, *The Investigation of Non-Native Substrates of Benzoate Dioxygenase for Pharmaceutical Applications, 2:15 p.m.*
The transformation of arenes by microbial dioxygenases represents a powerful method for the production of chiral synthons in organic synthesis. We present an investigation of specific substrates of a benzoate dioxygenase from the bacterial strain *Ralstonia eutropha* B9. Several novel substrates were investigated with specific focus on mono-chloro, bromo, fluoro, hydroxy and methoxy substituted benzoates. After initial small volume transformation screening, those substrates that appeared viable were transformed on a larger scale in a bioreactor. We present the results of screening 14 non-native substrates as well as explorations of routes to determine absolute configuration of 3-chlorobenzoic acid transformation product. Interesting differences between screening and bioreactor transformations of 3-hydroxybenzoate are also presented. It is anticipated that these metabolites will open the door to new approaches to the natural product Epoxyquinol A, a heterodimeric epoxyquinoid that has been shown to inhibit angiogenesis.
Faculty Sponsor: Jon Collins

WILLIAM MENDELSOHN, *Dicarboxylation of the CB11H12 Anion: Synthesis of 1,12-Dicarboxy-1-Carba-Closo-Dodecaborate, 2:30 p.m.*
1-Carba-closo-dodecaborate (CB11) is a stable cluster made of boron and carbon atoms that has many potential applications that include therapeutic drugs, catalysts for reactions in industrial chemistry, and new materials for electronics. Molecules based on carbon skeletons (organic molecules) are well studied, and many reactions have been developed for their modification. CB11, an inorganic molecule, is much less thoroughly explored and many new reactions for preparing new CB11 derivatives remain to be discovered. Our group has synthesized a new compound by attaching two carboxylic acid groups to the CB11 cluster. Carboxylic acids are groups present in a variety of molecules in biology, and can provide a great starting point for expanding the chemistry of the CB11 cluster, as the carboxylic acids can be converted to a series of different chemical structures. My presentation covers the synthesis of the new CB11 derivative.
Faculty Sponsor: Mark Juhasz

BRAD KLINE, *A Chemoenzymatic Approach to Total Synthesis of Epoxyquinol A, 2:45 p.m.*
Epoxyquinol A, a natural product first isolated from an unclassified fungus, is a heterodimeric epoxyquinoid that has been shown to inhibit angiogenesis. Members of the epoxyquinoid class of compounds are attractive targets for total synthesis due to their biological activity, structural complexity and low yields when extracted from natural sources. A novel iodolactonization-based approach to the total synthesis of epoxyquinol A, a representative epoxyquinoid, is presented. This route relies on the dihydroxylation of benzoate, a cheap and readily available starting material, by benzoate-1,2-dioxygenase (BZDO) expressed in *Ralstonia eutropha* B9 whole cells. The obtained (1S,2R)-1,2-dihydroxycyclohexa-3,5-diene-1-carboxylic acid provides a chiral building block from which to pursue an asymmetric synthesis of epoxyquinol A, as well as other compounds in the epoxyquinoid class. The key iodolactonization step and the following stereoselective installation of an epoxide on the hexadiene ring is highlighted in my presentation.
Faculty Sponsor: Jon Collins

ASHLEY PERSON, *Selective Inhibition of PARP4, 3:00 p.m.*
Poly-ADP-ribose polymerases (PARPs) are enzymes that catalyze the post-translational transfer of adenosine diphosphate (ADP) from NAD+ to target proteins. Some of the 17 PARPs have been studied extensively and are known to have important cellular functions, while little is currently understood about others. A cellular imbalance of one of these PARP enzymes,

PARP4, has been correlated with several disease states, including cancers, though its cellular roles and, thus, understanding of these correlations, are largely unknown. Selective inhibition of PARP4 is one technique to learn of its functions and may have pharmacological potential. In my research, several compounds were tested as inhibitors of PARP4 using a PARP inhibition screening assay. Based on initial results, a better understanding of the structure and activity of PARP4's catalytic domain was used to direct the synthesis and testing of PARP4 inhibitors that could be more selective.
Faculty Sponsor: Jon Collins

LAND AND SEA

SCIENCE 100
Devin Reese, moderator
Segun Sodipo, coach

LIZZI WONG, *Going Off the Not-So-Deep End, 2:00 p.m.*
Trimethylamine N-oxide (TMAO) is an organic compound that protects proteins from high pressure inhibition in deep-sea animals. It increases linearly with depth in benthic fish along the hydrostatic pressure gradient. However, there is little research on TMAO in pelagic fish, including vertical migrators which experience large pressure changes over short timespans. My research focuses on pelagic fish from Hawaii such as telescopefish, viper and angler fish from shallow waters (>500m) to 1500+ meters deep. Preliminary results suggest TMAO increases linearly with depth but with greater variation than in benthic fish, which may relate to differences in migratory behavior. Many pelagic species travel vertically through the water column daily, while many benthic species stay at the same depth for very long periods. These behavioral differences may explain the variance in pelagic data as daily migrators may not be able to adjust TMAO concentration in conjunction with their migration speeds.
Faculty Sponsor: Paul Yancey

JULIANA OZUR, *CaCO3 Production Rate in Hard Corals: Poorly Managed Marine-Protected Areas Have Effect on CO2 Production Rate, 2:15 p.m.*
Since the Industrial Revolution global temperature has increased, leading to ocean acidification and coral bleaching. Coral reefs could be counted as a carbon sink if there were no calcium carbonate exoskeleton that releases CO2 when CaCO3 is produced. However, when corals are stressed from ocean acidification they are forced to increase the release of CO2 because they are trying to rebuild their exoskeletons. To shelter these corals from other stressors, the Isla Bastimentos Marine Protected Area in Bocas del Toro, Panama was expected to protect corals from disease, mortality, and damage. However, my research indicates that there is no significant change between the biological rate of CaCO3 production, coral colony sizes or rugosity and pH inside versus outside the Marine Protected Area. The statistical tests run on the data collected shows that the Isla Bastimentos National Marine Park is ineffective in decreasing coral stress.
Faculty Sponsor: Amy Molitor

KAELEY PILICHOWSKI, *Effects of Marine Protected Areas on Coral Health: Coral Bleaching, Disease, Mortality, Damage and Coral Associates, 2:30 p.m.*
Coral health has significantly declined in the past century, affecting communities that rely on them for resources and ecosystem services. Marine protected areas (MPAs) are meant to protect coastal habitats, but many are ineffective. My research measured coral health inside and outside Isla Bastimentos National Marine Park (IBNMP), a marine-protected area in the Bocas del Toro Archipelago, Panama. Underwater visual surveys were conducted on indicators of

coral health at 15 locations, inside and outside IBNMP. Results indicated no significant difference between coral health inside and outside IBNMP. It can be concluded that this MPA is ineffective in improving coral health in the area. This example is representative of the ineffectiveness of MPAs worldwide due to lack of proper enforcement. If there is any hope of improving the state of the marine environment, an immediate effort must be made to assess the effectiveness of MPAs.
Faculty Sponsor: Delbert Hutchison

MARGARET MILLER-BARTLEY, *Historic Vegetation at Spring Gulch, 2:45 p.m.*
This summer I investigated the decline in sagebrush populations in Spring Gulch. After completing my research, I attempted to build a picture of the historic vegetation. It appears that native plants in the area are being replaced by cheatgrass and other invasive annuals. To assess how much the vegetation has changed, I analyzed the pollen content of soil samples collected from a nearby site. Next, I used GIS to analyze aerial photos of Spring Gulch from the 1960s and photos from the present to compare sagebrush abundances. I also used distance sampling, recording the number of sagebrush pieces I found along transects, to calculate estimated past sagebrush abundances. This work may indicate the amount of sagebrush that has historically been present. Through these methods, I hope to assemble a picture of how vegetation has changed in the area as a result of anthropogenic forces.
Faculty Sponsor: Tim Parker

DEVIN REESE, *Effect of Disturbance on Native Perennial Bunchgrass, 3:00 p.m.*
Pseudoroegneria spicata, more commonly known as bluebunch wheatgrass, is a perennial bunchgrass native to Walla Walla County. The population of bluebunch in Spring Gulch near the Wallula Gap appears to be decreasing, while the population of cheatgrass (*Bromus tectorum*), an invasive annual grass, appears to be on the rise. My research asks if disturbance plays a role in this observed phenomenon by studying disturbed plots where all plants were killed in order to see what would grow. Last summer, I collected point intersect data from 18 disturbed plots and 18 control plots at paired locations in Spring Gulch. These data suggest that annual grasses like cheatgrass are more efficient colonizers of disturbed areas than perennial grasses like bluebunch wheatgrass.
Faculty Sponsor: Tim Parker

MUSIC STUDIES
KIMBALL THEATRE
Signe Lindquist, moderator
Anne Elise Kopta, coach

AUSTIN KAMIN, *The Uncertain History of Sergei Prokofiev's Sonata for Solo Cello, Op. 134, 2:00 p.m.*
It wasn't until nearly two decades after his death that Sergei Prokofiev's Sonata for Solo Cello was completed in its modern, published form. Complicating the authorship of this sonata, the cellist Mstislav Rostropovich collaborated extensively with Prokofiev during the initial compositional

period, and the sonata was completed posthumously by the Russian musicologist Vladimir Blok. Because of the absence of information regarding this work, coupled with its relevance in understanding the progression of Prokofiev's musical idiom (especially pertaining to the cello), I set about uncovering the history and context of this sonata's conception, composition and completion. A multitude of unanswered questions remains, but my research combines sparse information from disparate sources to create a coherent history of Prokofiev's *Sonata for Solo Cello*, with the hope that the work may be further embraced by cellists, academics and audiences alike.
Faculty Sponsor: Albert Diaz, Sally Singer

ANDY BAINTON, *Religion and Hip-Hop, 2:15 p.m.*
In my presentation, I clarify a corollary within hip-hop, namely, having a religious idea, figure, ritual or system of belief as part of a culture, and the use of music as a forum to discuss these religious aspects within a culture. I hope to clarify further whether this correlation reinforces the importance of these religious aspects within the hip-hop community.
Faculty Sponsor: Courtney Fitzsimmons

MADISON WRAY, *Horrifying Sounds with Even-More-Horrifying Implications: The Music of Jordan Peele's Get Out, 2:30 p.m.*
Horror and science-fiction films often provide a coded response to contemporary social trauma, effectively exposing cultural ruptures and reflecting conscious and unconscious fears widely held by society. Jordan Peele's searing, witty, and expansive horror-satire film *Get Out* delivers a commentary on white people's collective insecurity with race, demolishes the idea that American society is post-racial and speaks to the manner in which systemic racism lurks insidiously beneath the surface of seemingly benign interracial interactions. Peele's film owes a large part of its efficacy to Michael Abels' original score/soundtrack, which is integral to grounding Peele's film in its temporal and cultural contexts. Abels' contribution amplifies the arguments about racial prejudice in thought and behavior that are constructed in the dialogue. His soundtrack helps to define nuanced moods, create plot relationships, establish social, geographic and temporal reference points, and psychologically unite the audience.
Faculty Sponsor: Albert Diaz

SIGNE LINDQUIST, *Remix and Reggaeton: Negotiating Latinidad, 2:45 p.m.*
Reggaeton, a fusion of hip-hop, reggae and rap music, began as a subversive genre from the *barrio* and has worked its way into mainstream popular music. My presentation investigates how the works "Oye Mi Canto" by Victor Santiago and "Despacito" by Luis López-Cepero and Erika Ender reflect a history of cultural exchange and negotiation of the Latino/Latina identity between Puerto Rican and North American culture, as well as the role of remix in defining and challenging the notion of a reggaeton song. A recent success, "Despacito" contrasts with "Oye Mi Canto" to demonstrate how reggaeton's unheard voice of the poor *morenos* of Puerto Rico has been dominated by the sale of the erotic Latina image for Anglo-American audiences. Additionally, reggaeton permits the influence of other artists and musical styles to change it to the point that they can interrupt the original sense of pride in the Latino/Latina identity.
Faculty Sponsor: Aaron- Aguilar Ramirez

SESSION 4
3:45-5p.m.

WHITMAN AND EDUCATION
OLIN 138
Grace Fritzke, moderator
Megan Waldau, coach

CAROLINE BAUWENS, *The Crash of Higher Education, 3:45 p.m.*
In my presentation, I assert that higher education is on a fast track to destruction and that we, are in trouble. In the early 2000s, the American housing market experienced an unprecedented mortgage crisis that paralyzed financial institutions and sent global markets into a tailspin. Higher education, I argue, is on its way to experiencing an institutional convulsion of its own. Although the two occupy different spaces in the U.S. economy, the market players of housing and higher education are strikingly synonymous, and the factors that contributed to the implosion of the housing market are at work within the ivory towers.
Faculty Sponsor: Timothy-Kaufman Osborn

MEGUMI RIERSON, *Examining the Endowment, 4:00 p.m.*
What is Whitman's endowment? How does it work, and who does it work for? Endowments have become a marker of power and prestige among institutions of higher education as the academic market becomes more competitive and financial viability becomes a pressing priority. Endowments have also garnered significant media attention in recent years as endowment returns at wealthier schools balloon and politicians accuse colleges of using endowments to hoard wealth. However, this heightened criticism has not brought with it an increase in clarity of the highly technical language that explain how endowments work and why such critiques are levied against them. My presentation analyzes and translates the mechanics of Whitman's endowment by examining investment strategies, tax implications and spending rules, and by placing these activities within the context of a broader conversation about the changing nature of higher education.
Faculty Sponsor: Shampwa Biswas

ZAN MCPHERSON, *Anti-Capitalism at Whitman: Pro-Environmental Behavior and Conformity in the Face of Crisis, 4:15 p.m.*
At a left-leaning, West Coast liberal arts school like Whitman College, students gravitate toward neo-Marxist and anti-capitalist beliefs that contradict the growth-centric adjustment to ecological needs. Yet, they still experience pressure to adopt "sustainable" changes and behaviors. My research used survey data from Whitman students to analyze patterns of pro-environmental behavior and the extent to which students have faith in capitalism to adapt to ecological limits. Follow-up interviews with students who exhibited anti-capitalist tendencies shed light on how they engage with the rise of "green" capitalism, and how this relates to their behavior. My research adds to the debate between ecological modernization and the treadmill of production theory, potentially revealing a tension between renewed socialist values and the push for market-oriented environmental change, a tension that will become increasingly important as the need for environmental protection becomes more pressing.
Faculty Sponsor: Kirsten Rudestam

GRACE FRITZKE, *A History of Religion, Tradition and Change: Considering Our Approach to Memory at Whitman College, 4:30 p.m.*
Chapel every day. A required proof-of-God philosophy course for seniors. The Marcus Whitman Club for future missionaries. Want to date? Ask her to church. Whitman College's religious roots go beyond Cushing Eells' desire to honor missionary Marcus Whitman; evangelical Christianity was built into the college's curricular and extra-curricular life. As the United States' political and social scene underwent significant changes during the 20th century, the role of Christianity at the college likewise changed. Memorial's bell doesn't conjure up chapel memories, and Reid Campus Center has replaced White Temple Baptist, but Whitman's past rings on. My presentation explores the ways Whitman explicitly and implicitly works to create a continuous sense of tradition while maintaining its secular positionality. As our controversial past becomes an increasingly recognized topic of discussion, the college's strategies for cohesive institutional memory should also be considered. My presentation hopes to contribute toward such a dialogue.
Faculty Sponsor: Stan Thayne

LANGUAGE, CULTURE, CRITIQUE
OLIN 129
Zuhra Amini, moderator
Erick Franklund, coach

MEGAN HEARST, *The Geography of Longing, 3:45 p.m.*
My presentation describes the way two poets, one Renaissance and one contemporary, handle their personal landscapes. Both Kimberly Johnson and John Donne employ the land as a potent metaphor for their emotional and physical state. I focus on Donne's metaphysical work, *Devotions Upon Emergent Occasions*, and Johnson's collection *A Metaphorical God*. I examine ecocritical and

devotional practices and the significance of regionalism and nationalism in Western poetry, considering England and the contemporary western U.S. in particular.
Faculty Sponsor: Theresa DiPasquale

JANE KERN, *Mermaids and Nationalism in Early 19th Century Germany, 4:00 p.m.*
Between 1800 and 1830, the territory that later became known as Germany was a part of the Holy Roman Empire, then part of Napoleon's empire and finally its own confederation. During this time of turmoil, decisions were made, consciously and unconsciously, about what it meant to be German versus French and about one land versus many entities. This nationalistic conflict played out politically and artistically, which can be seen through German mermaid literature and in the lives of the writers of poems and stories about mermaids. In my presentation, I discuss how this nationalistic conflict played out in literary productions about mermaids in the Rhine, focusing on the works of Brentano, Heine and Fouqué, in addition to the Brothers Grimm and Hans Christian Andersen. This literary tradition shows how authors formed their German national identity in a state of tension, constantly caught between acceptance and rejection of French influences.
Faculty Sponsor: Emily Jones, Susan Babilon

DAVID LILBURN, *Analyzing Oswalt: How PC Culture Interacts with Comedy, 4:15 p.m.*
On April 22, 2016, comedian Patton Oswalt released his critically acclaimed stand-up special, "Talking for Clapping." During his hour-long show, Oswalt talks about a wide range of topics, including his views on the difficulty of being politically correct. Oswalt is certainly not the first famous comedian to critique PC culture; Jerry Seinfeld has taken a similar stance. What makes Oswalt's critique different is its reception. Seinfeld was attacked by the public for his critique of PC culture. Conversely, Oswalt not only managed to avoid any major public blowback against his critique but also garnered a Grammy and an Emmy for his special. I analyze the rhetorical differences between these two comedians to determine why Oswalt was able to evade public scrutiny while Seinfeld was not.
Faculty Sponsor: Heather Hayes

ZUHRA AMINI, *Ethics of Contrapuntality, 4:30 p.m.*
In *Orientalism* Edward Said asks, "Can one divide human reality, as indeed human reality seems to be, genuinely divided, into clearly different cultures, histories, traditions, societies, even races and survive the consequences humanly?" After the colonial period and in the digital age, there is a danger of unethical appropriation of culture. But what does an unethical appropriation of culture look like? Some degree of cultural mediation occurs in most people's lives, even if they believe themselves to be situated within a singular culture. How are we to envision an ethics of cultural consumption without totalizing culture into an unidentifiable mass through constant appropriation or dividing human reality by restricting culture? To this effect, I analyze Said's notion of counterpoint to engage with the possibility of such an ethics.
Faculty Sponsor: Zahi Zalloua

PHYSICS AND INFINITY
SCIENCE 159
Olivia Gilbert, moderator
Ben Freedman, coach

KAITLIN HARRISON, BRIAN WU, *Cooling Method Effects on Crystal Quality in X-Ray Crystallography, 3:45 p.m.*
Structure determination of protein crystals using X-ray crystallography often requires cryogenic cooling of the crystals, which can damage them. There are several methods of cooling available, each with various benefits. Many crystallographers in the field today use liquid nitrogen plunging or its variant, hyperquenching, which cool the crystal rapidly and are therefore more likely to prevent damaging ice formation. We investigated the relationship between the cooling method and the crystal quality, testing nitrogen plunging, gas-stream cooling, hyperquenching and slow-cooling with a nitrogen plunge. Our results indicate that hyperquenching and nitrogen plunging can be damaging to the quality of the crystal compared to gas-stream cooling. Slow-cooling with nitrogen plunging can also help improve crystal quality. Since nitrogen plunging and hyperquenching are widespread in the crystallography community, these results indicate that for some crystals it should be possible to increase the crystal quality and structure determination efficiency by switching cooling methods.
Faculty Sponsor: Douglas Juers

GABE JUUL, *Secret Codes and Quantum Physics: Verifying the Security of a Quantum Cryptography System, 4:00 p.m.*
We have developed an understanding of quantum physics that enables us to harness the fascinating behavior of individual particles for numerous exciting applications. In my presentation, I focus on quantum cryptography, or the sharing of secret codes using quantum mechanics. My experiments describe a situation in which one party member attempts to fool another into believing their quantum system is secure, when it is not. I demonstrate a technique for identifying correlated errors in the data that can arise in this scenario. The presence of these correlated errors indicates that our system, used for transferring encryption keys, has been manipulated and is insecure. These findings can be used to minimize the assumptions we make when characterizing quantum systems, and to improve their security.
Faculty Sponsor: Mark Beck

OLIVIA GILBERT, *Science Beyond Truth and Falsehood: Perspectives on the Infinite, 4:15 p.m.*
In 1924 mathematician David Hilbert presented a lecture series on set theory and the mathematical concept of infinity. Having spent the summer translating a selection of the lectures from German into English, I use Hilbert's work as a jumping-off point for investigating mathematical infinity from a critical theoretical perspective. While infinity has long been discussed in mathematics and philosophy, current debates revolve around Georg Cantor's 1878 Continuum Hypothesis (CH), which deals with different sizes of infinity. Subsequent mathematicians proved CH to be neither provable nor disprovable. Contemporary

mathematicians have responded. Some seek to settle CH for good, while others are more open to exploration and improvisation. Drawing on linguistics, psychoanalysis and social theory, I explore the implications of the leading perspectives on infinity, ultimately asking how this mathematical conundrum provides paths for navigating intellectual territory in which the question of true/false is no longer helpful, if even possible.
Faculty Sponsor: Timothy Doyle

ENVIRONMENTAL STUDIES
SCIENCE 100
Elizabeth Greenfield, moderator
Emily Krank, coach

KATHLEEN DALY-JENSEN, KRISTINA JACKSON, TRISTAN CATES, *Decoding the Corn Genome, 3:45 p.m.*
Corn is major economic crop in the U.S., serving as a source of food for livestock and people, and as a major biofuel. In complex organisms, there are tens of thousands of protein-encoding genes, many of which have unknown or unconfirmed functions. Our project involves creating a functional "map" of the corn genes involved in development of corn ears. We investigated a collection of genes whose interaction with the hormone auxin is predicted to be important during ear development. We found significant evidence that these genes do in fact code auxin hormone-sensing proteins, and that each has a unique response to this hormone, suggesting these genes serve as a tuning knob for ear development. A better understanding of corn's genetic code will allow us to engineer more energy-efficient forms of a key resource.
Faculty Sponsor: Brit Moss

EVAN ROMASCO-KELLY, *Effects of Riparian Revegetation on Stream Temperature in the Walla Walla Basin, 4:00 p.m.*
Over the course of the past century, Pacific salmon stocks have fallen drastically due to widespread habitat degradation. Restoring these depleted populations is a high-priority conservation goal for government agencies, native American tribes and local nonprofits across the Pacific Northwest. Streams in the Walla Walla Basin serve as spawning grounds and migration pathways for steelhead salmon, Chinook salmon and bull trout. However, temperatures in these waterways can become dangerously high for salmonids during the summer months. Partly in response to this issue, organizations such as Kooskooskie Commons and Tri-State Steelheaders have initiated programs to plant native vegetation in riparian zones, providing shade along stream reaches. In my study, I compare water temperature data for multiple streams across the Walla Walla Basin to measure the effect of these riparian restoration projects on stream temperature.
Faculty Sponsor: Nick Bader

MADDY POEHLEIN, *'Colonialism' and Environmental Degradation in the Alaskan Arctic, 4:15 p.m.*
Alaska is known as the "last frontier," a phrase tied to fantasies of westward expansion and saturated with negative implications for indigenous cultures and their lands. Is it accurate to classify the Alaskan Arctic as a site of continued colonization? What is the relationship of this continued colonization to environmental degradation? My presentation addresses these questions, pushing against the notion that all colonization has been relegated to the past. I situate my project within the context of postcolonial and ecocritical studies, adding the case study of the Alaskan Arctic to existing literature. Where many theorists have maintained that colonialism impacts the environment, I argue that environmental degradation was — and still is — integral to the processes of colonialism. By viewing colonialism as a present occurrence integrally tied to environmental degradation, I hope to illuminate inequalities that come from both phenomena.
Faculty Sponsor: Elleni Zeleke

ELIZABETH GREENFIELD, *Commuting to Whitman: The Role of Alternative Transportation in a Rural College Town, 4:30 p.m.*
With accelerating climate change and the transportation sector contributing 27 percent of national carbon emissions, it is critical to increase the percentage of commutes that utilize slow transportation modes such as biking, walking and transit to cut transportation emissions and shrink individual carbon footprints. Whitman College is located in an area that should make alternative commutes widespread and convenient, yet car-based commutes are still very common. Through survey analysis and interviews with staff, faculty and students, my research aims to discover what can be done to incentivize alternative transportation. My study complements research in campus sustainability and urban sustainability by offering a case study of mobility at a more rural institution.
Faculty Sponsor: Kirsten Rudestam

GREAT PERFORMANCES
KIMBALL THEATRE
Gabe Merrill-Steskal, moderator
Izzy Sherwood-Reid, coach

DAN LOVATO, *Translating and Transcending: Adapting Non-Binary Identity From Source Material to Staged Musical, 3:45 p.m.*
My project is a multimedia program that blurs the lines between presentation and performance. Using Kander and Ebb's "Cabaret" in conjunction with Sater and Sheik's "Spring Awakening," I contextualize non-binary representation in American musical theater while providing analysis of the characters from a queer theoretical perspective. After contextualizing the characters and their importance in the oeuvre of American theater, I perform as two non-binary characters from contemporary American musicals, highlighting my own gender-fluid identity by transitioning from one character to the other while simultaneously presenting and remaining onstage. I intend to demonstrate the cultural impact of queer representation in theater and emphasize the importance of empowering minority identities through art and media.
Faculty Sponsor: Daniel Schindler

ROBBY BOYER, *String Trio No. 1, 4:00 p.m.*
My *String Trio for Violin, Viola and Cello* is a character suite depicting emotional responses to trauma. The first movement,

"Lament," is in ternary form. It opens with a dirge containing sustained dissonances before moving into a more lyrical lament. A fiery dance-like section with an ostinato bass line follows. The piece then returns to the dirge. The second movement, "Melancholia," is serene in contrast to the drama of the first movement. This mood is established by the cello solo, joined by the violin and then the viola, working chiefly in pentatonic counterpoint rather than the thick chordal structure of the preceding movement. The final movement, "Agitato Furioso," returns to the tumult of the first movement, dominated by driving rhythms and firm articulation. The strident melody is carried chiefly by the viola. Before the performance, I will speak briefly about the conception of and composing process behind the piece.
Faculty Sponsor: John Earnest

CORY COGLEY, *Geometric Suite, 4:15 p.m.*
Geometric Suite for solo piano began as an attempt to create a single lyrical "row" of music. This line of music was crafted utilizing specific interval and subset formations common in the early 12-tone works of Schoenberg, Berg and Webern. Once this single idea was established, the movements began to write themselves, flowing onto the page as naturally and cohesively as mathematically defined configurations. My piece is titled after the geometric patterns that they most resemble: "Spiral," "Circles" and "Intersecting Lines." Though I draw from previously established 12-tone ideas, all the structures used in my suite are entirely original. As a result, the piece is a complex puzzle that brings out as much musicality as can be wrung from this compositional style. Before I perform the piece, I will speak briefly about the applications of modern atonal compositional techniques that I have learned.
Faculty Sponsor: John Earnest

HUNTER DUNN, *'Americolor', 4:30 p.m.*
"Americolor," a set of five variations on an original theme, synthesizes of several different forms of 20th-century American (in the continental sense) music, including gospel, New Orleans jazz, ragtime, bossa nova and heartland rock. Written for saxophone, piano, bass and drums, the theme's initial statement contains heavy chromaticism and rich harmonies over relatively simple rhythmic patterns, a relationship that inverts itself as the five variations, each named for a prominent practitioner of its respective genre, progress. The primary melodic figures undergo inversion, fragmentation and rhythmic and harmonic transpositions throughout. The piece concludes with a triumphal recapitulation of the theme in its original form. I will present a brief description of these compositional techniques before the performance of the work. (Theme: "Mingus"; Variation 1: "Dr. John"; Variation 2: "Joplin"; Variation 3: "Davis"; Variation 4: "Jobim" Variation 5: "Springsteen")
Faculty Sponsor: John Earnest

GABE MERRILL-STESKAL, *Tree Suite, 4:45 p.m.*
Tree Suite for solo piano explores small musical forms, using motivic development (fragmentation, augmentation, rhythmic imitation, sequencing) and varied tonal centers to construct musically meaningful narratives. The first movement, "Twig," is lively and jumpy. It is a miniature variations form, with the theme interwoven throughout. "Leaves" is introspective and somewhat melancholy. A searching motif anchors the piece to B minor, which each section tries to escape but ultimately fails. When one section briefly succeeds and moves to A-flat major, a ray of sunshine appears amidst an otherwise gray, autumnal scene. Quick and cheerful, "Boughs" depicts a flurry of greenery dancing in the wind. A diatonic melody above a broken-chord accompaniment in E major moves to a contrasting section in A minor, and then joyfully returns to conclude the piece. Before the performance, I will briefly describe the genesis of the piece and the compositional techniques used in each movement.
Faculty Sponsor: John Earnest

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Department of Psychology

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Keck Geology Consortium, National Science Foundation

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Perry Summer Research Award

Emily Bowen
National Science Foundation

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Pisgah Astronomical Research Institute

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Kathleen Daly-Jensen, Kristina Jackson and Tristan Cates
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DIS Copenhagen

Abby Molloy
CIEE: Monteverde Sustainability and the Environment

Juliana Ozur
SFS: Panama Tropical Island Biodiversity Studies

Kaeley Pilichowski
SFS: Panama Tropical Island Biodiversity Studies

Brooke Terkovich
SIT Chile: Public Health, Traditional Medicine and Community Empowerment

NOTES

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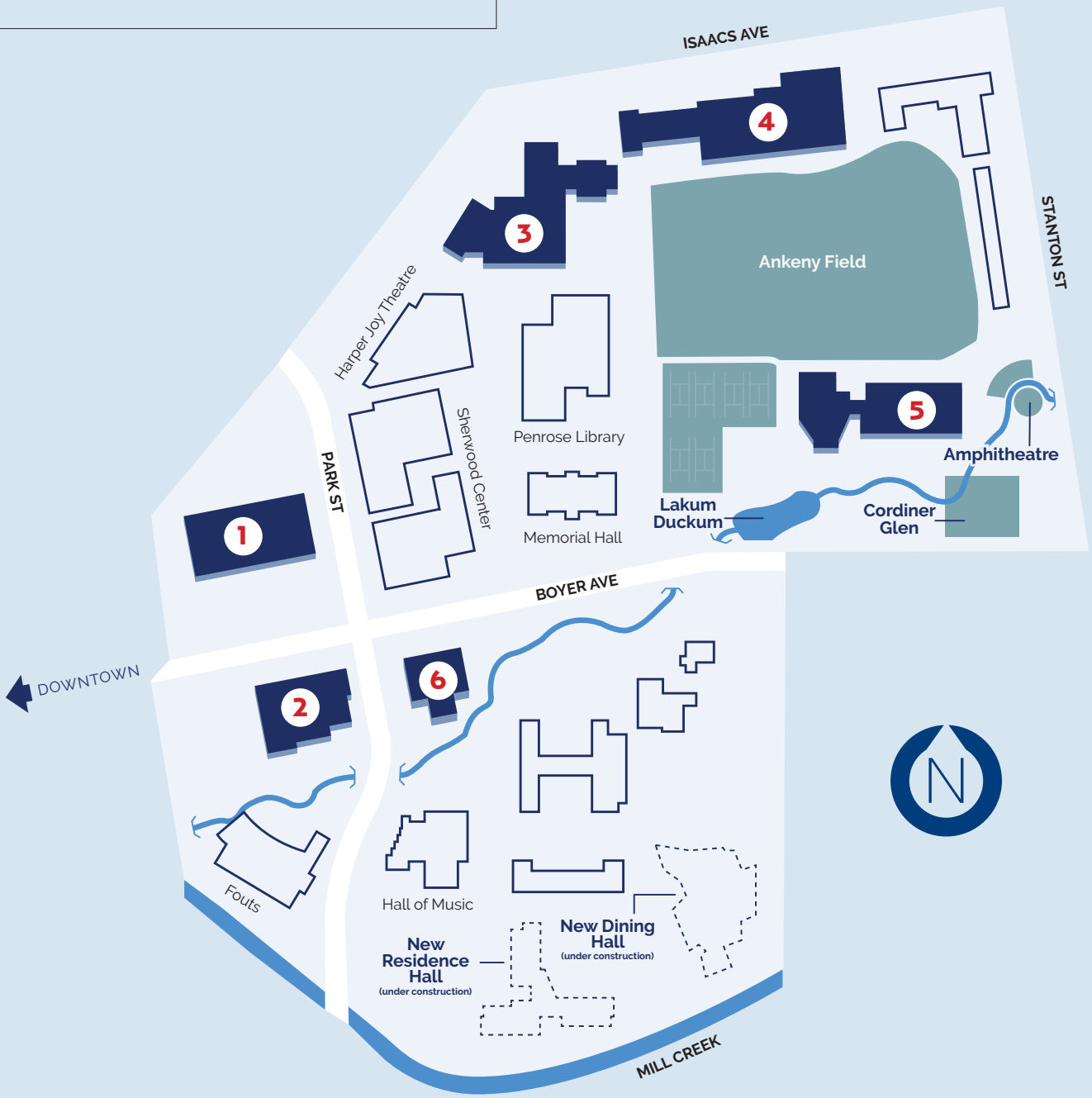
With special thanks to Phillip Schmatt, Robert Fricke, Amy Dodds, Doug Scarborough, Gary Gemberling, Whitman College Technology Services, Teresa Maddess and the staff of Bon Appetit, and the student musicians who share their art throughout the day.

CONFERENCE VENUES

1. **Cordiner Hall**
2. **Reid Campus Center**
   G02
3. **Hall of Science**
   100 (Brattain Auditorium)
   159
4. **Olin Hall**
   129
   138
5. **Maxey Hall**
   104
6. **Hunter Conservatory**
   Kimball Theatre



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