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Program and Proceedings

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Presentations

College of Arts and Humanities

Africana and Black Studies

Syrian Refugee Crisis - *Jacquelyn Barber, Faculty Mentor: Salam Awad*

This presentation is an analysis of the Syrian refugee crisis and the connection to the Black Lives Matter movement. The forces of imperialism, racism, state violence, xenophobia, and nationalism are commonalities between the Syrian refugee crisis and the Black Lives Matter movement. An analysis of these forces gives an understanding and connection to global issues and the bonds that are formed through solidarity as a result. The Syrian refugee crisis is an ongoing humanitarian crisis that has left half of the Syrian population displaced internally and abroad. The war that led to the refugee crisis and the Syrian refugee crisis has put pressure on the host countries and has caused political, social, security, and economic implications. Since the Syrian war started March 6th, 2011 that led to the refugee crisis, there has been a global increase in Islamophobia, including the US Muslim ban. The selectivity of countries and who they accept as refugees and the amount that is accepted is also linked to imperialism, racism, nationalism, capitalism, and power inequality. The common pain and suffering that comes from colonialism, imperialism, capitalism, persecution, and prejudice is different for each group of people that experiences it, but the pain caused leads to solidarity which can be seen between the Syrian refugee crisis and the Black Lives Matter movement.

A Live-Streamed Revolution: Before and After the Camera Cuts - *Karla Maravilla, Champagne Ryder, Marisa Villanueva, Faculty Mentor: Xavier Cavazos*

The history of the United States is a history of terrorism against Black, Indigenous People Of Color (BIPOC). From slavery, lynching, and Jim Crow for Blacks, genocide of Indigenous Peoples and theft of their land, to Japanese Internment, Chinese Head Tax and Zoot Suit riots, inhumane treatment of Latinos, the militarization of the border, bigotry, discrimination, and violence has been the historical rule, not the exception. While today there is not expressed racial discrimination in the law, there is violence of hate crimes shown in the recent mass shooting of Asian Americans and Pacific Islanders, border and inland internment, police brutality against African Americans and mass incarceration. This presentation is a response to the hate speech and rise in cultural erasure against marginalized people and the attempt to use domestic terrorism as a method of intimidation to silence their BIPOC bodies. These new young voices speak back, or speak a truth of living under the local news' helicopter's flashlight of domestic terrorism before and after the camera cuts.

Communication

"I am me. I am not defined by my disability." - *Angela Kyle, Faculty Mentor: Terri Reddout*

A set of visual stories composed of photographs and capturing portraits of participants. Bringing awareness to my audience that people with disabilities are people first and not defined by their disability. Written descriptions of individuals with name, age, favorite things, and interesting facts about the person. The disability that they have is not discussed in this part of the presentation. Individuals that attend the presentation are asked to think about if they have a connection or common interest with a person introduced. Select details shared that you feel you can relate to and that pushes participants to select an individual introduced to them. Once a person attending the presentation chooses who they feel they have the most in common with or want to get to know more, the visual component to the project is shown. A gallery of black and white photos will complete the presentation with the visual story of everyone. Keep in mind some disabilities are visible, and some are not, and are considered as invisible.

The next piece of the presentation is information about the disability and how it relates to them, how they live with it while attending college, working, or raising a family. What information is communicated will depend on everyone's desire to share.

Spreading awareness about disabilities, making them less intimidating due to lack of knowledge. Doing that by opening conversations about disabilities. Communication is key when the ultimate goal is awareness. The importance and key factor to grab the audience's attention is a visual story.

Exploding Pedagogy: Incorporating Innovative and Creative Assignments in College Courses to Promote Inclusivity - *Gabby Triana, Faculty Mentor: Maya Zeller*

This presentation navigates the website version of my Douglas Honors College capstone project, which explores ways of increasing accessibility and inclusivity in college writing assignments. My critical introduction draws on pedagogical theory and practices to examine how student-centered projects can sometimes stand in for the traditional academic essay assignment, addressing the issue of how scholarly language can be exclusionary to students whose dialects differ from Standard American English (SAE) or who struggle with academic writing for other reasons. I propose that creative and innovative writing projects can offer better assessment and learning measures for students of diverse backgrounds, identities, and learning styles. As a case study, I move to a portfolio of my own creative and hybrid projects--poems, illustrations, a lecture, and an interactive game--from my undergraduate courses, explaining in a précis for each project how I integrate analysis and research. The presentation showcases one such example: an ekphrastic poetry series for which I created the assignment guidelines and rubric. By revisiting comments from my instructors and analyzing my own work, I demonstrate how creative and innovative genres require intentional decisions about using form and course content, thus promoting critical thinking and interdisciplinary learning. Lastly, I invite instructors to consider how they might include more innovative and student-led projects in their courses.

Intertextuality and Hybrid Identity in Mario Vargas Llosa's *The Storyteller* -

James Thomas, Faculty Mentor: Christopher Schedler

This presentation explores an intertextual comparison between Saul Zuratas/Mascarita, in Mario Vargas Llosa's novel *The Storyteller* and Saul of Tarsus/Paul, the apostle from the Christian New Testament and, from a larger perspective, the Judeo-Christian tradition as a hybridization of elements from multiple cultures. The textual comparison includes the similarity in the names and backgrounds of both Sauls and the adaptation that accompanies the inclusion of an outsider into an exclusive group. An analysis of the indigenous Machiguenga tribe and intentional references to similarities between tribal migrations and the Jewish people's journey through the wilderness after a period of captivity are addressed. This paper also engages with recent scholarship to assess the role of identity in *The Storyteller* with an emphasis on assigned versus assumed identity. Overlapping categories of identity are examined to further delve into the individual's responsibility in the creation of their own identity.

Propaganda Shaping the Gender Role of British Women In World War One - Rachel Brown (G), Faculty Mentor: Christopher Schedler

This presentation will address how propaganda altered the gender role of women in Great Britain during World War One (WWI). Often overlooked for their contributions, the women who worked to directly support the war effort on both the home and war fronts were inspired by propaganda that helped to define the role of women in wartime. Not only is WWI often overlooked within the study of war literature, but also the roles and perspectives of women during that time is under researched within the realm of literary study. This presentation analyzes several propaganda posters targeted at women during WWI, and utilizes a gender theory approach to highlight how propaganda both defined and constrained the gendered expectations of women. By examining the propaganda of the time, this presentation reveals that women were crucial to the war effort, and by serving their country through war work, the gendered role of women was altered forever. The larger implication of this study is illuminating the impact that propaganda had then and now on the structuring of gender roles, as well as the need for new research on the diverse literature of WWI, including the work of Evadne Price and Mary Borden, wherein female authors and characters are the focus.

Night of Awakening: Strength and Empowerment in the Young Adult Fantasy Genre *Shelby Davis, Faculty Mentor: Sarah Sillin and M. O'Brien*

The Young Adult Fantasy genre is often written off as a useless, or immature form of writing. However, there are studies that prove that this specific genre is not only engaging, but it is also empowering for young readers. By writing toward adolescents readers, authors are able to promote various ways in which their characters adjust or interact with their surroundings, which also influences their reader's self and social awareness. By representing feminist perspectives and depicting the effects of trauma, YA literature fosters progressive social change and conveys the importance of mental health. In writing my own novel, *The Night of Awakening*, for my Douglas Honors College Thesis, I discovered how my own characters could represent young women's power and mental health awareness to change long-standing institutions. My main character, Alina, is isolated from all those around her because of a mysterious power that has taken her hostage. While seemingly "powerless" in a world of magic, Alina embodies feminist power as she finds her own ways to battle ancient powers and acknowledge the trauma her own family has inflicted upon her. By using scholarly articles to meter my study, I was able to discover the ways in which my novel might impact the literature scene and influence young, impressionable minds. This presentation will briefly highlight debates over YA literature's effects and then offer one model of how the genre can teach empowerment through a reading of a brief scene from my work.

Reimagining Women's Voices in the Next Centennial: Untold Stories of Female Poets

- *Theresa Daigle, Tami Jensen, Karla Maravilla, Faculty Mentor: Pedro Cavazos*

When Amanda Gorman took to the podium during the 2021 Presidential Inauguration, a fresh voice lifted off the page and onto the world's collective screen. The ability to express thoughts and feelings through verse and mixed media provides poets a new opportunity for greater exposure to redefine female poetic boundaries and themes. Combining the written word with video and social media, female poets are forging a new aesthetic. Scrolling through YouTube, or TEDx, the female poet's voice is empowering, uplifting, and speaking truth to power! Voices like Dr. Maya Angelou and Britta B talk directly to other young women. "Still I Rise," written by Angelou in 1978, gains a new audience with video by speaking words directly to over four million viewers. With the use of technology, poetry has grown increasingly accessible. Poetry is no longer contained exclusively in academic halls or validated by middle-aged white males. Streaming services are exploding with poetry in video form, also known as videopoetry, video-visual poetry, and media poetry. We will explore how the use of video, has given female artist's a new modality to express themselves. Three such artists will show their original videopoetry and discuss how social media has inspired their work. Poetry in this form can encourage closed mouths to speak their truths, and, in Gorman's words, "When day comes we step out of the shade, aflame and unafraid, the new dawn blooms as we free it for there is always light if only we're brave enough to see it."

Homecoming: A Climate Fiction Reading - *Kathleen Singleton, Faculty Mentor: Tamara Caulkins, Matthew Martinson*

How does the concept of home grow with you? Every year, salmon return to the streams they were born in to lay their eggs and die. Likewise, humans will always feel a pull towards what we consider home. This reading of a short piece of climate fiction will explore themes of migration, both of the natural world and of our relation to it. Drawing on techniques and knowledge gained in a recent class on climate change in history and literature, this piece of fiction tells the story of a school teacher who returns home to the Pacific Northwest, and how she passes on lessons about the salmon that return there every year.

Manastash Literary Journal Debut Reading - *()*, *Faculty Mentor: Barry Shelton, Xavier Cavazos*

This reading celebrates the 31st publication of Manastash. We at Manastash value the ability to stand up and voice the truths that are seen at a societal and personal level through poetry, prose, photography, and other art forms. These student authors chosen by Manastash editors provide a sample of writing from our upcoming edition and embrace our values of diversity and inclusivity. Join us in sharing these experiences and lifting our voices as we speak our truth.

The Impacts of the Vikings Seen Today - *Jasper McCutcheon, Faculty Mentor: Paula Collucci*

The general perception of the Viking Age is of an era filled with extreme violence. Men and women from northern Europe did raid and pillage many other European kingdoms throughout this time period, but they also traded, explored, and participated in the spread of ideas and culture. While there is no doubt that the Viking Age was filled with bloodshed there has been an overemphasis on the violence of this era. This false perception of the Viking Age arises from the lack of historical accounts written by the Vikings. The Vikings rarely wrote anything down; instead, they told stories orally. Many written accounts of their history came from members of Christian Europe, mainly churchmen, which resulted in the over exaggeration of the violence done by the Viking within these accounts. Unfortunately, this common narrative of the Viking Age overlooks their broader contributions to modern civilizations. When in truth, it is because of the Vikings' impact on everyday things, exploration, trade, and the formation of countries, that our world looks like it does today.

Korean Studies Panels

Societal Diet Culture and Fatphobia in South Korea - *Jennifer Rhee, Faculty Mentor: Chong Eun Ahn*

South Korea has become an epicenter of international entertainment- K-pop, Korean dramas and films, and video games can be seen enjoyed all over the world. Along with the rise of South Korean entertainment, many consumers have found obsession over the desired Korean "look" leading to eating disorders, plastic surgery appointments, and body shaming. Korean beauty standards are unrealistic and pushing harmful and dangerous body images. What is Korea doing to respond to the public outcries of body shaming?

Korean Feminism and Gender Roles - *Chloe Cairns, Faculty Mentor: Chong Eun Ahn*

This presentation analyzes how Korean tradition and culture enforces the strict social norms placed on Korean women. Where women are expected to follow traditional societal norms and prioritize cultural values. These values include the pressure to be a good wife and mother even if it is at the expense of a woman's career. However, in recent years, women in Korea have been fighting against the societal pressure placed on them. Korean women have accomplished this through pursuing careers and holding off on marriage and having children. These actions challenge present social norms and traditions, while working towards gender equality in current Korean culture.

Sunjang Baduk - *Kurt Stine, Faculty Mentor: Volha Isakava*

This presentation analyzes Sunjang Baduk and its decline in Korea over the course of 400 years (c. 1500-1940). It will also note the slight increase in interest in the 1990s before fizzling out again. A large portion of the presentation will be focused on explaining the rules of Go (the international name for Baduk) and the differences Sunjang Baduk brings to the table.

Gen Z in Korea - *Cassandra Santana, Faculty Mentor: Volha Isakava*

Gen Z or Generation Z consists of people in the age range of about 7-25-year-olds. Much of the younger generation in Korea often carry the heavyweight of societal pressure and family expectation throughout their lifetime. Despite facing so much stress, they have taken charge in many situations. Over the past decade or so, a lot of the younger generation have stepped up to contribute to their society. Many have worked their avenue of social change into daily reality. The first being the protests and rallies in Korea. Much of the protests happening have been about political challenges, with the majority of the people being high schoolers, middle schoolers, and young families with the influence of young people, some older people who fought with them. Looking at the last decade, there have been a number of students becoming politically invested in their country to fight for what they believe is right. One example of gen z's impact on Korean society is candlelight protests. The protest was held against former President Park Geun-Hye due to her inability to help people and being in political scandals, and much more. Another is the rallies for the LGBTQ community; this is due to much of the younger generation being more open or liberal about people's sexualities.

The Heart of Hallyu 2.0 - *Elisabeth Jenkins, Faculty Mentor: Volha Isakava*

The Hallyu Wave is the name for the increase in popularity of South Korean popular visual culture in other countries. It began with Hallyu 1.0, which was more of a regional growth in popularity, occurring approximately between the 1980s and the early 2000s. This presentation will cover Hallyu 2.0, which occurred more globally starting around 2007 and went through the mid-2010s, at which point, Hallyu 3.0 began. Hallyu 2.0 was a result of South Korea taking advantage of new digital technology and social media, mostly by posting contemporary K-pop music on YouTube, as well adding K-dramas to worldwide streaming sites. In the interests of time, and due to the wide scope of Hallyu 2.0, this presentation will only cover a select group of K-pop idols and one K-drama that were at the heart of this wave, and those are Super Junior, SHINee, BIGBANG, and Boys Over Flowers. All three of the K-pop groups were heavily active during the Hallyu 2.0 time period, and they helped pave the way for later interest in groups like BTS, BlackPink, NCT, and more. Boys Over Flowers is also generally regarded as one of the most iconic K-dramas, and the first K-drama people remember becoming popular in the West. Why were these artifacts of visual culture popular in South Korea? Why did these groups and this show in particular become so popular globally and in the United States in particular? And what effects have they had on visual culture in South Korea and beyond?

How Has Korean Mythology & Folklore impacted Korean Culture - Aracely

Cohetzaltitla, Laura Randolph, Faculty Mentor: Chong Eun Ahn

In our presentation we will discuss how Korean Folklore and Mythology has impacted Korean culture in the past and in the present. We will be discussing three important stories/ myths that Koreans grew up hearing, and also how these stories/ myths have shaped history, and how it has impacted and continues to impact the culture today. Some of the subtopics that will be discussed along with the stories are poetic justice, the diligence of Koreans, community vs. individualism and filial piety.

Korean Variety Shows - Adamari Valente, Faculty Mentor: Volha Isakava

The topic that will be presented on will be about Korean Variety shows. Korean citizens watch dramas and variety shows that will make them have a good time when they are taking a break from work or school. Korea has so many variety shows that are targeted to be enjoyed as a whole family. Depending on the type of show there is they are always to bring families together, show people of different ages about history, music, news, and all about the Korean culture. These shows are very different because they want to demonstrate the good things that has and will happen to the viewers. I will be presenting my topic about variety shows on showing the different variety shows there is and who their main approach is. From the ones I have seen there has been a lot for adults but also some for children to see.

How translations shape the American perspective of Korea - Coy Ryan, Faculty

Mentor: Booyoun Kim

While the human experience may be a shared one, language and culture shape the individual ways in which we perceive the world around us, how we express ourselves the ways in which we relate to others. Words from one language may have no equivalent in another language, and grammatical structurings can change where the main focus of a sentence lies. Korean and English are two very different languages, and South Korea and America may have two very different cultures, but over the last couple of decades, the two countries have found themselves growing closer than ever. As such, communication is important. However, seeing as no perfect translation exists, this presentation will focus on how the structure and vocabulary of the Korean language itself impacts the translation process in a Korean to English translation. And then, in turn, how this difference between the two languages affects how these translated messages are received by American, English speakers, and how this reception affects the American perception of Korean culture. This presentation will be looking into what makes the Korean language unique in its grammar, sentence structure, and vocabulary. It will then compare this to the same features of the English language. From here, I will dive into the process of translation for popular Korean materials like Manhwa, Kpop, Kdrama, and popular Korean products in an attempt to find how these differences are accounted, or unaccounted for. It will look for differences in both language and culture. Finally, it will look at how the final, English translation compares to the original, Korean message. When doing so, the presentation will explain how culture, word order, and word choice impact how the translated message is perceived vs how the original was intended to be. The hope for this presentation is that it may bring a greater understanding of Korean culture to American listeners.

Music Composition

How to Write an Album at CWU - *Alison Banchero, Faculty Mentor: Mark Samples* (Funded by OUR Grant)

This presentation will outline the process of my senior project here at CWU. The project is an album of original songs that have been written, arranged, recorded, and mixed. There are 9 songs total that vary in instrumentation—from piano and voice to strings, winds, voice, and classical percussion—and genre—from pop to musical theater, jazz, and soul. I will break down the steps of songwriting, revision, development, arrangement, contracting others, organizing recording sessions, and mixing. Audio recordings will also be shared. I will review some of the unique challenges and lessons learned throughout this process, such as recording during a pandemic, the importance of a positive attitude, diplomacy in the face of administrative issues, and management skills as they pertain to this field of work. It is my hope that this project lays the foundation for future students who choose to take on creative projects in the music department.

When I Am with You, a Song Cycle for Queer Love - *Matthew Shreve, Faculty Mentor: Gayla Blaisdell*

"When I Am with You, a Song Cycle for Queer Love" is a set of eight love songs composed by Matthew Shreve, featuring the poetry of Imagist poet Amy Lowell (1874-1925). Each song, a moment in time, that follows the loose narrative of a flourishing relationship, from bud to bloom — from the thrill of young love to the building of a nurturing home life. This presentation outlines compositional techniques, a short description of Amy Lowell's life and legacy, and piano and voice performance by CWU alumna Ruth Newkirk.

Music Performance

Branding the Witch: Mysticism, Femininity, Timbre, and Stevie Nicks - Michael Powers, Faculty Mentor: Mark Samples

Stevie Nicks, over a career spanning nearly fifty years, has established herself as one of history's most important rock musicians. Critics and fans alike have long recognized her characteristic image and voice. An analysis of Nicks' brand offers more than just an understanding of the singer herself. It exemplifies how musicians' personas are constructed, how those personas can function between solo and group settings, and how they develop over time. As music and promotion become increasingly intertwined, these are concerns scholars in all genres of commercial music will face. This paper addresses those concerns by defining a theory of the Stevie Nicks brand, what constitutes it, and how it has (and has not) changed since the 1970s. Through a musical, semiotic, and textual analysis of Nicks' persona (music, lyrics, album artwork, interviews, media appearances) and the discourse around it (newspapers, magazines, online forums, modern artist brands), three brand pillars will be proposed. The first is mysticism, broadly defined as the belief in supernatural, occult, or otherwise otherworldly modes of power and knowledge. Second is conventional, archetypal femininity. Finally, is Nicks' voice. I will propose that Nicks' identifiable vocal timbre imparts her brand with cultural ideas of authenticity. Her brand simultaneously connotes the voice with its existing meaning, particularly on recording. Mysticism, femininity, and Nicks' voice rely on and inform one another to create a coherent, consistent, and adaptable brand persona. This persona remains constant in both her solo and Fleetwood Mac careers, and has maintained relevance through the present. This paper addresses those concerns by defining a theory of the Stevie Nicks brand, what constitutes it, and how it has (and has not) changed since the 1970s. Through a musical, semiotic, and textual analysis of Nicks' persona (music, lyrics, album artwork, interviews, media appearances) and the discourse around it (newspapers, magazines, online forums, modern artist brands), three brand pillars will be proposed. The first is mysticism, broadly defined as the belief in supernatural, occult, or otherwise otherworldly modes of power and knowledge. Second is conventional, archetypal femininity. Finally, is Nicks' voice. If a brand is meant to distinguish and humanize a product, then the voice is essential in constructing the brand of a singer. I will propose that Nicks' identifiable vocal timbre imparts her brand with ideas of authenticity and complicates our perception of her femininity. Nicks' voice connotes her brand with these features; her brand simultaneously connotes the voice with its existing meaning. This symbiotic relationship is particularly apparent when Nicks' voice is disembodied on recording. Mysticism, femininity, and Nicks' voice rely on and inform one another to create a coherent, consistent, and adaptable brand persona. This persona remains constant in both her solo and Fleetwood Mac careers, and has maintained relevance through the present.

Non-Profit Management

Strengthening Interdisciplinary Leadership Teams through Team Development

Intervention - *Leana St. Clair, Meghan Gilbert Faculty Mentor: Jaime Gilbert*

In the workforce and the classroom, one of the fastest growing trends is teamwork. Organizational leaders, spanning across varying fields and disciplines, have indicated that the amount of time spent on team related tasks has continued to increase. Along with this growing trend, the Silo Effect, which is diminishing and damaging cross-departmental and interdisciplinary collaboration, is threatening organizational sustainability and creating a demand for team development solutions. In order to increase strength, communication, and collaboration amongst an interdisciplinary leadership team, a Team Development Intervention (TDI) was created that focused primarily on the factors of interpersonal communication management, problem solving, role clarification/flexibility, and goal setting/achievement. The TDI is made up of both Team Building and Team Debriefing components that can be implemented by faculty and staff with student-based leadership teams. This presentation will focus on the development of this TDI and how it can be utilized to strengthen both interpersonal communication-based team skills and the ability to successfully collaborate across disciplines. Along with that, it provides a model for university faculty and staff to effectively mentor future student leadership teams into strong organizational leaders, communicators, and collaborators.

Effectiveness of Balanced-Scorecard Performance Management on Organizational Team Innovation and Sustainability

Jackson Sorensen, Spencer Clifton, Leana St. Clair, Amy Morris, Dylan Gilbert, Faculty Mentor: Deanna Marshall

Organizational sustainability is facing resistance more than ever due to the COVID-19 global pandemic; previous in-person work teams are needing to learn how to successfully navigate their team dynamics (due to mandatory work-from-home mandates) while virtually working together from individual-home locations. The purpose of this continued Team Development Intervention (TDI) (Phase II) was to demonstrate how a newly formed higher-education interdisciplinary non-profit/social entrepreneurship student organization used the TDI outcomes from their first academic year in existence to further develop and strengthen their team in its second year efforts for the purpose of creating a 21st century sustainable organization; an organization that not only utilizes the diverse perspectives of its leadership team and members, but one that provides content that is educational and useful to its wide array of stakeholders, especially when it comes to diversity, equity, and inclusion. The five-member leadership team span from each of the university's colleges: College of Business, College of Sciences, College of Arts and Humanities, and College of Education and Professional Studies. The interdisciplinary leadership team will be sharing the outcomes that drove their team this year along with their reflections on their continued TDI assessment for the 2020/21 academic year, their balanced-scorecard leadership performance reviews from self-evaluations and stakeholder meeting survey evaluations, their diverse content development and engagement (through Social Media Insight Analytics), performance reviews from their multiple-tiered club advisors, and their recommendations for future club leadership teams, especially when moving forward in an uncertain global organizational dynamic.

Theatre

Alone - *Kaela Buffum Hogan, Faculty Mentor: Kathryn Stahl*

I started my exploration of humanity through creation in COVID by observing my own circumstances and reaching out to fellow artists in my community. My initial approach to this performance was with the intention of being performed live, but this was redirected by COVID safety precautions. Alone, is a response to the world we have lost. It is a reflection of the overwhelming confusion and sorrow experienced by the general population. This piece is an invitation to the audience to reflect, to breathe, to grieve, and to exist. Alone takes place in the spaces we hold dear to our hearts and in the times that we are most alone. In the creative process we used the zoom camera as a lens to view the character through their internal monologue and focused on designing a space that would be intimate and emotionally jarring. On social media, I reached out to peers for personal media and experiences about their lives in the past year of the COVID-19 pandemic, all of the media included in this performance was resourced that way. My actors and I focused on creating an authentic connection through a digital lens and this led us to interpret the script in new forms. Moving forward, I would like to use this art piece as a way to further interpret human relations to crisis response and how that impacts our relationships to our community.

College of Business

Economics

CWU Student Price Index - *Zachary Dowdy, Kaylee Cooper, Faculty Mentor: Tennecia Dacass*

This project aims to develop a price index of the cost of college living in Ellensburg. To be consistent with the information provided by the Bureau of Labor Statistics (BLS) for the U.S., but more representative of CWU students' cost of living, we administered a student expenditure survey to collect information on the expenditures and purchasing habits of the average student on the Ellensburg campus. This data provided the weights for the basket of goods purchased during a typical month. We then collected prices of the items in the basket from various stores in Ellensburg to calculate the first measure of inflation. This index's key strength is its applicability to students who are known to have different spending profiles than the average U.S. consumer. For example, we find that 42% of the typical student's monthly expenditure is spent on housing relative to the 33% reported by the BLS. Our initial findings reveal that the SPI decreased by 0.2 percent in February 2021 relative to the preceding month. The results from this study and future updates are expected to provide useful insights regarding students' cost of living, which is of immense relevance to university administrators and current and prospective students. This ongoing project should also guide the university administration regarding housing, tuition, and student wage.

The Economics of Pandemic - *Charles Courtney, Faculty Mentor: Nelson LaPlante*

This paper is an examination of the impact(s) that pandemics have upon the economies of nations effected. The sudden onset of the COVID-19 pandemic has thrust the world at large into a public health crisis the likes of which had not been seen since Spanish Flu ravaged the world nearly a century prior. The unexpected nature of the pandemic, coupled with the often-sudden actions taken by world leaders and businesses alike have left many questioning their economic prospects in the wake of diminishing job market. Utilizing historical analysis of the economic impacts of the Black Plague pandemic of the mid-fourteenth century and the Spanish Flu pandemic of the early-twentieth century, it can be observed that the immediate effects of pandemic on economies, at least on the level of an individual nation is an immediate economic boom due to an increased need for labor resulting in higher wages for those who survive. This is followed by a period of increased cost of living resulting in a period of economic depression which can take decades to recover from. Utilizing this analysis, a basic plan of action has been put together to help minimize the damage done by COVID-19 and how best to address future pandemics yet to be faced.

Determinants of Enrollment at CWU - *Jonathan Ehlers, Faculty Mentor: Toni Sipic*

Universities are always looking for ways to streamline the enrollment process. The process of sorting all of the applicants, choosing which ones to accept, and then documenting all of those who choose to enroll can be an inefficient time-consuming process. This study aims to find significant determinants of enrollment of potential students after they have been accepted into the university. This study does not try to predict acceptance, it only focuses on the students who have already been accepted and are choosing whether to attend the university. The sample for this study is drawn from students who were accepted into Central Washington University within the last decade. The variables tested were the characteristics of the potential student regarding sex, first generation student, FAFSA, veteran, state resident, race, income bracket, SAT score, and high school GPA. A standard logit general linear model was used to run a regression on the data using the default log link function. The results of the regression did yield a significant relationship between some of the variables we tested. Sex, FAFSA, income, veteran, high school GPA, and SAT score all proved to be significant variables indicating a likelihood to enroll after acceptance. This proves that some preliminary action in the acceptance office could potentially increase the efficiency of the enrollment process at the university level.

Socially Responsible and Environmentally Sustainable Investments at Central Washington University - *Derek Zinn, Jargal Ganzorig, Connor Wing, Kameron Eck,*
Faculty Mentor: Toni Sipic

Investors are increasingly playing an active role in influencing environmental and social impacts of companies and markets. Concerns with climate change and social movements have raised the prominence of corporate responsibility with their employees and investors alike. Shareholders promote disclosure transparency, corporate social responsibility and corporate sustainability to help ensure a healthy economy and preserve sustainable long-term returns. Universities have joined this growing chorus of investors and have started to reevaluate their endowments to better fit their missions. This has been encouraged by a growing academic literature on socially and environmentally responsible investing suggesting that such strategies have performed as well or better than traditional approaches.

In this study we analyze Central Washington University (CWU) financial investments and score them along environmental, social, and governance (ESG) categories. We then assess their financial performance, and compare it to potential alternatives with higher and lower ESG ratings. This research is conducted by the CWU Council on Investor Responsibility (CIR) subgroup that advises the University, through the office of the CFO, regarding environmental and social governance concerns that might influence the management of the University's investments. The results of the study seek to provide transparency to University investment holdings and decisions, advise on relevant ESG-related investing issues to ensure the Universities holdings match its mission and values, advise the VP of Business and Financial Affairs on socially responsible investment policy issues by proposing written policies for the Board of Trustees' consideration.

Finance and Supply Chain

Investing in a Global Pandemic - *Derek Zinn, Austin Brooks, Faculty Mentor: Fang Wang*

This presentation will attempt to offer insight into stock market movements and trends. Back in October members of the CWU Investment group formed groups and participated in a trading simulation where teams started with \$100,000 of fake money. Over the course of the school year we came up with an allocation of an original portfolio, adjusted the portfolio and presented our results to the club. In this presentation we will go over various macroeconomic indicators we used to pick securities and talk about trends that occurred over the last 8 months. This project will include research on the change from class room instruction to online instruction and the restructure of our campus clubs and events to online formats and the impact on our future. COVID-19 has opened the door to more online social interactions and the positive occurrence of inclusivity for all individuals including people with disabilities. Can we continue this trend of inclusivity for all or will it return to the days prior to COVID-19 where individuals were excluded from certain activities?

Marketing

Navigating Google's Nonprofit Marketing Immersive - *Kahlia Mafua, Hashmi Bhardwaj, Bailey Nygreen, Faculty Mentor: Sayantani Mukherjee*

This presentation will highlight CWU/CB digital marketing minor students' work in the Google Ads nonprofit marketing immersion global program. The program connects non-profits, students, and donors through the Google ads campaign. A campaign budget of \$10,000 is provided by Google. Five students from the digital marketing minor program at the College of Business are currently participating in the immersion experience as part of an individual study over winter/spring 2021. The student team is paired with a Nevada/California based 501 (C3) non-profit "On Common Ground" *OCG). OCG's mission is focused on sustainability and the food justice movement. The goal is to minimize food insecurity by diverting food wastage to nutrition, while providing enhanced access to nutritious food, education and tools for underrepresented and underserved communities. The student team is responsible for managing non-profit client relationships and designing, implementing and optimizing the Google ads campaign to increase awareness and reach fundraising goals. As part of the immersion, students completed Google search/measurement certifications, submitted a precampaign "design" report and is currently in the implementation and optimization phase of the campaign. The final deliverable is a post-campaign report which is an in-depth analysis of the campaign data and a self-reflection on the learning process embedded in the immersion program. This post-campaign report will be reviewed and evaluated by the students' faculty mentor, non-profit, and Google.

Construction Management

The Perception of Virtual and Augmented Realities in the Construction Industry in Washington State - *Kevin Ramsey, Faculty Mentor: Hongtao Dang (Funded by OUR Grant)*

The construction industry has a slow rate to adopt new technology with resistance to change and lack of research and development within the construction corporates. Virtual and Augmented Realities (VARs) have shown some practical applications in construction such as educational training, clash detection, project coordination, immersive visualization, and virtual project walk-through or flyover. Few construction companies use VARs in the pre-construction and construction phases because of unknown perceptions and benefits from project stakeholders. This paper investigates in the perceptions of VARs in the construction industry through survey questionnaires. The authors used a sequential explanatory approach. The approach took the advantage of mixed methods. The authors first sent a survey to collect data from general contractors that are members of Associated General Contractor of Washington. The survey includes 20 quantitative questions using the five-point Likert scale. Then, the authors conducted interviews to collect qualitative data. The collected data help understand the perception of VARs in project planning, development, construction, operation, and maintenance phases. The results inform advanced industrial practices and future research developments on virtual and augmented realities. The results also reveal that there is a lack of training and education on advanced construction technologies, such as virtual and augmented realities.

Strategic Planning for Residential Construction Business Startups - *Steven Hunt, Faculty Mentor: Hongtao Dang*

With over 70% of all construction startups in the U.S. failing within the first ten years, there are clear headwinds that new business owners face that are not being considered. This paper provides research into the link between strategic planning and successful construction startups, with a primary focus on the residential construction industry in the United States. The goal of this study is oriented around the considerations and planning that should be made prior to executing a startup business, and their importance in seeing success in the industry. The strategic planning considerations include market entry timing, market research, budgeting, financial forecasting, production forecasting, and business design. By analyzing nationwide survey data and researching successful construction startup owners means, methods, and considerations before beginning their work, strong differences can be found between those who succeed and those that struggle to find a footing in the industry. The key findings derived from the research show that those who see success considered all the strategic planning variables listed above, and not only had a strong understanding of the work, but how the industry was changing and innovating. Those that attempted to enter the industry without the necessary considerations either failed or did not see substantial growth for their business. With over two-thirds of startup businesses in the construction industry failing within the first ten years, this research helps shed a light on the strategic planning required to see success in the industry.

Dance

After the Pink Cloud Ends - *Marissa Bragg, Faculty Mentor: Gabrielle McNelillie, Therese Young*

Dance can be used to open the conversation about societal and taboo topics and give its audience a different viewpoint of the issue being addressed. Addiction is a controversial subject in America, and this work is intended to begin this conversation with the audience. This dance was created to show the internal suffering one goes through when fighting to stay sober. I was inspired to do this piece by the experiences of friends and family who battle with addiction, specifically alcohol and drugs.

Educational Foundations and Curriculum

Kepler's Space Program: Mission to Mars - *Kendra Gardner, Grace Warren, Isabella Taylana, Faculty Mentor: Bruce Palmquist*

Since 1997, human perseverance has led to multiple explorations of the Martian surface. Now, through a combination of the free programs Octave and Worldwide Telescope, high school math and science students have the opportunity to explore Mars for themselves. This interactive, educational activity introduces Kepler's Third Law of Planetary Motion and leads students through simplified versions of the real calculations that scientists use to transport rovers from Earth to Mars. Integrated within the activity are visual representations of Mars, along with some defining features and important locations on the surface of the Red Planet. There are four possible landing sites at the end of the activity, and each student will have the opportunity to calculate their way to the location that sparks their curiosity the most. In addition to using the Octave program, students will track information on a guided worksheet, which will also assist the student in their calculations. In the spirit of providing equal access to all students, this free and open source activity is intended to engage large groups of high school students from all backgrounds in the areas of astronomy, physics, and mathematics. Students who complete this activity will have met the NGSS standard, HS-ESS1-4: Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

Electronic Engineering Technology

Automated Control Unit that Adjust Volume Levels Based on Applied Sound Level to a Desired (dB) Level- *Draven Osiadacz, Faculty Mentor: Lad Holden*

During large concerts, or small shows there are times when a band is playing to loud or not loud enough for the venue. This project is designed to adjust the volume levels on a control system automatically to the appropriate user defined decibel levels. This project incorporates a sound level transmitter that will monitor the decibel levels in the room and transmit the data to a programmable logic controller (PLC). The PLC uses this data to control the out puts that control the volume up and down levels on an infrared remote. Either the volume up or the volume down button on the remote controlled by the PLC adjust the systems volume until the desired range is met. The remote then sends that signal to the receiver box that is hooked into the sound system, adjusting the volume levels to a set limit defined by the user. The user defined limits are controlled by a touch screen that changes the limits that are in the code. The touch screen is mounted to another similar case that is connected to the original. A set of stack lights colored yellow (low range), green (desired range), and red (high range) are used as a visual indicator for the user. The PLC and infrared remote are mounted inside of a carrying case while the stack lights and sensor are mounted to the top.

Atlas Robot Improvement - *Pongbob Supinee, Faculty Mentor: Lad Holden*

The Atlas robot that is used for the robotic class in Central Washington University does not process any sensor that will provide safety for the users or itself. The robot was made by a student and is capable of functioning like any other articulated robot that is used in the industry, but it is lacking any self-awareness for safety. This project aims to improve the robot's safety with the use of a sensor by attaching it to the claw of the robot. What this will accomplish is reducing the chances of the robot breaking any object that it is grabbing onto or hurting either the user or itself in the process.

To make sure that the robot can grab an object without damaging anything, a pressure sensor is used to measure the robot's grip force. By attaching the sensor to the robot's claw, it will read any force that is applied to the claw's grabbing point and make sure that it is not using too much force on the object. The result showed that with the use of the sensor, the robot can reduce any damage that it might cause by stopping its movement before damage is done to itself or the object.

The result shows that sensors do have an impact on the robot's self-awareness. On this basis, it is recommended that a pressure sensor is used as a key part in designing an articulated robot that is capable to control its grip force for safety purposes.

Teaching Program Template for Universal Serial Bus (USB) Protocol Human Interface Device (HID) Devices.- Benjamin Williams, Faculty Mentor: Lad Holden

The microcontroller sequence in the EET program at CWU currently does not contain a readily available program to setup communication using the USB protocol. The USB protocol is an internationally accepted protocol for data transfer and reception over two data lines, with the addition of two lines for power and ground. This project aims to establish a means by which students may display a basic understanding readily produce USB communication devices for classroom use.

The workflow for this project consists of reviewing and denoting research on USB communication structures, reverse engineering programs that are built to produce similar results, and building a program that students can utilize to produce devices using the USB Protocol.

Portable Powerwall Charging and Control System - Jeffrey Sargent, Faculty Mentor: Lad Holden

When there is an emergency that causes a loss of power, having a backup is extremely important in some cases while others might not want to leave their homes to have access to power. We have recently seen the need for this during the recent Winter storms in Texas where hundreds of thousands were out of power for several days on end. The use of generators is common to meet this need, but with the environmental impact of burning fossil fuels and the generally low efficiency of these machines it is not viable for everyone to use them. Others Turn to installing batteries into their homes to power important appliances, but eventually power will run out. A portable large-scale battery would provide emergency responders with the power they need to do their work and consumers with a backup power solution that can be taken to a location with grid power, or with ample wind or solar access to be recharged. This product could also be used in developing countries where access to power is limited all the time. This Project aims to design charging and monitoring systems for such a battery while future work can be put into integration with the home and portability.

Cooling Tower Water Treatment Using Programmable Logic Controller (PLC)

Project - Alec Brown, Faculty Mentor: Lad Holden

In water cooling towers used in industrial applications, continual use can lead to scaling, fouling, and corrosion inside the towers. These undesirable effects can lead to expensive equipment repair and plant downtime. This presentation will discuss the process of combating these problems with an automated system run by a Programmable Logic Controller (PLC) that can prevent the listed problems by measuring conductivity, measured in microSiemens per centimeter (us/cm) and monitoring the number of cooling towers active. Furthermore, this presentation will analyze the effectiveness of the PLC bleed and seed system used to lower the conductivity and pH levels of the cooling tower water, and this will be shown by graphing the conductivity level over time, with an emphasis on the regions where the cooling tower treatment is active. This bleed and seed system is controlled by a Proportional Integral Derivative (PID) loop to change the chemical pumps speeds as necessary. The conclusion of this presentation should display the effectiveness of this project and map out the process used to achieve these results.

Program To Avoid RFID Cloning - *Lorenzo Isiordia, Faculty Mentor: Lad Holden*

Security is crucial for any organization, especially for organizations with a great number of employees. Therefore, the purpose of this project is to assist security by providing a Radio-Frequency Identification (RFID) system that is impervious to sort of cloning. RFID cloning is where data from one RFID tag is copied to another tag, which leads to the user having access to a specific area or room. To construct an RFID system that can prevent cloning from occurring, a Microcontroller and a Reader are key components. How an RFID system works is by using a tag that contains a keycode being scanned by a reader (CR95HF), which sends the data to the microcontroller showing the keycodes of the RFID tag. One way to prevent cloning is by configuring how and when the RFID tags can be read within the program. Setting a time window when a tag can be used decreases the opportunity of cloning from happening. In conclusion security is of great import for organizations or companies' integrity and safety. Having control of who has authorization in a specific area or room is important and providing a RFID system that can prevent any sort of cloning from happening keeps security invulnerable.

Motor Function Demo- *Patrick Bennett, Faculty Mentor: Lad Holden*

The uses, function, and differentiation of control in electrical motors is a topic that is difficult to grasp to the average onlooker. This project aims to lessen or remove this difficulty for those in the Electronics Engineering Technology program. This was determined to be through the movement and observation of four motors: a common DC motor, a mini servo motor, a stepper motor, and a shaded pole AC motor. From these four, data was measured in respect to what one wants out of each motor in their respective industry setting. For the DC and AC motors the RPM is measured in respect to their voltage input and input frequency, respectively. The stepper and servo motor have their current position measured and compared to their respective inputs. All of which is programmed accordingly in LabVIEW for the purposes of it being a more visual learning tool. This will allow any prospective EET majors or other student who have even a hint of interest in electrical motors a chance to interact with and understand how they work.

E paper picture frame - *Zachary Cushon, Faculty Mentor: Lad Holden*

This project aims to solve a few fundamental problems that are posed with the design and form factor of digital picture frames. Digital picture frames are a great decoration and perform the same function as a regular picture frame but are more dynamic, allowing multiple pictures to be shared in one frame. Although these are great advantages there are also disadvantages that come with digital picture frames such as frequent charging or needing to be plugged into an outlet during use. With the use of Electronic-paper(E-paper),both of these problems were solved! E paper works by physically displaying an image or text(as seen with the kindle) rather than displaying it as light. This is important because it allows for the display to draw no power unless transitioning between pictures allowing for the frame to have a 3 month battery life with a moderately sized battery.

Thordax-Tai: The Stars Climbing Robot. - Inaya Allen-Singleton, Faculty Mentor: Lad Holden

The Thordax-Tai project was made to help people who are older or have a disability that makes it harder to go upstairs. The CDC has said that at least 60% of people over the age of 60 years old will develop arthritis. This disease can hamper a person's ability to walk upstairs with items. With this information, the project was started. This robot is made from two Lego Mindstorms sets. Lego Mindstorms is a Lego product that is used as an introduction to robotics. I wanted to use this product because it was the best material, I could get my hands on. The original idea for Thordax-Tai was to have a robot go up the stairs. This concept could be evolved later to have additional functions.

Motor Loading Project- Mohammad Farajallah, Faculty Mentor: Lad Holden

The Motor Loading project aims to help students understand how an AC motor works and how it is affected when a load is being applied to it. In this project there are three variables to keep track of and measure. One of the things that is being measured is the speed of the motor by using a proximity sensor, this measurement is recorded in Revolution Per Minute (RPM). The second thing that is being measured is the amount of load being applied to the motor by measuring the amount of Amperage the motor needs to work, this measurement is recorded in newton meter (N-m). The third thing that is being tracked is the amount of weight being used to apply the load to the motor by using weights, this measurement is recorded in Kilogram (kg).

The way a load is being added onto the motor is by using an All-Terrain Vehicle (ATV) brake rotor, brake caliper, and brake pads that are attached to the motor. The brake caliper is attached to a brake puddle that will be used to add weights on it which will then add pressure on the brake rotor. To make sure student's safety while the motor is operational it will be placed inside a plex glass box.

Custom Ultrasonic Anemometer - Emily Raney, Faculty Mentor: Greg Lyman

Collecting wind speed and direction measurements can vary greatly based on the location that the measurement is being taken from. On the Hogue Technologies building roof there is an ongoing project funded by an NSF grant that is intended to measure the wind-loading effects on the solar panels or photovoltaic array (PV array) due to wind blowing across the Hogue roof. In the weather recording station, there are two existing ultrasonic anemometers, one stationed a short distance away from the PV array and a second anemometer one story higher. An ultrasonic anemometer uses ultrasonic waves to measure wind speed and direction. These two anemometers do not provide accurate enough wind data on the PV array; thus, a third ultrasonic anemometer was needed for implementation into the project. This anemometer is mounted directly onto the PV array to measure the exact wind speeds and direction affecting the panels. Air flow through the ultrasonic wave path will change the time it takes for transmitter data to reach the sensor. This delay in expected data measurement is quantified as a change in voltage from the sensor to the data acquisition system. The voltage runs through a calculated conversion via software programming to obtain the wind effects on the panels. Acquired data is then recorded and exported to an excel spreadsheet for further analysis

Elementary Education

Integrating Arts and Children's Literacy to Create a Culturally and Historically Responsive Classroom- *Katie Stoen, Faculty Mentor: Grace Blum*

This project will look at one example about how as educators we can design lesson plans that will create a culturally responsive classroom using Dr. Gholnecsar "Gholdy" Muhammad's historically responsive framework in "Cultivating Genius: An Equity Framework for Culturally and Historically Responsive Literacy" (2020) through integrating arts and children's literature.

Social Justice and Art Learning Standards Integration in an Anti-Bias Curriculum- *Michelle Reinicke, Faculty Mentor: Grace Blum*

This project was created to integrate learning standards in social justice, Washington State Art Disciplines and children's literacy. This project highlights meaningful activities integrating a widely-acclaimed anti-bias text, *The Day You Begin* by Jacqueline Woodson, to help children in celebrating who they are and what makes them unique. Integrating the Art Disciplines into this will help them to celebrate not just their uniqueness but also the uniqueness of their friends and classmates.

Engineering Technologies, Safety, and Construction

Potentials and Challenges Associated with Accessory Dwelling Units and Small Smart Homes in Modular Construction - *Dillon Mackenstadt, Faculty Mentor: Hongtao Dang (Funded by OUR Grant)*

Accessory Dwelling Units (ADUs) and Small Smart Homes (SSHs) have become more and more popular in recent years. ADUs are independent living spaces built on the same land as an existing residence, or added to an existing residence. SSHs are small residences, typically designed for one or two people, that incorporate technologically advanced devices into the function of the home. As more people have the desire to live independently or downsize the space they need, quickly delivering ADUs and SSHs using modular construction has become critically important. This paper investigates the potentials and challenges of ADUs and SSHs through semi-structured interviews with companies that are leading the innovation in the modular construction industry. Research participants are individuals who are involved with the construction and delivery of ADUs and SSHs. The results revealed some potentials including the use of these spaces for affordable housing, generating additional income through rent, being able to live close to family while still being independent, and having a space that is just big enough for the occupant's needs. Both ADUs and SSHs increase housing affordability, mobility, intelligence, and resilience. The results also uncovered some challenges such as city zoning requirements, building permits, delivery difficulties, and legal issues.

Analysis and Solutions to the Fossil Fuel Dilemma Within the Construction Industry

- *John Finnerty, Faculty Mentor: Hongtao Dang*

As the population continues to grow at an almost exponential rate, the demand for more infrastructure will increase at a substantial rate as well, with full responsibility landing on the construction industry. With the rapid increase in construction activity to compensate for the growing population, the use of heavy equipment and transportation vehicles will also increase. This analysis will investigate the modern, daily use of fossil fuels, the ultimate downfall of fossil fuel dependency, and future solutions to the fossil fuel dilemma within the construction industry. The industry accounts for a significant portion of emissions and fossil fuel depletion due to the inefficient fuel consumption of heavy equipment and transportation vehicles. Furthermore, the construction industry is dependent on engines powered by fossil fuels and with the inevitable conclusion to the fossil fuel dilemma, we are left wondering, how will we power such massive machines using alternative resources? To this end, this research paper will look extensively into a promising alternative fuel source. Additionally, data collected through experts will be used to decide if a potential solution can be applied in the construction industry.

Family and Child Life

Pregnant women's experiences during the COVID-19 pandemic: A mixed method exploration of prenatal depression- *Adrienne Larson (G), Gracie Manlow, Faculty Mentor: Tishra Beeson, Amy Claridge (Funded by Provost Research Grant)*

Risk factors associated with prenatal depression have been studied extensively, but it is unclear whether typical risks are relevant during the COVID-19 pandemic. This mixed-method study involved surveys and interviews with women in their third trimester of pregnancy to understand prevalence and correlates of prenatal depression during a pandemic event. Survey participants included 378 pregnant women in the United States with due dates between April and December 2020 who self-reported depressive symptoms using the 10-item Edinburgh Postnatal Depression Scale (EPDS). Participants were predominately white, married, and highly educated. A subset of 21 women participated in qualitative interviews. In total, 56.3% of women reported depressive symptoms consistent with clinical levels of prenatal depression. Correlates of depressive symptoms included younger age, unmarried status, lack of access to paid parental leave, feeling unsafe in current romantic relationship, fear and worry about upcoming childbirth, and change in birth plans due to the COVID-19 pandemic. In-depth interviews with participants revealed key themes around pregnant women's experiences with fear and anxiety, mixed emotions, and grief and loss. These findings underscore the pervasive impact of the COVID-19 pandemic on women during the perinatal period, with specific implications for the care of women with prenatal depression and their families. The heightened potential for prenatal depression in the context of the COVID-19 pandemic is concerning given the potential adverse effects of maternal depression. Practitioners must work together to engage in additional assessment of risks of prenatal depression to ensure support for expecting families is readily accessible.

Family and Consumer Sciences

The Impact of Food offerings on social media engagements in the Yakima Valley Wine Industry during the COVID-19 pandemic. - *Katrina Doonan, Faculty Mentor: Jill Clark*

This oral presentation looks at the effects of the COVID-19 pandemic on the Yakima Valley Wine Industry - specifically from March 2020-August 2020. This study will analyze four wineries within the Yakima Valley that offered food, in addition to outdoor wine tastings at their tasting rooms during the specified time frame. This study will pull data from the social media accounts of each of the wineries (Instagram & Facebook) to examine the food offerings, price points, and related events. This data will then be analyzed with regard to social media engagement (as defined by likes, shares, & comments). The goal of this presentation is to clarify whether or not there is a correlation between wineries that offered food and related events to higher social media engagement. Due to the restrictions imposed on businesses during the specified time frame, social media engagement was shown to be a valuable tool in maintaining customer relations and overall visibility. This information is valuable to the Yakima Valley wine and tourism industry, as it identifies successful strategies for increased social media engagement during the Covid-19 pandemic.

The Sibling Relationship: The Effects of Chronic Illness on the Quality of Sibling Relationships- *Caitlin Burkwist, Faculty Mentor: Katy Tenhulzen, Amy Claridge*

Children with chronic illnesses have been studied for the psychological effects their illness has on them, such as their quality of life, social functioning, and attachment style. The siblings of these chronically ill children are becoming the topics of research in order to bring to light the effects a child's chronic illness has on this underrepresented population. However, the relationship between the sick child and their sibling has been minimally investigated. This study will add to the literature of how childhood chronic illness impacts the sibling relationship, with the hope that the results will inspire the creation of interventions because the greater understanding of the challenges and needs of siblings can influence future support. This study will investigate how the conflict, warmth, rivalry, and power/status aspects of the sibling relationship are affected when one of the siblings has a chronic illness. This will be accomplished by the use of the Sibling Relationship Questionnaire (Furman, 1968). This measure has been used to compare different relationships within a child's life, to study how a child's emotional understanding develops in certain contexts, and to study the effects of birth order has on the sibling relationship. Parents of both healthy and chronically ill children will be asked to fill out the questionnaire, which will ask them to rate certain aspects of the relationship with their siblings on a Likert scale with a range of answers provided. Results showed a significant different between groups in regard to power/status, but not for any of the other three aspects. This implies that parents who have a chronically ill child reported more power/status within the sibling relationship than parents whose children are both healthy.

Maternal Depression Perceived During Adolescence and Attachment Security in Adulthood -*Adrienne Larson, Faculty Mentor: Amy Claridge*

Previous literature has found that maternal depression and adversity can decrease the likelihood of the formation of a secure attachment in infants, but few studies have examined the association between maternal depression during adolescence and how it relates to adult attachment security. The purpose of this study was to examine if the perception of maternal depression during adolescence is related to adult attachment security. The current study examined the relationships between perception of maternal depression during adolescence, adult attachment security, and secondary caregiver involvement during adolescence among adults (N = 180) by implementing quantitative survey methods. The results indicated that maternal depression perceived during adolescence was associated with adult attachment security, and that secondary caregiver involvement during adolescence was not a statistically significant moderator. Findings suggest there is a need for more research examining the relationship between maternal depression perceived during later childhood and adult attachment security.

Parental Authority and Parent-Child Relationship Satisfaction- *Payton Mannen, Rebekah Holter, Madison Wolf, Faculty Mentor: Sarah Feeney*

Previous literature has found that mental health and parental authority tend to be correlated, but few have looked at parental authority and relationship satisfaction. The current study examined whether parental authority affects the parent-child relationship satisfaction of emerging adults (N=299) by implementing quantitative survey methods. The results indicated that higher parental authority was associated with lower parent-child relationship satisfaction. Findings suggest that there is a need for more research looking at parental authority and relationship satisfaction in emerging adults. Further research on this topic is warranted because the relationships that adults make in their lives have a lot to do with the relationships that they had with their parents growing up.

Sibling Closeness after Family Member Death - *Sydney Davies (G), Faculty Mentor: Sarah Feeney*

Previous literature has found that siblings who lose a parent at a young age consider themselves close regardless of contact due to the permanence of losing a parent. Few studies examine the relationship between family member death and sibling closeness among young adults, and tend to focus on one sibling dynamic, limiting generalizability. The current study explores the potential association of family member death on sibling closeness, and the association between family closeness and sibling closeness. Using quantitative survey methods, the current study examined the differences in sibling closeness between emerging adults (N = 402) who reported losing a family member after the age of 12 and those who did not. Results indicated that siblings who did not lose a family member (M = 3.71, SD = .61) were slightly closer than those who did (M = 3.61, SD = .70), though differences were not statistically significant. Among participants who experienced a loss, there was no association between sibling closeness and closeness to the deceased ($r = .10, p < .05$). Among those who lost a family member, there was a significant association between sibling closeness and family closeness ($r = .24, p > .01$) and a significant association between sibling closeness and family contact ($r = .14, p > .05$). Findings suggest more research is required to understand the relationship between family member death and sibling closeness.

Health Careers

Associations Between Cognitive Impairment with Body Mass Index, Race/Ethnicity, Educational Attainment, and Sex in Older U.S. Adults Participating in NHANES

2011-2014 - *Christianna Dix, Faculty Mentor: David Gee, Nicole Stendell-Hollis, Amie Wojtyna*

Body Mass Index (BMI) is a quick, inexpensive nutritional assessment which may assist RD's in efficiently applying optimal care techniques to enable the best achievable quality of life for adults as they age. Utilizing data from 2011-2014 NHANES of older US adults (≥ 60 y), this study proposes to evaluate potential associations between BMI, sex, race/ethnicity, and educational attainment with cognitive impairment. Differences in prevalence were assessed through traditionally used cut-off percentiles for each cognitive assessment: Consortium to Establish a Registry for Alzheimer's Disease (CERAD) Word Learning and Delayed Recall, Animal Fluency (AF) test, and the Digit Symbol Substitution Test (DSST). Of participants who completed at least one cognitive test ($n=3123$), 44% had an impaired score for at least one test and were considered cognitively impaired (48.8% males, 40.2% females; $p=0.0002$). Within each BMI category, 58.6% of underweight participants were cognitively impaired, compared to 43.4% normal, 45.4% overweight, and 41.7% obese ($p=0.09$). Among race/ethnicity, only 38.7% of the Non-Hispanic White sample showed cognitive impairment, compared to 60-66.5% of other self-identified ethnicities ($p<0.0001$), suggesting possible cultural biases of the assessment tools. When compared to other educational levels, higher educational attainment (college graduate or higher: 29% impaired) was associated with a lower prevalence of impaired cognitive ability (Less than high school (77%), high school grad or equivalent/ GED (50%), some college (37%); $p<0.0001$). In conclusion, while differences in sex, race/ethnicity and educational attainment were associated with differences in the prevalence of impaired cognitive ability, there was no significant effect of BMI category.

Mechanical Engineering

Balsa Wood Drawbridge- *Kyle Engebreston, Faculty Mentor: Charles Pringle*

Which truss design is best suited to a drawbridge when precision equipment is unavailable for the construction process and what design is suitable for the articulation system? To address this problem, several different designs were considered for a truss made of balsa wood. Initially a warren truss, a k-truss, and a bowstring truss were considered. The designs were evaluated using a decision matrix, the winning design was produced and tested. The testing methods used were a mass limit of the bridge, a minimum length requirement, loading requirements, and a minimum height for the roadway to reach when raised. Various other smaller tests were conducted but they had little to no impact on the design of the bridge. The design was evaluated during the testing phase using a pass-fail system for each of the requirements. The warren truss design was able to sustain the twenty-kilogram loading, span the four-hundred millimeters between the abutments, and the final mass of the bridge was fifty-four grams without the articulation system attached, which was less the maximum allowable weight of eighty-five grams. During the articulation process the bridge was lifted with the center of the roadway reaching a height greater than fourteen centimeters from the resting position. The bridge was also able to maintain this position without assistance for the ten second required before being lowered.

Mini RC Baja - Jason Schindler, Faculty Mentor: John Choi

Cars have each aspect of engineering incorporated into them, which make them a great learning tool. That is why an RC Baja car is a great senior project for Mechanical Engineering students. The approach that students must take to design, construct, and test the car is to set parameters, and to make overall goals that can be easily measured. These goals include things like a \$700 budget and withstand a 1-foot drop to flat on all four wheels. First, the design must meet the specifications and rules that are set previously. This ensures that there is a driving factor to the design. For example, if there is not a price restriction on the design, then budgeting and using material more effectively would not occur. Once goals were made, then designs were made to reach these goals. Designs specifically made for design goals were calculated using both material analysis, thermodynamics, and kinematic systems. For example, if the car had to be able to drop from a 1-foot elevation, then the suspension of the car must be able to withstand the force of the entire weight of the car as it is dropped from that height. The resulting goals of the car are then tested, and depending on the results of these tests, merits either re-design, or continued use of these components that were tested. Keywords: Suspension, RC Baja, Drivetrain

RC Baja Racer - Chesna Kern, Gizan Gando, Faculty Mentor: John Choi

The American Society of Mechanical Engineers (ASME) holds a competition at their annual conference for college students to design an RC car that will compete in sprint, slalom, and obstacle course races. The RC Baja car was designed to complete every event in the competition with a focus on the obstacle course due to the anticipated impacts inflicted on the project car by jumps and other obstacles. The project was a collaborative effort. This presentation focuses on the chassis and suspension while Gizan Gando will present about the drivetrain. The drop and frontal impact test requirements guided the design process by providing the parameters that were used to determine size and strength of components. Each component was modeled in SolidWorks during the design period to make sure everything fit properly. During the construction period, all but one of the designed components were manufactured using a 3d printer. Testing involved measuring components to check weight, bending, and clearance as well as frontal impact and drop tests. The drop and impact tests test the strength of the car by submitting it to the forces it would experience by participating in the ASME Baja competition, which includes one and a half foot jumps as well as possible frontal impacts at full speed. The project car was able to withstand a frontal impact at twenty five miles per hour without sustaining damage and being dropped on its wheels from a height of two feet without sustaining damage.

Balsa Wood Bridge - *Logan Bronemann, Faculty Mentor: Charles Pringle*

The objective of the project undertaken is to design and build an articulating bridge which can be raised and lowered constructed from only balsa wood. To meet the objective set forth for this project a series of requirements were set to determine the design parameters such as height, length, weight and more. Using these requirements, a series of analysis can be undertaken upon the bridge design and structure. These analyses consist of column buckling, tensile stress analysis, and compressive stress analysis. The analysis determined the dimensional requirements of the structural members to include a $\frac{1}{2}$ "x $\frac{1}{2}$ " lower support beam with varied cross sectional members being either $\frac{3}{8}$ " x $\frac{3}{8}$ " or $\frac{1}{4}$ " x $\frac{1}{4}$ ". These analyses allow for the demonstration of mechanical engineering principles both in design and construction methods. Work to date includes achieving construction of an articulating bridge with the ability to meet the 10 second locked raise requirement. The device constructed for this project delivered on the original objective as it is fully constructed from balsa wood while also allowing for articulation of the bridge in a vertical direction. These dimensions will allow for a load of 20 kilograms to be placed upon the structure as well as the ability to articulate vertically and remain in place for at least 10 seconds.

Hydraulic Balsa Wood Rising Bridge - *Kaitlyn Greenfield, Faculty Mentor: Charles Pringle*

What is the solution to allowing tall vessels to navigate past a vehicle bridge that is less than 10 [ft] above the water? To answer this question, a balsa wood bridge was designed, constructed, and tested. The bridge needed to articulate by mechanical means, allow for travel through the bridge, and be able to withstand ample force while the main structure only being constructed of balsa wood and glue. The project was analyzed in sections. These sections include: the bridge structure and its members, the hydraulic lift, and the pins needed for the bridge and hydraulic lift to operate. The analysis determined that the bridge design would be suitable for the specified requirements. The requirements include: being able to hold 18.9-20 [kg], articulate to 140 [mm], hold the position for 5 seconds through mechanical means, weigh less than 85 [kg] without the articulation mechanism, span a gap of 400 [mm], and allow travel through the bridge without obstruction. Construction of the parts needed to build these sub-assemblies and assemblies was completed first. The bridge structure was then built in sections: the bridge structure sub-assembly, the hydraulic lift sub-assembly, and the bridge assembly. Once built, the balsa wood bridge was tested to make sure it met its objectives. These tests were conducted on an engineering basis, such as the concepts of bending stress, moments, and material properties. The series of tests conducted proved that the final design of the bridge would meet the requirements stated above.

JCATI - Drive System - *Tim Boswell, Faculty Mentor: Charles Pringle*

Each year, Mechanical Engineering Technology students receive a grant from The Joint Center for Aerospace Technology Innovation (JCATI) to engineer a device that is capable of breaking down carbon fiber trimmings for recycling. The students who received the grant this year have redesigned portions of the existing system in an attempt to solve issues that have kept the system from working properly in the past. Though much collaboration between group members has been needed, each member has been responsible for their own portion of the project. The purpose of this portion of the project has been to address binding and interference in the spur gears of the existing system. Many analyses related to drivetrain forces were done in order to determine what type of drive system would be able to handle the large forces that the system creates. Once a chain drive was selected as the best solution, shear and tensile load analyses were done to ensure that each component could withstand the large forces and pressures. The resulting chain drive required ANSI #100 chain and sprockets, along with some modification to existing parts. The drive system now functions correctly with no binding and less deflection than before. The chain drive has shown to be capable of withstanding the 2000 ft-lb of torque created by the reduction system, resulting in better reliability in the drive system.

Balsa Wood Bridge - *Joshua Nye, Faculty Mentor: Charles Pringle*

The project requires the individual to design and construct a truss bridge made from balsa wood and wood glue to perform several objectives. The main objectives are to articulate the bridge by raising it, to conform to dimensional requirements, to allow a vehicle to travel along the road deck, and to hold a minimum load. The bridge must be able to articulate in two different ways. First, the articulation system can lift the road deck vertically while on top of the bridge. Second, raise the bridge with a pivot when the articulation system is placed at the specified end of the bridge. The bridge was able to raise the road deck to the required 280 mm height and allowed a sheet of paper to slide between the abutment and bridge using the pivot, holding it for ten seconds. The bridge without the articulation system weighed less than 85 grams when measured with a digital scale. The vehicle represented by a block pulled with a string can travel across the road deck without obstructions. The bridge was then tested for loading by adding weights to the inserted rod; however, the bridge couldn't reach the 20 kg load before it began to fail.

Pulse Heated Thermistor Device - *Matthew Schrenk, Faculty Mentor: John Choi, Charles Pringle*

Currently, there are several ways in which thermal conductivity can be calculated or assessed on a given material. However, with each method of testing comes potential limitations such as size, material state, complexity, and time. The goal of this study was to develop a pulse heated thermistor that would reduce all four limitations, thus provide precise and timely results regardless of the material state and size. A thermistor is resistor which changes resistance in accordance to temperature. To achieve the design, heat transfer and electrical methods were applied. As with all resistors, heat is dissipated across the element and released into the surrounding environment. With this idea, the thermistor can be introduced with a large voltage, causing its resistive element to overheat and thus reduce its resistance. To manufacture such a device insulative material was added to prevent heat dissipation in the wrong direction. To achieve precise results, test specimens were required to be prepared to reduce the effects of ambient convective heat transfer. Measurement times after pulse were shown to have best results after seven seconds due to the thermistor achieving a steady decay of temperature back to equilibrium. Water was observed to have a thermal conductivity value of 0.613 W/m-K, within 5% of its accepted value. The results were obtained within five minutes, exceeding the fifteen-minute requirement. With the results obtained, it is conclusive that the device is functional and precise.

JCATI Base Plate - *Jacob Atamian, Faculty Mentor: Charles Pringle, Jeunghwan Choi, Muir Hamilton*

Students of the Mechanical Engineering Technology (MET) program at Central Washington University have contributed to an ongoing Carbon Fiber Recycler project funded by the Joint Center for Aerospace Technology Innovation (JCATI). The goal of this project was to modify the existing recycling system to produce a higher success rate of recycled carbon composite material. This report focuses on increasing the rigidity of the crushing gears so that the deflection occurring among the components during operation was below 0.005 inches to ensure proper operating conditions. The operating speed of the crushing gears was 2.5 rpm with a crushing load of 10,500 pounds. A base plate design ensured the rigidity of all components operating on a singular plane. Flat plate analysis was conducted to determine the thickness of the plate required of ASTM A36 Steel to produce a deflection less than the required value. Plate models run in Autodesk Nastran provided stress and deflection results used to confirm green sheet calculations and assembly modifications. Testing consisted of using dial indicators to determine deflections at various locations of the base plate and confirmed the deflection of the plate to be 0.003 inches within the required maximum deflection of 0.005 inches. All testing, manufacturing, and analyses took place in the Hogue Technology Building at Central Washington University with the help of MET Faculty.

Carbon Fiber Recycling Shredder - *Benjamin Cooley, Faculty Mentor: Charles Pringle*

Once carbon fibers are cast into a resin and used in a composite material, retrieving those fibers can be a difficult task. However, it is beneficial to recycle and reuse the fibers from old unneeded components rather than pay the cost of acquiring new ones. The Joint Center for Aerospace Technology Innovation (JCATI) carbon fiber recycling device condenses the multistep process of extracting the fibers by integrating all steps into one automated device. In the previous version of the device, the cutting blades turned the long composite strips into thin fingers but did not sever them across the width. The goal of the cutters is to create composite pieces small enough to undergo pyrolysis in the next section of the device, so the long thin fingers must be severed along the width at intervals to create composite chips containing long enough fibers to reuse. To sever the strips across the width, the number of blades on the cutter shafts was increased and the blades were moved closer together. The blades being closer together allows the system to act as a crosscut shredder and cut the strips along the length and width at the same time. This results in composite chips that contain fibers between 0.25" and 0.5". These chips are small enough that they can undergo pyrolysis in the next step of the device to extract the fibers, and large enough that the fibers inside are reusable.

3D Printed Drone Frame - Jed Flippin, Faculty Mentor: Charles Pringle

3D printers have dropped in price to the point that an average consumer can purchase one. Accompanying this rise in home 3D printing is a relatively new sport known as drone racing. This sport involves racing drones through a predetermined course at high speed, which inevitably results in a high crash rate. This project is about building a 3D printed drone frame that is strong enough to survive minor crashes but can be easily and cheaply replaced after major crashes. The frame is made of PLA+ filament using an Ender 3 printer. Each arm is individually mounted for easy replacement, while the main frame is bolted together to protect the vital electronics. Filament was printed at 100% infill to improve strength and reduce vibration input from the motors. The device was tested using the official drone racing time trial course and rule book. It was compared to other pre-built drone times with the goal of being within 15% of the average time. Accompanying the speed test was a durability test versus common obstacles at 25% throttle. The 3D printed frame was expected to stand up to triple the crashes that a commercial frame of the same size and weight could withstand before complete frame failure. The printed frame met this condition while remaining under the cost of an average pre-built drone frame worth \$25.

RC Baja - Drivetrain & Steering - Tucker Odegaard, Colton Hague, Faculty Mentor: Jeunghwan Choi, Charles Pringle

There was a need for an RC car that would turn the power of a brushless motor into torque to the wheels, in order for it to move forward and backward. The car needed to meet given requirements in order to compete in the annual American Society of Mechanical Engineers (ASME) RC Baja competition. The team requirements were to reach a top speed of 20 mph, turn 60° in both directions, survive a three-foot drop, and spend no more than \$500 total on the project. In order to meet the requirements, the device chosen was an RC Baja that had a floating rear end. The Baja was broken down into two categories, the drivetrain and steering, which was completed by the principal engineer, and the chassis and suspension which was completed by Colton Hague. The complete device was modeled in SolidWorks based off of a two-wheel drive floating rear end vehicle. The assembly was then broken down into sub-assemblies which had certain parts that were manufactured as well as purchased. The principal engineer and Colton combined the sub-assemblies at the end in order to construct the device, as it was built on SolidWorks. After successfully completing construction, several tests were done to determine if the Baja was ready to race. All requirements above were met, and the device successfully competed in the competition.

NRJ RC Baja Car: Chassis and A-Arms - Naoki Masuda, Jeffrey Harn, Ryder Satak,
Faculty Mentor: Jeunghwan Choi, Charles Pringle

Three students from Central Washington University have come together to design and manufacture a unique RC Car for the annual regional RC Baja Car competition held by the American Society of Mechanical Engineers (ASME). The RC car will compete in three events, Baja, Slalom and Sprint. The objective for this project was to create a unique build based off previous team's projects. The new design was optimized for functionality and performance to compete in each event and excel above other competition as well. The design process before finalizing on a design that resembled that of a real car was thoroughly calculated and researched. The new chassis was created from wood rather than metal which allowed for a custom design and significant amount of weight reduction from more than 7 pounds down to an impressive 5 pounds. Using manufacturing machines such as drill presses, routers, table saws, and mills, connection locations on the chassis for each component was created. To simulate jumps and crashes, the car was subjected to a 2-foot drop and frontal impact. The results showed the vehicle could withstand the 2-foot drop without compromising performance. The frontal impact test resulted in minimal damage that did not compromise the operation of the vehicle.

RC Baja Car: Suspension and Chassis - Colton Hague, Tucker Odegaard, Faculty
Mentor: Jeunghwan Choi, Charles Pringle

An RC Baja car was designed and manufactured to compete in the ASME RC Baja competition. The American Society of Mechanical Engineering (ASME) Baja competition is a time trial that has a variety of obstacles like jumps, rocks, and turns. The objective of the project was to improve the performance of the suspension and chassis while offering a variety of different adjustments that can be made to fit a given terrain. To begin the design process, a benchmark car was selected, and research was performed on trophy trucks to incorporate suspension features into the design. Using engineering methods, analysis was done to determine dimensions, fitments, and materials that would improve the performance. To optimize the performance of the suspension over different terrain types, multiple mounting locations for the front and rear suspension were provided. Using 3D software, the individual parts of the car were modeled and then assembled. With the dimensioned part drawings, manufacturing of the car began. To manufacture the parts, a variety of different manufacturing machines were used such as a mill, 3D printer, and laser cutter. The parts had to be manufactured within tolerance to maintain functionality of the design. A series of tests were completed to ensure the requirements were met. To simulate the RC car being jumped, the car was dropped from a height of 1.5 feet. The suspension of the car absorbed the 192-newton force.

RC Baja Chassis and Suspension - *Donovan Dueber, Jason Schindler, Faculty Mentor: Jeunghwan Choi*

A team made up of two students have developed a unique design of a RC Baja Car to optimize functionality and performance. A Baja car is a remote controlled 1/10 scale car that is used for recreation or competition, usually meant for competing in the American Society of Mechanical Engineers (ASME) Baja car competition against various teams. The objective for the project was to create a unique suspension different from previous individual's projects by creating a two-type suspension. This was completed by having a coil suspension in the front which allows more travel in the suspension of the car and a leaf spring suspension in the rear which helps keep the rear tires in contact with the ground. The inspiration for this suspension came from researching and seeing how various RC cars have performed in the past. To integrate this concept, multiple analyses were conducted to help create the design of the RC car. The angle of the suspension arms and tolerances needed to be precise in order to produce a cohesive functional suspension between the front and rear of the car. Manufacturing machines such as a band saw, end mill, and a drill press were utilized to create the support for the suspension which connects the shocks to the a-arms. With the two-type suspension and allowable adjustments within the design, the RC Baja Car was able to withstand a drop of 1.5 feet.

Thermal Conductivity Measuring System (TCoMS) - *Lucas Hill, Faculty Mentor: Jeunghwan Choi, Charles Pringle*

The Mechanical Engineering Technology department at Central Washington University is lacking a method to reliably measure the thermal conductivity of bulk materials, with dimensions of at least a 1 cm radius, within a teaching environment. Thermal Conductivity Measuring System (TCoMS) will be a useful tool to perform these measurements as it is able to obtain measurement readings for materials between 0 C and 50 C within 20 seconds. TCoMS will accomplish this by using the pulse decay method of measuring thermal conductivity, a form of transient heat transfer analysis. This method is performed by generating a pulse of heat at the measurement location and measuring the temperature change with respect to time which can then be used to determine a material's thermal conductivity. To accomplish these tasks TCoMS runs on an Arduino Due, a programmable circuit board used for controlling, timing, and measuring the temperature and the heat pulses through the thermistor. A voltage divider in the form of a Wheatstone bridge is used to allow for the high accuracy needed in voltage measurements across the thermistor. These voltage measurements are then used to calculate the electrical resistance of the thermistor. To determine the temperature of the thermistor, using the coefficients provided by the thermistor's manufacturer, the Steinhart-Hart equation is used to determine the thermistor's temperature. These measurements are accurate to within 5% of a material's actual thermal conductivity value. This was tested on materials such as water, potatoes, and apples.

JCATI Carbon Fiber Recycling: Pyrolysis - *Jack Dutton, Faculty Mentor: Charles Pringle, John Choi*

The Joint Center for Aerospace Technology Innovation (JCATI) project is designed to recycle carbon fiber pieces for use in manufacturing. Part of the system requires the removal of resin from the carbon fibers to facilitate the recycling of carbon fiber. To accomplish this task the pyrolysis process is implemented using a commercial grade oven with a conveyor system. Argon gas is injected into the shroud and over the oven to purge the interior of oxygen. The conveyor system enables this to be a batch process. A ramp is used to allow simple addition of material to the conveyor system and a shelf catches the processed carbon fiber at the end for easy retrieval. Flat plates were added to the existing conveyor system to allow the carbon fiber pieces to be moved with falling through. The resulting system achieved the recommended temperature of 500o Celsius to properly heat the carbon fiber pieces. The system provided a practical movement of product along the conveyor belt while also allowing for a full 30-minute heating time to give the carbon fiber pieces enough time to undergo the process. The addition of flat plates to the conveyor system did not impede operation. The electrical circuit added to control the movement of the conveyor system allows for a 30-minute heating time within 5%. The final carbon fiber pieces produced by the system were deemed adequate for reuse in manufacturing processes.

Balsa Vertical Lift Bridge - *Andrew Harris, Faculty Mentor: Charles Pringle*

Faculty at Central Washington University proposed a challenge to mechanical engineering students that could be accomplished in an in-home setting. The goal was to create a balsa wood bridge, weighing no more than 85 grams, that can support a load over an open span and raise above its resting position by means of a mechanical system. To produce a successful solution to the problem, a vertical lift bridge was created consisting of two lifting towers and a load bearing bridge. Using equations of static equilibrium and strength of materials, the required width for each member was determined. Project requirements were accounted for with multiple supporting analysis on various parts in the design. The contents of each structure were limited strictly to balsa wood and glue, by evaluating both the tensile and shearing strength of each, stress concentrations were identified and mitigated. The construction of the device was achieved by setting up multiple fixtures to manufacture and join each component of the assembly. Testing is achieved with multiple nondestructive procedures first, followed by a final load bearing test. The device when tested can successfully raise and lower through use of the articulating components. When at rest the device can support the static testing load of 20kg and meets the weight requirement at 84.4 grams.

Articulating Balsa Wood Bridge - Anndie Watterson, Faculty Mentor: Charles Pringle

A model for a strong bridge that could span a set distance and rise up to allow for passage underneath was requested, and specifications for the design were given. The catch was the bridge portion needed to be made of exclusively balsa wood and glue. The model bridge was designed out of balsa wood to meet all the requirements. Using structural and material analysis and simple mechanical designs, a bridge was designed and constructed out of balsa wood, wood glue, and metal components used for articulation that met all of the criteria set by the assigner. The bridge was tested to ensure all specifications were met. The resulting bridge can hold 20kg of weight suspended from the center and rise 1400mm above rest, while remaining locked in the raised position. It spans the 400mm distance between the two abutments it was designed to rest on and allows for a car to pass over the bridge without raising over 25mm at any point. The overall weight of the bridge did not exceed 85 grams, and the road deck rested within 12mm of the abutment, allowing for the model cars to access the bridge deck with ease. Aside from an 8mm hole in the road deck for testing, no other obstructions were present. The resulting product was a functional and effective model of a bridge that, when tested, successfully held the required weight and could also easily be raised, locked, and lowered for passage beneath the bridge.

NRJ RC Baja Car: Suspension and Transmission - Jefferey Harn, Ryder Satak, Maoki Masuda, Faculty Mentor: Jeunghwan Choi, Charles Pringle

Students of Central Washington University's Mechanical Engineering technology program were tasked with designing, manufacturing, and testing a remote-controlled scale vehicle for the American Society of Mechanical Engineers (ASME) Radio-Controlled (RC) Baja Car Contest sanctioned by Remotely Operated Auto Racers (ROAR). A team of three students was assembled and responsibility over the sections of the RC vehicle were divided amongst the three students. This report focuses on the design, manufacture, testing, and evaluation of the suspension and transmission systems of the RC vehicle. A suspension tower component and transmission housing assembly were conceived to satisfy the RC suspension and transmission systems. Engineering analyses were conducted on various aspects of the then to-be-manufactured parts to achieve optimal dimensions. The parts were 3D-modeled using SolidWorks software, and were manufactured using 3D printing methods and machining methods. The various parts were then tested and evaluated to ensure they satisfied their basic requirements and met the criteria of the ASME Contest.

The suspension towers and transmission covers conceived in this project are interchangeable, require less than three tools to disassemble, and are able to be assembled and disassembled in less than five minutes. The transmission covers and suspension towers successfully completed a one-hour continuous operation test without any disassembly or reduction in function. The covers also successfully withstood the required exterior forces specified in the report. Both components resisted a drop from two feet, along with the entire RC vehicle.

Thermal Conductivity Measuring Device - Kyle Saalfeld, Faculty Mentor: Charles Pringle, Jeunghwan Choi

The thermal conductivity measuring device is used to measure thermal conductivity of solids, liquids, and food products. Thermal conductivity is a material property that determines the rate at which heat disperses through a material. This determines how well insulation works, what materials are used as heat sinks and refrigeration, and how thoroughly food is cooked. The device measures thermal conductivity by heating up a thermistor bead using a high magnitude current for a set duration and allowing the given heat to disperse; meeting the goal of designing a device that can easily measure the conductivity. Additional requirements of this device include; weight, volume, test time, prep time, accuracy, and easily replaceable thermistors. Most importantly the device must measure with a minimum of 95% accuracy. To accomplish these goals the measuring device utilizes multiple DAQ NI modules and electrical components to construct a successful instrumentation system. The circuitry is housed in 3D printed ABS plastic sized for handed held use. A puncturing piece made from stainless steel is used to puncture through food product. Methods used to create this device include 3D printing, circuitry construction, software construction, soldering, casting and machining. The thermal conductivity measuring device constructed exceeds all requirements and is a conventional method of measuring thermal conductivity.

Radio Control (RC) Baja Car Drivetrain - Gizan Gando, Chesna Kern, Faculty Mentor: John Choi

The purpose of the RC Baja Car is to compete in the American Society of Mechanical Engineers (ASME) competition, a series of events to prove the functionality of the vehicle. This series of events includes the Slalom, Drag, and Baja race. The Slalom is a test in the steering capability of the car. The Drag is a test in the acceleration of the car in a straight line. Lastly, the Baja puts all factors together in a race to test every component of the car. This project is about building an RC car that can function under these conditions and hit maximum performance capabilities. This report describes the analysis, design, construction, and testing evaluation of the drivetrain and steering systems of the car. Chesna Kern was responsible for the chassis and suspension portion; together, this makes a complete system. The drivetrain was built with two different gear ratio systems for the idea of being able to get high speed and get high torque. The steering was constructed with a high ratio servo and Lego pieces for easy change and adjustability. Using lightweight material was one of the most critical aspects of building, so most car parts used ABS and acrylic plastic to keep the weight low. The resulting car reached speeds of 25 mph, an acceleration of 10 ft/s², a turning radius of 35 degrees, and all weight under 5 pounds. These were the critical factors that the car needed so that the event runs could be successful.

Public Health

Perinatal and Post-Partum Depression during COVID-19 - Mary Korth, Faculty Mentor: *Tishra Beeson, Amy Claridge*

Introduction: Post-partum depression impacts the health and well-being of both mothers and children, leading to higher rates of chronic depression in mothers and resulting in physical, emotional, and cognitive deficits in children (American Public Health Association, [APHA], 2019). Our study looked at how the stressors of the COVID-19 pandemic contributed to perinatal and post-partum depression.

Methods: This mixed-methods study collected data from online surveys using a convenience sample of expectant mothers with due dates from April-July 2020. Depression scores of participants were collected using the Edinburgh Postnatal Depression Scale during the third trimester of pregnancy and 4-8 weeks post-partum (EPDS; Cox et. Al, 1987). Participants provided a variety of demographic data. Depression scores were evaluated using bivariate analysis and multiple logistic regression analysis to examine the relationships between depression scores and independent variables.

Results: Our study found that 46% of expectant mothers met the criteria for clinical depression during the perinatal period, with 26.3% meeting this threshold post-partum. Mothers with positive EPDS scores perinatally were 6.1 times more likely to screen positive in the post-partum period. Household income was found to be a protective factor against depression scores.

Discussion: Our findings highlight the need for consistent and frequent EPDS screenings in the perinatal period. Our study was limited by the fact that our sample consisted of highly educated, partnered women with high financial resources. Future studies including a more representative sample may reveal significant relationships between financial resources and post-partum depression.

Reducing Post-Partum Depression Through Peer Support Interventions - Mary Korth, *Faculty Mentor: Tishra Beeson*

Post-partum depression occurs in 7-20% of pregnant women in the United States (Patel et. Al, 2012). Many mothers experience depression for the first time while pregnant (APA, 2008). Mothers who experience post-partum depression are 60% more likely to experience it again in subsequent pregnancies (Patel et. Al, 2012). Post-partum depression disproportionately impacts mothers of low socio-economic status, with mothers in poverty experiencing post-partum depression 2-4 times more often than their peers (Hansotte et. Al, 2017). A literature review was conducted to determine whether peer support interventions are effective tools in managing post-partum depression. It was found that while peer support interventions are effective, there are a variety of barriers that prevent mothers from engaging in peer support, especially for mothers of low socioeconomic status. It was found that utilizing multiple formats for peer support including home visits, internet, and text-based support is crucial to providing access to care for mothers in this digital age. Many barriers to treatment were noted, including lack of medical insurance coverage, and competing priorities, particularly for mothers of low socioeconomic status. Many mothers cannot prioritize post-partum medical visits due to needing to return to work as soon as possible to maintain adequate housing and necessities such as food and electricity. Recommendations to improve care for mothers include expanding Medicaid coverage to cover mothers for at least 1-year post-partum and screening for post-partum depression at WIC offices and DSHS to help identify mothers needing additional support.

Coping Strategies Among On-Campus Resident Students During COVID-19: Differences by Gender Identity - Sierra Martin, Jordan Lancaster, Brooke Writer, Faculty Mentor: Tishra Beeson

The continuance of the COVID-19 pandemic has surpassed the year mark and already we are seeing effects of quarantining and social distancing on the mental health of many around the world. One particularly vulnerable population is university students living on rural campuses, as rural towns often have low capacity for care and university students have high rates of mental health issues, leading to a disparity in mental health treatment. Little research has been conducted examining the effects of the pandemic on the mental health of university students, especially as it relates to different genders and coping strategies. Due to the increased stress and anxiety many are feeling during the pandemic, coping strategies have become increasingly important. This study opted to research students attending Central Washington University to better understand the current coping they use and compare them across different gender categories. Results for the quantitative data revealed significant differences in gender identities and differing coping strategies. More specifically, non-binary students were more likely to utilize avoidant coping styles, moreso than the female and male groups. The qualitative research revealed that female respondents were much more likely to request therapy and counseling services, as well as all three gender groups requesting an increase in social interaction. Moreover, it is apparent that mixed-methods designs are needed for this type of research, as the quantitative measure alone did not account for the great need of social support requested by students. Implications, recommendations for future mental health research, and limitations are also identified.

Prenatal, Birth, and Postpartum: Decisions During the COVID-19 Pandemic - Sarah Adams, Faculty Mentor: Tishra Beeson

A global pandemic of the COVID-19 disease was declared in 2020 due to the spread of the novel SARS-CoV-2 virus. This research investigates how changes to public health guidelines and policies during the pandemic have affected the decisions of pregnant and postpartum individuals. Transcriptions of phone interviews from eleven prenatal and postpartum participants were analyzed using thematic coding. Seven different themes were identified. Nearly all participants reported negative emotions in relation to their decisions. This research provides insight into a subject that has relatively limited research available. Despite rapidly changing information about the risks of a pandemic event, the results of this study suggest that providers and health systems should systematically review policies and practices for harm and benefit to mothers and infants to ensure that select practices are evidence-based and support optimal maternal and infant outcomes. Clinical providers can utilize this research to inform their knowledge of how prenatal and postpartum patients may feel about decisions during the COVID-19 pandemic. Because this research analyzes secondary data from interviews conducted in 2020, further research may be required to assess the continued relevance of the identified themes. Overall, respondents reported significant modifications or elimination of services, supports, and expectations they had intended for their pregnancy, childbirth, and postpartum experiences. As a result of these changes, most respondents expressed sentiments of stress, anxiety, and isolation which may yield negative outcomes. Further research is required to investigate these findings.

The Collective Experience of Pregnant Women During the COVID-19 Pandemic: A Qualitative Exploration of Open-Text Survey Response - Sarah Evans, Faculty

Mentor: Tishra Beeson

COVID-19 has impacted each of us and dramatically affected our health and the health care system. The CDC has recorded that the cases in the United States have exceeded 29,000,000, and there have been more than 500,000 deaths. In the case of health care workers, there have been more than 440,000 cases and 1,400 deaths. Pregnant women cases have exceeded over 75,279, with more than 82 deaths. The purpose of this presentation is to evaluate and analyze the collective experience of pregnant women during a major pandemic. The qualitative method was used to study the experience of 290 pregnant women in the United States through a web-based questionnaire survey. The survey asked each participant how their pregnancy or childbirth experience changed because of the COVID-19 pandemic. The collective experience of the participants included: increased challenges with health care communication, limitations on prenatal education, and elevated anxiety due to uncertainties during a pandemic. The research raises several issues which require further investigation. These areas include additional support for pregnant women and their teams in telemedicine, how to reduce anxiety for pregnant women and their families, and effective birthing education during a pandemic.

Assessment of Mental Health Language Literacy among Cambodian (Khmer) communities: A scoping review of literature - Rearthraiy Lee, Faculty Mentor: Tishra Beeson

The Cambodian (Khmer) community continues to face significant language disparities and inequalities in the field of mental health. In this theme of mental health, it is established that there are multiple explanations for the stagnant progress in language accessibility and health literacy. To further identify and analyze details and results that may assist in this improvement of better serving the elderly in these communities, we will use a scoping literature review. Here, we will use this scoping literature review to draw conclusions from existing U.S. academic journal studies and articles through scientific libraries and sites. These studies and articles are of observational, epidemiological, cross-sectional, and experimental studies that focus on post-traumatic stress (PTSD), major depression, and anxiety. Data obtained, illustrates the ongoing gaps of cross-cultural language, including policies and community issues that may exacerbates progress in the field of mental health. Contrary to what is assumed about language accessibility and health literacy in the mental health field, the demand for resources of inclusive language is rising with the ever changing environment. Findings and results on this scoping literature review are ongoing and forthcoming.

Pregnancy-related concerns and priorities among Latina women during the COVID-19 pandemic in the U.S. - Aritzandi Martinez, Faculty Mentor: Tishra Beeson

Pregnant women are experiencing changes both in pregnancy and childbirth due to the effects of COVID-19, raising concerns both for themselves and their baby's health. This study investigates group differences in the expressed concerns and experiences related to pregnancy during the COVID-19 pandemic between Latina and non-Latina women. This study aims to investigate three central questions, Do Latina respondents worry more about pregnancy during COVID-19 than non-Latina women? Do Latina women have a higher Fear of Birth Scale (FOBS) than non-Latina women during the COVID-19 Pandemic? and Do Latina women report different concerns related to pregnancy during the COVID-19 pandemic? Pregnant women were recruited in their third trimester if they had an expected due date between April - July, 2020 and filled out a survey about their pregnancy related experiences and expectations. Descriptive statistics on key variables were conducted (fear of birth scores, COVID-specific worry, and concerns/priorities related to the pandemic) and also used unpaired t-tests to identify group differences on dependent variables by the respondents' self-identified Hispanic/Latina ethnicity. Based on the results, no statistically significant difference in reported COVID-specific worry, no statistically significant difference in reported Fear of Birth scale was found. However, Latina women respondents reported higher concerns related to the postpartum stage than their non-Latina counterparts which is highly significant. These findings should be taken into account in order to fulfill the gaps in providing timely, high quality, and patient-centered care to pregnant women and expecting families during a major health and social crisis like the COVID-19 pandemic.

Everybody Eats - Jaeda Nelson, Gisselle Espinoza, Bianca Sanchez, Chante Jacobs, Tess Sparks, Faculty Mentor: Kate Doughty

CWU PUSH strives to meet students as they are and celebrate their wholeness by offering support through consistent action and co-active leadership. This work is not just to solve a problem, but to humanize it. If students are without a basic need as important as food, their ability to perform and experience life is compromised. Oftentimes, there is a cultural stigma that discourages college students from receiving free food. Programs and organizations can offer amazing solutions, but there must also be a heavy emphasis on creating ways for students to feel comfortable and normalize using those opportunities. This year is unique than others due to the pandemic which created an opportunity for the officers to reimagine how to solve food insecurity for CWU students. This presentation analyzes the solutions and practices implemented by PUSH officers that satisfies a socially distant and virtual world. More specifically, by creating covid safe resources and building the community within and outside CWU.

COVID-19 Stressors & Coping Among On-Campus Resident Students in a Rural Washington County- Brooke Writer (G), Faculty Mentor: Tishra Beeson

The present study examines the effects of the COVID-19 global pandemic on the mental health and well-being of college students residing in rural Washington. Eligible students living in on-campus residences or apartments were sent online survey instruments containing measures of mental health status using the Patient Health Questionnaire (PHQ-9) and original items to capture students' experiences during the pandemic event. Univariate and bivariate statistical analyses using unpaired t-tests and chi-square tests of proportions were utilized. Open-text responses about students' barriers to navigating mental health challenges during the COVID-19 pandemic among on-campus resident students were summarized using thematic content analysis and key themes will be presented. Among the 283 respondents with complete data in the sample, nearly 60% of the sample identified their gender as woman or female, with an additional 37% identifying as man or male, while an additional 1% identified as non-binary. Over 40% of respondents were 1st-year undergraduate students, and 74.75% of the sample identified their race as White. Based on previous literature, we expect to see statistically significant differences in mental health statuses and barriers to mental health identified by race and ethnicity, as well as differences by gender identity. We also expect to find that first-year students will have statistically significant differences in their mental health statuses compared to other grade levels. Key themes on students' experiences and barriers with mental health during the COVID-19 pandemic will be summarized and presented.

Intended Support Strategies Among Pregnant Women Before and During the COVID-19 Pandemic - Gracie Minks (G), Faculty Mentor: Tishra Beeson (Funded by Provost Research Grant)

Pregnant women have faced rapidly changing information about COVID-19 disease and its related outcome. As health systems and providers shifted care delivery models to adapt to the realities of pregnancy care during a pandemic, some pregnant women may have experienced changes to their care experience and gaps in their intended support services or strategies. This pilot study surveyed pregnant women in their third trimester (n = 297) about their intended use of supports, services, and benefits prior to COVID-19 being declared a global pandemic, and any alterations to their plans for using these support strategies during the pandemic. Paired t-tests were used to analyze differences between intentions for support service utilization between the two reporting periods. Linear regression models were used to test associations between the number of support strategies reported by pregnant women and demographic characteristics, as well as outcomes of interest such as perinatal depression, measured on the Edinburgh Postnatal Depression Scale (EPDS). This study highlights the importance of family-professional partnerships through a continuum of care, establishing and improving communities and systems for the MCH population, and robust resource assistance and referrals to health and social service providers for pregnant women as they navigate the complexity and uncertainty of the COVID-19 pandemic. Ensuring a person-centered, flexible, and responsive coordination of care model that is reflective of local contexts is vital to meeting the overall health and social needs of pregnant women during a time of high uncertainty.

Vaccine Intentions and Attitudes toward the COVID-19 Vaccine among Pregnant Women in the U.S.- *Jessica Craig, Gracie Minks, Adrienne Larson, Amy Claridge, Faculty Mentor: Tishra Beeson (Funded by Provost Research Grant)*

BACKGROUND: Vaccination during pregnancy aids in protecting mothers from serious disease, while the development of maternal antibodies can help protect their babies from serious diseases early in life. This practice is especially critical during a global pandemic. This poster presentation will report on a national survey of vaccine attitudes and intentions of pregnant women during the COVID-19 pandemic.

METHODS: Utilizing social media platforms, a convenience sample of pregnant women was taken, surveying vaccine attitudes and intentions. Data was also collected for age, race, education, marital status, household size and income, and provider influence. **RESULTS:** Preliminary data of 110 pregnant mothers surveyed reported that 51.8% (n=57) would definitely receive a COVID-19 vaccination, 10.0% (n=11) would probably receive the vaccination, 8.2% (n=9) were unsure, 16.4% (n=18) would probably not receive the vaccine, and 13.6% (n=15) would definitely not receive the vaccine. Using logistic regression modeling, we were able to determine that, while accounting for individual and household characteristics, individuals whose provider expressly recommended the vaccine were 37 times more likely to report positive intentions to receive a COVID-19 vaccine (adj. OR 37.89, p-value=0.003). Similarly, respondents who reported stronger agreement with items on vaccine safety were over 10 times more likely to report positive vaccine intention (adj. OR 10.3, p-value=0.007) while individuals who reported stronger agreement with concerns about potential harm during pregnancy (adj. OR 0.397 p-value=0.009) and concerns about limited testing of the vaccine among pregnant populations were less likely to report positive vaccine intentions (adj OR 0.22 p-value=0.026).

H5N1: Containing and Preventing Avian Flu in Vietnam - *Spring Munsel Gideon, Faculty Mentor: Tishra Beeson*

In a country with a poultry population over 385 million birds, controlling the Highly Pathogenic Avian Influenza (HPAI) strain H5N1 in Vietnam is of global importance. Vietnam's early policies of mass bird culling with no compensation had a higher socioeconomic impact on the nation's poorer citizens who depend on poultry sales, leaving them without product to sell or the means to replace their flock that had been destroyed. This case study aims to explore the disproportionate impact on low-income residents of Vietnam in the wake of the nation's response to H5N1 in 2004, and highlights the evolution in bird culling as a result of the socioeconomic issues experienced by those dependent on poultry sales for survival. We discuss the viability of vaccination against H5N1 and the importance of the continued collaboration necessary to mitigate outbreaks of H5N1 and other infectious disease events of concern.

The Zika Virus in Brazil- *Karoline Berge, Faculty Mentor: Tishra Beeson*

The Zika virus outbreak of 2015 disproportionately affected Brazil, a South American country with a history of fractured health systems and infrastructure. Factors that have contributed to Brazil's higher burden of Zika virus include physical environmental factors, a previously struggling economy, social and health inequalities, and political and financial constraints. With Brazil's unequal distribution of wealth, individuals living in low-resource areas had fewer protective factors against the virus. The case study presentation focuses on describing these factors, including how the Zika virus affected the population's health in Brazil and why the country's previous historical events led to poorer regions disproportionate burden of the Zika virus. This case study identifies key lessons learned from the Zika virus outbreak that may help mitigate future infectious disease events of concern in public health, especially among marginalized communities and those living in poverty.

Dueling Crises: The Case of Regional Flooding During the COVID-19 Pandemic in Sudan - *Kalea Bokma, Faculty Mentor: Tishra Beeson*

Sudan is a low-income country located in north-eastern Africa that has faced several decades of regional conflict and constrained economic growth. In July of 2020, amidst the current COVID-19 pandemic, the entire country was hit with record-breaking floods that affected all 18 states in the country. This case study will report the emerging data on the compounded effects of the flooding event during the global pandemic, as well as summarize ongoing action to respond to these intersecting crises. The case study also presents recommendations for future efforts to address infrastructure and health system capacity to mitigate the impact of similar public health crises of international concern. Future efforts will focus on expanding disaster preparedness plans and on summarizing lessons learned in Sudan that may be applied to other similar global health contexts.

Perinatal Women's Intentions to Use Lactation Support during the COVID-19

Pandemic in the U.S.- *Heather Pahl, Jaclyn Johnson, Faculty Mentor: Tishra Beeson, Amy Claridge*

This present, ongoing research aims to investigate how the COVID-19 pandemic has impacted mothers' intentions to utilize professional lactation support. We also investigated associations between the intentions and certain demographic variables (age, income, race/ethnicity). Quantitative data from online survey responses by pregnant women with an estimated delivery date between April—July 2020 (n=297) was analyzed to identify trends in the intention to utilize lactation support before the pandemic versus during the pandemic, along with demographic variables. Open-ended question responses were analyzed to find key themes in concerns related to lactation support and infant feeding. Our analysis shows that there was a significant decrease in participants' intentions to use lactation support during the pandemic compared to before. Our analysis did not show that any demographic variables were associated with intentions to use lactation support during the pandemic. The key themes that emerged within the open-text question responses were maternal and child separation, lack of breastfeeding support, and access to infant formula. Further research is needed to understand the reasoning behind the change in intentions to use lactation support so that breastfeeding is facilitated and encouraged during future emergencies.

Academic Service Learning in Public Health - *Brittaney Carroll, Faculty Mentor: Amie Wojtyna*

The PUBH 489 course allows students to engage in community and/or campus based academic service learning related to public health. In Winter quarter 2021, CWU students were trained and certified in case investigation and contact tracing (CICT) for the COVID-19 pandemic. In conjunction with the Kittitas County Public Health Department (KCPHD), the CWU CICT team has been working to help limit the spread of COVID-19 in the community. The CICT team has been heavily involved in ensuring that COVID-19 positive students, and those identified as being close contacts, are following all recommendations for isolation or quarantine periods, respectively. As a student involved in the CICT team, I have been investigating positive cases to pinpoint infectious period timelines, determine isolation, and identify close contacts. Contacts are then notified and given instructions for quarantining, whether on-or-off-campus. Once cases and contacts have been investigated, each receives a daily call regarding general health and well-being, development of symptoms, and to determine if they are in need of any support or assistance from the University. This experience has allowed me to prioritize the well-being of my student community. I have been able to take the public health knowledge and skills I have learned throughout my education at CWU and apply that to something that is making a difference and giving me experience that I can utilize post-graduation.

Contraceptive Use Among Black and African American Women: A Look at Racial Disparities in Utilization of Birth Control Methods - *Uwaila Stewart, Faculty Mentor:*

Tishra Beeson

This study aims to understand contraceptive disparities and identify opportunities to improve access to and utilization of high-quality contraceptive care for women who may experience a higher burden of unintended pregnancy and other disproportionate outcomes. The research questions are (1) do Black and non-Black women utilize any form of contraception at similar rates, (2) are there differences in whether or not women are using their preferred (first choice) contraceptive method, by race, and (3) are there differences in contraceptive method type reported between Black and non-Black women. This study used secondary data from an original survey done with non-random sampling fielded from 2014-2015 on family planning experiences of women receiving primary care in a community health center (FQHC) setting. A total of n=2,117 participants recorded responses to survey items, and respondent's use of any FDA-approved contraceptive method was recorded. The findings show that while a majority of women reported using some form of contraception, approximately 1-in-4 women report not using a contraceptive method to protect against unintended pregnancy, and specifically, 1-in-3 Black women reported no contraceptive use. Future research should continue to investigate disparate experiences among Black and African American women receiving reproductive health care and how factors like access, cost, education of both the woman and health care provider, and community perceptions of contraceptive care could all affect disparities in contraceptive use. This study's preliminary look into the racial disparities in contraceptive care creates a foundation for more research surrounding disparities and lack of access to high-efficacy contraceptives.

Academic Service Learning in Public Health - *Brittaney Carroll, Faculty Mentor: Amie Wojtyna*

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Public Policy

Paid Leave Benefit Utilization for Expecting Mothers in the COVID-19 Pandemic-

Mary Miller, Faculty Mentor: Tishra Beeson

Of 41 developed countries, the United States is the only one that does not have federal paid parental leave. Consequently, families across the United States face the financial burden of pregnancy with the limited support of their state policies. This is especially true for those expecting during the COVID-19 pandemic, who have lost wages and benefits from their employer and from that of their partner. This puts them at increased risk for food insecurity, depression, anxiety, and other chronic diseases. This study aims to identify intended paid leave utilization of expecting mothers before and during the pandemic and investigate trends in these rates based on demographic factors. 443 expecting mothers across the United States were surveyed about their demographics, intentions to utilize paid leave benefits, and experiences in pregnancy. Data was analyzed with descriptive and inferential statistics, paired T-tests, chi-square and Pearson correlation analyses, and logistic regression models. When accounting for age, race, ethnicity, education and household size, analysis of the data showed statistical significance in the relationships between utilization of any type of leave and household income, publicly funded insurance, and prenatal depression. We can conclude that intention to utilize any type of benefit was lower during the height of the pandemic, and that the rates of reported benefit utilization are highest in highly educated, higher income, privately insured women. While more investigation is needed into the temporality of these findings, we can begin to identify populations who are most in need of more substantial paid parental leave benefits.

Public Relations

La Comunidad Project - Yajaira Perez, Faculty Mentor: Cesar Garcia

Systemic racism in the education system is an issue that has been overlooked for too long. Students who attend low income school districts have an exceptional disadvantage at life. It has been proven that student who attend low income school districts have exceptionally lower test scores and a lower graduation rate, in comparison to a student who attends a high income school district. Usually, low income school districts have a high percentage of minorities. In the Yakima School District in Washington State, 80.1% of students are Hispanic and/or Latino; furthermore, these students hold the lowest test scores amongst other student demographics. The Latinx community have many disadvantages that stops students from pursuing higher education; moreover, disadvantages including low income, low resources at high schools, citizenship situations, and low parent involvement. These disadvantages leads to Latinx students taking different paths in life that are short term. La Comunidad Project is an Amazon communication plan that will assist Latinx high school students in Yakima, Washington to grow and excel in higher education. The goal for La Comunidad Project is to build a relationship with Latinx high school students in the Yakima School District by providing resources, exclusive scholarships, summer internship opportunities, and interactive workshops. The efforts in offering exclusive scholarships and internships, hiring Amazon Advisors, hosting computer science workshops, and providing advanced laptops to students are strategic tactics in targeting Latinx students who attend Davis and Eisenhower High School. La Comunidad Project will be giving Latinx high school students the opportunity to plan, grow, and excel in higher education.

Social Services

The Need for Change - *Eryn Haddox, Faculty Mentor: Judith Hennessy*

This project includes an evaluation of recent changes regarding the rights of transgender individuals, as well as my own suggestions for how we as a society may be able to lessen the discrimination these individuals face. My project will also include a resource page - an online resource that can be used by individuals in need to aid them in finding services available to them in their area. My resource page will include resources available in Yakima County and possibly surrounding areas - for transgender peoples, as well as other people in need.

Sports Management

Evaluating College Football Coaches' Legal and Moral Obligations in Reporting Sexual Violence Perpetrated by Athletes- *Tori Carpenter (G), Faculty Mentor: Sean Dahlin*

Sexual violence on college campuses has been a significant public health issue for many years now. NCAA Division I institutions report a higher number of sexual assaults and violence. Particularly, athletes at the NCAA Division I level are more likely to perpetrate such violence, and, in many cases, coaches have been notorious for concealing the sexually violent behavior their athletes have carried out even with previous knowledge of it. With changes in Title IX that no longer required coaches to report sexual violence carried out by their athletes, moral clauses within coaching contracts are examined in this review in order to determine what moral and ethical standards athletic departments hold them to. The purpose of this legal review is to determine the process of reporting that college football head coaches at this level are legally and morally held to. The methodology used is examining what the law says and what contracts say that hold coaches to a higher moral standard. Based on current coaching contracts, moral and ethical clauses are lacking in many employment agreements, and there is not much moral or ethical accountability for coaches at the NCAA Division I level.

Teacher Education

The Benefits of Mentoring - *Maddie Farrell, Faculty Mentor: Allyson Rogan-Klyve*

Mentoring is the building block to confidence, positive self-esteem and individual success. Every school should implement a mentoring program to allow for Elementary School students to be supported by Middle or High School students. As a mentee, students will experience love, guidance and will feel empowered. As a mentor, students will find their own purpose in this world and in their academic careers, fulfilling a need for community service in our society.

Stressors Impacting Academic Integration and Self-Efficacy of Female Adolescent Refugees of Middle East Conflict - Kathryn Metzger (G), Faculty Mentor: Denise Shaw

This presentation examines the available research and literature on female adolescents who are refugees from areas of conflict in the Middle East and the impact that cultural, gender-based, and trauma-related stressors have on their self-efficacy and integration into the classroom. With the increase of regional conflict, the global population of refugees continues to expand. The United Nations Children's Fund (UNICEF) reports that, as of 2019, 15% of refugees entering the United States were children. This population includes children and adolescents caught up in forced migration resulting from war and regional conflicts. As these students have been resettled here in the United States and incorporated into the local school systems, educators and researchers have begun to examine the unique needs of this student population as well as the factors which impact their academic performance.

College of the Sciences

Actuarial Science

Finding Next Meal: A Research Based Cost/Benefit Analysis of Nutrition Related Programs in the United States - Margaret Battisti, Faculty Mentor: Yvonne Chueh

The Centers for Disease Control and Prevention (CDC) found, in a survey based study, that 88% of adults in the United States do not meet the required daily intake of fruits and 91% do not meet the required daily intake of vegetables. Missing out on substantial daily consumption of fruits and vegetables can increase risk for and exacerbate chronic diseases including diabetes and heart disease. Maintaining a nutritious diet has numerous benefits; however many Americans are simply unable to afford it. The Feeding America organization predicted that, due to economic and employment changes due to the COVID-19 pandemic, more than 35 million people in the United States (US) could be food insecure right now. Feeding America defines food insecure as households that either had to change the variety and appeal of their diets while maintaining the amount consumed or households where at least one member had to significantly change their eating patterns and/or decrease their food consumption due to lack of resources. In the United States there are many nutrition related programs with themes ranging from access to nutritious food, food purchase assistance, and food provided through education. Utilizing information gathered from federal departments and offices and supplemented by other credible sources when necessary, selected programs will be analyzed for their benefits to Americans and their monetary cost per capita to draw a final conclusion regarding what types of programs are the most nutritionally beneficial and the cost per capita of funding.

Housing- Edward Ho, Faculty Mentor: Yvonne Chueh

The homeless population in the United States has had a sharp increase resulting from the pandemic, the racial disparities among the populations are intensifying as well. A recent study (Homelessness Research Institute) shows that people of color are more likely to be homeless, while 54% of African American, 20% of Hispanic, 4% of Asian, and 11% of Whites. People of color experience a higher cost burden which is 54.9% for African American renters who are more likely to experience evictions since they have been systematically 1excluded from equal access to housing. And because of the economic insecurity, that pandemic brought they had suffered the most then became homeless. While efforts are being made by policymakers, housing assistance approaches include housing vouchers, homeless assistance, eviction prevention, and supplemental funding. Despite HUD allocates more than \$20 billion each year to local housing agencies, the results have shown that a benefits program does not necessarily benefit anybody. There are simply not enough funds, especially when you have an estimate of 25,7 million households who are eligible to receive the voucher. Researches also show that even if you hit the lottery and got the voucher, there is only a slim chance of landlords accepting the voucher. The goals of this research are to find out how the housing voucher had worked against the people of color vouch holders and to provide more insights into allocations of various housing assistance programs.

Universal Basic Income: A Five Year Breakdown of its Cost Across the United States- Keegan Negron, Faculty Mentor: Yvonne Chueh

In the wake of the economic upheaval caused by the Coronavirus Pandemic, numerous Americans have received stimulus checks and unemployment benefits from the government. These act as a safety net to prevent those who have been financially impacted by the pandemic from entering into poverty. Universal Basic Income (UBI) is a policy that similarly has been proposed as a more permanent safety net and a potential solution to help people out of poverty. Currently the US government provides welfare, food stamps and public transportation to help those who are currently impoverished. Universal Basic Income could take the place of these as an expanded form of government aid. It has been proposed at set levels of anywhere from \$1000 to \$6000 a month for every citizen above the age of 18 without any distinction of where the recipient lives in the United States. This article will discuss and evaluate the cost of Universal Basic Income in the lens of cost of living and inflation throughout the US. A model will be created by using the average cost of living and population as the cost determination in each county and parish in the United States, as well the District of Columbia. Using the cost of living from each county, a cumulative cost of UBI currently will be created and the average cost per capita reported. Another model to project the cost of UBI 5 years into the future will be created by analyzing projected inflation.

Anthropology and Museum Studies

Chemical Sourcing and Technical Analysis of Volcanic Glass Lithics from the Grissom Site (45KT301) - Nik Simurdak, Faculty Mentor: Patrick McCutcheon

The Grissom site (45KT301) is a large archaeological site with artifacts spanning pre-contact to historic periods. Past research by Central Washington University students sought to understand stone tool type variation, distribution, and diversity across space and time in the site. This has included an effort to chemically source lithics made from volcanic glass using x-ray fluorescence. Combined with technological analysis, chemical sourcing reveals patterns of trade and exchange by showing which sources are most represented and how much processing of different source materials occurred. This project built on previous research by completing the sourcing analysis across 59 of 114 newly identified volcanic glass artifacts. Our results were combined with past results permitting us to look at source representation across the entire site excavation area. The results show that two local sources represent 49% of the sourced pieces and demonstrate the greatest diversity of object type and reduction sequences. Two more distant sources, though having far fewer cores and bifaces, represent the greatest proportion of flakes (n=32) than the two local sources (n=30). A total of 13 sources, some over 250 miles away, are represented in the site. Areas of intensive tool production were also identified through total lithic artifact counts.

Developing a morphometric protocol for identifying and analyzing morphological variability in stone tools- Nik Simurdak, Faculty Mentor: Patrick McCutcheon

Morphometrics analysis of stone tools emphasizes the use of metric data to capture information about tool attributes, such as shape. These techniques are still under development, with some adapted for less reduced tools and others making use of prohibitively expensive technology. This project developed a morphometric analysis technique that is more accessible and attuned to more reduced tools. The artifacts used come from a teaching collection of 18 projectile points from the mid-Columbia River Valley in Kittitas County, Washington. We compare a novel technique to two pre-existing approaches. Our research objective is to identify morphological attributes whose presence, frequency, and distribution are shaped by natural selection in contrast to those traits influenced by cultural transmission. The comparative methods fell short of identifying shape trends but some data suggested there are greater differences in variation around the haft elements than those of the blade and point. The novel method indicated blade shape was a functional element influenced by natural selection and hafting was a stylistic trait influenced by cultural selection.

Analysis of 3000 Year Old Dentition: Barbuda, West Indies - Harley Biggs, Izzabella Perini, Faculty Mentor: Steven Hackenberger, Steve Spencer (Funded by OUR Grant)

The CWU Anthropology Department sponsored a field school in Barbuda-Antigua in 2000. Poorly preserved human remains were discovered eroding into the ocean and rescued by a team of students supervised by Dr. Hackenberger and Mr. Gregg Wilson. A tooth was AMS radiocarbon dated to approximately 3000 years ago. People at this time were among the earliest preceramic settlers in the Eastern Caribbean Islands. In addition to reevaluating the burial positions of the individuals, we have focused our attention on a sample of two dozen teeth from three individuals. Our analysis has included tooth identification and assessment of tooth wear. We are using photography and 3-D imaging and printing to document and replicate the teeth before they are returned to a new heritage center being created in Barbuda. Previous efforts to recover DNA samples from the teeth have not been successful. We are hoping that the University of Oklahoma, Laboratories of Molecular Anthropology and Microbiome Research (LMAMR), will help us recover DNA from soil samples and/or dental calculus removed from the teeth.

Middle Columbia River Environmental Archaeology- Astra Palmer, Harley Biggs, Faculty Mentor: Steven Hackenberger (Funded by OUR Grant)

As part of our Provost and OUR supported research project with Dr. Hackenberger, we have undertaken a focused study of the sediments and stratigraphy of the Wahluke Site (45GR306). This site is situated on a high terrace on the Hanford Reach of the Columbia River. The site was investigated in 1989. We are reevaluating the radiocarbon dating and comparing the natural strata (paleo-floods) with cultural layers. The cultural features and occupation layers include house floors and house fill. Large circular “pithouses” were built partially below ground, and during disuse or abandonment the house “pits” were filled with sediments transported by wind and water. We are obtaining more accurate radiocarbon dates on bone to compare with previous dates from charcoal samples (1300 to 1150 BP, or about A.D. 650). We suspect that these age estimates from charcoal reflect an older wood bias. More precise bone dates for salmon (with a marine carbon correction) pinpoint house occupations. Combined with other studies our results will contribute to models of climate change and the long-term productivity of salmon fisheries.

What do you meme?: An analysis of how college students use memes - Skyler Smith, Faculty Mentor: Rodrigo Renteria-Valencia

This exploratory study provides insight into the behaviors of Central Washington University college students as it pertains to the discovering, sharing and creating of memes. Additionally, it explores meme use in inter-personal communication, the effects of meme interaction on personal interests and understanding of the digital and physical world, and opinions about memes being used in institutional and commercial contexts. Cultural anthropology methodology such as an online survey, long-form interviews, pile-sorting activities and analysis of current literature were used to collect and analyze the data for this study. A relevant finding from this study was student perception of memes in comparison with definitions made available in the current academic literature on memes. The results of this study are likely to be of interest to researchers who aim to understand memes and their use by this key population of meme users as well as institutional and corporate entities who seek to use memes to encourage interactions with themselves and this population.

Pasefika Identities: How Museums Can Start Conversations Around Identity through Collections and Education - *Leilani Salu, Faculty Mentor: Hope Amason*

Inspired by previous internships and community work within the PNW, this presentation analyzes the way in which museums serve as a point to facilitate conversations around identity, indigenous knowledge and transformational learning. Centered on Pacific Islander identities, this presentation aims to create dialogue on Pacific identities within museums, higher education and their relation to larger pedagogical themes of decolonial education, research and identity exploration. Using indigenous ways of knowing and sharing knowledge i.e. storytelling, this presentation aims at how we can reconsider using museum collections to work with communities and decolonize how public institutions discuss museum objects, community affiliation, and etc. In this presentation, I will be drawing on my time interning at the UW Burke Museum using their Oceanic collections as a focus as well as incorporating how research and community work call for intentional educational opportunities that respond to community interest, i.e. how this research becomes a basis for classes in UW's Anthropology Dept. By using museum collections and collaborative community work, we can introduce new ways of understanding identity, using museum collections, and highlighting marginalized groups in academia.

Biochemistry

Toxicity testing for five different newly synthesized organic compounds- *Phuong Luong, Faculty Mentor: Carin Thomas*

Mouse liver cells have been utilized in pharmaceutical industry for their vital role of determining the toxicity of chemicals that may be used as novel treatments in disease. Five newly synthesized organic compounds, obtained from Dr. Timothy Beng's research team (CWU Chemistry), were used as five different xenobiotics to be tested for their toxicity to mammalian cells in vitro. Vector transfected Hepa-V mouse liver cells were grown in 25 cm² flasks using a complete media solution containing DMEM/F12, 10% Nu-Serum and 1% Penicillin-Streptomycin. When cell confluency reached 80%, the cells were exposed to different treatments including: complete media (no xenobiotics or DMSO), vehicle control (0.5% v/v DMSO), positive control (10% v/v DMSO), or the appropriate xenobiotics (0.1 µg/µL in 0.5% v/v DMSO) for 24 hours. Using the WST-8 assay and the Synergy 2 instrument, cell viability was determined through measuring absorbances at 450nm. The results showed that cell viability in the positive control decreased by 70% on average compared to the vehicle control, indicating the WST-8 assay was working properly. The results also suggested that all five organic compounds were toxic to mouse liver cells, decreasing cell viability by 40-80% as compared to the 0.5% v/v DMSO vehicle control.

The development of cell culture techniques to investigate the role of Emx2 in neocortical arealization - Brett Vagt (G), Faculty Mentor: Todd Kroll (Funded by Provost Research Grant)

The neocortex is a structure unique to mammalian brains and mediates conscious thoughts and actions. This structure contains four primary areas that processes discrete types of information: motor output and auditory, visual, and somatosensory (touch) input. Although these functional areas are separated by discrete boundaries shortly following birth, these clear boundaries are nonexistent during embryogenesis. The development of these boundaries (a process called neocortical arealization) is partially mediated by a variety of transcription factor proteins produced in gradients across the developing neocortex. These include the homeobox protein Emx2, which is one of the most studied proteins involved in this process. Emx2 is produced across the developing neocortex in a high posterior-medial to low anterior-lateral gradient. This gradient influences the boundary positions between the neocortical areas. Emx2, however, is not sufficient on its own to mediate this process. The Kroll lab focuses on the identification of novel binding partners for Emx2 that may assist with proper neocortical arealization. This strategy has led to the identification of four primary proteins of interest: Cnot6l and three isoforms of Quaking-I (QKI). The objective of this project has been twofold. First, to develop and implement procedures for mammalian cell culture, transient transfection, and RT-qPCR, for use in the Kroll lab, to further investigations of novel protein-protein interactions. Second, to investigate a potential mechanism for the regulation of p27KIP1, by Emx2, through interactions with Cnot6l and/or any of the quaking isoforms.

Biological Sciences

Remeasurement of the Health of Whitebark Pine Stands in the Central Washington Cascades- Nancy Parra, Faculty Mentor: Alison Scoville

Whitebark pine (*Pinus albicaulis*) plays a vital role in colonizing newly disturbed area, providing shade for other tree species to colonize, and supplying food for a variety of birds and mammals, such as Clark's nutcrackers (*Nucifraga columbiana*) and grizzly bears (*Ursus arctos horribilis*). Whitebark pine's decline has been attributed to several factors such as white pine blister rust (*Cronartium ribicola*), mountain pine beetle (*Dendroctonus ponderosae*) outbreaks, and fire exclusion. In 2009, the U.S Forest Service began to install permanent plots in whitebark pine stands in Washington and Oregon as part of a Pacific Northwest restoration strategy to track blister rust and mountain pine beetle mortality. Forest Service crews conducted surveys on these plots that included standard tree inventory and measurements of blister rust, mountain pine beetle, and fire activity. Before summer 2020, only 12 of 47 plots located in the Okanogan-Wenatchee National Forest had been remeasured. To evaluate the changes that occurred in the whitebark population and provide updated data to the Forest Service, volunteer crews during summer 2020 remeasured eight of these plots located in three areas of the Okanogan-Wenatchee National Forest: Mission Ridge, Clover Springs, and Darland Mountain. Results indicate a significant increase in blister rust stem cankers (from 2% to 16%: $t(5) = -5.6434$, $P = .0024$) and low, unchanged mountain pine beetle activity, but more plot remeasurements are needed to understand the current status of the whitebark pine population, the changes that occurred since 2009, and the future status of whitebark pine.

Prevalence of Rocky Mountain Spotted Fever in Kittitas County Ticks - Raeanne

Tegman, Faculty Mentor: Gabrielle Stryker

Rickettsia rickettsii is a pathogenic bacterium that causes Rocky Mountain spotted fever in individuals who have been the recipient of a tick bite. Rocky Mountain spotted fever causes fever, headache, rashes, and can be deadly in those who do not receive proper treatment. In the North Eastern part of the United States, tick surveillance is a common method used to identify the prevalence of pathogenic bacteria. In Washington State, however, the detection of this pathogenic bacterium is primarily based on human incidence. My project focused on identifying the prevalence of *R. rickettsii* in the Kittitas County tick population. Methodology include dragging known tick areas for collection of specimens, donations of ticks from local residents, and DNA sequencing for detecting pathogenic bacteria. The ticks collected were identified by comparison of mouth and body signatures to known species, which resulted in the identification of two tick genera, *Ixodes* and *Dermacentor*. After DNA extraction, Polymerase Chain Reaction (PCR) was performed in order to identify the presence of *R. rickettsii*. Results confirm the presence of this bacterium in at least one tick. A number of ticks indicated the possibility of infection, but more research must be done in order to confirm.

Longitudinal Patterns of Microplastic Abundance and Potential for Food Web

Uptake in the Yakima River - Janell Shah (G), Faculty Mentor: Clay Arango (Funded by Provost Research Grant)

Microplastic (MP) pollution is ubiquitous worldwide with plastics found even in pristine terrestrial, marine, and freshwater environments, but the ecological consequences of widespread MP remain unknown concern is growing because. A growing number of MP studies in marine environments reveal XX and YY, however the impacts of plastic pollution on freshwater ecosystems have received less research attention. While many studies have investigated species-specific ingestion of MPs, very few have investigated the pathways of MPs into a local food web. Therefore, I will examine aquatic insects as a potential food web uptake mechanism and how microplastics are distributed in the insect community of the Yakima River. Because wastewater treatment plants (WWTPs) are a known source of MP to freshwaters through laundering synthetic fabrics, I will focus my investigation upstream and downstream of the City of Yakima Wastewater Treatment Plant. I will sample stream water, biofilm (the algal and microbial layer that naturally grows on rocks in rivers), and aquatic insects at each site. All samples will be processed in the lab to isolate and enumerate MPs. It is anticipated that samples taken downstream of the WWTP will contain more MPs than samples taken upstream, due to WWTPs being known as point source inputs of microplastics. This analysis will reveal where and at what concentration MPs are accumulating in the base of the riverine food web in the Yakima River and whether insects, which are a common food source for higher order consumers such as fish, accumulate MPs.

Evaluation of Synthesized Organic Compounds as Potential Therapeutics for Human Leishmaniasis - Hunter Korf, Faculty Mentor: Blaise Dondji (Funded by OUR Grant)

Leishmaniasis is a disease caused by the parasitic protozoan *Leishmania*. The disease is present in 88 countries, with 350 million people at risk and 12 million patients. There are three main clinical types of the disease: cutaneous, mucocutaneous, and visceral leishmaniasis. About twenty species of *Leishmania* cause human diseases. *Leishmania major* was used in my studies. It causes cutaneous disease in Africa and the Middle East and symptoms include facial lesions. Amphotericin B (Amp B) is the only FDA approved treatment for leishmaniasis in the US and is toxic to patients. Consequently, there is an urgent need for new compounds that are active against *Leishmania*, non-toxic or less toxic, and affordable. In my contribution to this ongoing drug discovery project, I am working towards the identification of candidate compounds that have higher activity levels against *Leishmania* parasites and have no or less toxicity. To evaluate the anti-*Leishmania* activities of bicyclic lactam compounds, I performed in vitro assays. Amp B served as the positive control with expected anti-*Leishmania* activity, while dimethyl sulfoxide served as the negative control as it is an effective solvent. Twenty μL of Alamar blue, which is a dye that is used to assess cell viability, is added to each well. The dye turns from red to blue when cells die, so wells with compounds that are active will appear more blue than red after incubation and exhibit lower optical density levels once read with a spectrophotometer. Preliminary findings indicate compounds with activity levels comparable to Amp B.

Purification of a Recombinant Paraflagellar Rod Protein-5 from *Trypanosoma cruzi* - Kylie Howson, Faculty Mentor: Gabrielle Stryker

Trypanosoma cruzi is a single-celled parasite found in the Americas, from the southern United States through South America, and is responsible for causing Chagas disease. This vector-borne parasite can infect all mammals, including humans, through exposure to the feces of Kissing bugs (Triatomine bugs). These large bugs feed on blood and can infest mud-walls or thatched roofs of rural homes. Trypanosomes contain a distinct structure known as the paraflagellar rod (PFR) that runs alongside the parasite's flagellum. The PFR is required for cell motility and is a complex structure of cytoskeletal filaments in a lattice-like arrangement. The PFR constitutes an immunologically unique set of proteins that have been shown to protect against *T. cruzi* infection in mice. Paraflagellar rod protein-5 (PFR-5) is a putative minor component of the PFR of Trypanosomes that contains both PFR and SH3 protein domains. This research aims to identify the sub-cellular location of PFR-5 within the parasite *T. cruzi*. The 5' end of the *pfr5* gene has been subcloned into the PinPoint Xa expression plasmid in *Escherichia coli* (JM109) cells. My research has focused on induction, extraction, and purification of the soluble PFR-5 fragment. Protein purification is completed with pH manipulation of strep-avidin beads for protein collection and verified through SDS-PAGE and western blot. The goal is to immunize mice with the collected protein to generate PFR-5 specific antibodies for fluorescent microscopy. This research contributes to the understanding of the PFR in Trypanosomes and increases the number of potential vaccine target proteins for Chagas disease.

Acoustic Monitoring of Clark's Nutcrackers in Whitebark Pine Habitat of the North Cascades - *Lauren Taracka, Faculty Mentor: Alison Scoville*

Clark's Nutcrackers (*Nucifraga columbiana*) and Whitebark Pine (*Pinus albicaulis*; WBP), both native to the subalpine habitats of the Cascade Mountains, are part of a fascinating mutualism: WBP, a keystone species which is currently declining, provides high energy seeds and shelter for smaller trees and plants, while the nutcracker is its only seed disperser. The goal of this project was to survey nutcrackers in WBP habitat through acoustic recording units to assess how habitat variables impacted nutcracker occurrence and detectability throughout summer and fall. We deployed monitors at 12 randomly chosen study sites and collected 908 days of acoustic recordings. In addition, we conducted visual occupancy surveys (to compare with the recording units), habitat surveys (to assess nutcracker occupancy as a function of important habitat variables), and WBP cone counts. Nutcrackers were observed at locations 39% of the days, and we are currently developing occupancy models to assess which habitat variables most strongly influences nutcracker occurrence. The methods we developed during this pilot season will be expanded in 2021 and are the base of a proposed long-term citizen science monitoring project. The results from this season of monitoring will be used to understand the current local nutcracker population and habitat use. The methods used will provide a new approach to nutcracker monitoring. The results will be useful to biologists, and wildlife and forest management in further understanding the unique relationship between the species in the Pacific Northwest, implementing WBP conservation protocols, and determining which populations need the most support.

Investigating the Effects of *Sambucus nigra* on the Adaptive Immune Response In Vivo - *Paul Messier, Daniella Mendez Paddilla, Faculty Mentor: Gabrielle Stryker*

Elderberry extracts, obtained from the berries of the plant *Sambucus nigra*, are marketed as an immune stimulant and are widely available. Previous research has suggested that bioactive components of elderberry extract exhibit anti-inflammatory and, in other studies, pro-inflammatory effects in immune cells. Much of the body of research done with elderberry has involved in vitro studies. However, there are few in vivo studies of elderberry to date, which is the real test of immune bioactivity. The goal of this study is to investigate the effects of a commercially available elderberry extract on the adaptive immune response. We carried out an in vivo study of BALB/c mice measuring their immune response to a foreign protein (ovalbumin (OVA)) while being dosed with elderberry. The mice were trained to eat gelatin to receive the elderberry and were then immunized with an adjuvant, with half receiving OVA in their immunization. Following immunization, the mice were given gelatin with or without elderberry for a period of 10 days to allow an immune response to be generated. After one-month, blood and immune cells were collected from the groups to measure the immune response generated to OVA. Both the T-cell and the B cell responses were measured with ELISAs. The T-cell responses were below detectable levels after a single immunization. The OVA-specific serum antibody levels were high and there was no significant difference in mice fed elderberry while developing an immune response to OVA. Thus, there was no demonstratable effect of elderberry on the adaptive immune response.

The Effects of Prolonged Cold Exposure on Adipose Tissue in NAG-1 and Wildtype Mice - Taylor Arndt, Faculty Mentor: April Binder

The NAG1 gene is the non-steroidal anti-inflammatory gene 1. Mice with the activated NAG1 gene have been associated with a leaner phenotype, longer lifespan, less adipose tissue, and higher metabolic activity. Although the mechanism is not completely understood, previous studies show that thermogenesis is upregulated in mice expressing the NAG1 gene. Thermogenesis is the process of generating heat rather than ATP in brown and beige adipose tissue. Thermogenesis can also be activated by cold exposure, involving the B3-adrenergic signaling. This study is designed to further our understanding of the mechanism of the NAG1 gene by comparing NAG1 and wildtype mice in cold conditions that are already known to induce thermogenesis. Previous reports have demonstrated the effect of brief cold exposure, but there are no prolonged cold exposure studies, as well as none involving mice expressing NAG1. By learning more about how NAG1 and cold exposure effects thermogenesis, we can use the information to further study metabolism and obesity. In this study both NAG1 and wildtype mice were exposed to 10C temperatures for seven days. After this prolonged cold exposure, the mice were euthanized prior to collection of both brown and white adipose tissue. This tissue is currently being sectioned, stained, and scored to determine differences in adipose tissue in wildtype and NAG1 mice after prolonged cold exposure.

Lichen Coverage on North- and South-Facing Slopes in Central Washington - Ben Keller, Molly Robertson, Justin Nickolaus, Faculty Mentor: Lisa Ely, Dan Beck

Lichen are symbiotic organisms that live on trees, rocks and other surfaces. For our research we wanted to know if the direction the slope faces affects the growth rate of lichens in central Washington. Previous research has indicated that UV-B exposure reduces growth rates in some lichens. We therefore hypothesized that north-facing slopes would have a higher lichen coverage than south-facing slopes. To calculate the amount of lichen we laid down a transect line with a tape measure and measured the centimeters of lichen compared to the overall length of the transect. We had eight transects for both north- and south-facing slopes on Manastash Ridge south of Ellensburg. Our results indicated that the south-facing slopes had a higher percentage of lichen coverage than the north-facing slopes. The average lichen coverage twelve percent on the south-facing slopes and just under two percent on the north-facing slopes, causing us to reject our hypothesis. We believe that one reason why the south-facing slopes had more lichen was that very few rocks were found on the north-facing slopes, providing fewer surfaces for lichen growth. We conducted our experiment in the beginning of March, and there was still some snow on the north-facing slopes, which made the ground very saturated. The longer persistence of winter snow cover and greater moisture on the north-facing slopes could increase the amount of soil development, further reducing the exposed rocks for lichen habitat.

Mice Mice Baby! Cold-induced metabolic changes in lean, transgenic mice - Rachel Davey (G), Faculty Mentor: April Binder (Funded by Provost Research Grant)

Obesity is a multifaceted metabolic disorder with severe worldwide public health consequences. While obesity can often be treated using diet and exercise, there are complex genetic interactions driving obesity that don't always respond to such changes. One important research focus for addressing genetic factors is activating brown adipose tissue which increases thermogenesis, the process of burning stored fats to generate heat. Cold exposure is a known way to activate brown adipose tissue through B3-adrenergic signaling. This signaling pathway causes an upregulation of thermogenesis in brown adipocytes and beige adipocytes, which is white adipose tissue that "browns" and becomes metabolically active. In this study, transgenic mice that constitutively express the human non-steroidal anti-inflammatory gene 1 (NAG-1) were used as a model to further understand the mechanisms of increasing metabolism. At room temperature, NAG-1 mice have less adipose tissue, higher metabolic rates, and longer lifespans than their wildtype littermates. Wildtype and NAG-1 mice were subjected to a prolonged cold exposure at 10°C for seven days. The metabolic rates of the mice were measured before and after cold exposure using respirometry. Quantitative real-time PCR has also been done to measure expression of genes associated with thermogenesis in adipose tissue. Changes in expression levels can indicate the upregulation or downregulation of thermogenesis. The data from these analyses will help to inform whether NAG-1 acts synergistically with the B3-adrenergic stimulated response or not. Further downstream targets of NAG-1 in conjunction with cold exposure can be identified for possible therapeutics to treat obesity.

Bridged lactam-lactones and amino lactones are active in vitro against Leishmania major, the causative agent of human cutaneous - Cameron Smith, Faculty Mentor: Blaise Dondji (Funded by OUR Grant)

Leishmania are protozoan parasites and causative agents of leishmaniasis, utilizing female sandflies (a blood sucking parasite) as their vector for transmission. A bite from an infected female sand-fly to vertebrates (notably humans, rodents, canines) is where infection of leishmaniasis begins and has the potential to rapidly spread. Today, it is estimated that leishmaniasis is prevalent in over 88 countries with more than 15 million infected globally and 400,000 cases emerging annually. Prevalence of this parasite is seen predominantly in tropical to sub-tropical regions throughout the world and prevails in underdeveloped nations thus earning the nickname "poor man's disease." This disease exists in three clinical forms: cutaneous, mucocutaneous, and visceral, with visceral being the most devastating especially if left untreated. Our lab has developed in vitro assays to assess the activity of organic compounds against the causative agent of leishmaniasis. This project is of great public health importance considering the toxicity and relative high cost of currently available drugs. Some bridged lactam-lactones and amino lactones have offered evidence of activity against Leishmania parasite similar or better than Amphotericin B, one of the drugs of choice. Active compounds were screened for the lowest effective concentration with some active at 25 ug/mL and others at 50 ug/mL. Additional compounds are being assessed with potential in vivo treatment of leishmaniasis.

How Prolong Cold Exposure Affects Adipose Tissue in NAG and WT Mice - Rebecca Follett, Rachel Davey, Faculty Mentor: April Binder

Cold exposure has been shown to affect metabolic activity and adipose tissue. Therefore we aimed to examine the differences caused by prolonged cold exposure in two strains of mice. We used a transgenic mouse expressing the human non-steroidal activated gene 1 (NAG). NAG mice are lean and have a higher ratio of brown to white fat compared to the wildtype (WT) mice. The prepubertal mice were held at a constant temperature of 10°C for one week. After cold exposure the animals were euthanized and both white and brown fat were collected, sectioned, stained, and analyzed. White fat stores lipids as an energy source, therefore the size of the cells was analyzed and compared between the two strains of mice. The main function of brown fat is to maintain a constant body temperature via thermogenesis. These cells are very small therefore we performed qualitative analysis of this tissue. After cold exposure, white fat has been shown to resemble a third type of fat, beige fat. Beige fat can provide a thermogenic effect or characteristic, but it is unable to significantly support brown fat in maintaining a constant body temperature. It is expected that the NAG mice will show more beige fat than the WT after prolonged cold exposure.

Isolation of RNA from adipose tissue using TRIzol reagent - Mukobe Lukwesa, Faculty Mentor: April Binder

The ability to isolate quality RNA from a sample is an integral component for studying gene expression. By studying transcribed RNA, researchers can observe changes in gene expression and investigate the role of specific genes that are expressed in different cells in order to understand cell specialization and function. RNA isolation involves isolating RNA from biological samples and is a prerequisite procedure for further assays including cDNA synthesis and real-time PCR (RT-qPCR). Isolated RNA can also be quantified using fluorescence and UV based methods, such as a microplate reader. In this procedure, TRIzol reagent was used to isolate RNA from white and brown adipose tissue collected from mice in order to perform qualitative and quantitative RNA analysis, cDNA synthesis, and RT-qPCR. TRIzol is a phenol based reagent generally used to isolate RNA from cell and tissue samples. TRIzol contains phenol and guanidinium isothiocyanate that solubilize cell materials before the addition of chloroform, which causes phase separation into an aqueous RNA phase, a DNA interface, and a protein organic phase. The aqueous phase is then separated and precipitated into a pellet using isopropanol and washed in diethyl pyrocarbonate (DEPC) water before being left to dry. Finally, the RNA pellet is resuspended in DEPC water to be used in further assays. Isolating RNA from adipose tissue can be challenging compared to other tissue types and cells. This presentation demonstrates the protocol that was determined to successfully isolate high quality RNA from adipose tissues and then confirm primers to be used for qRT-PCR.

**An Ecological Comparison Between Resource Subsidies: Pacific Lamprey (*Entosphenus tridentatus*) & Pacific Salmon (*Oncorhynchus sp* - *Jocelyn Wensloff*,
*Faculty Mentor: Clay Arango***

The regular return of resource subsidies in the form of anadromous fish are especially important in the Pacific Northwest where many streams are nutrient limited. Thus far, stream resource subsidy studies in the Pacific Northwest have focused on Pacific salmon (*Oncorhynchus spp.*), overlooking other anadromous fish species such as Pacific lamprey (*Entosphenus tridentatus*) as potential subsidies. In order to better understand how Pacific lamprey could subsidize stream food webs, I used a modified nutrient diffusing substrate (NDS) approach to compare the stream ecosystem response to nutrients transported by Pacific lamprey versus Chinook salmon in both summer and fall in the Upper Yakima River Basin. I measured chlorophyll a as the autotrophic food web response and community respiration (CR) as the heterotrophic food web response. Chlorophyll a responded equally to lamprey and salmon but was significantly higher in summer. Alternatively, CR had a stronger response to salmon compared to lamprey and was significantly higher in fall compared to summer. These results indicate that Pacific lamprey are equivalent to salmon as a resource subsidy for the autotrophic food web. Moreover, lamprey spawning occurs in the summer when salmon do not spawn, possibly extending the temporal subsidy provided by all anadromous fish returns in Pacific Northwest streams. These data indicate that anadromous lamprey and salmon are equally important in stimulating algal growth in the summer and can stimulate stream food web activity which would directly support both lamprey and salmon. These results should be considered in justifying future lamprey restoration efforts.

“I see you; you see me”: How a crocodile sanctuary can teach us to create a more sustainable future with our cohabitants. - *Mackenzie Stinson*, *Faculty Mentor: Daniel Beck, Rodrigo Renteria-Valencia*

Mexico is a diverse and wonderful place for cultures, biospheres, and organisms. Along the Costalegre region of Jalisco there is a vast expanse of habitat called the Chamela-Cuixmala Reserve. Located just south of the reserve is El Cocodrilaro de La Manzanilla. El Cocodrilaro means crocodile sanctuary, and at just over one 260 hectares, there isn't much free space to spare for nearly 500 hatchlings to fully grown crocodiles. It is operated by a local cocodrilo enthusiast, Pepe Martinez, and was granted its space through the dictation of land action by the Mexican ejido system. Any visiting tourist can pay a fee and experience these behemoths gliding through the water under their feet, view them from a lofty sight tower, and even hold baby crocodiles guided by skilled biologists. El Cocodrilaro encourages its municipal locals to visit at a mere fraction of the price in an effort to spread educational material and awareness about this widely feared reptile. This paper analyzes how the use of space balances a close, intimate understanding of crocodiles with a respectful distance and admiration for these creatures. Multiple intersections of bio-tourism, conservation, and preservation create the Cocodrilaro's unique environment. The integration of all three provide the resources for people to become educated about animals in a way that promotes a sustainable relationship between people and one of the world's oldest apex predators.

Biomedical Science Specialization

Strength in Numbers: The Case for Vaccination and Promoting Herd Immunity - Ian Forth, Faculty Mentor: Blaise Dondji, Allyson Rogan-Klyve

Vaccinations are one of the most important and successful innovations in the history of scientific research. They have been promoted throughout recent medical history as a readily available and low-risk prevention method against various diseases, and they have been researched and developed extensively over the past century. Although the use of vaccinations has proven to exhibit widespread lifesaving results, their celebrated and renowned status in the field of public health is not without controversy. There has been a growing number of people that oppose the use and administration of vaccinations, who society collectively refers to as members of the "anti-vaxxer" movement. The anti-vaxxer movement is deep rooted in American society, and as states have passed laws requiring public school students to receive vaccinations, opposition to these laws has inevitably grown due to the spread of misinformation among the general public. This should be a great cause for concern in regards to public health, and in order to promote vaccines as the lifesaving innovation that they are, it is necessary to thoroughly understand the facts about vaccines and simultaneously debunk any misinformation that has made its way into public discourse. This paper explores the origins of the anti-vaxxer movement, debunks common myths and misinformation spread about vaccines, stresses the consequences of decreased immunization rates, and makes the case for promoting herd immunity through increased vaccination rates.

Chemistry

Sustainable Synthesis Medicinally Important Large, Nitrogen-Containing Cyclic Compounds - Jane Eichwald, Jayme Zesiger, Faculty Mentor: Timothy Beng (Funded by OUR Grant)

Macrocycles are large, flexible cyclic molecules containing 11+ atoms. They are present in pharmaceuticals such as Rhazinilam (anticancer) and in naturally-derived molecules. However, their large size makes them fragile and difficult to create. Meanwhile, concerns about climate change have led to an outcry for green synthesis methods. The Environmental Protection Agency (EPA) has articulated that the use of green chemistry techniques eliminated 826 million pounds of hazardous chemicals and solvents, saved 21 billion gallons of water, and eliminated 7.8 billion pounds of carbon dioxide equivalents released to air on an annual basis. In this embodiment, the synthesis of N-macrocycles will be explored in an environmentally friendly, selective, and cost-effective way. This will be achieved through the Castagnoli-Cushman reaction, which uses commodity chemicals such as amines, aldehydes, and cyclic anhydrides. A sustainable solvent such as 2-methyltetrahydrofuran (2-Me THF) will be utilized to create a diverse library of N-macrocycles. Solvent-free and microwave-assisted synthetic routes will be evaluated. Following completion of the project, the compounds will be sent to in-house collaborators for bioactivity and toxicity studies.

Stöber Process Variation Via a Coacervate Environment - Rory McFarland, Matthew Rimpler, Faculty Mentor: Dion Rivera

When introduced into an aqueous solution of potassium bromide within a well-defined concentration range, poly(diallyl ammonium chloride) (PDADMAC) and poly(sodium-4-styrene sulfonate) (PSS) polyelectrolytes can form a biphasic state known as a complex coacervate. The coacervate divides into low polyelectrolyte concentration (lean) and high polyelectrolyte concentration (dense) phases. While many researchers have proposed these complex coacervates can provide unique environments for chemical reactions the number of practical examples is limited. Research presented here employs a novel use of the Stöber synthesis to create silica nanoparticles using tetra ethoxy silane and 3-aminopropyl triethoxy silane within the complex coacervate environment. These reactions were controlled by the molecular weight of the PSS, using 70,000 and 1,000,000 mean molecular weights. The system is characterized with attenuated total internal reflection Fourier transform infrared spectroscopy (ATR-FTIR) and scanning electron microscopy (SEM). Differences in the molecular weight of the PSS used give rise to different mechanisms for silica particle formation. Higher molecular weight PSS leads to production of silica particles within the coacervate environment while the lower molecular weight PSS leads to silica formation in a separate solid phase. The molecular weight of the PSS also influences the amount of silane reagent required for the synthesis of the silica particles.

Site-Selective Functionalization of a Versatile Lactam - Emma Nelson, Faculty Mentor: Timothy Beng (Funded by OUR Grant)

A fundamental goal of organic synthesis is to identify methods where simple and easily accessible synthetic intermediates are converted into a diverse collection of products. The structural motifs, originating from a single intermediate, yield molecules with the potential for use in the chemical community. In this research, a highly functionalized, easily synthesized compound will be manipulated to produce motifs with the potential for use in pharmaceuticals. The compound of interest contains a lactam unit, which is commonly found in naturally biologically active compounds. Some lactam-containing compounds have also shown promise as antineoplastic agents. Another appealing aspect of the compound of interest is that it contains two stereocenters with known spatial arrangement. This allows for complete control over the stereochemistry of possible products. The importance of stereochemistry in pharmaceuticals is highlighted in the infamous case of thalidomide, a drug used worldwide to treat morning sickness in pregnant women in the 1950's. The compound of interest has been used as the starting material in several chemical reactions and led to motifs showing potential biological activity against neglected tropical diseases.

Investigation of Dalea nana Flavonoids with the Potential for Activity Toward ABC Transporters of Genetically Modified Fungi - *Caroline Cruz, Faculty Mentor: Gil Belofsky*

The flowering plant *Dalea nana* Torr. ex A. Gray, native to Arizona, has never been explored for its chemical content. In our ongoing research of the chemistry of *Dalea* spp., we explore the potential for medicinal activity of the isolated compounds against fungal infections. The plant roots were extracted in methanol and the metabolites purified through successive column chromatographic fractionation. The root extract of *D. nana* afforded a suite of compounds, which were characterized by 1D and 2D NMR spectroscopy and supported by high resolution mass spectrometry. We will report here the isolation and structure determination of these metabolites highlighted by a presentation of an example of the structural details of one of the compounds. The pure compounds will be tested in collaboration with the laboratory of Professor Marcin Kolaczowski, Wroclaw Medical University, Poland. His research involves the testing of compounds against a panel of genetically-altered test fungi of the genera *Candida* and *Saccharomyces*. These designer strains up- or down-regulate key membrane transport proteins that enable fungal multi-drug resistance. The crude extract of the root of *D. nana*, and fractions from the first chromatographic step, exhibited activities ranging from 21–167 $\mu\text{g/mL}$, and appeared to inhibit transport in specific fungal strains. The pure compounds reported here result from further purification of these active materials.

Towards the Synthesis of Novel Boronates as Potential HIV-1 Protease Inhibitors - *Aleksey Lanin (G), Alexandria Glebe (G), Faculty Mentor: Levente Fabry-Asztalos*

Human Immunodeficiency Virus (HIV) is a transmissible pathogen that negatively impacts nearly 38 million lives globally. The virus attacks the host's white blood (CD4) cells to successfully replicate viral genetic information. Retroviral aspartyl protease HIV-1 hydrolyses peptide bonds of host's dsDNA in which HIV's genetic material is then integrated, resulting in new viral particles. The infected immune T cells replicate abnormally when they undergo cell division stages. Consequently, the immune system of the infected host weakens, resulting in increased vulnerability to other infections and diseases. HIV pathogens can develop antiviral drug resistance via genetic mutations; therefore, development of new HIV medicine is essential for effective antiretroviral therapy (ART). Antiretroviral therapy (ARTs) suppresses HIV and rapidly replicates peripheral blood CD4 T-cell count, reversing immunodeficiency. HIV-1 protease inhibitors are believed to reduce the development of HIV into Acquired Immunodeficiency Syndrome (AIDS) by blocking and preventing protease from hydrolyzing viral proteins that are needed for successful viral replication. In this work we are proposing the synthesis of cyclic 1,3-azaborines. These compounds are designed to potentially act in dual mode, as competitive and as associative inhibitors of HIV-1 protease.

Green Synthesis of Pharmaceutically Pertinent Bicyclic Pyrrolidines using the Castagnoli-Cushman Reaction - *Claire Borg, Michael Moilanen, Faculty Mentor: Timothy Beng*

The synthesis of nitrogen-containing cyclic compounds (commonly known as azaheterocycles or N-heterocycles) has constantly been of importance to pharmaceutical companies given that they have great beneficial biological activities. One of these N-heterocyclic motifs is the azadiquinane (two fused 5-membered rings bearing one nitrogen atom, such as Hadinecine; a muscle relaxer). In this proposal, a cost-saving approach to highly functionalized azadiquinanes, using a simple starting precursor will be explored. Two functional groups within the molecule will be joined through a process called intramolecular cross-coupling. Starting from an appropriately designed compound, which bears an alkene unit (double bonded carbon atoms) and an alcohol (OH-containing) functional group, this cross-coupling process will enable the formation of the desired product. The reactions are performed without expensive transition metal-catalysts and under mild conditions (e.g., at room temperature). The method is potentially inexpensive, stereoselective, and sustainable, thus, making it the most preferable to medicinal and environmental chemists. Through collaborations, the generated compounds will be screened for potential bioactivity and toxicity, with a strong focus on G-protein coupled receptors.

Construction of Conformationally Restricted Bicyclic Lactam-Lactones by sp^3 C-H Oxygenation - *Victoria Shearer, Faculty Mentor: Timothy Beng (Funded by Provost Research Grant)*

Climate change is a daunting predicament the world has found itself in, leading to an increase in green chemistry. A green chemistry technique that utilizes C-H bond activation is desirable. Due to this, a sustainable, cost-effective, and selective carbon-oxygen bond-forming lactonization (production of a cyclic ester) using amido acids was sought after. The conversion of a sp^3 C-H bond of a lactam to a new C-O bond was done under mild (green) reaction conditions by using N-iodosuccinimide rather than a transition metal. Such a synthesis of conformationally constrained [3-2-1] bicyclic lactam-lactones is of great importance to pharmaceutical companies since they have beneficial biological activities. It is anticipated that this novel discovery would impact the arena of complex molecule synthesis in which late-stage oxygenation is often desirable. The motivation comes from observations that nitrogen and oxygen-containing heterocycles found in a broad range of products ranging from feedstock to pharmaceuticals. The only byproduct of this experiment will be hydrogen gas specifically, which in turn will be collected and used as a clean fuel that is not harmful to the environment.

Charting the Chemical Reactivity Space of Castagnoli-Cushman-Derived N-Heterocyclic Sulfones - *Jorge Garcia, Faculty Mentor: Timothy Beng (Funded by Provost Research Grant)*

N-heterocyclic sulfones are present in many pharmaceuticals, including antityrosinase drug Nifurtimox. There is therefore an increasing demand for methodologies that create N-heterocyclic sulfones. This is all the more necessary since drug-resistance issues continue to persist, and there is a decreasing number of potent compounds isolated from nature that tend to satisfy the demands of high throughput screening. This project has achieved a cheap, site-selective, and orientation-selective protocol for constructing N-heterocyclic sulfones. The novel sp^3 -enriched compounds have considerable structural diversity. Moreover, the approach is highly modular and afforded highly functionalized N-heterocyclic sulfones bearing synthetically useful functional groups such as alkenes, alkynes, and aldehydes. This library of N-heterocyclic sulfone compounds will undergo structure-activity relationship (SAR) studies via an in-house collaboration with Dr. Dondji, with a focus on neglected tropical diseases.

Clinical Physiology

Identifying Quadriceps Muscle Composition Differences in Young and Older Adults: An Ultrasound Approach - *Jessy Moore (G), Jonathan Dickinson (G), Faculty Mentor: Jared Dickinson, Leonardo D'Acquisto*

Echogenicity (EG) measured via ultrasound (US) represents a practical strategy to assess skeletal muscle composition. This study examined the extent to which US can detect differences between young and older adults in skeletal muscle EG, and how imaging site/anatomical location impacts this comparison. US images of the quadriceps muscle from young (26 ± 4 yr, $n=8$ M, 8F) and older (70 ± 7 yr, $n=7$ M, 5F) adults were captured using B-mode ultrasound (Terason 3300). From each participant, five images were collected from anatomical sites along the anterior and lateral plane of the right leg (in supine position) corresponding to 59%, 39%, and 22% of femur length. EG analyses (Image J, range: 0=Black, 255=White) was performed on anterior images for the rectus femoris (RF), and vastus intermedius (AVI). Lateral images were taken for the vastus intermedius (LVI), and vastus lateralis (VL). Collapsed across all imaging sites and muscles, older adults had higher ($P < 0.05$) average EG compared to young (53.7 ± 11.1 vs. 39.6 ± 18.3). For the individual muscles, older adults had higher average EG ($P < 0.05$) for both AVI (58.1 ± 10.9 vs. 40.0 ± 11.0) and LVI (54.4 ± 14.1 vs. 37.1 ± 20.5), however, no differences were observed for EG of the RF or VL ($P > 0.05$). Specific to each imaging site, differences ($P < 0.05$) between young and older adults were found at 0/2 imaging sites for the RF, 4/5 sites for the VI, and 1/3 sites for the VL. These data indicate that US is able to detect differences in composition between muscles of young and older adults, however, differences were not homogenous among the quadriceps muscles.

Computer Science

Delaunay Triangulation for Outlier Detection and Determining Smoothness - *Michael Berge, Faculty Mentor: Razvan Andonie*

Spatial outlier detection is a method used to filter data before processing. There are many different techniques to solving this problem of detection. In this paper we will look specifically at a technique using Delaunay triangulation to both filter the data and give a rough estimate of its smoothness. Outliers skew data and produce unreliable datasets and are caused by a variety of factors. Removing outliers is easily done in one, two, and even three dimensions as you can visualize them. But what about 4-dimensions or even higher? Delaunay triangulation is an algorithm used primarily in mathematics and computational geometry which connects a set of n -dimensional data points in such a way to create a mesh of evenly spaced, non-overlapping triangles. This was used in a paper by Min-qi Zheng in 2008, which used this method to calculate and detect spatial outliers in a data set, which he called DT_SOF, or Delaunay Triangulation Spatial Outlier Factor. My research has been implementing an algorithm to find a way to determine the smoothness of a set of data. There were different methods tested such as projection using the cross product of vectors, the random cut algorithm, standard deviation, but in the end all failed. To achieve the smoothness factor of a dataset, the data is first pre-processed through the DT_SOF algorithm and then calculated using the sum of Delaunay edges divided by the number of data points, which has proven to be the best way to calculate smoothness so far.

Bias and fairness in Evasion Attack of Image Perturbation - SiChong Qin (G), Faculty Mentor: Razvan Andonie

Adversarial attack machine learning method plays key roles in privacy protection area. These methods protect personal privacy by adding perturbations (noises) to input images. These methods achieve good performance in protecting personal privacy. By doing experiments with adversarial attack system Fawkes, we found the inequality, that is people from different groups of people are treated with different protection performance. We design a categorized input for Fawkes system to enhance the performance of treating each group of people as fair as possible.

Cocoo a WebAssembly Compiler for Image and 3D Material Generation - Cheng Su (G), Faculty Mentor: Szilard Vajda

Material generation is a key step in creating 3d model for render in computer. Most of the software right now especially industrial standard ones requires installation on a machine and does not support web version. With the improvements of the user's hardware computing ability, it is possible to move it in to the browser and remove the restrictions of the platform. This project is based on WebAssembly to compile the source code for material generation inside the browser. Users are able to upload images and generate textures locally without connecting to a server.

Context-Sensitive Visualization of Deep Learning Natural Language Processing Models - Andrew Dunn, Faculty Mentor: Razvan Andonie

The introduction of Transformer neural networks has changed the landscape of Natural Language Processing (NLP) during the last years. So far, none of the visualization systems has yet managed to examine all the facets of the Transformers. This gave us the motivation of the current work. We propose a new NLP Transformer context-sensitive visualization method that leverages existing NLP tools to find the most significant groups of tokens (words) that have the greatest effect on the output, thus preserving some context from the original text. First, we use a sentence-level dependency parser to highlight promising word groups. The dependency parser creates a tree of relationships between the words in the sentence. Next, we systematically remove adjacent and non-adjacent tuples of n tokens from the input text, producing several new texts with those tokens missing. The resulting texts are then passed to a pre-trained BERT model. The classification output is compared with that of the full text, and the difference in the activation strength is recorded. The modified texts that produce the largest difference in the target classification output neuron are selected, and the combination of removed words are then considered to be the most influential on the model's output. We then take the most influential word combinations and visualize them in a heatmap.

Cultural and Environmental Resource Management

A Regional Synthesis of Post-Glacial Fire History in the Eastern Cascades, Washington, using Macroscopic Charcoal Analysis - Brynn Harrison (G), Faculty Mentor: Megan Walsh

The recent rise in severe wildfires in the Pacific Northwest (PNW) has created a heightened sense of urgency and reignited public interest in wildfire risk. In order to put this rise into a broader spatial and temporal context, a more in-depth look at fire histories from frequently burned areas in the eastern Cascades is needed. One major objective of this study was to develop a regional synthesis of post-glacial fire activity for the eastern Cascades using the seven existing charcoal-based records by developing a regional biomass burning curve. Results indicate that biomass burning in the eastern Cascades rose throughout the post-glacial period, likely due to climate shifts, the establishment of modern forests (particularly after ca. 7,000 cal yr BP), and increased human use of fire in the late Holocene. This increase continued until ca. 500 cal yr BP, when fire activity drastically declined, first from cooler climatic conditions, and then due to indigenous population decline and land-use changes that occurred as a result of Euro-American settlement (ca. 100 cal yr BP). By completing this analysis, much needed data points from multiple sites on the eastern side of the Cascades now contribute to our understanding of past and future drivers of fire activity in the PNW.

Evaluating Determinants of Residential Solar Photovoltaic (PV) Uptake in Washington State: A Spatial-Temporal analysis of 2000- Caleb Valko (G), Faculty Mentor: Robert Hickey, Charles Wassell, Hongtao Dang

The Earth is experiencing the effects of climactic warming as a result of greenhouse gas emissions. One way to address this problem is to replace existing generation capacity with clean sourced energy such as photovoltaic (PV) solar. Washington State's Clean Energy Transformation Act, amongst other state and federal policies encouraging solar, make WA a candidate for research on local determinants and barriers to residential uptake. In this project, residential solar uptake is mapped by county (2000-2019) and census tract (2017-2019) in cumulative and non-cumulative manners to identify trends over time and space. Installations and capacity were normalized by households to account for the skewed population distributions. These were run against demographic, electricity price, and solar potential variables in uni- and multi-variate regression models in an attempt to explain the distribution of residential solar installations in WA. The tract-level results were inconclusive, perhaps because the determinants operate at larger scales. At the county level, the models are robust and parallel existing literature. For the un-normalized data, the variables accounted for 95% of the variance in the dataset, however, we think this is largely explained by the population distribution in WA. Once normalized, the following variables accounted for only 45% of the variance: college attainment, a younger population base (20-55 year-olds), household income, and households. We posit that there are other variables at play which could include local utility policies; the ease of obtaining loans, permits, and installation; peer influences; or local programs that encourage residents to invest in clean energy.

Understanding the CWUMCE's Collections using Cultural Biographies: A Study of Edward and Juanita Haines - *Dyana Poffenroth (G), Faculty Mentor: Hope Amason, Lourdes Henebry-DeLeon (Funded by Provost Research Grant)*

Just like larger museums, small museums are ethically obligated to reconnect their collections to creator communities—albeit under the constraint of minimal resources. Within the Central Washington University Museum of Culture & Environment (CWUMCE), curatorial neglect, beginning from the museum's origin in then-Central Washington State College (CWSC), was caused by resource constraint: lack of staffing (particularly in collections management), lack of space for housing collections, and the necessary funding for proper maintenance. Now that this physical curation is being addressed through additional resources and new protocols/policies, the CWUMCE has begun to focus on other aspects of museum curation, such as ethical, spiritual, and intellectual forms of care. Completing cultural biographies on the CWUMCE collection will aid in the implementation of these best-care practices through re-creating the chain of ownership and uses of material culture. While the goal is to ultimately learn more about creator communities (who have cultural ties to objects), museums begin building cultural biographies by researching collectors. The collection this research is focused on was amassed by Edward and Juanita Haines, professors at Central Washington State College now Central Washington University. Both participated in art-centered activities and were avid collectors of material culture from around the world—much of which was acquired by CWU through a purchase in 1970. The purchase of the Haines Collection was a significant step towards establishing what is today the CWUMCE. Archival research was used to develop this cultural biography, which includes a timeline as well as a study of relevant biographical information.

Environmental Studies

Inductively Coupled Plasma Mass Spectrometry Analysis of Heavy Metals found within the Spokane River - *Devlin Mee, Faculty Mentor: Carey Gazis*

The Spokane River, a tributary of the Columbia River, is the main river that flows through Eastern Washington and through the City of Spokane. This river serves as the primary source of recharge for the Spokane Valley–Rathdrum Prairie Aquifer (SVRP), providing water for Spokane, Post Falls, and Lake Coeur D'Alene. Historical mining at Lake Coeur D'Alene that occurred in the 19th and 20th centuries is believed to be one potential source of pollution in the river. While research has analyzed contaminants in the Spokane River, there has been a lack of pollution measurements consistently over time. To assess the impact of historical mining on the Spokane River, researchers collected samples of river water at five separate locations between Gateway Regional Park and Riverside State Park on a single day. Three of these sampling sites were upriver from Spokane, one within the city, and one downstream of Spokane. At Central Washington University, the samples were analyzed with an inductively coupled plasma mass spectrometer to determine concentrations of heavy metals. Calcium, measured between 6 parts-per-million (ppm) and 25 ppm seem to be consistent with prior measurements made in the SVRP of 30 ppm of Calcium. Waters sampled closer to the Washington- Idaho border are more dilute, with the lowest total dissolved solids. Despite this dilution, these samples appear to contain higher concentrations of lead, zinc, and iron. More samples need to be tested at each site to give a better understanding of chemical variability in the Spokane River.

Exercise Science

Using Ultrasound to Assess Muscle Thickness of the Quadriceps in Young and Older Adults - Jonathan Dickinson, Jessy Moore, Faculty Mentor: Jared Dickinson, Leonardo D'Acquisto

Ultrasound imaging (US) is a practical, non-invasive means to measure skeletal muscle architecture. To what extent and how best to use US to identify differences in muscle size between younger and older adults is not fully explored. The purpose was to determine 1) the ability of US to identify differences in quadriceps muscle thickness (MT) between young and older individuals, and 2) the impact of imaging site/anatomical location. B-mode ultrasound (Terason 3300) was used to collect two-dimensional images of the quadriceps of one leg in young (26 ± 4 yr, n=8M, 8F) and older (70 ± 7 yr, n=7M, 5F) adults. All images were collected from five sites along the anterior (A) and lateral (L) plane of the leg corresponding to 59%, 39%, and 22% femur length. All images were collected with the participant in the supine position. MT analyses (Image J) were performed for the rectus femoris (RF), anterior portion of vastus intermedius (AVI), lateral portion of vastus intermedius (LVI), and vastus lateralis (VL). Older adults had lower MT ($P < 0.05$) for RF (1.64 ± 0.38 vs. 1.33 ± 0.40 cm), AVI (1.66 ± 0.28 vs. 1.22 ± 0.45 cm), VL (2.11 ± 0.38 vs. 1.54 ± 0.34 cm), and LVI (1.78 ± 0.43 vs. 1.16 ± 0.44 cm). Specific to each imaging site, differences between younger and older adults were observed at 2/3 sites for VL, 0/2 sites for RF, and 5/5 sites for VI. These data indicate that US is effective for assessing MT, and that US is capable of identifying differences in quadriceps MT between younger and older adults. However, consideration may need to be taken when selecting imaging sites.

Food Science and Nutrition

Development of Nutrition Education for K-5 Students for The Daily Mile Program - Shannen Apresto (G), Faculty Mentor: Kelly Pritchett, Nicole Stendell-Hollis, Tafere Belay

With the rising rates of obesity and low consumption of well-balanced meals among children, the introduction of nutrition education is vital for improving health outcomes considering that poor diet is a modifiable risk factor that can help prevent or treat obesity. Otherwise, obesity can impact children physically, socially, and psychologically. Therefore, a supplemental nutrition education resource for students in grades K-5 was developed to complement the Daily Mile program. For the purpose of this project, ten nutrition-related topics were first chosen that explore food groups, eating practices, and food sustainability. This led to the development of scripts discussing each topic which were used to narrate and develop approximately one-minute videos. Each lesson plan was also developed to meet certain learning standards for health education in Washington State. In addition to the lesson plan, a worksheet was created, and an online recipe was selected to accompany the videos. Therefore, this project provides ten lessons that can be easily implemented on a weekly basis due to the short duration of the videos. With the completion of this project, educators can use this resource to help provide students with basic nutrition knowledge which could positively affect eating behaviors and physical outcomes. Furthermore, future research can evaluate the efficacy of the project's lesson plans on accomplishing learning outcomes.

The Effects of Probiotics, Prebiotics, and Synbiotics on Measures of Lactose Intolerance: A Systematic Review - Taylor Roice (G), Faculty Mentor: Susan Hawk, David Gee

Lactose intolerance disproportionately affects racial minority groups in the United States, adversely impacting the incidence of calcium deficiency and low bone mineral density in these populations. The nutritional quality of lactose-containing food products incentivizes the investigation of long-term treatment options for lactose intolerance. Modifying the gut microbiome to increase the quantity of lactose-fermenting bacteria in the intestines is a promising avenue of treatment that merits investigation. This modification is typically done via consumption of probiotics, prebiotics, or synbiotics in various forms. This systematic review examined 23 studies measuring outcomes of lactose intolerance in subjects given probiotic, prebiotic, or synbiotic treatments. Bacterial strains with the greatest degree of evidence for symptom and/or hydrogen breath test score reduction were *Bifidobacterium longum* and *Streptococcus thermophilus*. Also, the novel galacto-oligosaccharide RP-G28 prebiotic may attenuate adverse outcomes of lactose intolerance.

Effects of CoEnzyme Q 10 Supplementation on Women Suffering from Episodic Migraines - Avery Coffin (G), Faculty Mentor: Nicole Stendell-Hollis

Migraine headaches affect a large portion of the human population, disrupting productivity and quality of life. Limited research suggests potential preventative properties of consuming the antioxidant, Coenzyme Q 10 (CoQ10); which could lower various migraine characteristics such as frequency, severity, and duration. For this randomized controlled trial (RCT), 70 cis-female subjects (ages 18 – 50 years) will be recruited and randomized to either a CoQ10 or a placebo supplement for three months. This trial will collect baseline and post data to see the effects of CoQ10 consumption along with regular prescribed medications on duration, frequency, and severity of migraine headaches. All data will be collected through a virtual daily journal log. Daily journal logs include a numeric rating scale (NRS) to assess pain severity, hours and minutes to record durations, and frequency is based on number of migraines recorded. We hypothesize that young to middle aged women who suffer with episodic migraines will decrease in the severity, duration, and frequency when consuming the antioxidant, CoQ10.

Among Asian Americans, the waist to height ratio is a more sensitive screening tool for diabetes than waist circumference - Kayla Wyatt, Faculty Mentor: David Gee, Dominic Klyve

Diabetes is the seventh leading cause of death in the US and its prevalence is rising. Physicians commonly use a patient's BMI or waist circumference (WC) for evaluating abdominal obesity (AO) as these have both been associated with diabetes risk. This study used the National Health And Nutrition Examination Survey database from 2011-2018 (n=20,052) and showed that a higher percentage of Asian American (AA) adults have diabetes compared to non-Asians (nA) (14.6% vs 12.1%, $p=0.004$), despite a far lower prevalence of obesity (14% vs 40%, $p<0.001$) and lower mean WC (88.7cm vs 100.5cm, $p<0.001$). The prevalence of diabetes was three times greater in normal weight (NW) AA's (11%) than NW nA's (4%). This study also evaluated whether WC compared to waist to height ratio (WHtR), which measures AO relative to height, better predicts diabetes in AA and nA's. Among Asians, WC had a much lower sensitivity (46% of AA's with diabetes have a high WC) compared to WHtR (89% of AA's with diabetes have a high WHtR), meaning that WHtR correctly predicts far more patients with diabetes than WC does. The sensitivity of both WC and WHtR for nA's was similar and high (84% and 88%, respectively). When stratified by BMI categories, WHtR was found to be eight times more sensitive predicting diabetes among NW AA's compared to WC (86.1% vs 10.7%). Therefore, WHtR is more accurate in assessing AO compared to WC among AA's, especially in the NW BMI category, and should be used in a physicians' practice.

Geography

A Foundational Component of Military Intelligence: A Country Overview Map - Garrett Miller, Faculty Mentor: Robert Hickey

Geographic information has long been a critical component for military operations to succeed. Gaining a baseline understanding of both the physical geography and human geography features of the specific area an operation is going to be taking place is the first step in developing a course of action for potential missions. The purpose of this project was to gain insight into the type of work that is commonly done by military intelligence (MI) soldiers and create an example of one of the common tasks done by MI soldiers, which is a country overview map. An overview map is a common type of map that would be created by a geospatial MI soldier in order to show the basic geographic information for an area of interest. The map would then be used to brief officers so they have an understanding of the area and can make an informed decision on potential courses of action for future or present operations. The country of Armenia was selected due to the recent conflicts over the Nagorno-Karabakh territory with neighboring Azerbaijan. The basic information found on this map includes a base of the physical terrain (elevation, lakes, and rivers) with the following features placed on it: the political borders of countries, major cities, international airports, hydroelectric stations, primary and secondary roads, and railroads.

Reconstructing the post-glacial fire history at Waterdog Lake, Oregon, using charcoal analysis of a lake sediment core. - Rebecca Mitre, Faculty Mentor: Megan Walsh (Funded by OUR Grant)

In the past decades, wildfires have been growing more intense and frequent in the Pacific Northwest (PNW). An example of this was the 2020 wildfire season during which numerous communities were displaced and millions of dollars worth of damage was done. In order to better understand the current pattern of wildfires, we must determine what past wildfire activity was like in various regions of the PNW. The goal of this research was to reconstruct the fire history for the Waterdog Lake watershed. This study site exists in a mid-elevation, mixed conifer forest in western Oregon, which is an under-studied region in the PNW in terms of fire history. We reconstructed the fire history for the post-glacial period (last ~15,000 years) using macroscopic charcoal analysis of a 5 meter-long lake sediment core extracted from the site in 2012. Radiocarbon dates were obtained from the sediment core to create an age-depth model and the charcoal data were plotted to show the trends in fire activity. The primary research question in this study was: "How and why has fire activity changed at Waterdog Lake in the last ~15,000 years?" The results of this research show greater fire activity during the last several thousand years of the record as compared to earlier. Data from this site will help contextualize current rises in fire activity in this area, and can further be used to piece together a greater understanding of the post-glacial fire history of the PNW as a whole.

Geological Sciences

Identifying the trace element chemical fingerprint of blue colored quartz stones - Sydney Dale, Faculty Mentor: Angela Halfpenny (Funded by OUR Grant)

Ellensburg Blues are a locally sourced blue quartz that retail for a higher price than blue quartz samples from other localities. We hypothesize that Ellensburg Blue samples have a distinct trace element fingerprint in comparison to blue quartz samples collected from other locations, such as Holley blue agates from Oregon. To test this hypothesis, multiple samples from known locations were analyzed using the Murdock Research Laboratories portable X-ray fluorescence spectrometer (pXRF).

To gather a large enough dataset of known and unknown origin samples for analysis, this project analyzed samples from Carl Carlson's Ellensburg Blue mine, the Kittitas Museum blue quartz collection, the CWU Geological Sciences collection, amongst others.

Initial testing began with measuring the dimensions of each individual sample and then using the pXRF to perform bulk chemical analysis of the major and trace element compositions. The data was plotted based on its chemical composition, so similarities/differences between the samples could be identified. The Ellensburg blue samples have a distinct trace element composition with a spike in zirconium corresponding with the resulting blue color.

The known locality samples were used to create ratios between various important trace elements to produce statistical relationships and develop the sourcing key for blue quartz samples. To test the key, we ran all of the samples from known locations and checked for a correlation i.e. an Ellensburg Blue was labelled as an Ellensburg Blue by the key. Our results showed that we can use the sourcing key to authenticate blue quartz samples as Ellensburg Blues.

Long-term geomorphic effects of the Glines Canyon Dam removal on the Elwha River, WA, USA - Alyssa DeMott (G), Faculty Mentor: Lisa Ely

Over the last few decades, it has become well-understood that dams inflict serious damage to riverine ecosystems. Because of this, dam removals are becoming more common. The Elwha River in western Washington once provided vital habitat for a variety of salmonid species, but after two dams were emplaced on the river in the early 1900s, habitat diminished and salmon populations declined. In 2014, after decades of effort, the dams were finally removed to restore the Elwha ecosystem. Because dam removals are a relatively new phenomenon, the changes that occur on river channels after large dam removals are not well understood. With this project, I analyzed how the morphology of the Elwha River changed after the Glines Canyon Dam removal. This project focused on four parameters: large wood in the channel, channel sinuosity, channel braiding, and sedimentation. High-resolution imagery from 2012-2020 was used to map large wood and digitize main and secondary river channels, and field surveys were completed to assess sediment-size distribution. My analysis revealed that the most drastic changes in the river occurred during the dam removal process, specifically individual log content and channel braiding, which increased during the removal process and then stabilized after the completion. However, some parameters like logjam area, sinuosity, and sediment-size changed throughout the 8-year study period. While some of my results suggest the Elwha River has reached a new equilibrium state, others suggest that the river is still evolving 6 years after the completion of the dam removal.

Using remote sensing techniques to identify geomorphic modifications caused by landslide tsunamis - Trent Adams (G), Faculty Mentor: Breanyn MacInnes, Jennifer Lipton, Lisa Ely (Funded by Provost Research Grant)

When a large landslide falls into a deep body of water it can produce giant tsunami waves capable of causing widespread geomorphic change to landscapes. What changes occur and how long impacts from landslide tsunamis persist in the geologic record is not well understood. Landslide tsunamis often occur in relatively recently deglaciated regions, such as Alaska in the U.S. and in Greenland. In the last century four of the largest historic landslide tsunamis occurred in these regions that caused vegetation loss, reorganization of stream channel networks, and the formation of unique geomorphic features indicative of landslide tsunamis. We used remote sensing techniques to analyze satellite images and digital elevation models of sites where landslide tsunamis have occurred in the past to determine what geomorphic modifications were caused and to assess the timeframe at which modifications remain preserved in the geologic record. Our methods of event identification can be applied to other historic landslide tsunami sites and can potentially be used to identify unknown historic landslide tsunamis.

Modeling the Effects of Cascadia and Aleutian Tsunamis on Nu'u, Hawaii - *Jasmine Stanek, Faculty Mentor: Breanyn MacInnes*

Nu'u, Hawaii is a wildlife refuge located on the island of Maui, where multiple coral boulders deposited in the area are interpreted by the refuge scientists as having deposited in a high energy event, likely a tsunami, due to their size and depositional pattern. There is also a deposit of marine sediments deposited in the Nu'u wetlands that are located about 300 feet inland from the shoreline, similarly, interpreted as from the same tsunamis. Over the last few hundred years, Hawaii could have been susceptible to multiple tsunamis from both Cascadia and Aleutians earthquake sources.

Through modeling I am able to distinguish differences in the effects of these tsunami on Nu'u and the regional area to compare to the geologic data. In my project I use the GeoClaw tsunami modeling program to simulate the tsunamis using data from past earthquakes from the Aleutians and Cascadia. The Aleutians are thought to have occurred anywhere between 1425-1665 while Cascadia happened during 1700. By modeling the paths of these tsunamis, using simulated tide gauges to record tsunami wave heights around Maui, and calculating the inundation in Nu'u, I have analyzed differences in the effects of Cascadia and the Aleutians, in some of my preliminary results the Aleutians tsunamis seemed to have higher wave heights near Nu'u in comparison to Cascadia.

Effects of in-stream large wood on shallow aquifer recharge at Indian Creek in central Washington - *Stephen Bartlett (G), Faculty Mentor: Lisa Ely, Carey Gazis*

Restoration of streams and floodplains using large wood is now common practice in Washington. The primary goals are to restore aquatic habitat, and riparian ecosystems and reconnect streams to floodplains. A key factor for the success of these projects is to slow down the surface water so that it can filter into the ground to recharge the surrounding alluvial groundwater aquifer. This project investigates whether large wood piles recently placed in a stream channel have influenced shallow groundwater recharge at Indian Creek, a tributary to the North Fork Teanaway River in central Washington. In-channel large wood restoration began at Indian Creek in 2016. The methods and data necessary to complete this work are groundwater levels, floodplain stratigraphy, aerial imagery, and hydraulic stream modeling. Data loggers installed in monitoring wells across the floodplain have recorded groundwater levels from 2014-2020, before and after the in-channel wood restoration. Aerial imagery and modeling were used to assess differences in stream levels with and without wood at different flow rates. Model results suggest adding wood in stream can increase water on floodplain during the high flow season. The stratigraphy of the floodplain was described along the stream bank and using an auger. The upper 2 meters consists mainly of fine silt and clay. Manual groundwater level measurements show water within a sand and gravel layer beneath the clay layer. The widespread clay layer in the lower Teanaway watershed may impede vertical movement of the groundwater and could limit the recharge capacity of the shallow aquifer.

Assessing Weathering of Vertical and Horizontal Limestone Tombstones in

Washington State - Mary Powers, Faculty Mentor: Lisa Ely

Rain, wind, and other processes modify Earth's landscape and rock material over time. Examining tombstone weathering is a way to measure the weathering rates of rock. The date listed on the tombstone provides the approximate year that weathering started. The limestone tombstones examined in this study are especially susceptible to chemical weathering by acid rain, which is created by fossil fuel combustion. While some might think tombstones are a permanent reminder of their loved ones, over the years they can become difficult to read due to the weathering processes. To discover which tombstones show more weathering, vertically oriented tombstones and horizontally oriented tombstones were examined from multiple graveyards using a visual weathering classification system. A total of five cemeteries were visited in Yakima, Ellensburg, Leavenworth in central Washington, and Black Diamond in western Washington. The goal was to sample 500-1000 tombstones older than the year AD 1930 within these cemeteries. I hypothesized that vertically oriented tombstones would show more weathering than horizontally oriented tombstones, because vertical tombstones are more exposed to wind whereas horizontal tombstones are protected from wind. However, preliminary findings suggest that horizontal tombstones show more evidence of weathering than vertical tombstones. A contributing factor to this observation could be that moisture stands on horizontal tombstones for longer periods, allowing more time for the chemical weathering reaction. By sampling from both central Washington and western Washington one can gain an understanding as to whether acid rain weathering is more prevalent in wetter or dryer climates.

Evaluating the role of deep Earth processes in mineral deposit formation, North Cascades, Washington. - Colton Bell, Faculty Mentor: Christopher Mattinson (Funded by OUR Grant)

The demand for new technologies and clean energy sources has brought an increase in demand for mineral resources to supply the elements needed. Sulfide minerals are the source of many economically significant elements, such as copper, and are thought to be concentrated by a combination of deep and shallow processes. However, the role of processes deep in Earth's crust is not well known compared to shallower processes. The Chelan Migmatite Complex is located in the North Cascades near Chelan, Washington and has a multistage history spanning both deep and shallow processes. Preliminary results for a sample recording the deep stages of the geologic history shows an early stage with abundant pyrite (FeS_2) containing minor inclusions of chalcopyrite (CuFeS_2), with a later stage associated with the replacement of sulfide minerals by magnetite (Fe_3O_4). These observations suggest that the concentration of copper occurs at the earliest stages of the geologic history, which occurred approximately 30 km deep in the crust. The next stages of my research will further characterize mineral abundances and compositions, as well as compare the relations of samples recording varying depths across the multistage history.

Law and Justice

Racial Threat, Small Town Policing and Latinos Plus - *Priscilla Perez, Faculty Mentor: Charles Reasons*

The literature on the Racial Threat Hypothesis has been growing. This theory asserts that as the number and proportion of racial minorities grows in a city, higher levels of social control are imposed by the dominant race. Most of the research behind this theory has been in larger urban areas. This paper will present a summary of existent research and suggest that it may also apply to the small towns studied. A sample of small towns in Washington state with less than 10 police officers were analyzed using longitudinal data for a time period of 2000-2018. This data includes population and proportion changes of Latinos and crime data for this period. This will be discussed in terms of the applicability of the small towns, Racial Threat Hypothesis, and Latinos.

Old Facts Make Old Law: The Law as it Evolves to Meet Privacy Needs of the 21st Century - *Mariah Hogan, Faculty Mentor: Robert Claridge*

Presently, *Smith v. Maryland* is the governing piece of authority over matters concerning the privacy of metadata - something that has grown in prevalence since the advent of the 21st century, and with it, the predominance of technologies such as social media and instant messaging in day-to-day life. *Smith*, which was decided in 1979, necessarily relies on facts that - while once relevant - are now outdated and, as a result, now hinder the full potential of the law to protect individual privacy rights over metadata. This presentation will provide an overview of *Smith*, with particular detail as to the implications of its time, and those that remain today. Further, this presentation will attempt to demonstrate the vulnerabilities our data and its rights face as a result of *Smith's* continued standing, and will evaluate potential alternative legal avenues that can be pursued further in the name of complete protection beneath the law.

Women, Prison and Cognition in Washington State - *America Sanchez, Faculty*

Mentor: Christine Henderson

There is a current need to construct gender-based reentry and rehabilitation correctional programs in Washington State. There are differences surrounding men's and women's correctional rehabilitation, such as women having more components that hinder the social support. On average, Washington State incarcerates 796 women per day in Washington's two women's state prisons – Washington State Correction Center for Women (WSCCW) and Mission Creek Corrections Center for Women (MCCCW). Both WSCCW and MCCCW have gender-based restorative rehabilitation programs. However, there are gaps in programming and research where the two Washington women's prison rehabilitative models of personal responsibility are stifled. Future research is needed to examine how personal responsibility models, like prison writing programs, increase success in beliefs, behaviors, and past and future crime pathways. Women who are incarcerated in Washington State could benefit from the psychological actions or practices of gaining understanding through thought and experience that began earlier in life or pre-incarceration. Therefore, the researchers propose a qualitative exploratory approach based on a constructivist paradigm or worldview for the current research. The investigators propose using qualitative interview data collection methods to explore and understand the experiences, beliefs, thoughts, and ideas of implementing cognitive-based programming at WSCCW and MCCCW and pre and post reasoning to crime pathways. The purpose of this study is to gain a better understanding of mental gendered-based cognitive programming. This study aims to develop and create a gender-based cognitive model for pre-and post-incarceration at Washington State women's prison WSCCW and MCCCW.

Policy Analysis - Solitary Confinement, Civilly Detained Individuals and Bureau of Immigration and Customs Enforcement - *Jannice Cebreros, Faculty* *Mentor: Christine Henderson*

In the United States, Immigration and Customs Enforcement (ICE) detention centers are for-profit and privately owned. Privately own detention centers are often affected by profit motives. In ICE detention centers, there are numerous allegations of abuse and unhygienic living conditions. Solitary confinement is a commonly used form of punishment in ICE detention centers, meant to be civil, not criminal. ICE personnel are not adequately trained on mental health and have placed detainees with mental illnesses in solitary confinement, resulting in devastating consequences to both government, institutions, and individuals. The use of solitary confinement on civilly detained individuals has led to controversy concerning the appropriateness of solitary confinement as a form of punishment in civil detention centers and the Eighth Amendment against cruel and unusual punishment in the United States Constitution. Hunger strikes and, unfortunately, deaths have occurred from the amount of abuse and inadequate living conditions that detainees have been subjected to in ICE detention centers. By analyzing the ICE “Placement in Solitary Confinement” policy and the implementation of solitary confinement within ICE detention centers, it is possible to learn more about policy effects on both an institutional and an individual level. This policy analysis provides a secondary analysis review of the discretionary use of solitary confinement in ICE detention centers, the effects of solitary confinement, and alternative solutions to the existing policy.

Policy Analysis – Seattle’s Sweetened Beverage Tax - *Austin Reiber, Faculty Mentor:*
Christine Henderson

Seattle's sweetened beverage tax might adversely affect Seattle's soda industry. Seattle's sweetened beverage tax put a \$.0175 tax per ounce of sweetened beverage. The beverage tax has caused soda prices to go up by more than half and soda sales to shrink by 29 percent. The twenty-two million dollars collected from the tax are designated for healthy food access and children's health and education. All these benefits sound good, but in practice, it is not clear if the tax has reduced soda consumption and where the money collected from the tax goes. The Seattle City Council has already put five million dollars into the city's general fund, and this was promised not to happen. The second part of this analysis focuses on two specific questions. The first, how the City of Seattle uses the collected tax money. The second question is how has buying sugary beverages lowered people's purchasing of Seattle sweetened beverages, focusing on marginalized communities. The sweetened beverage taxes have significant effects on disproportionate and marginalized communities. While disproportionality and marginalized communities are not the central focus of the policy analysis, it is timely and essential to note how public funds are equitably distributed.

A Systemic Analysis of the BRAAM Agreement - *Taylor Sanford, Faculty Mentor:*
Christine Henderson

This research's relevance and importance is the need to explore solutions in addressing Washington State's foster care system and decide whether to recommend the re-creation of the disbanded BRAAM oversight panel. According to, Partners for Children, in 2016, the Washington State Department of Children, Youth, and Families (DCYF) investigated and assessed 43,800 households and placed 6,065 Washington State children in foster care. While the BRAAM agreement was in place in 2014-2017, 6,428 in 2014 children were placed in foster care, 6,093 in 2015, 6,065 in 2016, and 6,207 in 2017. Following the disbanded BRAAM oversight panel, 5,838 in 2018 and 2019, 5,333 children were placed in foster care, showing a significant drop in either investigations or household assessments. Exploring the significant drop of investigations after the BRAAM agreement's disbandment is timely and essential for children in Washington State and gives rise to the discussion of possibly re-creating the BRAAM oversight panel. This research's chosen method is a systematic review aiming to find, evaluate, and summarize all relevant individual studies and findings from 2011 to present from the BRAAM agreement, thereby making available evidence more accessible to decision-makers. This research is vital for the public, Washington State policymakers, and the Washington State Department of Children, Youth, and Families.

Math Education

Emerging STEM Discipline-Based Education Researchers - *Samantha Wilson, Faculty Mentor: Emilie Hancock*

Engaging more faculty in Discipline-Based Education Research (DBER) can increase the number of Science, Technology, Engineering, and Math (STEM) faculty utilizing evidence-based practices for undergraduate teaching and learning, as well as the number of contributors effectively addressing critical issues in STEM education. DBER is a rapidly evolving discipline that requires both a mastery of quantitative, qualitative, and mixed methodologies and a nuanced understanding of breadth of topic, questions, and theoretical frameworks. The fundamental interdisciplinarity, blending discipline-specific content with educational theories and methods, is a particular challenge for new DBER researchers who are often switching into DBER with only discipline-specific content and research training. A collaboration between STEM educators from different disciplines is essential for providing both the fundamental knowledge of educational theories and research methodologies, but also an interdisciplinary lens. This research project is one part of a larger collaboration between STEM education experts in DBER professional development from two different disciplines, math and physics. The leadership on the overarching project represents collaborative work between active participants in the Research in Undergraduate Math Education (RUME) and Physics education communities who have organized various workshops to bring STEM and STEM education researchers together. Together, this interdisciplinary team would like to continue to develop more accessible ways to provide professional development and sustainable mentorship, and the team is actively researching how to best develop these supports. In this project we seek to answer the central research questions: What are new DBER researchers' needs and intentions in participating in DBER research?

Mathematics

Estimating Jazz Standard Key and Form with Hidden Markov and Hidden Semi-Markov Models post EM Optimization - *Elijah Jarreau Bergevin, Faculty Mentor: Sooi-Hoe Loke (Funded by OUR Grant)*

Hidden Markov and hidden semi-Markov models are utilized to predict structures of American jazz standard repertoire. Two separate relationships are explored. First, the 24 major and minor keys of the Western musical canon are designated as hidden states. Pairs of consecutive chord symbols represent observable emissions from those keys. HMM initial, emission, and transition parameters are defined by previous work on tonal relations, and optimized. Second, the bisectional nature of American jazz standards is parsed into two hidden states. Melodic pitch is used as an observable indicator. HMM and HSMM parameters (including duration) are semi-uniformly initiated, and optimized. The functionality of this project's components are evaluated using ten jazz standards with key modulation and ten with bisectional form. Varying levels of accuracy are achieved. Discussion of use in digital cataloging/retrieval and for composition software is included, as well as an appendix of hidden-Markov statistical methods.

Explorations and Applications of Modern Cryptology - Kimberly Wiles, Faculty Mentor: Stuart Boersma

From as early as 400 BC, civilizations have been using cryptography; the art of creating codes. Often utilized among military personal, encrypted messages contributed a significant amount to the success of a nation or region in wars and battles. Today, cryptology is used to secure our data, keeping our private information hidden from unwanted eyes. As mathematics and sciences advance, new methods for cryptology arise. In this project, we researched a variety of encryption methods. From lower level algebra to upper level abstract algebra, these methods vary in complexity which affect how difficult the resulting ciphers are to break. After an exploration of these methods, we made an attempt to decrypt a journal from the 1800s that has never been deciphered before. This presentation will provide a summary of this journey from learning to applying cryptology.

Cost Analysis for State-to-State Covid-19 Digital Inclusion Policies- Jay VanderZanden, Faculty Mentor: Yvonne Chueh

Prior to Covid-19, according to the Federal Communications Commission (FCC), approximately 19 million Americans lacked access to the broadband network. At the time, this gap in access to the internet was not really an issue since most of daily life, including education and jobs, did not require an internet connection. Covid-19 resulted in the need to maintain distancing and reduce contact with others. This resulted in the need for work and education to be done remotely through the internet. This highlighted the gap in availability of remote access. To alleviate this gap, policies and benefits are introduced which are going to be referred to as digital inclusion policies. These policies are primarily implemented at a state government level. Since policies and benefits are introduced on a state-to-state basis, there are differences in the allocation of funds, and not all states enacted the same benefits and polices. However, there is some similarity in the types of policies that the research discovered. Some of these types of policies are: Funding for internet and/or technology for K-12 students, Maps of freely available wi-fi hotspots, webpages and hotlines detailing affordable internet and/or mobile services, and expansion of free public wi-fi. The purpose of this report is to analyze the cost per capita of these policies from information provided through press releases, state and national government provided statistics, and other credible sources when necessary.

Representations of Algebras - Adara Andonie, Faculty Mentor: Danny Lara

Arbitrary finite dimensional K -algebras have been classified into three types by the famous theorem of Drozd by their representation type. These categories are Representation Finite, Tame, and Wild. Our focus is on Algebras of Wild Representation type. As the name suggest, the indecomposable representations of these algebras are not feasible to classify. In fact, it's impossible. However, Dense Orbit Algebras that are of wild representation type seem to have finitely many representations (up to a certain equivalence) that satisfy a geometric property. There are very few examples of such algebras in the current literature. We explore a particular algebra of wild representation type and show, via a computational algorithm, that the algebra is a Dense Orbit Algebra.

Investigating Mathematical Hormone Models for Human Ovulation - Vanessa

Montano, Faculty Mentor: Brandy Wieggers

Polycystic Ovarian Syndrome (PCOS) is a hormone related health condition that impacts 10% of people who ovulate. This can cause problems with regular ovulation, fertility, and other aspects of biological systems in people who ovulate. As such, having a solid mathematical hormone model could lead to better understanding of PCOS, its impacts, and treatment. Unfortunately, many of the mathematical hormone models available were created many decades ago. In reviewing previous and more recent work, we see opportunities to update the models to make them more inclusive and accurate. This work started by verifying the ovulation model created by Chen and Ward, providing a base computational model that shows the interaction of hormones in charge of human ovulation. The presentation will focus on the corrections made to this model and plans for further investigation into PCOS. The ultimate goal is to develop more personal treatment plans for women based on models that account for the diversity in age, race, and other factors that could impact the overall hormone model.

Nutrition, Exercise, and Health Sciences

The Prevalence of Underlying Medical Conditions that Increase the Severity of COVID-19 Among U.S. Adults - Jacqueline Flaherty (G), Faculty Mentor: David Gee, Nicole Stendell-Hollis, Susan Hawk

Individuals with underlying comorbidities and multimorbidity may be at higher risk for severe COVID-19. The purpose of this study is to quantify the prevalence of medical conditions that increase the risk for severe COVID-19 infections using conditions the CDC identified that show sufficient evidence of this association. These results will provide a context for the extent of the U.S. adult population at risk for complications from COVID-19. A total of 10,530 subjects ages ≥ 20 were used from NHANES data cycles 2015-2018. Underlying medical conditions identified by the CDC that increase the risk of severe COVID-19 outcomes were quantified. The most common comorbidities included hypertension (49% $n=5551$), obesity (40.7% $n=4270$), and type 2 diabetes (13.6%, $n=1,886$). Of the 10,530 subjects, 5,252 (45.2% ± 1.1) have two or more COVID risk factors. After stratifying by age group, sex, and race/ethnicity, the prevalence of multimorbidity (≥ 2 risk factors) was highest among males, adults ≥ 60 years and non-Hispanic Black adults; Age group (≥ 60 : [67.2% ± 1.3]; 40-59: [46.1% ± 1.67]; 20-39: [26% ± 1.33]; $P < 0.0001$) Sex (males: [47% ± 1.63]; females: [43.4% ± 1.24]; $P < 0.021$) Race/Ethnicity (Non-Hispanic Black: [51.3%]; non-Hispanic White: [46.7%]; Mexican American: [40.9%]; Non-Hispanic Asian: [27.5%]; Other race-including multi-racial: [42.8%] $P < 0.0001$). The results of this study indicate that almost half the population has multimorbidity and HTN. Consistent with the literature, non-Hispanic Blacks, males, and adults ≥ 60 years may be at higher risk for severe COVID-19 due to higher multimorbidity prevalence.

Training and weight-control methods among elite female runners competing at the 2020 Olympic marathon trials- *Sophia Berg (G), Faculty Mentor: Kelly Pritchett, Dana Ogan*

Athletes participating in aesthetic sports, such as endurance sports, report more frequent attempts to lose weight and greater training volumes than athletes participating in non-aesthetic sports. Various training styles, weight periodization, and presence of an eating disorder (ED) can affect energy availability.

Purpose: This study investigates the relationship between presence of ED with training and weight-control methods among elite female endurance athletes. **Methods.** Female runners (n=151) who participated in the 2020 U.S. Olympic Team Trials Marathon completed an online questionnaire (34 questions) examining training volume, weight-control methods, and self-reported history of/current ED (AN, BN, BED and EDNOS). Participants were grouped according to responses on incidence of ED. Chi-square test indicated statistically different when $p \leq 0.05$. **Results.** Roughly 31% reported experiencing an ED. Incidence of ED was significantly associated with weight dissatisfaction ($\chi^2_{23,151}=8.362, p<0.039$) and restricting or reducing food ($\chi^2_{25,151}=15.688, p<0.008$). Current struggle with an ED was associated with less hours of cross-training per week ($\chi^2_{2149}=20.04, p<0.045$). **Conclusion.** One-third of participants reported history of an ED which is consistent with previous literature. This investigation reveals that past or current ED may affect weight control methods and increase feelings of body dissatisfaction in elite female runners.

Physics

Determining the Exoplanet Detection Capabilities via the Transit Method of the CWU 0.6-m Telescope - *Josh McRae, Faculty Mentor: Cassandra Fallscheer*

With the growth of astrophysics research surrounding extrasolar planets, determining the detection capabilities of the Central Washington University Discovery Hall Observatory's 0.6-m Telescope will grant students a greater understanding of the research opportunities at CWU for this field. Utilizing the following stellar systems with confirmed extra-solar planets: HAT-P-18, HAT-P-32, and Kepler-20, images of these systems and their associated star field were captured. Stellar magnitudes of each of the three parent stars in this study were measured over 11 nights from 1 October 2020 through 12 March 2021. The resulting light curves are consistent with the transit depth and transit length associated with the exoplanets HAT-P-32b and Kepler-20c indicating possible detection of these exoplanets. The next steps of this project are the detailed analysis and utilization of that analysis to determine a theoretical limit for how small an extrasolar planet can be before it's undetectable by the 0.6m telescope.

Model for Neuronal Growth Cone Guidance Using Optical Signals - Desiree Ramirez, Faculty Mentor: Erin Craig

During neural development, a structure at the tip of a growing axon called the growth cone detects extrinsic guidance cues in order to advance the axon to the correct synaptic target. Several experimental studies have shown that near infrared (NIR) lasers can change the direction of growth cone motility and axonal outgrowth, with the potential to be used for neural repair once the mechanism for optical guidance of growth cone motility is better understood. Here, we develop a computational model of the growth cone turning mechanism in response to a NIR laser, based on the hypothesis that the laser induces asymmetric growth of an intracellular network of filaments called f-actin. To test our hypothesis, we developed a computational framework in MATLAB to simulate growth cone motility in response to a focused laser beam applied to one side of the growth cone. Our simulations predict changes in the shape of the growth cone that precede growth cone turning toward the site of the laser. The framework we established for predicting growth cone motility for different laser placement strategies can be used as a tool for planning experimental tests. Detailed understanding of NIR laser guidance of growth cones could contribute to the development of minimally invasive techniques for neural repair.

Titan Atmospheric Loss Along Magnetic Field Lines - Marc Dennis, Faculty Mentor: Darci Snowden

Titan is the largest moon orbiting Saturn that is comparable in size to planets present in our solar system. Titan is compelling because the makeup of Titan's atmosphere has a likeness to Earth's. The scientific community is interested in understanding the loss rates of Titan's atmosphere. The problem I am solving involves Titan's atmospheric loss via outflow along the magnetic field of Saturn. Photochemical reactions in Titan's atmosphere produce ions and photoelectrons that are more energetic than electrons normally found in the charged upper portion of the atmosphere, commonly known as the ionosphere. Energetic electrons escape along the magnetic field lines and create a charge-separation, making it possible for these ions to be pulled from the atmosphere due to the electric field created. The goal is to estimate loss rates due to ion outflow along these field lines. I have analyzed magnetic field data and electron density data collected from the Cassini spacecraft. I will establish the framework for a one-dimensional model to simulate ion outflow along magnetic field lines due to the ambipolar electric field. Future projects may involve more analysis and the creation of a model for two or three dimensions.

A Possible Explanation for the Sharp Decrease of Ions in Titan's Ionosphere:

Atmospheric Waves - *Henry Reinhardt, Faculty Mentor: Darci Snowden*

Titan, the largest of Saturn's moons, was the target of a series of flybys from NASA's Cassini mission. We will use the data from the 5th flyby of Cassini (T5), where the Ion and Neutral Mass Spectrometer (INMS) measured ionic and neutral particle densities within the atmosphere. The data recorded displayed a sharp decrease in densities of ions with short lifetimes, like CH_5^+ , whereas ions with longer lifetimes did not have this same decrease. One possible explanation of this decrease is that there could be an atmospheric wave propagating, changing ion densities. If we can model this decrease, then we can not only explain the data but also have a new way of understanding the waves in Titan's atmosphere, which will lead towards a deeper understanding of the structure and transport of energy of Titan. To explore the ionosphere of Titan, I created a model that uses photoionization to simulate the chemistry where the densities of each ion species is determined by solving the continuity equation with production and loss terms from the reaction equations. When this photochemical model is complete, a vertically propagating wave will be added to explain the sharp decrease of the ion densities. Once the vertical wave is added to the system, we can explore the effect of different wave parameters to see if the T5 data can be reproduced with this model. Should the model work as hoped, we can then look at the other flybys and analyze that data as well.

Microtubules, Take the Wheel: A Neuron's Journey to its Target - *Kahmina Ford,*

Faculty Mentor: Erin Craig

Neuroplasticity, the ability for neurons to reorganize and form new connections, has major implications for brain trauma recovery and neurological disorders. During nervous system development, neurons extend long narrow fibers called axons that must grow in the correct direction to form neural connections. The microscopic navigators that lead axon extension are called growth cones. These sensitive motile structures at the tip of axons respond to various chemical cues for navigation. In this study, we develop computer-based models to investigate how growth cones respond to external chemical "traffic signals" and guide axon outgrowth. Our model framework builds on previous studies by assuming that a dense network of dynamic filaments called f-actin operate as the engine of the growth cone vehicle. We use this framework to investigate the less well understood growth cone steering mechanism. We introduce long filaments of dynamic biopolymer proteins termed "exploratory" microtubules (MTs) that extend from the axon into the growth cone, randomly switching between states of growth and shrinkage as they "explore" the growth cone leading-edge. Our leading hypothesis is that microtubules respond to external guidance cues by triggering a biochemical reaction, causing the f-actin growth cone engine to engage. The objective of the current model is to investigate the physical role of the exploratory MTs and the mechanisms that bridge chemotactic cues to growth cone turning. By computationally reconstructing the mechanics of the growth cone, we are addressing an essential step to understanding the underlying causes of neurological diseases.

Primate Behavior and Ecology

No Ape Left Behind: Orangutan Conservation Education Project - *Danna Boshak, Faculty Mentor: Mary Radeke, Lori Sheeran, Stephanie Stein*

Orangutans are critically endangered and if action is not taken, their extinction is imminent. Zoological institutions worldwide serve as an educational means to engage the broader public in conservation awareness and action behaviors. The Association of Zoos and Aquariums (AZA) created the Saving Animals From Extinction (SAFE) initiative to provide zoos with a platform to expand conservation efforts beyond their institutions. In collaboration with the Orangutan SAFE (OSAFE) education committee, the No Ape Left Behind: Orangutan Conservation Education Project develops educational activity resources that provide information about orangutan behavior and ecology as well as action items that individuals can take to assist conservation efforts. These materials are made available to zoo educators, parents, teachers, students, and community members through the OSAFE "I Heart Orangutans" toolkit distributed around International Orangutan Day, which takes place annually on August 19. Partnering with AZA institutions allows for broad outreach and potentially significant impact on the survival of orangutans.

Psychology

Complex Post-Traumatic Stress Disorder and Communication - *Nicole Boyer*

As with the basis of cognitive behavioral therapy, it is recognized that the behaviors of the individual are reflection of the individual's thought processes. For the purpose of this essay, this fact should be pointed out as it translates also to the overt behaviors of an individual with post-traumatic stress disorder (PTSD), Complex-PTSD (C-PTSD), or a history of domestic violence (DV). Abnormal, inappropriate affect and behaviors of the like can and should be attributed to the extensive number of traumatic experiences incurred by these individuals throughout the course of their lifetimes. The purpose of this essay is to examine some of these seemingly antisocial behaviors, what longitudinal effects those behaviors may have for the individual, the cognitive processes behind those behaviors, as well as how to challenge some of those behaviors and processes within the individual. The traumatized self will often, unwittingly, set the stage for the recurrence of trauma because of their lack of social and coping skills, their presentation of subjectively frail self-concept, and extreme defense mechanisms. Advocated herein will be the need for creating new treatment methods and models for skill building groups, individual work, and family systems therapy to address these deficits in social functioning. Such communication based skill building is likely to induce psychological healing from past trauma and have a significant impact upon the phenomena of recurrence.

Nonverbal bias amid the pandemic: Race-based differences in distancing and perceptions of change - *Dene Diedericks, Faculty Mentor: Tonya Buchanan*

Over 30% of Asian adults report experiencing race/ethnicity-based prejudice/discrimination since the outbreak of Covid-19 began, and the majority believe people express insensitive views about Asians more frequently (Pew Research Center, 2020). However, less is known about more subtle forms of bias (i.e., nonverbal and physical distancing). Across two studies, we examined perceptions of distancing behaviors amidst the coronavirus and the extent to which perceptions differ by race. Compared to pre-pandemic interactions, we expected participants to report increased distancing behaviors toward them and that perceptions of change would depend on race. Specifically, given the harmful rhetoric on the virus and its origin, we expected Asian Americans would report more distancing behaviors from others. Study 1 was conducted in the early months of the pandemic. MTurk workers (N=197) rated physical and nonverbal distancing behaviors toward them in the past week, and perceptions of changes in those behaviors compared to before the outbreak. Supporting our hypothesis, overall, participants reported experiencing greater distancing compared to pre-pandemic (e.g., physical distance, closed body posture, less eye contact; $t_s > 3.05$, $p_s < .003$). While participants experienced a change toward more distant behaviors, this change was more extreme for Asian Americans for nonverbal distancing behavior involving closed body posture, $t(187) = 1.93$, $p > .03$, $d = .53$. Study 2 replicated results with a students (N=140) later in the pandemic, with participants reporting greater physical and nonverbal distancing compared to pre-pandemic (all $t_s > 2.83$, $p_s < .006$). Once again, experienced changes in closed body posture were greater for Asian American participants, $t(138) = 1.87$, $p < .04$, $d = .68$. Implications for race-based biases are discussed.

Facial Inferences: Facial Expressions or Emotional Labels? - *Amber Anderson, Faculty Mentor: Anthony Stahelski, Mary Radeke (Funded by Provost Research Grant)*

Happy, surprised, fearful, disgusted, sad, or angry are classic emotional labels inferred from facial expressions (Ekman & Friesen, 1971). This study examines the impact different emotional labels have on social trait and personality inferences while viewing the same facial expression. In an online survey, participants were randomly shown pictures of scowling younger and older male and females chosen from a facial database (Ebner, Riediger & Lindenberger, 2010) while completing the Self-Assessment Manikin (SAM) Temperament Assessment scale, and five social perception questions. Specific emotional labels were deemed as either 'correct' or 'incorrect' according to Ekman and Friesen (for example, labeling a smiling face as happy). Comparing the data collected from the participants who labeled a scowling facial expression as angry to those who labeled the expression as disgusted, fearful or sad indicated that those who labeled the expressions as angry found the face as significantly more negative on six of the nine dependent variables (pleasing to look at, honesty, threat, negative, dominant, and 'bad'). Those who saw the faces as disgusted, fearful or sad had significantly less negative inferences. These findings suggest that negativity per se is determined by facial expressions, and the assigned emotional labels can reduce or intensify that negativity.

From the TV to the Brain: Anime's Effect on Emotion - Aaron Duckworth, Faculty

Mentor: Tonya Buchanan

Anime has become increasingly important to audiences around the world, including the college community. Despite observations that Millennials have aided in the rise of the adaptation of anime throughout the western world, little research has examined the impact of anime on psychological variables among college students.

Anime editorials suggest that anime has a relatively unique impact because it is, ... "one of the few forms of entertainment that openly deals with issues like depression, anxiety, psychosis, PTSD, and many other conditions. Unapologetically portraying it in a raw, gritty manner, not pulling any punches."

(LadyEveSidwich, 2016). The story-telling, along with the flexibility/creativity afforded by its animated nature both likely influence the ability of viewers to connect with, and be influenced by, anime.

In our study (data collection ongoing), we examine the influence of anime on the emotions of college students who watch an animated episode of anime compared to those who watch a live-action version of the same clip. After completing a pre-test measure of emotion (PANAS), participants watched a short clip from an animated or live-action version of My Hero Academia; participants completed a post-test measure of their current affect (PANAS) and answered a series of questions about their connection to the characters/content, as well as their entertainment/anime viewing habits and demographic characteristics. We hypothesize that participants will feel more connected to the characters/content and exhibit greater changes in affect after viewing the animated (vs live-action) anime clip. Future research, limitations, and implications will be discussed.

Emotion Label Priming: Does The Placement of an Emotion Perception Question Matter? - Personality Traits - Miranda Roseman, Faculty Mentor: Mary Radeke, Anthony Stahelski

This study investigates personality trait inferences through priming emotion recognition in facial expressions. The emotion on a face must be recognized before appraisal can be attained, and cognitive primes (categorization and perceptual prompts) produce significant changes in judgement (Murphy & Zajonc, 1993). This study closely replicates the study published by Radeke & Stahelski (2020) that used different age and gender models to measure social perception and personality trait formations from smiling, scowling, and neutral facial expressions. Results indicated that across all gender and age conditions, smiling expressions elicited positive personality inferences while scowling expressions elicited negative personality inferences. The presence of the emotion label question placed at the beginning of Radeke & Stahelski's (2020) study led researchers to question whether or not the position of the question influenced the results. Participants in this study viewed a model demonstrating anger, disgust, and neutral expressions to elicit Big-5 personality trait inferences: agreeableness, conscientiousness, emotional stability, extraversion, and openness (Goldberg, 1992). Four conditions were compared to determine if the position of the emotion recognition question primed responses to the Big-5 personality inferences. A randomized emotion recognition question was presented before, mid-way, and after the Big-5 adjectives (a shortened version of Goldberg's 100 adjective Big-5, referred to as Mini-Markers, was used for this study) (Saucier, 1994, 2002). A fifth condition; no emotion recognition question, was included for comparison. Preliminary analysis indicates that the emotion priming question position has no effect on the way participants perceived personality inferences. Implications are discussed.

Examining the relationship between eating behaviors and attitudes, and gender expression among Washington state college students - Maya Jensen, Faculty Mentor: Meaghan Nolte

The present research explored the connection between eating attitudes, eating behaviors, and gender expression. There have been few studies examining the connection between eating attitudes, eating behaviors, and gender expression, especially among young adults in university. Participants were recruited from Washington State universities through their wellness centers. Participants were 18 years and older and came from a variety of backgrounds, including cisgender, transgender, and non-binary individuals. Participants completed an online survey through Qualtrics. This survey included demographic questions of age, gender, ethnicity, and education; the Eating Attitudes Test-26, a 26 item self-report questionnaire where participants answered questions regarding their eating attitudes and behaviors; and the Personal Attributes Questionnaire, a 24 item self-report questionnaire where participants answered questions regarding their gender expression. Data collection is completed. However, data analysis is in progress and will be complete by the SOURCE presentation. Conclusions will be drawn based on data analysis and shared at SOURCE.

Review of Insecure Attachment, Emotional Loneliness, and Alexithymia - Becky Fromm (G), Faculty Mentor: Meaghan Nolte

As many as 50% of the US population operate with an insecure attachment style, associated with a plethora of physical, psychological, and socio-emotional issues. These styles of insecure relating (anxious, avoidant, or disorganized attached) are acquired in infancy, becoming ingrained during brain development. This results in adverse internal working models outside of conscious awareness. Literature presents strong evidence that the first years of life set the stage for socio-emotional development. Without an environment that promotes the awareness of and language to describe emotions, alexithymia, difficulty identifying and communicating one's feelings and needs, may emerge. Both alexithymia and insecure attachment styles have significant effects on later life socio-emotional well-being, because of difficulty building and maintaining close, healthy relationships. Without such close, secure relationships, a person is prone to feel emotional loneliness. Indeed, lack (or loss) of a secure attachment figure is one underlying predictor of emotional loneliness; further, emotional loneliness is a major repercussion of alexithymia. This study hypothesizes that emotional loneliness and alexithymia can be consequences of, and indicators of, an insecure attachment. This presentation focuses on a review of the research around these three topics (insecure attachment, alexithymia, and emotional loneliness) with the goal of building awareness. While an insecure attachment is generally found to remain over a lifetime, consciousness can be fostered and tools can be learned to improve socio-emotional-relational well-being.

The Creation of Personal Happiness - Jayme Zesiger, Faculty Mentor: Natalie Lupton, Fen Wang

Happiness is something human beings all strive to acquire but how to obtain this elusive feeling remains a longstanding and intriguing inquiry. One reason for this is that there is no one specific definition of happiness and no standard measurement for it. This project focuses on defining what is believed to affect happiness from an individual's personal perspective and aims to shed light on the current research and understanding of how to define happiness and what common variables lead to happiness. To this aim, a meta-analysis was conducted which led to the development of a mixed methods survey designed for a sample population of college students. The quantitative section of the survey utilizes the Subjective Happiness Scale (SHS) by Sonia Lyubomirsky and Heidi Lepper. The SHS provided a new and widely accepted approach to measure the construct of subjective happiness with high validity. Qualitative questions were added to provide more breadth and depth expanding the range of descriptive evidences to be gathered. Examples of these questions are, "What is your definition of happiness?" and "What would you say is/are a significant factor(s) that raises your happiness?" It is also noteworthy that the emergence of Covid-19 increased stress and anxiety worldwide disrupting the initial survey's intent and reliability. This presentation provides an overview of the meta-analysis, presents the developed survey, and discusses the disruptive impact of the pandemic on the study. Suggestions for future research will be provided.

Music Perception and Cognition: A Clinical Neuroscientific Perspective - Tyler Ussery (G), Faculty Mentor: Ralf Greenwald

Scientists and historians agree that music has been one of the most culturally relevant phenomena in the history of mankind. Every society and civilization in known history has regularly practiced musical activity. With recent developments in brain imaging technology and therapeutic applications the empirically elusive "power of music" has recently begun to be scientifically explored. By studying the physics of sound, brain anatomy and physiology, western music theory, and improvisation, music scientists show evidence for the extensive benefits of musical practice and performance. Thus, music cognition and perception are becoming an internationally popular field of interdisciplinary research; This is especially apparent when considering the observed benefits of current music therapy practices. This presentation is designed to provide an overview of how the brain perceives, processes, and creates music from a neuroscientific perspective. Additionally, practical applications will be discussed to provide an educational foundation for those working in research, education, and therapy.

The Neuroscience of Mental Health - Tyler Ussery (G), Faculty Mentor: Ralf Greenwald

COVID-19 has affected our world in countless ways, but most of all, the virus has encouraged reflection in most areas of humanity. One of the most pressing global issues currently is mental health. An overall ambiguous term, mental health encompasses several areas of the human experience. As scientific study rapidly develops, new information regarding behavioral neuroscience and genetics has introduced the opportunity for individuals to develop personal “best practices”. This presentation is designed to provide an overview of how our “ancient brain” interacts with a modern lifestyle. Specifically, major brain regions and neurophysiology will be introduced in relationship to mental illness, motivation, and general homeostasis. The interplay between diet, exercise and use of technology in relation to mental health will also be explored.

Using superimposition with fading procedure to transfer textual control from image to words when using an activity schedule - Omar Luna (G), Faculty Mentor: Richard Marsicano

Super imposition with fading is a teaching procedure that has been used to transfer textual control from images to words. This is done by superimposing a word over an image and then reducing the image until the word is the only thing that remains. This teaches the individual the same verbal response for the image and the word. For example, a card with an image of a shampoo will have the word “shampoo” superimposed over the image. When the participant verbally responds to the presentation of the card to the set criteria (8/10 times) a portion of the top and bottom of the image on the card will be reduced. To test if control of the verbal response has transferred from the card with the image and word to the card with only the word participants will be tested on whether they can verbally respond correctly when cards with only written words are presented. In addition, participants will be tested on whether they can gather the items presented on an activity schedule with only written words on it. Activity schedules are used to break complex tasks into small steps that can be thought in sequential order. Participants will be between 5 and 12 years old. The purpose of this study is to extend the research on superimposition with fading by using this teaching procedure through telehealth.

The Link Between Sleep, Healthy Food Choices, and Physical Activity - Amanda Cantu, Faculty Mentor: Tonya Buchanan

Many college students regularly get insufficient sleep – as little as six hours on average per night. Many factors contribute to the lack of sleep including demanding academic schedule, work and family obligations, and time-consuming extracurricular activities. Furthermore, most students do not take proper care of themselves, endangering their overall health. Sleep is the time when the body restores itself from the previous day. Insufficient sleep can jeopardize the body's ability to restore itself, and negatively affect cognitive ability and decision-making. The ability to make good decisions is crucial to health and general functioning in the world. This research aims to study the link between number of hours of sleep, food choices, and physical activity. We hypothesized that, as sleep time increases, so will healthy food choices and time spent on physical activity. In an online survey, recruited college students from social media platforms (N=60) were asked to record their number of hours of sleep the previous night and minutes spent doing physical activity the current day, as well as complete a food questionnaire. Results suggested that as sleep increases, so do healthy food choices, $r(58)=.41$, $p<.001$. Although we did not find a significant relationship between sleep and physical activity ($p>.05$), this may be partially explained by hectic college student schedules (e.g., schoolwork, club activities, jobs, family), that make it difficult to set time aside for physical activity.

Finding Meaning: Semantics, Context and the N400 - Naomi Cady (G), Faculty Mentor: Ralf Greenwald

Semantic memory refers to a portion of long-term memory that processes ideas and concepts that are not drawn from personal experience. Research shows that information processing benefits from a priming effect for access to semantic memory. For example, seeing a certain word or gesture, can form a prediction of what will follow. Encountering information that is incongruent with this priming effect elicits the N400 brainwave. The N400 can be used to identify incongruity in sentences, gestures, and even facial expressions. However, there is emerging evidence that context given to even incongruent information has the effect of lessening the strength of the N400. To date, there has been very little research conducted in relation to context and its effect on the N400. This review will further evaluate the effect of contextual cues to incongruent information and examine the N400 brain wave in relation to semantic cognitive processing.

School Psychology Recruitment- *Cody Kuster (G), Natalie Amos, Tahlia Lopez, Alex Reimann, Faculty Mentor: Heath Marrs*

The field of School Psychology has shown a shortage of practitioners across the nation. With that, applicants to graduate schools are needed more than ever to help fill the gap of the shortage. Our research team wanted to see whether the knowledge of the field of School Psychology helped determine whether undergraduate students would be applying for School Psychology graduate programs depending on their class in undergrad. The study also looked at if the factor of whether the participants knew who their School Psychologist was during their time in primary and secondary school, and if that may contribute to their decisions of applying for School Psychology programs in the future. Participants were asked to fill out a survey to help assess their knowledge of the different Psychology fields/graduate programs as well as their choice intention to apply/enroll into School Psychology Programs. The participants consisted of 372 undergraduate students at Central Washington University.

Modifying School Psychology Practica Experiences to Better Serve Students During COVID - 19 - *Jacqueline Jimenez (G), Ariana Antles (G), Samantha Hamilton (G), Faculty Mentor: Richard Marsicano*

The long-term academic, behavioral, and social impacts of COVID-19 on school-aged children won't be fully understood for many years; however, the effects on university training programs' pedagogy were immediate. The CWU School Psychology Program (CWUSPP) uses classroom-based learning and applied experiences—called practica—to train SPs in order to help students succeed. Practica experiences are integral to training and are opportunities that mutually benefit university trainees and school aged-students by providing all parties the opportunity to practice and continue to build their respective skills while under the supervision of university and school-based experts. Due to the COVID-19 pandemic, the CWUSPP was forced to address certain issues such as the number of practicum opportunities available to graduate students, the inability to prepare practica experiences ahead of time, and has contributed to newfound difficulties such as how to apply practicum experiences that are appropriate and valuable to all levels of graduate students. Throughout the 2020-21 academic year, anecdotal data suggest COVID-19 has affected local school districts and students by upending the traditional, predictable, full-day schedule from an all-in person learning method to either online or hybrid models of learning. In turn, this has contributed to a loss of instruction which may have led and/or lead to academic challenges. Additionally, already existing inequities, such as access to technology, were exacerbated. This poster will address how SP grad students, faculty, and school officials amended practica experiences during the 2020-21 academic year to meet the ever-changing needs of all school-based and university-based students during COVID-19.

Science Education

Undergraduate students' beliefs about science teaching and learning.- Matthew Changar, Faculty Mentor: Anne Egger, Devarati Bhattacharya, Leighanna Hinojosa

Teaching with Investigation and Design in Science (TIDeS) is an NSF-funded education research project focused on: 1) Engaging and supporting undergraduate faculty in developing, testing and implementing high-quality instructional materials that make use of investigation and design in introductory science courses, and 2) Assessing the impact of the use of the materials and the development process on faculty and students. One component of this study is to better understand and characterize undergraduate students' beliefs about science teaching and learning. This quarter, we are piloting a pre-course survey in four introductory science courses at CWU in which students indicate their level of agreement with statements like, "The most important thing you need to teach science is how to do science." Preliminary analysis of a portion of the data suggests that many students do not feel comfortable voicing their own ideas in science class, yet agree that talking about data with other students helps them develop explanations. We will be further analyzing student responses for overall trends as well as trends within student demographics. This analysis allows us to validate survey questions and provides insight into the beliefs of CWU students towards science teaching and learning. In combination with classroom observation data and post-course survey data, these data will allow us to develop a better understanding of how students are impacted when learning through investigation and design.

Sociology

Qualitative Methods for Studying Pre-Exposure Prophylaxis (PrEP) Among Young Queer Men of Color in the US: A Literature Review - Gerald Lemmon, Faculty Mentor: Griff Tester

In the U.S., gay and other men who have sex with men (G/MSM), especially young Black and Latino men of color, are disproportionately impacted by the human immunodeficiency virus (HIV), representing a large percentage of the HIV-positive population and accounting for the bulk of new infections. Pre-exposure prophylaxis (PrEP) is a highly effective HIV-prevention method that includes HIV-negative individuals taking a daily anti-retroviral medication and visiting a medical provider quarterly to test for sexually transmitted infections. Since 2012, when the FDA approved the fixed-dose combination of tenofovir disoproxil fumarate and emtricitabine (TDF-FTC), or Truvada, for PrEP, uptake has been increasing, but is still low, and access and use disparities exist among racial and ethnic minority G/MSM. The aim of this systematic literature review is to identify useful qualitative methods for recruiting and studying PrEP among queer men of color. To do this, I examine scientific articles, published between 2010 and 2020, that meet the following criteria: (1) Focus on HIV-prevention, specifically PrEP; (2) Use samples of G/MSM; and (3) Use qualitative data collection approaches. My research questions are: (1) What strategies do PrEP researchers use to recruit and qualitatively study G/MSM? (2) How do the approaches used, and methodological limitations discussed, differ among studies using samples that include white G/MSM and those focused exclusively on G/MSM of color? The findings of this review will help researchers identify methodological barriers to accessing these understudied populations and develop strategies for overcoming these difficulties.

Outdated Expectations of Women in Vietnamese Traditions Via "Truyện Kiều" and Its Impact on Women Nowadays- *Kim Nguyen, Faculty Mentor: Paula Collucchi*

Truyện Kiều is written by Nguyễn Du, who is one of the most prestigious poets in Vietnam. This poem is written in the early 19th century based on a Chinese novel, *Đoạn Trường Tân Thanh*, by Thanh Tâm Tài Nhân. In *Truyện Kiều*, as well as many other Vietnamese or Chinese literature, the principles of Confucius root deep in the societal morals since centuries ago. Even nowadays, Confucian principles are still the core of Vietnamese education system. Through analyzing the culture and research about the Vietnamese society then and now, this paper breaks down how the patriarchal principles of Confucius have built a culture that has such high standards and expectation on women while not providing them any resources. This is a close focus on the suffer and hardship of many Asian women, and the responsibilities they have to maneuver through life while keeping up with the cultural standards, especially ones related to gender roles and being a "proper lady".

Technology Education

Providing More Meaningful Feedback for Autograding of Programming Assignments Through Use of Static Code Analysis - *Chard Magendanz, Faculty Mentor: Denise Shaw*

Computing occupations are the #1 source of all new wages in the U.S., but currently less than half our schools teach computer science. New legislation is mandating that all WA high schools offer computer science starting next year, but we don't have nearly enough qualified teachers. One of the keys to recruiting computer science teachers from within is the power of interactive online curricula and autograding, which enables staff to teach computer science who are not necessarily subject matter experts. This paper reviews current dynamic and static code analysis tools which can be repurposed to provide immediate and meaningful feedback for programming assignments, freeing teachers who lack confidence in their coding skills to focus on the underlying pedagogy.

Community Presentations

Motivations for Educators Who Apply and Work for Informal Learning Institutions - *Joanne Park*

This mixed methods study investigated the motivating factors for educators to work and apply at an informal learning institution and also examined shared characteristics of these individuals. The investigation was situated at the conservation engagement department at the Point Defiance Zoo and Aquarium (PDZA). Data was collected through online surveys that were sent to both current and former conservation engagement interpreters. Responses were quantified and analyzed by looking for emerging codes. Many respondents were former interpreters, majored in science, and had a bachelor's degree. Most of the respondents enjoyed interacting with visitors and perceived their role at PDZA as an educator. They also appreciated the team atmosphere as they enjoyed working with like-minded individuals within their own community of practice. PDZA and other informal learning institutions can utilize this data to improve team-building and training, offer professional development opportunities, and improve collaboration between departments to ensure retention of dedicated and knowledgeable staff.

Theocratic Education in Pictures- *Khodi Kaviani*

Examining the school curriculum used in today's Islamic Republic of Iran reveal a disturbing attempt by the theocracy to impose its values on the entire population of Iran. This study reveals how schools have become a tool for indoctrination by the government to recruit young members to serve as Basij (mass mobilization force) in upholding this Shi'i theocracy. Images used to illustrate the textbooks show how segregation of boys and girls are normalized and justified through Islamic teaching. A democratic government with tolerant citizens can allow for different religious practices to exist within a multicultural framework. However, an Islamic theocracy is inherently incapable of accepting any ideas that it perceives as a competition or challenge to its rule.

Decoding Ice: A Novel and Economical Method by which Non-Science Majors/Secondary Students Measure the Atmospheric CO₂ of Ea - *Rus Higley*

Global Climate Change tends to be incompletely understood or misunderstood by non-scientists, and effectively teaching about this phenomenon is a concern of educators at the secondary level and at the non-science major undergraduate level. One key idea is that the increase in atmospheric CO₂ is the major driver of this process. We are developing a conceptually simple hands on demonstration in which students measure contemporary levels of atmospheric CO₂ and compare this to the CO₂ level in air trapped in glacial ice \approx 10,000 – 20,000 years ago. The majority of the classrooms for which this activity is appropriate will be subject to budgetary constraints for equipment and are unlikely to have access to a mass spectrometer. Thus our challenge is to inexpensively detect the CO₂ levels of a small (20 ml – 100ml) volume of gas. Our projected range of CO₂ levels is 50 – 450 ppm, and we desire accuracy within plus or minus 25 ppm. This presentation documents and discusses our initial methodological approaches, our successes and challenges, results thus far, and some projected new methodologies for improving accuracy of CO₂ measurement technique in the absence of mass spectrometry equipment.

Accessibility Studies Capstone Panels

Accessible School Programs

A panel of Accessibility Studies Program capstone projects featuring real world applications of the accessibility, e.g. the civil rights of people with disabilities to participate in all public accommodations, and universal design principles that improve the accessibility of all facilities and communication for all people.

These projects all feature school programs:

- Are Future High School Coaches Adequate Prepared to involve students with disabilities? (School sports should be a meaningful experience for all students of all abilities. Does the CWU sports management program teaches students about accessibility and disability?)- Trevor Barger, Sports Management.
- SmartMind: A Program to Alleviate Engagement Problems of Remote Learning in a Challenging High School (High schools with remote learning are experiencing problems with levels of disengagement, the communication between staff, student, and the parent. SmartMind is a program to solve or alleviate these problems.) - Alyssa Howard, Social Services.
- The Accessibility of Pandemic-era Communication from a School District Before-and-After School Care Program (The pandemic has shifted all communication to digital formats. The website of a school district before-and-after school care program was analyzed for compliance with WCAG guidelines.) - Laura Korsgaard, Psychology.

Accessibility Issues for Children

A panel of Accessibility Studies Program capstone projects featuring real world applications of the accessibility, e.g. the civil rights of people with disabilities to participate in all public accommodations, and universal design principles that improve the accessibility of all facilities and communication for all people.

These projects all feature Accessibility Issues for Children:

- The Accessibility of the Sequim McDonald's PlayPlace. (By studying ADA laws, and McDonald's own designs, we can begin to see the limited access that children or their caregivers with disabilities have limited when approaching the play piece.) - Annie Guthrie, Social Services.
- Accessibility in Daycares. (Many teachers and centers do not have proper training or accommodations to provide care that meets their needs. This project looks into barriers that parents with children with disabilities face when seeking adequate child care.) - Teresa Olarte, Psychology.
- Accessible Design in Water Parks. (If water parks like Wild Waves implemented accessible and universal designs, people with physical disabilities would not be as excluded from enjoying the experience.) - Patience Pruitt, Economics.

ADHD and Invisible Disabilities Awareness

A panel of Accessibility Studies Program capstone projects featuring real world applications of the accessibility, e.g. the civil rights of people with disabilities to participate in all public accommodations, and universal design principles that improve the accessibility of all facilities and communication for all people. These projects all feature ADHD and Invisible Disabilities Awareness:

- The Gender Bias in Diagnosing ADHD and Lasting Impacts It Has Had Upon the Lives of Women. (It is essential for women with ADHD to receive proper diagnosis so that they can; receive treatment, therapy, and accommodations needed to be successful, but many receive late or no diagnosis with tragic results.) - Sara Cannarella, Sociology.
- How Invisible Disabilities Affect College Student Participation in School-Sponsored Events (Social events are an important part of university life. How are college students with invisible disabilities supported to help them participate?) - Ellie Chaffin, Family and Child Life.
- Current Social Media Pages focused on ADHD Awareness. (ADHD is widely misunderstood and suffers from stigma. Do Social Media Platforms have accurate information and positive portrayals of ADHD?) - Alexa Stewart, Sociology.

Accessibility in the College Setting

A panel of Accessibility Studies Program capstone projects featuring real world applications of the accessibility, e.g. the civil rights of people with disabilities to participate in all public accommodations, and universal design principles that improve the accessibility of all facilities and communication for all people. These projects all feature Accessibility in the College Setting:

- Accessibility Awareness in CWU's Nutrition Dietetic Curriculum. (Nutrition is designed to serve the entire population, which includes Persons with Disabilities (PWDs). Are nutrition majors adequately orientated to the realities of disabilities in their field?) – Nicole Gibson, Nutrition.
- Universal Design for Learning Training for Faculty using the Canvas Learning Management System. (Modeling best practices of Universal Design for Learning (UDL), this training helps faculty design Canvas Learning Management System (LMS) courses to serve students with the greatest range of ability) - Bridget Irish, Instructional Technology
- How Academic Libraries Can Improve Accessibility for Employees with Invisible Disabilities. (As a disabled library worker I'm looking into ways that academic libraries can change their practices to be more accessible for employees who have invisible disabilities.) - Tasha Robertson, Interdisciplinary Social Sciences.