

Student Research & Internship Symposium

Summer Faculty-Student Collaborative Research (SCoRe)
and Internship Presentations

FRIDAY, SEPT. 27, 2019

3–5 p.m.

Screening Room & Schlessman Main Space,
Edith Kinney Gaylord Cornerstone Arts Center



SCHEDULE

Student Research & Internship Symposium

Friday, Sept. 27, 2019

Edith Kinney Gaylord Cornerstone Arts Center

3-3:50 P.M. THE SCREENING ROOM (OVERFLOW FLEX ROOM)

Opening Remarks

Jill Tiefenthaler, President of the College

Student Presentations on their Collaborative Research

Haley Colgate '20, Measuring Gerrymandering

Max Kronstadt '20, From the Swamp to the Stream: The Politics of PFAS

Michael Todd Brown '22, Ogataea polymorpha Strain Creation to Study Gene Silencing

Anne Daley '20, Anti-Capitalist Social Movements

Student Presentations on their Internships

Cameron Mongoven '21, Blue Shield of California, San Francisco, CA

Jacqueline Nkhonjera '20, NPR, Washington, DC

Benjamin Swift '21, One Colorado Education Fund, Denver, CO

3:50-5 P.M. CORNERSTONE MAIN SPACE

Poster Presentations

3:50-4:25 P.M. Poster Session 1 Research Abstracts P1-P42/ Internship Abstracts P1-P18

4:25-5 P.M. Poster Session 2 Research Abstracts P43-P81/ Internship Abstracts P19-P31



DEAR STUDENTS, FACULTY, STAFF, AND PARENTS,

Welcome to the annual Student-Faculty Collaborative Research (SCoRe) and Internship Symposium, which brings our community together to recognize the many hours of research and experiential learning Colorado College students have undertaken with the support of their faculty, staff, and alumni mentors, both on and off campus.

The symposium includes short presentations, poster sessions, and conversation across the disciplines, allowing participants a window into the experiential and deep learning that summer research and off-campus internships provide. Supporting these student experiences is central to our mission at Colorado College.

This kind of learning cultivates many important skills. Critical thinking; the ability to communicate clearly in writing and speaking; comfort with complexity and ambiguity; and sorting, organizing, and analyzing information are all skills that are essential for the nimble and adaptable leaders of the future. Studies also tell us that students who take part in these experiences are more likely to thrive in their careers and lives.

This symposium is an opportunity to acknowledge great work, thank the faculty, staff, and alumni who provide invaluable mentoring, celebrate the impact of our summer experiences, and encourage the students whose passion for learning inspires us every day. Thank you for joining us!

Best regards,

JILL TIEFENTHALER

STUDENT ORAL PRESENTATIONS

Measuring Gerrymandering

Student Researcher: Haley Colgate '20

Major: Mathematics

Faculty Collaborator: Beth Malmskog, Mathematics and Computer Science

Research Collaborators: Austin Eide '16; Kadin Mangalik '20; Jose Monge Castro '20; Edgar Santos Vega '20

After the 2020 census, every state in the U.S. will redraw their congressional and legislative voting districts. When plans are proposed, they will be examined for compliance to state laws, and in Colorado, Amendments Y and Z, passed in 2018, will require that plans be free of partisan bias. This summer we gathered data and ran analysis on Colorado to contextualize measures of gerrymandering when applied to the current voting districts. We used statistical sampling methods with real population and voting data to model election outcomes and partisan advantage under thousands of possible district plans. Future work will examine communities of interest and fairness criteria specific to the state of Colorado. With the upcoming redistricting and new census data, our work will serve as the backbone of a tool that may be used to analyze proposed plans, both by politicians and by the public.

From the Swamp to the Stream: The Politics of PFAS

Student Researcher: Max Kronstadt '20

Major: Political Science

Faculty Collaborators: Tyler Cornelius, Environmental Policy; Eli Fahrenkrug, Chemistry

Research Collaborators: Karina Grande '20; Nicole Chavarria '22; Samantha Sanson '20; Sonia Klein '20

In 2016, residents of the Fountain Valley learned that their drinking water contained a class of chemicals that most of them had never heard of, in concerning quantities. Known as Per- or Poly Alkyl Fluorinated Substances, or PFAS, these chemicals got into Fountain Creek and the aquifer below it because they were used to put out imaginary jet fuel fires in weekly training exercises at Person Air Force Base, and Fort Carson (until 1991). PFAS chemicals don't naturally breakdown, and long term exposure to them has been linked to a number of different diseases, including cancer. And the Fountain Valley isn't alone—PFAS contamination is a problem in thousands of communities across the United States because loopholes in our regulatory system have allowed dangerous chemicals to proliferate, with little regard for human health and safety. Action is needed on a federal and local level to solve this urgent problem. The Fountain Valley Water Project is a group of Colorado College students and faculty working to bring Colorado College's human and scientific resources to bear on this important problem. We are focused on learning where and how PFAS are moving throughout the hydrologic system, monitoring citizens' water quality to keep regulators and the military honest, and accessibly communicating difficult science to affected citizens and the rest of the world.

Ogataea polymorpha Strain creation to study Gene silencing

Student Researcher: Michael Todd Brown '22

Major: Undeclared

Faculty Collaborators: Jennifer Garcia, Molecular Biology; Sara Hanson, Molecular Biology

All organisms use gene silencing to prevent transcription of DNA that isn't necessary to express. *Ogataea polymorpha*, a methylotrophic yeast, use gene silencing to establish their cellular identity. We wanted to devise a way to observe the factors of gene silencing phenotypically in *O. polymorpha*. To achieve this we created a DNA construct containing the *URA3 gene*, which can be inserted into a silenced region of the genome and used to observe gene silencing in a phenotypic plating assay. We successfully created the DNA construct and hope to insert it into a strain of *O. polymorpha* to investigate the factors involved in the gene silencing of *O. polymorpha*. This research serves as the stepping stones to discover mechanisms responsible for *O. polymorpha's* gene silencing and better understand gene expression as it applies to all organisms.

Anti-Capitalist Social Movements

Student Researcher: Anne Daley, '20

Major: Philosophy

Faculty Collaborator: Alberto Hernández-Lemus, Philosophy

In this continuation of our project, we extensively examined theoretical readings in an effort to rethink and reconceptualize the term "communism" to distance it from its Soviet Union-dominated connotations and via the concept of the commons, commonwealth, and the common. Our work led us to Walter Benjamin's *Theses on the Concept of History*, which gave us the tools to reinterpret the vast series of anti-capitalist movements, not as isolated occurrences, but rather as an ongoing manifestation of a single spirit or principle of *the common* whose characteristics include: a) an emphasis on solidarity against competition, b) a well-informed suspicion about the tendency of power to concentrate and exclude democratic participation of the group, c) a keen awareness of the centripetal tendency of capital and of the need for the group to prevent individual capital accumulation, d) a belief in the shared identity of the human species, and a suspicion about nationalistic claims to underpin the governmental form of the nation-state. Our project is ongoing.

Blue Shield of California, San Francisco, CA

Student Intern: Cameron Mongoven '21

Major: Sociology

This summer I worked for Blue Shield of California as an Intern in the Talent Acquisition department. In addition to gaining a baseline familiarity of what working full time looks like, I gained a greater level of independence by living on my own in a city I have never been to before. Given that this was my first time working full time, I was most challenged by just getting my footing and just understanding the different stakeholders of the company. I am really happy I was able to grasp Blue Shield's mission and unique culture. My manager and coworkers' support allowed me to leave this summer with a deep appreciation for flexibility and pacing your workload. I plan to take this with me back to school. <https://www.blueshieldca.com/>

National Public Radio, Washington, DC

Student Intern: Jacqueline Nkhonjera '20

Major: Political Science

Minors: Feminist and Gender Studies and African Studies

When I received an offer to work at NPR's Education Desk for the summer, I wasn't entirely sure what to expect. I had very little experience in the field of Journalism but I knew that I wanted to pursue my passion for storytelling. I was excited to find that my story telling opportunities would not be limited to doing research for other journalists, as I had imagined, but would instead be extended to reporting my own stories, producing my own pieces, and having the opportunity to assist in the production of other people's work. I was given the opportunity to explore different angles of journalism and after my time at NPR, I am more sure than ever about pursuing a career in media and storytelling. <https://www.npr.org/>

One Colorado Education Fund, Denver, CO

Student Intern: Benjamin Swift '21

Major: Sociology

As the Development Fellow at One Colorado, I worked with development staff to help solicit and manage silent auction donations, as well as help with the general planning of a major fundraising event. Through my work, I developed and honed my skills of event planning, time management, and fundraising, while gaining comfort with constantly navigating change as an emerging young professional. Through my fellowship, I had the opportunity to interview Colorado influencers, learn about the Colorado legislative process, and immerse myself in the Denver nonprofit world. While I am still coming to realize and process how my summer at One Colorado will impact my future plans, I now know what questions I need to ask of myself and what I still need to learn in order to reach my full potential. www.one-colorado.org

from **PEDRO DE ARAUJO**
Vice Provost
Associate Professor, Economics

What is SCoRe?



During the summer of 2019, over 140 students participated in research under the mentorship and support of Colorado College's dedicated faculty both on and off campus. While the Block Plan structures academics around a condensed timeline, summer research allows students and faculty collaboratively to explore deeper into topics, by spending extended time researching in the classroom, the library, the lab, and the field.

The Student Collaborative Research (SCoRe) Program supports both students and faculty through academic and community field trips and gatherings, peer-to-peer presentations and discussions, and professional development workshops. We are excited to showcase the work CC faculty and students have done this summer.

Visit:

www.coloradocollege.edu/offices/dean/students/research-opportunities/

“The SCoRe program provides an excellent opportunity for students to experience both the excitement and struggle of research. Many students have done short research projects in their courses at CC, but for most students, the SCoRe program is their first chance to fully immerse themselves in a full-time, long-term research project. Through this longer exposure to a research problem, students not only hone their technical skills and learn to become independent problem-solvers. Students also learn how to navigate the highs and lows that come with the rare breakthroughs and frequent failures of research. Learning about both the technical and human aspects of research are crucial in preparing students for graduate school and beyond.”

AMY DOUNAY, Associate Professor, Chemistry and Biochemistry

P1 **Urban Bat Activity in Colorado Springs**

Student Researchers: Nabeel Elabdeia '20

Majors: Organismal Biology and Ecology

Faculty Collaborator: Steven Taylor, Office of General Studies

Research Collaborators: Hiromi Kondo '20

While most of us are unaware of the day to day activities of bats in ecosystems, they play crucial roles, including natural biological control of important pest species. Utilizing .wav files obtained from AudioMoth and EchoMeter Touch Pro 2 acoustic recorders, we scored bat calls using Kaleidoscope Pro software. We evaluated bat activity based on counts of bat call passes in areas with differing landcover and across time of night to reveal trends within the urban landscapes of Colorado Springs. We documented significant differences between numbers of bat call passes and landscape types. Landcover, specifically tree canopy, varied by landscape type. There was a significant correlation between landcover and bat calls, which translated to a correlation with landscape as well. Tree canopy explained 47% of the variation in number of bat call passes, and both number of bat call passes and tree canopy cover were highest in the residential zones. These findings provide a better understanding of the influence of urban landcover in Colorado Springs upon bat habitat utilization.

P2 **Soundscapes in Colorado Springs**

Student Researcher: Hiromi Kondo '20

Major: Environmental Science

Faculty Collaborator: Steven Taylor, Office of General Studies

Research Collaborators: Nabeel Elabdeia '20; Jenna McDonald '20

Ecoacoustics provides a powerful, yet unobtrusive method for analyzing landscapes that relies on audio recordings to expose a seemingly intangible layer of information within ecosystems – the soundscape, characterized by variations among anthrophony, biophony, and geophony. By investigating the frequency of occurrence and loudness of types of sounds, we identify the dominant sounds, the timing of their occurrence, and the widespread prevalence of anthrophony across three landscape types—commercial, residential, and parks and open spaces. Data were recorded through AudioMoth acoustic recorders and analyzed using R in RStudio to visualize patterns and assess statistical significance. The data reveal the far-reaching influence of anthrophony on different landscapes and confirms that biophony is most frequent in parks and open spaces and anthrophony is most frequent in commercial zones. Our study of ecoacoustics can help inform future urban planning in Colorado Springs and provides a baseline of acoustic data for future studies of soundscapes in the Rocky Mountains.

P3 **Reconstructing Environmental Conditions in the Earliest Paleogene**

Student Researcher: Spencer Levy '20

Major: Geology

Faculty Collaborator: Henry Fricke, Geology

Organic geochemical data from the understudied K-Pg extinction, and subsequent recovery period in the earliest Paleogene can provide context for modern climactic repercussions induced by perturbations in the carbon cycle. By isolating and quantifying concentrations of organic metabolites and tracing them through time, a detailed reconstruction of the local paleoenvironment can be interpreted. Isolated organic carbon-containing compounds from bulk sediment can also be used to create a compound specific isotope curve, the utility of which can decouple lurking fractionation relationships within bulk sediment, more precisely capturing natural global phenomena. The sediment deposited during the subsequent 400,000 years following the meteor impact recorded a period of dramatic recovery within the global ecosystem as well as shifts in the local ecological regimes. Other relationships between the lithosphere and biosphere such as wildfires and hydrologic cycling are also recorded in the fossil metabolites of organisms and can be traced through the geologic section. Combined with previous work completed pertaining to mean annual temperature and average annual precipitation from the same section, a comprehensive reconstruction begins to emerge.

P4 **The Body Game: An Exploratory Model for the Effects of Picture-Based Social Media on Hostility and Empathy Among Women**

Student Researcher: Nan L. Elpers '20

Major: Psychology

Minor Feminist and Gender Studies

Faculty Collaborator: Tomi-Ann Roberts, Psychology

Recent self-objectification research has proposed an intrapersonal model demonstrating that women who strongly believe that beauty is currency are less likely to identify as feminist and participate in gender-based activism. Our research seeks to map an *interpersonal* pathway onto the existing model. Firstly, we hypothesize that women who view their own beauty as currency participate in appearance-based competition with other women. This competitive relationship renders gender-based activism counterintuitive to the self, as it may help “competitors.” Secondly, we propose that picture-based social media activity exacerbates this effect by reifying the salience of the body project – an ongoing effort to conform to beauty standards. Our data show positive correlations between both high levels of Instagram use and hostility towards other women, as well as between Instagram use and empathy towards other women. Next steps will explore how picture-based media use might enhance women’s empathy towards female friends while reinforcing intra-gender competition.

P5 Fountain Valley Water Project

Student Researcher: Sam Sanson '20

Major: Film and Media Studies

Faculty Collaborator: Tyler Cornelius, Environmental Policy

Research Collaborator: Fountain Valley Water Project (PFAS Research Group)

Toxic Per and Poly Fluorinated chemicals or “PFAS” contaminate the groundwater just south of Colorado Springs. Although the municipal water is being treated, private wells are still pumping these chemicals through citizens taps. These chemicals are linked to various adverse health effects and two prominent members of this chemical family called PFOS and PFOA have an EPA health advisory. An advisory that was exceeded until recently. The Fountain Valley Water Project examines levels of PFAS in private wells communicating the results back to the public and examining how these chemicals move. My specific role on the team is creating a media project to tell the story of the Fountain Valley Water contamination to properly inform the community on the substances they’ve been drinking for decades and share information on these chemicals with the general public. They are after all, in all of us. Everywhere.

P6 Geospatial and Temporal Mapping of per-Fluorinated Alkyl Substances Contamination in Colorado Springs Via EPA Method 537.1

Student Researcher: Nicole Chavarria '22 and Karina Grande '20

Major: Undeclared; Chemistry

Faculty Collaborator: Tyler Cornelius, Environmental Policy; Eli Fahrenkrug, Chemistry

Research Collaborators: Karina Grande '20; Max Kronstadt '22; Samantha Sanson '20; Sonia Klein '20

Per- and poly-fluorinated alkyl substances (PFAS) are an unregulated class of human-made chemicals. PFAS has been used heavily in Aqueous Film Forming Foams (AFFFs) to suppress fuel fires at military installations and commercial airports. However, recent studies have connected PFAS exposure to several health conditions including three different types of cancers. This work is a joint academic/citizen science initiative aimed at investigating the fate and transport of ten individual PFAS compounds through the surface water and groundwater as it continues to infiltrate the aquifer. Groundwater samples are collected directly by citizens and organized for analysis in-house using a modified version of the EPA 537, a method employing a combination of solid phase extraction (SPE) and high-performance liquid chromatography tandem mass spectrometry (HPLC-MS/MS). Chemical data is analyzed using both geospatial and temporal models. Our initial work indicates differential diffusion/adsorption of PFAS compounds correlated with chain length and equilibrium partition coefficient. Further, surface water analyses confirm the point source of contamination as the Northwest boundary of the Peterson Air Force Base.

P7 **Epstein-Barr Virus (EBV) Latent Membrane Protein 1 (LMP1) Regulates the miR-155 target FOXO3a via P13K p110 α Activation**

Student Researchers: Melanie Mandell '21; Carissa Sherman '20; Madeline Stesney '20

Majors: Molecular Biology (minor Biochemistry); Molecular Biology; Molecular Biology,

Faculty Collaborator: Olivia Hatton, Molecular Biology

Research Collaborators: Madison Alexander '20; Madeline Smith '20

EBV is a herpesvirus that alters expression of host B cell genes, including microRNAs (miRs), to promote development of cancers such as EBV+ B cell lymphomas. miRs function by degrading mRNA or inhibiting translation of target genes. Our preliminary data indicate that the primary oncogene of EBV, LMP1, upregulates miR-155 via PI3K p110 α . To determine if LMP1 regulates expression of miR-155 target genes FOXO3a, SHIP1, and PI3K p85 α via PI3K p110 α , we utilized EBV- B cell lymphoma lines stably expressing inducible, chimeric LMP1 molecules. We then activated LMP1 in the absence or presence of the PI3K p110 α selective inhibitor BYL719 (BYL) and measured expression of miR-155 targets by Western blot. When LMP1 is active, FOXO3a and SHIP1, but not PI3K p85 α , expression significantly decreased compared to basal levels; only FOXO3a levels were partially rescued by BYL. Thus, LMP1 regulates expression of the miR-155 targets FOXO3a and SHIP1, but not PI3K p85 α . Moreover, LMP1 regulates FOXO3a expression via P13K p110 α . P13K p110 α , miR-155, and FOXO3a may be potential therapeutic targets for EBV+ B cell lymphomas.

P8 **Optimization of siRNA Knockdown to Validate the Mechanism of miR-155 Regulation by Epstein-Barr Virus (EBV) Latent Membrane Protein 1 (LMP1)**

Student Researchers: Madison Alexander '20; Madeline Smith '20

Majors: Molecular Biology; Molecular Biology

Faculty Collaborators: Olivia Hatton, Molecular Biology

Research Collaborators: Melanie Mandell '21; Carissa Sherman '20; Madeline Stesney '20

EBV infects over 90% of people worldwide and can drive B cell lymphomas in a fraction of infected people. LMP1 is the primary oncogene of EBV and affects host cell microRNAs (miRs), small RNAs that interfere with translation of mRNA to protein. miR-155 is a multi-functional miR that can drive B cell lymphomagenesis. Preliminary data using small molecule inhibitors indicates that LMP1 activates miR-155 via PI3K p110 α . To validate this data using small-interfering RNA (siRNA), we first had to optimize the conditions for siRNA transfection and knockdown of target genes. Viability was optimal at lower cell concentrations (0.25 - 0.5 x 10⁶ cells/mL). Transfection efficiency was optimal with 5 μ M siRNA without serum in the cell media. Due to unreliable RNA isolation, we were unable to confirm knockdown by qPCR. With these optimal conditions, we achieved partial (70%) knockdown of GAPDH, our endogenous positive control. In the future, we will utilize these conditions to measure the effects of PI3K p110 α knockdown and validate our preliminary data demonstrating miR-155 upregulation by LMP1 via PI3K p110 α activation.

P9 Decision Making in the Criminal Justice System

Student Researcher: Yurong Ye '22

Major: Economics

Faculty Collaborator: Christina Rader, Economics and Business

When charged with a crime, defendants have to make a decision about pleading guilty or going to trial. The present study examined three factors that could affect plea decision: guilty versus innocent (role), high versus low level of trust towards Public Defenders, and the order of options presented. A hypothetical scenario presented people with different roles, levels of trust, and orders. We found that role had the largest impact on participants' decisions: guilty participants were more likely to plead guilty ($M=71.9\%$) than innocent participants ($M=19.5\%$). We also found that trust impacted participants' confidence in their decision: when people had a high level of trust towards Public Defenders, they had higher confidence about their decision. Results did not differ when the order of option presented was changed.

P10 Optimization and Application of Red-Emitting Carbon Quantum Dot Sensors for Measuring H^+ and Mg^{2+} in *Dictyostelium discoideum*

Student Researcher: Rosa Mallorson '20

Major: Biochemistry

Minor: Environmental Issues

Faculty Collaborator: Murphy Brasuel, Chemistry and Biochemistry

The facile synthesis of fluorescent, non-toxic, and stable red-emitting carbon quantum dots were optimized as nano-ion sensors. Medically-important compound protonation and diseases states in eukaryotic cells are altered by H^+ and Mg^{2+} ion transduction pathways. Carbon source, steric stabilizer, carbonization acid dilution, temperature, and dialysis reagent were varied. Mixed carbon sources with amine groups and variable oxygen content, dilute acid, low temperature, and dialysis in neutral solution were optimal to develop red-emitting dots either containing or omitting a steric stabilizer with ethylene glycol. A longer synthesis, up to 48 hours, results in a greater yield of red-emitting dots. Red-emitting dots are less polar than shorter-wavelength emitting dots and exhibit a direct correlation between emission intensity and acidity. Combined with a passivating long-chain carboxylic acid and fluorescein isothiocyanate or coumarin 343 dye to measure H^+ and Mg^{2+} respectively, a ratiometric analysis of dye to red-emitting dot peak facilitates real-time monitoring of intracellular ion flux. A decrease in H^+ in *Dictyostelium discoideum* upon addition of caffeine was observed. Optimization of coumarin 343/dot constructs will enable Mg^{2+} tracking.

P11 **Terminal Deoxynucleotidyl Transferase Mediated Attachment of Dye-conjugated Nucleotides to Unlabeled smFISH Probes**

Student Researcher: Pedro Tirado Velez '20

Major: Molecular Biology

Faculty Collaborator: Mathew Taliaferro, Anschutz Medical Hospital

Subcellular RNA localization can directly impact the interactions, morphology, and cellular functions that occur at a given site. The importance of maintaining proper delivery of mRNA transcripts has been previously studied, with improper subcellular localization associated with problematic phenotypes. To study these elements involved in localization, many techniques have been employed such as single-molecule fluorescence *in Situ* hybridization (smFISH). This technique has allowed for investigations of RNA localization but involves the production of expensive fluorescently labeled oligonucleotide probes and prior knowledge of the target RNA. To help ease the financial burden of conducting smFISH with preordered fluorescently tagged probes and improve the overall sensitivity of this technique, our lab sought to create a procedure for attaching more than one dye to readily available unlabeled DNA probes. By increasing the attached dye counts from one to several, a greater fluorescence can be achieved allowing for higher sensitivity of even the smallest quantities of localized RNA. Although further optimizations are required before usage in smFISH, our lab successfully attached more than one dye to the unlabeled probes.

P12 **The Role of Clonal Capability in Life History of the Bromeliaceae: Evidence from Anatomy, Development, and Physiology**

Student Researcher: Emma Fetterly '20

Major: Organismal Biology and Ecology

Faculty Collaborator: Rachel Jabaily, Organismal Biology and Ecology

Most bromeliad species have some ability to expand their body and asexually reproduce through the initiation of axillary meristems. Clonal ability, and inability, vary between taxa and are adaptive characters. Some taxa lack the ability to clone and are thus semelparous - entirely reliant upon one attempt at sexual reproduction for continuation. The relative timing of clone production to inflorescence production differs between taxa, as does the number of clones produced, length of stolon and maintenance of connectivity, and the relative energetic investment into the inflorescence versus vegetative growth. We present results from multiple complementary approaches that attempt to encapsulate and explain the variation in clonality and life history across the family. We consider the anatomical origin and tissue connections between mother rosette and clone. We analyze the developmental timing and allometric scaling of three bromeliad species studied for 18 months. Finally, we analyze functional traits in one species across three various developmental stages of pup and inflorescence production.

P13 **Screening Rodents from Paraguay for Hantavirus-specific Antibodies Using Indirect Immunofluorescence Assay**

Student Researchers: Jia Mei '21

Major: Molecular Biology

Faculty Collaborators: Colleen Jonsson, University of Tennessee Health Science Center

Research Collaborator: Mariah Taylor

Hantavirus is a single stranded RNA virus that can infect humans and cause hantavirus pulmonary syndrome (HPS) in the New World (North and South America) and hemorrhagic fever with renal syndrome (HFRS) in the Old World (mostly in Europe and Asia). The first outbreak of hantavirus in the US occurred at the Four Corners (Arizona, New Mexico, Colorado, and Utah) in 1993. Hantavirus is transmitted to humans through aerosolized infected rodent excreta. Since rodents are the natural hosts of hantaviruses, researching infected rodents serves as the first step in understanding the epidemiology of hantaviruses. This summer, I took part in sorting rodent samples that were collected from Paraguay in February 2019 and screening blood samples for hantavirus-specific antibody titers using indirect immunofluorescence assay (IFA) to identify novel species of hantaviruses.

P14 **Barriers to Action: Construction of a Scale of Feminist Shame and Guilt**

Student Researcher: Jessica Keniston '20

Major: Psychology

Minor: Feminist and Gender Studies

Faculty Collaborator: Tomi-Ann Roberts, Psychology

Often, individuals report a high level of social-justice oriented knowledge or identification but fail to engage in congruent behaviors. Scholarship has explored the disconnect between attitude and behavior, but this domain lends itself to a study of the specific emotions acting as barriers to activism. The self-conscious emotion of shame is theorized to predict inaction or anger, whereas its counterpart guilt often results in reparation. Thus, we hypothesize individuals' feelings of guilt inspire them to engage in activism, whereas shame acts as a barrier to action. Although social justice movements have many identifiers, we utilize the term "feminism" as an umbrella term for multiple movements. We modified Tagney et. al's TOSCA-3 to utilize situations engaging with social justice issues. We then tested this "Feminist TOSCA" for individuals with differing levels of feminist identification and ideology. We found that feminist identification and ideology are highly correlated with feminist shame and guilt, significantly more so than simply with trait shame and guilt. Future research will test whether high shame or guilt in these situations predict activist behavior differently.

P15 Investigating Factors Suspected of Affecting TFIIC-dependent Boundary Function in *Schizosaccharomyces pombe*

Student Researcher: Emma Carlson '20

Major: Molecular Biology

Faculty Collaborator: Jennifer Garcia, Molecular Biology

Research Collaborators: Alex Barone-Camp '20; Peter Lehman '20

Gene expression, which is essential for cell function, can be controlled by DNA organization. In eukaryotic cells, DNA is wrapped around histone proteins to form chromatin. There are two main types of chromatin: euchromatin is accessible and gene-rich while heterochromatin is packaged tightly and inaccessible for transcription. Heterochromatin is marked by a specific modification to histone proteins, generally called repressive histone methylation. Although repressive histone methylation is essential for proper cell function, if uncontained it will spread, silencing other regions of the genome, thus interfering with gene expression. In *Schizosaccharomyces pombe*, the spread of silencing can be prevented by specific DNA elements called boundary elements, which require the RNA polymerase III transcription factor TFIIC. Other factors critical for boundary element function remain unknown. Previous research identified ten mutants that may interfere with this pathway. We confirmed the presence of three mutations. We aim to introduce these mutations into wild type cells using cloning techniques to observe their effect on boundary function. Chromatin Immunoprecipitation can then be performed to test for the spread of methylation. This analysis will identify factors that contribute to boundary function and give insight to mechanisms by which boundary elements limit the spread of repressive histone methylation.

P16 Locust Eradication and Political Discourse in China, 1660-1965

Student Researcher: Zhuang Xu '20

Major: Political Science

Faculty Collaborator: John Williams, History

The research project concerns locust control in China from 1660s to 1965. Specifically, the project examines the changes of locust control methods, the obstacles encountered by people and institutions engaging in locust extermination and the cultural, political and scientific implications of Chinese locust control activities. Through reviewing relevant primary documents, such as newspapers, magazines Qing Dynasty Court Record, oral history collection and bulletins, and secondary documents such as local gazetteers and books, the researchers are able to learn that while for a long period of time popular practices utilized to eliminate locusts were consistent in China, with regime changes the problem of locusts was politicized by different governments to fit specific political narratives. Moreover, locust control in China is linked with popular religion and modern campaigns to eradicate 'superstition'. Various regimes believed that the commoners' religious beliefs obstructed official mobilization to exterminate locusts but they took different approaches to tackle the problem.

P17 **Quantitative analysis of dendritic arbors of supragranular pyramidal cells in CTE and control brains**

Student Researchers: Ray Shin '20, Coby Dodelson '20

Majors: Neuroscience; Neuroscience

Faculty Collaborator: Bob Jacobs, Psychology

Chronic traumatic encephalopathy (CTE), a neurodegenerative disorder, has been diagnosed in individuals of many professions (e.g., boxers, football players, hockey players, military veterans) exposed to repetitive traumatic brain injury (rTBI). Although prior research on the enduring effects of CTE and rTBI are supported by studies, potential long term microscopic structural changes in dendritic arbors have not yet been recorded. The present study assesses the long term effects of rTBI and CTE by quantifying the dendritic system of supragranular pyramidal cells in the frontal and occipital poles of the human brain. A total of 440 cells (220 from frontal pole; 220 from occipital pole) were traced using the NeuroLucida camera system. Analysis of these data is still in process.

P18 **Spatial Patterns in Summertime Surface Ozone in the Southern Front Range of the Rocky Mountains, USA**

Student Researcher: Margot Flynn '20

Major: Environmental Science

Faculty Collaborator: Lynne Gratz, Environmental Science

Research Collaborator: Erick Mattson, Colorado Department of Public Health and Environment

In the past decade, El Paso County, home to Colorado Springs, Colorado, has grown by more than 100,000 people, with another 300,000 expected by 2050. Increased motor vehicle emissions and the city's proximity to Denver's metro area threaten to intensify ozone production. Already, the annual mean ozone mixing ratio in the Pikes Peak region has increased by approximately 5 ppb in the past 15 years. From June through September 2018, The Colorado Department of Public Health and Environment measured hourly ozone mixing ratios at eight sites to characterize the spatial distribution of ozone in the Pikes Peak region. We find that higher ozone is associated with daytime upslope winds, causing polluted air to travel from the city center to higher elevations. Additionally, during 4 out of 5 periods when 7 out of 8 sites exceeded 70 ppb on a running 8-hour average, regional wildfire smoke likely impacted Colorado Springs surface air. Our results expand current knowledge of ozone in the Colorado Front Range and lay groundwork for managing ozone in a growing metropolitan area.

P19 Empirical Testing of an Option Pricing Model with Memory

Student Researcher: Makayla McDevitt '21

Major: Mathematics

Faculty Collaborator: Flavia Sancier-Barbosa, Mathematics and Computer Science

The Black-Scholes model computes theoretical option prices. Although reputable, the model's assumptions that the stock price has constant volatility and no arbitrage opportunities impedes the accuracy of the model. The current work serves to test an adjustment of the Black-Scholes model, first presented in *An Option Pricing Model with Memory*, published by F. Sancier-Barbosa and S. Mohammed. Rather than using constant volatility, the Option Pricing Model with Memory utilizes a continuous history of the stock prices and therefore counters the original assumptions of constant volatility and independence among current and historical stock prices. To test the Option Pricing Model with Memory against the Black-Scholes model for S&P 500 stocks for time frames within and outside the 2008 crisis, we did a series of comparisons involving variations of memory length, the duration of historical stock prices, and the amount of time between the final historical price and the current price. We've found that the Option Pricing Model with Memory is more likely to perform better than the Black-Scholes Model during times of financial crisis.

P20 Roman Imperial Coinage from the Julio-Claudian to Flavian Dynasties: Cataloging Coinage from the American Numismatics Association's Collection

Student Researcher: Helen Donovan '20

Major: Classics

Faculty Collaborator: Richard Buxton, Classics

Research Collaborator: Douglas Mudd, American Numismatics Association Museum Director and Curator

Members of both Colorado College and the greater Colorado Springs community alike have long benefited from access to the expansive coinage collection of the American Numismatics Association, housed in the Money Museum of Colorado Springs. Unfortunately, much of the ANA's Greco-Roman collection is held within the museum vaults, and the organization's current lack of an online library of artifacts places restrictions on the general public's interaction with ancient materials. In an attempt to bring previously inaccessible material into regular academic circulation, my research project focused primarily on the creation of a digital catalog of Roman Imperial coinage issued between the Julio-Claudian and Flavian dynasties. Working in the museum, I photographed and collected data on each coin of relevance, assigning each a reference number, allowing for my eventual compilation of a complete record through which all information on individual artifacts can be easily searched and studied.

P21 Exploring Cheaper Alternatives to Detecting Diacetyl in Beer

Student Researcher: Aaron Cronin '20

Major: Biochemistry

Faculty Collaborator: Murphy Brasuel, Chemistry and Biochemistry

In this research, we set out to develop a cheaper alternative to detecting a common contaminant in beer, diacetyl. Diacetyl is a contaminant that develops naturally in the fermentation process, and in very small concentrations ruins the taste of beer. With the recent increase in popularity of microbreweries, finding cheap and effective methods in quality control has become more important. We devised a technique that uses a UV-vis spectrometer to detect the presence and quantity of diacetyl. Through heating the beer and trapping the contaminant on a thin layer of poly vinyl alcohol (PVA), we can measure the change in absorbance of the PVA membrane, and then calculate the concentration of diacetyl. This method shows promise to be reliable and accurate when compared to an already accepted method of testing (Liquid Chromatography Mass Spectrometry), but is much cheaper and more accessible to smaller breweries.

P22 The Block Plan: Studying Change at CC

Student Researcher: Benedict Wright '20

Major: History/ Philosophy

Faculty Collaborator: Susan Ashley, History

In the fall of 2020, Colorado College will recognize the fiftieth anniversary of the inauguration of its distinctive block plan. This project has involved assisting professor Susan Ashley in her work writing a book on the history of the block plan to mark the occasion. Her work explores the formulation, implementation, progression, and present state of what was once called the Colorado College Plan. By gathering data from the Colorado College archives, the Dean's Office Archives, and interviews with faculty and alumni, we have identified key individuals and developments in the block plan's history. In particular, the present research focuses on the Leisure Program, the types of courses offered, and the relationship of the block plan to Colorado College's stated missions. The goal of this project has been and continues to be the promotion of a heightened consciousness within the college community of the unique academic experience Colorado College offers and of its history.

P23 Spontaneous Generation in 19th Century America

Student Researcher: Maya Day '20

Majors: English and Creative Writing

Faculty Collaborator: Sylvan Goldberg, English

My summer research project pertains to the ways evolution was conceived of in the United States predating Darwin's theory of evolution for a larger book project that Professor Sylvan Goldberg is working on. Specifically, I'm interested in how the scientific theory "spontaneous generation" was disseminated and discussed in an American context in the 19th century. Spontaneous generation is a theory in which living organisms are produced from nonliving matter. While there's scholarly work done on this concept in a European context, little has been researched in terms of how this concept surfaced in the United States. I have primarily looked at the databases 19th Century US Newspapers, JSTOR, HathiTrust, and MLA International Bibliography for this research, extracting information on the public conceptions of this term through newspaper articles and the scientific work being done in the United States on this subject as they surface in science journals. This ostensibly scientific and archival research will be used by Professor Goldberg in a book that concerns time and nature in 19th century American literature.

P24 Population Modelling for Gerrymandering-detection Tool Implementation in Colorado

Student Researchers: Kading Mangalik '20; Jose Monge Castro '20; Edgar Santos Vega '20

Majors: Mathematics; Chemistry and Mathematics; Mathematics (minor Race, Ethnicity and Migration)

Faculty Collaborator: Beth Malmskog, Mathematics and Computer Science

Research Collaborators: Haley Colgate '20; Austin Eide '20

Gerrymandering is the intentional manipulation of districting maps to favor partisan interest over the will of the people. In the light of the upcoming 2020 census, joint efforts have started at Colorado College and UC Boulder to adapt and implement methods developed to detect gerrymandered districts, developed by the Metric Geometry and Gerrymandering Group (MGGG), to the state of Colorado. The work to evaluate the current district lines in Colorado has been limited by the availability of demographic data at the precinct scale. This group demonstrated that census population level at the county and block group scales can be used to estimate precinct level populations with significant accuracy. This analysis is performed through the use of GIS software and custom block code. The model is analyzed using 2000 census population data to predict 2010 census data, which is shown to be consistent with actual 2010 census population data.

P25 **Reactivity of Malonic Acid Half Thioester Derivative with Benzyne Precursor under Base Catalyst Conditions**

Student Researchers: Yu Wu '20

Major: Chemistry

Faculty Collaborator: Jessica Kisunzu, Chemistry and Biochemistry

Research Collaborators: Rana Abdu '22; Jake Heiser '20

Malonic acid half thioesters (MAHTs) are capable of forming C-C bonds through nucleophilic addition reactions without metal catalysts at room temperature. In nature, polyketide synthases use MAHTs for the biosynthesis of fatty acids and polyketides in all life. In previous studies, ketones and aldehydes have been tested and shown to work well in reacting with MAHTs. We propose that *o*-benzynes could also be considered as great electrophiles for the C-C bond formation, for their high reactivity from bond strains. Since MAHTs tend to decarboxylate spontaneously, thus preventing further reaction, conditions that use an amine base as a catalyst are considered to be favored to move the reaction forward. We herein introduce a new addition reaction between the MAHT derivative and the benzyne, and the optimized conditions for this reaction. ¹H NMR, ¹³C NMR and LC-MS were used to characterize the product, which might bring a mechanistic insight of such addition reaction.

P26 **Monothiomalonate Synthesis and Investigation of Its Reactivity with Benzyne**

Student Researcher: Rana Abdu '22

Major: Undeclared

Faculty Collaborator: Jessica Kisunzu, Chemistry and Biochemistry

Research Collaborators: Jake Heiser '20; Yu Wu '20

Strained molecules, such as benzynes, have been an area of interest for organic chemists due to their high reactivity. Previous research on the reactivity of benzynes with β -ketoesters showed that the aromatic ring can insert, unexpectedly, into one of the C-C bonds of the β -ketoesters even under mild conditions. Our research targeted the synthesis of malonic acid derivatives, such as monothiomalonates (MTMs) and malonic acid half thioesters (MAHTs), and their reactivity with benzynes since they are similar in structure to β -ketoesters. We present preliminary results on the different conditions tested (e.g., time and temperature) and future directions. We found that different MTMs give different results, so further optimization and characterization of the reactions will be useful.

P27 **Monothiomalonamides and Benzyne: An Investigation into Novel Reactivity Patterns**

Student Researcher: Jake Heiser '20

Major: Chemistry

Faculty Collaborator: Jessica Kisunzu, Chemistry and Biochemistry

Research Collaborators: Rana Abdu '21; Yu Wu '20

Benzyne is a highly strained, highly reactive molecule used by chemists in a variety of organic syntheses. The discovery that benzyne reacts with certain malonic acid derivatives to form an acyl-alkylated benzene ring spurred new research into benzyne's reactivity patterns with other dicarbonyl compounds. Monothiomalonamides, or MTMAs, are one type of malonic acid derivative whose reactivity with benzyne has not yet been deeply investigated. This research began to investigate MTMA's interactions with benzyne by analyzing the products formed when a specific MTMA reacts with benzyne. Product analysis suggests that MTMAs do react with benzyne to initially form an acyl-alkylated product as predicted, but that this product degrades over time into disulfides and/or sulfoxides. Reaction duration, temperature, reactant equivalency, and solvent were all found to affect product distribution. Further investigation is necessary to fully identify the products and enable this reactivity pattern to be harnessed in new synthetic pathways.

P28 **Effects of Short Chain Fatty Acids on The Social and Cognitive Well-being of Rats Subjected to Early Life Adversity**

Student Researchers: Sixuan Chen '20; Eric Fang '20; Noah Siddiqui '20

Majors: Neuroscience; Neuroscience; Neuroscience; Neuroscience

Faculty Collaborator: Lori Driscoll, Psychology

Microorganisms in the gut, termed the microbiota, communicate bi-directionally with the brain and promote central nervous system (CNS) development and function. One such form of communication is through signaling molecules known as short chain fatty acids (SCFA), which are byproducts of bacterial fermentation. Exposure to a neglectful childhood can cause dysbiosis, or imbalance, of the gut microbiota, leading to broader, lifelong deficits in mental health. Dietary supplementation with SCFAs, butyrate in particular, can decrease the severity of such mental conditions. To further elucidate the role of SCFAs in CNS development, particularly how they affect the brain's response to stressful stimuli, we are measuring social behaviors, pleasure seeking behaviors, and cognition in Long Evans rats who experienced early life neglect. Half of these rats were supplemented with SCFAs to attempt to mitigate the effects of neglect. Our hypothesis is that SCFAs, especially butyrate, will facilitate the development of an attenuated anxious phenotype in rats subjected to neonatal neglect.

P29 Collaborative Advancements in Forming a Relational Dataset

Student Researchers: Darryl Fillmore '20; Gabe McGill '20

Majors: Computer Science; History- Political Science

Faculty Collaborator: Jane Murphy, History

The SCoRe research completed this summer contributes to a multi-year project that explores the influential book *The History of Egypt*, written by the late 18th century Egyptian scholar 'Abd al-Rahman al-Jabarti. The four-volume text comprises of hundreds of biographies that reveal an intricate network of scientists, philosophers, and theologians working largely in Cairo in the late 18th and early 19th centuries. The summer research resulted in a significant amount of progress, both in the improvement and accumulation of data, and in refining the ongoing practice of collaboration. Combining knowledge of a Digital Humanities software named Nodegoat, proficiency in Arabic, and data collecting skills, the dataset was not only restructured to more appropriately fit the project's aims, but was also expanded considerably in order to better understand how the community and network of scholars behaved. While keeping in mind other projects that survey Islamic Scientific authors, this newly expanded database might eventually work in conversation with related projects. Having researchers from two different majors allowed the team to develop a clear workflow that emphasized exploring new ideas and building off each member's strengths to achieve more tangible progress than in previous years.

P30 Determining Mating Efficiency in *O. polymorpha* with Green Fluorescent Protein Fragments and Quantification by Flow Cytometry

Student Researchers: Cody Leong '20; Coco Hibberd '21; Margaux Rose '20

Majors: Molecular Biology; Molecular Biology; Molecular Biology

Faculty Collaborator: Sara Hanson, Molecular Biology

The yeast species *Ogataea polymorpha* is an important model organism for the study of the evolution of sexual reproduction, as well as other aspects of cellular biology. However, current studies are limited due to a lack of efficient methods for examining mating. *O. polymorpha* is capable of existing in two haploid mating types, which mate to form a diploid cell through fusion. We constructed plasmids that contained one of two fragments of green fluorescent protein (GFP), which will be transformed into the genome of *O. polymorpha*. Once created, these strains will produce a complete functional protein after a successful mating between two haploid cells. Using the method of flow cytometry, we can then determine mating efficiency by counting fluorescent diploid cells.

P31 **Determining the Upper Mass Limit for the Companion Star of Sub-subgiant S1063**

Student Researcher: Conrad J.L. Monson '20

Major: Astrophysics

Faculty Collaborator: Natalie Gosnell, Physics

Sub-subgiants are magnetically-active stars that are cooler and dimmer than main sequence and subgiant stars, respectively, bringing into question how they form. To better understand interactions of sub-subgiants in a binary star system, we look at the spectroscopic binary system S1063 located in the M67 open cluster. Magnetic activity in these stars produces starspots which disrupt stellar convection, lowering the overall temperature and causing the star to dim. To better understand the magnetic activity in S1063, we aim to place an upper limit on the mass of the secondary star, which is undetected in the data. We create synthetic binary spectra combining models of the primary star with different secondary star models of decreasing mass. These synthetic binaries are then analyzed in the same manner as the data to test whether the modeled companion is detectable. Our preliminary conclusion is that the secondary star must be less massive than 0.23 Solar Masses.

P32 **Identification of Mating-Type Genes in the Methylophilic Yeast *Ogataea polymorpha***

Student Researcher: Kristie Shirley '20

Major: Molecular Biology

Faculty Collaborator: Sara Hanson, Molecular Biology

Understanding the processes that underlie cellular differentiation is important because it allows us to better comprehend the factors that make one cell different from another. The mating types in *Ogataea polymorpha* are dictated by the expression of transcription factors *MATa2* or *MATa1* in a and α -type cells, respectively. While these genes are known to be essential for mating type identity, their downstream effects are unknown. In order to identify the a and α -specific genes in *O. polymorpha*, expression of the transcription factors was induced in both wildtype strains and strains that have either *MATa2* or *MATa1* deletions. Transcriptome analyses comparing the mRNA expression of deletion strains to the control strains reveal what genes are unique to each cell type. Preliminary data indicate that *MATa2* affects the expression of pheromone pathway genes, transcription factors, DNA repair proteins, and a possible GTP-ase activating protein. Once the a-specific and α -specific genes for *O. polymorpha* are known, comparisons can be made to other yeast species in order to better understand how cell-type identity has evolved over time.

P33 **The Sound of Sadness: Does Sound Symbolism Modulate the Influence of Affect Labeling on Emotional Experience?**

Student Researcher: Daniel Walsh '20

Major: Psychology

Faculty Collaborator: Kevin J. Holmes, Psychology

Affect labeling, or applying a word to an emotional stimulus, has been found to dampen the labeler's emotional response. In an ongoing study, we are investigating whether the degree of dampening depends on the form of the word itself--specifically, the sound-symbolic emotional connotation of the first phoneme. Participants will view negative images and select corresponding labels that contain either a positive first phoneme (e.g., ch) or a negative one (e.g., d), and then report their levels of distress. If sound symbolism modulates the effectiveness of affect labeling, we should find lower distress ratings when the label's first phoneme is positive than when it is negative. Such results would suggest that not all labels have the same dampening effect on emotional experience. Our findings may provide insight into why some talk therapy strategies are more beneficial than others.

P34 **How Victim Framing Shapes Attitudes Towards Sexual Assault**

Student Researcher: James van der Vord '21

Major: Psychology

Faculty Collaborator: Kevin Holmes, Psychology

Sexual assault cases typically involve a perpetrator and a victim, yet some media outlets portray the alleged perpetrator as the "real" victim. Holmes et al. (2019) found that such *victim framing* yields relatively greater support for the alleged perpetrator. In three high-powered, preregistered experiments ($N = 2008$), we investigated the robustness of this effect and explored potential mitigating factors. Participants read a brief news report about sexual assault allegations that framed either the female or male character as the victim or was relatively neutral about victimhood, and then rated their support for the two characters. Results showed that the framing effect, though replicated (Experiment 1), was weaker when the frame was relatively minimal (Experiment 2) and when the report described a familiar case, namely the allegations against Supreme Court nominee Brett Kavanaugh (Experiment 3). However, in all three experiments, participants who cited the victim language as the most influential part of the report showed strong framing effects, even when controlling for their preexisting beliefs. Our findings highlight the persuasiveness of media portrayals of sexual assault.

P35 Untold Stories from the American Frontier: A Case Study of Historic Settlement Patterns in the Manitou Experimental Forest, Woodland Park, Colorado

Student Researcher: Emma Paradiso '20

Majors: Anthropology and French

Faculty Collaborator: Scott Ingram, Anthropology

This project is centered around understanding the historic landscape of the Manitou Experimental Forest based on the archaeological findings of Dr. Scott Ingram and Colorado College students from 2017 until present. The project incorporates archaeological survey, dendrochronology, mapping, and documentation of historic cultural resources that date to the late 1800s. The project seeks to answer “What is the human history of the Manitou Experimental Forest, ca. 1850 to 1950? Who lived there, when did they live there, and why were they there?” This research provides an opportunity to reconsider historic settlement patterns in Colorado and has allowed for a rich culture history of the Manitou Experimental Forest to emerge and become accessible to local residents and other researchers.

P36 A Potential Role for Non-Coding RNAs in the Regulation of Mating-Type Switching in *Ogataea polymorpha*

Student Researcher: Julianna Olliff '20

Major: Molecular Biology

Faculty Collaborator: Sara Hanson, Molecular Biology

Sexual reproduction is a risky process that can lead to DNA damage or decrease a genome's chance of survival. Thus, organisms who sexually reproduce have evolved highly regulated signaling mechanisms for ensuring reproduction and mating proceed smoothly. Mating-type switching (MTS) is an example of regulated sexual reproduction found in many yeast species. When a yeast cell has no viable mating partner, it can divide into two cells; the mother cell then switches to the opposite mating-type, allowing the two cells to mate. To perform this switch, the cell must form two DNA breaks and reorient part of its chromosome, which could result in DNA damage or cell death. To decrease risk, MTS is regulated by multiple signal cascades. In this research, we looked for RNA molecules potentially involved in the MTS signaling cascade in the methylotrophic yeast *Ogataea polymorpha*. We induced MTS in *O. polymorpha* and performed RNA-seq to identify non-coding RNAs regulated by *STE12* that are potentially involved in MTS regulation.

P37 **Riding on Cloud 'Find': Sane Data Organization for Decentralized, Encrypted Team-Based Services**

Student Researcher: Daniel Barnes '21

Major: Computer Science

Faculty Collaborator: Benjamin Ylvisaker, Mathematics and Computer Science

Research Collaborators: Mataan Pe'er '21

Encryption algorithms and techniques have been developed and improved to the point that computers are capable of encrypting information in formats that would take longer than the age of the universe to brute-force decrypt. However, the objective of making these techniques accessible to the general public is an entirely different problem—many of the activities people engage in online involve communication where data may be exposed to middlemen (such as online services) or individuals who snoop on Internet data as it is being transmitted. Recently, as security breaches and data monetization increase in frequency, the general public is becoming more concerned about their privacy of their personal data. While there has been a recent push by some services to offer end-to-end encrypted (E2EE) options for everyday tasks, such as Signal providing secure messaging, there exists no mainstream solution which guarantees high data security for team-based services, such as collaborative editing services. ManyHands and the UWS protocol is an effort to make encrypted team-based services practical and realistic, such that higher security expectations will become the norm for the average internet user. To accomplish this, research has been done on efficient ways of propagating information across many users and storing data in a decentralized format across commodity cloud services (such as Dropbox or Google Drive) efficiently, in order to minimize the tradeoffs necessary in achieving high data security for this format of application.

P38 **Investigating the Genetic Control of Nervous System Development Using Genome Editing**

Student Researchers: Patrick Ende '20; Judy Cheng '21

Majors: Molecular Biology; Molecular Biology

Faculty Collaborator: Darrell Killian, Molecular Biology

The nervous system is composed of neurons – cells with cellular extensions called axons and dendrites – whose complexity of morphology and interconnection dictates neuronal function. The *nanos* gene is important for dendrite development in the fruit fly. However, other species have more than one *nanos*-related gene, which complicates genetic analyses. In *C. elegans* there are three *nanos*-related genes (*nos-1*, *nos-2*, and *nos-3*) and loss of any one or two has minimal effects on dendrite branching. This suggests that the three *nanos*-related genes play genetically redundant roles in dendrite development. To test this hypothesis, we used CRISPR-Cas9 genome editing to create a triple mutant, which we are now analyzing for defects in dendrite development. Another gene, *rbm-39*, has suspected roles in dendrite branching in both fruit flies and *C. elegans* based on experiments that reduced *rbm-39* activity. To further investigate the role of *rbm-39*, we aimed to delete the gene using CRISPR-Cas9. Molecular evidence suggests that genome editing was successful, but we are still working to obtain animals homozygous for the deletion.

P39 **The *dpy-19* Gene is Important for Cell Migration During Nervous System Development in *C. elegans***

Student Researcher: Martin Parks '20

Major: Molecular Biology

Faculty Collaborator: Darrell Killian, Molecular Biology

Research Collaborators: Patrick Ende'20; Judy Cheng'20

An evolutionarily conserved aspect of nervous system development is the migration of undifferentiated cells, termed neuroblasts, to specific locations where they differentiate into neurons. Recently, we isolated a mutant strain of *Caenorhabditis elegans* in which the PQR tail neuron is aberrantly located in the head. This suggests that there is a defect in neuroblast migration. The mutants also have a "dumpy" (Dpy) phenotype. To learn more about how this mutation (*cnj1*) impacts neuroblast migration, we sought to identify the gene affected by the mutation. Three experiments suggest that *cnj1* is a mutant allele of the *dpy-19* gene. First, we mapped *cnj1* to a region of chromosome III near the *dpy-19* gene. Second, when *cnj1* was crossed to *dpy-19* mutants, the progeny displayed PQR defects and a Dpy phenotype. Third, injection of a wild type copy of *dpy-19* into *cnj1* mutants rescued the PQR defect and Dpy phenotype. We are currently sequencing the *dpy-19* gene from *cnj1* mutants to learn the precise mutation in this gene, and we are determining which other neuroblast migrations are impacted.

P40 **Feather Molt Patterns in Flammulated Owls (*Psiloscops flammeolus*)**

Student Researcher: Olivia Noonan '20

Major: Organismal Biology and Ecology

Faculty Collaborator: Brian Linkhart, Organismal Biology and Ecology

Molting is a process gone through by all avian taxa that involves periodically replacing old flight feathers with new ones. This process is extremely energetically expensive for birds but usually does not overlap with other energy-taxing processes such as mating and migration. Understanding the unique molt pattern of an avian species has important conservation implications, as it can allow researchers to better understand the age demographics of specific populations and can also serve as a tool for assessing territory quality. The Flammulated Owl (*Psiloscops flammeolus*) is a small, territorial raptor that breeds in the montane forests of western North America and migrates to Mexico and Central America during the winters. While research crews have collected molt data on this species over the past nine years, the exact pattern exhibited in Flammulated Owls – and its implications – remains virtually unknown. In my poster, I present some preliminary findings on the molt pattern of Flammulated Owls extrapolated from my summer research that I hope to continue into a senior thesis this school year.

P41 **The Importance of Stopover Site Ecology in Flammulated Owls (*Psiloscops flammeolus*)**

Student Researchers: Matthew Luzincourt '21, Sarah Lloyd '21, Kyle Cadwallader '21

Majors: Organismal Biology and Ecology; Organismal Biology and Ecology; Organismal Biology and Ecology

Faculty Collaborator: Brian Linkhart, Organismal Biology and Ecology

Research Collaborators: Kelsi Anderson '18; Jordan Ellison '19; Adam Mahler '20; Olivia Noonan '20; Eliza Stein '18

Migration routes have significant implications on population dynamics and conservation in migratory avian communities. The ecosystem type of the breeding grounds, stopover sites, and wintering grounds are essential for the success and fitness of the avian migrant. The Flammulated Owl (*Psiloscops flammeolus*), a small migratory raptor, utilizes multiple stopover sites, consisting of similar ecosystems to that of their wintering and breeding grounds. This study has tracked migration patterns of Flammulated Owls from 2017-2019 using GPS pinpoint trackers. Flammulated Owls travel an average of 2057 +/- 128km from central Colorado to Central America. All three recovered 2018 GPS pinpoint birds migrated to different wintering grounds within Central America; however, they all used two essential stopover sites in the Spanish Peaks and the Sierra Madre Mountains within a 15km radius of each other. These stopover sites are composed of coniferous forest and woodlands containing pine-oak ecosystems, homologous to that of the breeding and wintering ground ecosystem types. The close geographic proximity of these essential stopover sites compared to the geographic disparity between the wintering grounds of these individuals, suggests that these stopover sites are of great conservational and ecological significance for the survival and fitness of the Flammulated Owl.

P42 **Nest Habitat Selection in Flammulated Owls**

Student Researcher: Adam Mahler '20

Major: Organismal Biology and Ecology

Faculty Collaborator: Brian Linkhart, Organismal Biology and Ecology

Research Collaborators: Olivia Noonan '20; Kyle Cadwallader '21; Matt Luzincourt '21; Sarah Lloyd '21

The flammulated owl (*Psiloscops flammeolus*) is an insectivorous nocturnal raptor that breeds in the montane ponderosa pine ecosystems of western North America. As an obligate secondary cavity nester, it is limited in nest site selection by the availability of suitable cavities, created predominately by northern flickers (*Colaptes auratus*), Williamson's sapsuckers (*Sphyrapicus thyroideus*), and red-naped sapsuckers (*Sphyrapicus nuchalis*). Clutch size is typically 2-3 eggs, and only one clutch is laid per breeding season. Predation by red squirrels (*Tamiasciurus hudsonicus*) of flammulated owl eggs and nestlings has been observed, especially in or directly following dry years, and appears to be a potential driver of nest site selection. Using nest habitat data from 2005-2019 and suitable cavity data from 2014-2016, I intend to test the specific suitable cavity attributes for which flammulated owls are selecting, including tree and excavator species, cavity height, and diameter at breast height (DBH). Because ponderosa pine ecosystems throughout western North America are being shaped by climate change, logging, and fire management practices, understanding flammulated owl nesting habitat selection has distinct conservation implications.

RESEARCH POSTER PRESENTATIONS, ABSTRACTS P43-P81

P43 **East is Down? Effects of Local Topography on Route Planning**

Student Researcher: Wyatt Newhall '20

Major: Cognitive Science

Faculty Collaborator: Kevin J. Holmes, Psychology

Navigators rely on several heuristics for selecting the most efficient route between locations, even when using a map. One such heuristic—the *southern route preference*—refers to the tendency to select a southern route even when an equally long and complex northern route is available. This preference has been attributed to the misperception that north is elevated, and thus more effortful for travel, compared to south. Here we examine route preference in an environment where elevated terrain is associated with the west: Colorado Springs, Colorado. In Experiment 1, Colorado College students displayed a preference for eastern routes over equally long and complex western routes on a familiar map of Colorado Springs, reliably selecting routes that head away from the mountains. Interestingly, no southern preference was observed. Experiment 2 (forthcoming) will investigate whether the eastern preference generalizes to unfamiliar maps. We propose that salient terrain differences along the east-west axis can override the north-is-up heuristic, in this case leading west rather than north to be associated with higher elevations. Our findings have important implications for real-world navigation decisions.

P44 **Solving Abalone on Small Boards**

Student Researchers: John Koerner '20; Joe Gutstadt '20

Majors: Mathematical Economics; Mathematics

Faculty Collaborator: Kirsten Hogenson, Mathematics and Computer Science

Abalone is a 2 player board game with perfect information. The game is played on a 6x6x6 hexagonal grid and ends when a player pushes 6 of their opponent's pieces off the board. Using combinatorial game theory to analyze Abalone is interesting because of its similarity to games like chess and Go. All three games have high branching factors, so there are too many possible choices at each turn for a computer to easily determine the outcome of a game. However, solving smaller, simplified versions of Abalone can offer insight into how to play the full-size game optimally. This summer, we strongly solved a variation of Abalone played on a 2x2x2 hexagonal board. We also weakly solved variations on 2x2x3 and 3x3x3 hexagonal grids. In particular, the 2x2x3 version will end in a draw, and the 3x3x3 version will be won by the first player to move. Our research methods could serve as a guide for future attempts at solving larger variations of Abalone.

P45 **Invariants in Knot Theory: The Alexander Polynomial**

Student Researcher: Vladimir Vintu '20

Major: Mathematics

Faculty Collaborator: Molly Moran, Mathematics and Computer Science

Imagine a string with loose ends. If we take the ends and glue them together, we can obtain a circle; in Knot Theory, this is called a trivial knot, because no knots are formed in making it. But what if instead, we take both ends and start playing around with them? We may entangle them, move them around each other or around the rest of the string, and create loops or any forms we want, as long as we do not cut the string. In the end of such a process, if we take again the ends and stretch them, will we get a straight string, or will knots form along the string? And how can we distinguish between our results? One such way is through invariants, which are mathematical objects that do not change through the operations that we are allowed. In particular, through this research I attempted to use the Alexander polynomial, which assigns a specific polynomial to each knot, and which can be used to tackle such questions.

P46 Examining the Activity of eIF3a in *Caenorhabditis elegans*

Student Researcher: Claire Tobin '20

Major: Molecular Biology

Faculty Collaborator: Kayleigh Morrison, MDI Biological Laboratory

Germ cells play an important role in reproduction because they give rise to gametes. Germ cells contain RNA and protein rich cytoplasmic germ granules that are highly conserved across animal species. In *C. elegans*, germ granules are called P granules. Previous work has shown that P granules regulate the translation of mRNAs into protein and that this regulation is important for germ cell identity. GLH-1 is an essential scaffolding protein in P granules and a recent co-immunoprecipitation followed by mass spectrometry showed that it associates with CLU-1. Limited evidence suggests that CLU-1 is found on the A subunit of eIF3, a protein complex important for translation initiation. In this study, V5 and mCherry were added to the N-terminus of CLU-1 to serve as biochemical and visual tags. Results suggest that eIF3 is present in germ cells and exhibits occasional docking with GLH-1. However, CLU-1 is not found in the mature oocyte. This research gives new insight into P granule structure and activity with other cytoplasmic factors that may regulate translation and germ cell identity.

P47 Does Learning about Linguistic Diversity Influence Beliefs about Category Discreteness?

Student Researcher: Theresa K. Westphal '20

Major: Psychology

Faculty Collaborator: Kevin J. Holmes, Psychology

People often assume that words carve nature at its joints, yet the lexical systems of different languages vary considerably. Such diversity might seem to imply that categories in the world lack discrete boundaries. We investigated whether comparing the lexical systems of different languages may instead highlight structural commonalities, thus reinforcing category discreteness. Participants identified lexical differences between three languages (Compare condition), lexical features for each language separately (No Compare condition), or only English lexical features (Baseline condition). Then all participants judged category discreteness by classifying items as full-, partial-, or non-members of ten categories. Overall, the Compare group gave more partial-member judgments (i.e., rejected category discreteness) than the other groups. Critically, however, participants who identified more meaningful cross-linguistic differences gave *fewer* partial-member judgments. Together, these results suggest that relatively shallow cross-linguistic comparison can challenge beliefs about category discreteness, but that deeper comparison has the reverse effect, perhaps because it directs attention to structural commonalities across languages. In a future study, we will test this possibility directly by manipulating how deeply people compare across languages.

P48 Pseudo-Intellectualism; Predictors of Fake News Detection

Student Researcher: Josh Alvarado '20

Major: Psychology

Minor: Linguistics

Faculty Collaborators: Amanda Minervini, Italian; Jason Weaver, Psychology

Research Collaborators: Polly McNeely '20; Alexis Griggs '21

Fake news purposely mimics genuine media to mislead the public and spread toxic ideologies. However, analytical thinking styles can improve media truth discernment. Additionally, previous research has shown that using a non-native language promotes effortful information processing. The present study investigated whether fluency in more than one language strengthens the ability to detect fabricated news headlines through increased analytical thinking. Participants (MTurk, $N = 420$) self-reported their fluency in non-English languages and rated the accuracy of various news headlines. Consistent with previous research, higher CRT scores predicted lower accuracy ratings of fake news headlines. Mediation analyses revealed that fluency scores negatively predicted CRT performance and led to greater ratings of accuracy for fake news, but critically, participants' fluency was positively correlated with their tendency to overclaim knowledge. Those who reported greater fluency were thus more likely to rate headlines—real or fake—as accurate. These results suggest that the disposition to overclaim a) motivates individuals to exaggerate their fluency and b) leaves them susceptible to fake news.

P49 Exploring the Role of *S. cerevisiae* Rny1 in mRNA Degradation

Student Researchers: Lucia Costanza '20

Major: Molecular Biology

Faculty Collaborator: Jennifer Garcia, Molecular Biology

In all living organisms, the ability to properly modulate gene expression patterns is vital for survival and when cells are unable to quickly respond to cellular changes, the result can be detrimental. Rny1 is a ribonuclease which help enable rapid adaptation of the gene expression through the degradation of RNA. Despite its importance, Rny1, which is found in *S. cerevisiae*, and its human ortholog, RNASET2, are still poorly understood. Using RT-qPCR, which quantifies mRNA levels, we measured Rny1 mRNA in different yeast growth phases. Our research suggests that Rny1 is not expressed during fermentation but becomes prevalent when the cells begin to respire due to a lack of nutrients in their environment. These findings, in conjunction with previous research, lead us to believe that Rny1 may play a key role in degrading mRNAs that encode proteins to promote respiration. We then looked at specific mRNA targets that may be degraded by Rny1 using the TET-off system. With further investigation of Rny1, we will better understand important mRNA decay patterns for respiration and how to prevent harmful disfunction.

P50 **Hodge Polygons of 2x2 Upper Triangular Matrices**

Student Researchers: Cinea Jenkins '20

Majors: Mathematics and Romance Languages

Faculty Collaborator: Shishir Agrawal, Mathematics and Computer Science

The purpose of this research was to understand F-Crystals, but turned into an exploration of Hodge Polygons. The research began with working to understand p-adic numbers, particularly p-adic integers as these are the numbers we worked with. We then looked at Frobenius automorphisms in order to understand F-Crystals over the p-adic integers. Finally, we explored Hodge Polygons for F-Crystals over the p-adic integers resulting in a conjecture concerning Hodge Polygons of 2x2 upper triangular matrices. The conjecture predicts what a Hodge Polygon will look like based on the powers of prime number p (in accordance with the prime in the p-adic integers) along the diagonal of the matrix.

P51 **The Wild West and Indian Authenticity: Modern Representations of Native North Americans in Germany**

Student Researcher: Judy Fisher '20

Major: Feminist and Gender Studies

Faculty Collaborator: Heidi R. Lewis, Feminist and Gender Studies

For many Native North American people, including myself, the fascination of Indian hobbyists in Europe is suspect and viewed as anything from genuine interest to cultural appropriation. Indian hobbyists, in this context, refers to non-Native people in Germany who: invest in literature about Indians and the Wild West; recreationally learn Native North American dances and languages; recreate or buy regalia; and participate in "powwows," Wild West theme parks, and festivals. In the summer of 2019, I attended two events in Germany welcoming Indian hobbyism, hoping to investigate the conditions in which Native people choose to engage with hobbyist groups as well as the motivations behind particular representations of Native North Americans by hobbyists. In grappling with questions about German colonialism, US imperialism, cultural appropriation, and authenticity, I argue that representations of North American Native people are reflective of social, political, and cultural attitudes. Although the representations expressed by German hobbyists are often based on romanticized caricatures of Native people, they also provide opportunities for Native Americans to resist, navigate, and survive in Germany.

P52 **Assessing Potential for Plant-Pollinator Phenological Mismatch in Alaskan Tundra**

Student Researcher: Hayes Henderson '20

Major: Environmental Science

Faculty Collaborator: Roxaneh Khorsand, Organismal Biology and Ecology

Research Collaborator: John Feigelson '19

Climate change is warming the Arctic at a dramatic rate. Earlier snowmelt and warmer air temperatures are contributing to an advance in the onset of the growing season. The reproductive ecology of arctic tundra plant communities is not well understood, and the potential of asynchrony between plants and pollinators requires further study. Our research investigates the possibility of a mismatch in timing between plants and pollinators on the North Slope of Alaska. Throughout the flowering season, we observed and collected floral visitors, monitored flowering, tested for pollen limitation, and evaluated the reproductive strategies of our focal plant species both in experimentally warmed and control plots. Our results will provide novel information on the natural history of arctic tundra plant and pollinator communities, and will show if the plants are at risk of losing their pollinators in the future.

P53 **Tangled Transmissions: The Differentiation of Historic Telephone and Telegraph Lines**

Student Researcher: Josh Birndorf '20

Major: Anthropology

Faculty Collaborator: Scott Ingram, Anthropology

In numerous survey projects, including one undertaken by Dr. Scott Ingram and Colorado College students in 2018, it has become commonplace when encountering a collection of poles, wires, and insulators, to state the possibility of either a telephone or telegraph line without differentiating between the two. Further inquiry into this lack of distinction shows that little to no documentation exists regarding how an archaeologist may differentiate between these two categories of historic feature while in the field. This research project focuses primarily documenting the material culture associated with telephone and telegraph lines, identifying methods of differentiation, and emphasizing the importance that this difference has when interpreting a cultural landscape.

P54 **Validating Numerical Modeling Through Modern Conditions at Engabreen, Northern Norway**

Student Researcher: Laura Davison '20

Major: Geology

Faculty Collaborator: Eric Leonard, Geology

Plummer and Phillips' (2003) 2-D numerical model of snow/ice energy balance and ice flow can be used to determine paleo-climate conditions from geomorphic markers of paleo-ice extent such as moraines. Resulting climatic conditions can be used to infer the character of intense paleo-climate fluctuations and inversely to make implications for future climate changes. This study aims to determine the viability of the second generation of the Plummer and Phillips numerical modeling system by using recent climate conditions from Engabreen, Northern Norway, and comparing the resulting equilibrium line altitude (ELA), mass balance data and geometry to that of modern Engabreen. Although older versions of the model have yielded expected results when run under modern conditions, the newly developed version of the model has not yielded the modern ELA, mass balance or ice extent of Engabreen. Potential reasons for this problem are hypothesized to be due to inaccuracies in the climate input, calculated albedo, differences in precipitation on the Western and Eastern sides of Engabreen, or internal issues with the model itself. This study is part of a larger project aimed at using Engabreen moraines dated from the Younger Dryas and Little Ice Age to determine the paleo-climate conditions that were needed to sustain Engabreen during those times.

P55 Isotopic Constraints on Fluid Transfer to the Mantle in Modern Arc Systems

Student Researcher: Jess Hebert '20

Major: Geology

Faculty Collaborator: Emily Pope, Geology

The size of Earth's oceans is controlled by fluxes of seawater in and out of Earth's interior via volcanism and subduction, respectively. This project investigates the controls on how much water is subducted, and whether those controls can be geochemically fingerprinted in subduction related volcanic rocks. We have identified strong correlations between the speed of subducting plates, subduction zone type (ocean-ocean, ocean-continent, flat slab, and transitional), and calculated water flux. We will further investigate the relationship between these data and isotope and trace element chemistry of lavas at subduction zones, to identify whether they can be used to predict fluid transfer to the mantle in modern and ancient subduction zones.

P56 Tiger Lily Project

Student Researcher: Magali Blasdel'21

Major: English, Creative Writing

Faculty Collaborator: Natanya Pulley, English

The goal of this research was to investigate and understand not only Peter Pan and other works by J.M. Barrie, but also the historical context within which Neverland was created. Because Professor Pulley is working to rewrite and re-examine Neverland, the Picaninny tribe and their princess Tiger Lily, this research focuses on what guided Victorian ideas of foreign places and the people who lived there. The original authors' understanding of Indigenous people was highly influenced by the prevalence of Human Zoos, Social Darwinism and British Imperialism, all of which Othered those who were not white. It gives insight into the original narrative viewpoint as Professor Pulley crafts her retelling from Tiger Lily's perspective. This research helped unravel the context in which Neverland was created in order to shift what Neverland can become to contemporary author and audience.

P57 **Maternal Floral Color, UV Protection, and Germination in *Ipomopsis aggregata***

Student Researchers: Charlotte DiBiase '20; Alex Shapiro '20

Majors: Organismal Biology and Ecology; Organismal Biology and Ecology

Faculty Collaborator: Shane Heschel, Organismal Biology and Ecology

Scarlet gilia (*Ipomopsis aggregata*) is a red to pink flowering plant which shows floral color plasticity within populations on the eastern slope of the Rocky Mountains. Anthocyanin is the red flavonoid pigment which gives these petals color, and has been shown to act as protection from UV damage in plants by shielding chloroplasts and acting as an antioxidant. This study was conducted on seeds from 24 plants from Manitou Experimental Forest (12 dark with dark petals, 12 with light petals). After being counted and weighed, seeds were germinated in a growth chamber over the course of 23 days, and were censused for germination rate every other day. Photosystem efficiency, anthocyanin content, chlorophyll content, and biomass were measured on germinated seedlings after the census was completed. Dark-flowering maternal plants yielded seeds and seedlings with higher biomass than light-flowering ones. Seeds from darker maternal plants also germinated faster than those from light maternal plants, and had higher anthocyanin content. The hereditary nature of anthocyanin content thus suggests that higher anthocyanin levels are linked to measures of fitness such as higher seed weight, germination rate, and seedling biomass, indicating that UV protection provided by anthocyanins potentially increases the realized fitness of maternal plants.

P58 **Purification of *A. baylyi* TerY-P Triad Proteins**

Student Researchers: Halle White '20; Henos Negash '20

Majors: Biochemistry; Biochemistry

Faculty Collaborator: Margaret Daugherty, Chemistry and Biochemistry

Acinetobacter baylyi is used as a model organism to study the metabolic pathways that may be responsible for some microbes' persistence in sterile environments and ability to cause nosocomial infections. Evidence strongly indicates that the TerY-P Triad, which is upregulated during long-term stationary phase, codes for a phosphatase, a kinase, and a metal-binding protein. A working hypothesis is that, once expressed, these three proteins form a complex which helps the microbe to survive during starvation periods. Individual purification schemas were designed for the kinase and phosphatase proteins, expressed in *E. coli* as fusion proteins regulated by the lac operon. Cleavage of the protein tag did not result in purified target protein. However, when phosphatase and kinase fusion protein samples were combined during the cleavage process, a purified band was isolated at the molecular weight of the two combined target proteins. This data suggests that the proteins do form a complex, and are more stable as such; further research is needed to confirm this and to study the role of this complex during stationary phase.

P59 **Exploratory Study of How Elite Liberal Arts Colleges Incorporate Diversity and Inclusion Initiatives and their Influence of Employers' Perceptions of Students Graduating from these Institutions**

Student Researcher: Takudzwa Nhira '20

Major: Economics

Faculty Collaborator: Kat Miller-Stevens, Economics and Business

This research explores perceptions of elite liberal arts students as viewed by employers offering entry-level jobs, and the diversity challenges that encompass these perceptions. The research seeks to explore diversity challenges from the student, programmatic, and employer perspectives. To answer the question, we used the Public Interest Fellowship Program at Colorado College as a case study. The PIFP represents a program in an elite liberal arts college that faces diversity challenges both within the program and when working with employers in the community who hire Colorado College students. The PIFP provides more than a decade of data from the student, programmatic, and employer perspectives that will help answer the research question posited above. Diversity initiatives at other elite liberal arts colleges will also be explored and researched with potential interviews of program directors at other institutions.

P60 **Refining Statistics of Exoplanets Occurrence in Stellar Clusters by Correcting for Systematic Biases**

Student Researcher: Marta Nowotka '21

Majors: Physics and Mathematics

Faculty Collaborator: Natalie Gosnell, Physics

Observing young exoplanets is difficult but invaluable in testing models of planetary formation. Recent surveys such as Kepler/K2 have provided data on several exoplanets found in young clusters and star-forming regions. These extrasolar planets evolve in close relationship to their host stars. Understanding any relation between properties of exoplanets and their host stars requires an accurate understanding of the cluster environment where they reside. By measuring the line-of-sight velocities of stars, it is possible to determine which stars belong to the cluster and the rate of binary stars. This research focuses on measuring the line-of-sight velocities of stars in young open clusters where exoplanets have been observed. Presented are methods for determining velocities through the analysis of stellar spectra, and results for one of the clusters in the survey, the Pleiades.

P61 **Maximal Subgroup Growth of a Few Polycyclic Groups**

Student Researcher: Elizabeth Wolfe '21

Majors: Mathematics and English

Faculty Collaborator: Andrew Kelly, Mathematics and Computer Science

In this paper we counted the maximal subgroup growth of groups of some groups. For one group, we counted the maximal subgroup growth of all groups of a certain form. This group had maximal subgroup growth which is prime, 2, or 0. For two other groups, we counted the maximal subgroup growth of a group of one form under two sets of ring actions. For the first of these groups, we counted the maximal subgroup growth to be prime, a prime plus one, 7, or zero. For the second of these groups, we counted the maximal subgroup growth to be $1+2p$, where p is a prime, 7, or 0.

P62 **Computational Screening and Optimization of Small Molecules for African “Sleeping Sickness” (HAT)**

Student Researcher: Tyler Walker '21

Major: Biochemistry

Faculty Collaborator: Amy Dounay, Chemistry and Biochemistry

Research Collaborator: Ben Sokol '21

Despite thousands of cases a year, African "sleeping sickness" (trypanosomiasis) remains a “neglected tropical disease” receiving limited interest or investment from the pharmaceutical industry. In this research, synthetic and computational methods yielded new compounds for development into effective treatments. Through laboratory synthesis, four compounds were prepared and submitted for analysis against *T. brucei*, the parasite which causes the disease. Computational work complemented the synthetic work: virtual screening prioritized new compound design possibilities. Further, visualizing interactions between compounds and the target protein computationally led to our design of a promising new molecular scaffold. Future work will involve laboratory preparation and evaluation of compounds with these new structural modifications. Further studies will also include optimization of the amide portion of the molecule and computational structure-based ligand prediction and design.

P63 **Design and Synthesis of Second Stage HAT Inhibitors**

Student Researcher: Ben Sokol '22

Major: Chemistry

Faculty Collaborator: Amy Dounay, Chemistry and Biochemistry

Research Collaborator: Tyler Walker '21

Human African Trypanosomiasis (HAT), more commonly known as African Sleeping Sickness, is a vector borne parasitic illness endemic in Sub-Saharan Africa. The disease is transmitted by the Tsetse Fly, and, when left untreated, is fatal. The lack of monetary incentive for the process of drug development has caused this illness to be classified as a neglected disease; therefore, drug discovery efforts have mostly been a result of smaller institutions backed by public funding, with contributions from industrial sources. Previous studies have suggested that molecules which interfere with, or inhibit GSK3, a specific parasite protein, could provide a new treatment strategy for HAT. Our project focused on the design and laboratory synthesis of novel GSK3 inhibitors in an attempt to discover an effective HAT treatment option.

P64 **Distributed Drug Discovery: Solid Phase Synthesis of Acylated Amino Acids**

Student Researcher: Saket Mereddy '22

Major: Biochemistry

Faculty Collaborator: Amy Dounay, Chemistry and Biochemistry

The Distributed Drug Discovery project is centered around designing and preparing potential new antibiotic medicines. Researchers at Indiana University - Purdue University Indianapolis (IUPUI) have identified certain fluorine-containing amino acid derivatives that showed promising activity against *P. Aeruginosa*, a multi-drug resistant pathogen that often affects cystic fibrosis patients. With collaborators from several colleges and universities around the world, this project aims to synthesize a set of 80 non-natural, fluorine-containing derivatives of the 20 common, natural amino acids and further test them for antibacterial activity. This summer we focused on a set of several phenylalanine derivatives with one or two fluorine atoms incorporated into the molecular structures. After completing the original synthesis goals, we also began working to reduce the environmental effects of our chemical methods by exploring the use of alternate solvents.

P65 I Kissed a Girl and He Liked It: Pornography and Comfort

Student Researcher: Polly McNeely '20

Major: Psychology

Faculty Collaborator: Jason Weaver, Psychology

Previous research suggests that straight men's positive attitudes towards lesbians are driven by the eroticization of lesbianism rather than the acceptance of homosexuality (Louderback & Whitley, 1997). Participants ($N = 101$) watched gay, lesbian, and straight pornography clips and then rated their discomfort. Straight participants reported more discomfort than queer participants during the gay video. However, during the lesbian video, only straight women were uncomfortable. Straight men's discomfort with the gay clip—yet lack of discomfort in the lesbian clip—suggests sexualization of lesbians rather than acceptance of homosexuality. Although we predicted that straight men would be uncomfortable during the gay video due to masculinity threats, we did not anticipate that straight women would also be uncomfortable. It is possible that straight women's discomfort is due to their low exposure to gay male sexual encounters. This “low exposure” explanation could also explain why straight men are comfortable during the lesbian video. Consistent with these interpretations, reports of prior pornography consumption predicted discomfort ratings for the gay and lesbian videos.

P66 Rationale, Creativity, and Critical Thinking

Student Researcher: Zizhen Fan '20

Major: Computer Science

Faculty Collaborator: Janet Burge, Mathematics and Computer Science

The Rationale, Creativity, and Critical Thinking project studies how design rationale can be used to assist with student cognitive development and creativity. The goal is to build assignments that use student design rationale to help teach decision-making skills so that students are encouraged to reason over their choices and make decisions based on evidence presented in class and discovered in their own research. This uses a software tool that is integrated with a Learning Management System so that these assignments can be created by their professor and used in class, lab, and homework activities. During this summer, Zizhen has transplanted this software using Ruby on Rails and connected it with Canvas.

P67 History of The Performing Arts at Colorado College

Student Researcher: Chidera Ikpeamarom '22

Major: Computer Science

Faculty Collaborator: Ryan Bañagale, Music

Colorado College has a rich history of Performing Arts, which for better or worse serves as a reflection of American society. In CC's early history, this sometimes meant performance practices that we now view as racist. Our campus archives reveal instances of blackface minstrelsy. Although highly problematic, these minstrel shows were part of the world of American entertainment both broadly and here at Colorado College. However, starting in the 1960s, performance at CC becomes increasingly inclusive. More representative cultural presentations emerged alongside theatrical productions that told stories about people from more diverse backgrounds. From the 1970s to the 1990s, affinity groups such as BSU and MEChA brought Black and Chicano performers for annual cultural awareness programming. Today, diversity in performance can be found in the range of artists CC brings to campus as well as in our own productions focused on the telling of diverse narratives. Although there is still work to do, CC is actively improving the diversity of performance on campus and there is much to learn from our collective past as we envision the future.

P68 **Instream Flow Rights in Colorado and How They Will Evolve with Climate Change**

Student Researcher: Anita Klaeser '20

Major: Environmental Policy

Faculty Collaborator: Eric Perramond, Southwest Studies

Colorado water rights are based on the prior appropriation doctrine which states that the first in time is the first in right. This first come first served system has benefitted many people, but for most of its history has not been beneficial to the environment. In 1973, Colorado created their instream flow program. This program was designed to benefit the natural stream flow and lake levels in Colorado. The program has evolved since its creation to provide the greatest benefit possible to the natural environment. Instream flow water rights can only be held by the Colorado Water Conservation Board, but the water rights may be bought, donated or acquired. Due to the changing climate, Colorado is facing reductions in stream flow and lake levels. This paper hopes to explore what the impacts of flow reduction will be on the instream flow program and how the program may evolve to continue supporting Colorado's natural environment.

P69 **Numerical Application of a Picard-Lefschitz Approach to the Path Integral**

Student Researcher: Kate Herman '20

Major: Physics

Faculty Collaborator: Johnathan Brown, Physics

The Path Integral provides a very general approach to analyzing quantum dynamics. However, computing closed form exact solutions to the Path Integral is usually impossible. Approximation schemes are then required to obtain useful results. Perturbative schemes (while very useful) cannot describe certain non-perturbative phenomena such as quantum tunneling. Traditionally the Euclidean time prescription is used to arrive at non-perturbative solutions to the Path Integral. However, a Picard-Lefschetz (PL) approach to the Path Integral may provide a schema more general than the Euclidean time prescription, which can also provide justification for Euclidean time instanton solutions. In this presentation we will introduce PL theory and cover our work numerically testing agreement between PL solutions and Euclidean solutions. To test such agreement we are producing a program which will identify the complex saddles of the action which dominate dynamics. These saddles can then be compared to Euclidean solutions for verification. Further work is required to create such a program, however we have developed some techniques for identifying the contributing saddle which are reported here.

P70 **Stochastic Models of Incoherent Feedforward Loops in Gene Regulatory Networks**

Student Researcher: Hanqing Li '20

Major: Mathematics

Faculty Collaborator: David Brown, Mathematics and Computer Science

Mathematical models help us generate a better understanding of gene regulatory networks. The incoherent feedforward loop (IFFL) is a prominent motif in gene regulatory networks and plays an important role in the self-regulation of the cell. In this paper, we focus on the behavior of IFFL under conditions of molecular noise using stochastic models. We use the Gibson-Bruck algorithm to model all four types of IFFL and compare the results with the predictions of deterministic models. We also examine IFFL under different conditions of dimerization, transcription, and translation. Our results show that in the stochastic model, IFFL manifests significant variation and lacks certain features that are demonstrated by the deterministic model. Moreover, this study sheds light on how networks perform certain functions in the presence of high levels of noise.

P71 **Semantic Maps as Windows into Universal Conceptual Structure: Accounting for Cross-Linguistic Similarity**

Student Researcher: Qichao Wu '20

Major: Neuroscience

Faculty Collaborator: Kevin J. Holmes, Psychology; Beth Malmskog, Mathematics and Computer Science

Semantic maps capture universal conceptual structure underlying semantic variation across languages. There are two components: vertices (nodes) correspond to concepts (e.g., cup on table), and edges connect related concepts. Regier, Khetarpal, and Majid (2013) used a computational algorithm to generate sensible semantic maps in the domains of indefinite pronouns and spatial categories. However, these maps do not necessarily provide the most complete and accurate picture of universal structure. Here we present several alternative methods: (1) language-weighted graphs, which depict the cross-linguistic frequency (i.e., "importance") of edges by weighting them; (2) language-based graphs, in which the basis for choosing edges is cross-linguistic frequency; and (3) order-independent graphs, in which all edges that share the same cross-linguistic frequency are included in the graph, as opposed to one edge being chosen arbitrarily. Each of these methods yields maps that are more informative than Regier et al.'s maps, though in some cases sacrificing simplicity.

P72 Analysis and Clustering of Election Data

Student Researcher: Samuel LeBlanc '20

Major: Mathematics

Faculty Collaborator: Molly Moran, Mathematics and Computer Science

A key aspect of political science is understanding how and why different demographics vote in certain ways. This information is critical to predicting the outcome of future elections and voting patterns. The goal of this project was to use mathematical techniques such as algebraic topology, graph theory and data clustering, to find demographic similarities between the roughly 3000 counties in the United States. Each county was visualized as a point in Euclidean space where the distance between counties could be used to create a topological space we could analyze. Demographics were selected based on their ability to accurately group counties based on how they voted in previous elections. Hopefully, these groups of counties can help predict future election results as well as assist in targeted advertising for campaigns.

P73 Learning from Colorado's Electric Vehicle Policy

Student Researcher: Britta Lam '20

Majors: Environmental Policy and German

Faculty Collaborator: Corina McKendry, Environmental Policy and State of the Rockies

Internal combustion engines are the second highest source of greenhouse gas emissions in Colorado. Also seen as a major factor contributing to the non-attainment zones in the Denver Metro and North Front Range areas under the EPA's clean air standards, the state has responded by establishing low and zero emission vehicle mandates. Drawing upon existing literature on best practice strategies for electric vehicle (EV) implementation, this research aims to understand the underlying reasons for the success of the electrification of private transportation within Colorado. Through interviewing state-level officials and looking through the conceptual lens of transition management, the study finds that multilevel participation and issue-framing have been key to the success of EV policymaking in Colorado. As the basis of EV policies have been justified under the motivation of improving public health, it shows that climate change policies do not need to be named as such to be successful. This framework can be used as a model for politically divided states to enact climate change policies.

P74 Water Sharing Agreements Along Colorado's Front Range

Student Researcher: Grace Harmon '20

Major: Environmental Policy

Faculty Collaborator: Corina McKendry, Environmental Policy and State of the Rockies

Buy and dry, or the permanent transfer of water rights from agricultural to municipal use, has resulted in the economic ruin and environmental degradation of rural communities in order to fuel the water demands of growing urban populations. Alternative transfer methods (ATMs) and similar water sharing agreements are upheld by the Colorado Water Plan as a pathway to avoid buy and dry and to mutually benefit both agricultural communities and urban water users. This investigation highlights the perceptions of water utility employees; regional entities, such as water conservancy districts; and third-party entities, such as land trusts, toward water leasing agreements. The current trajectory of ATMs highlights the need for long-term and reliable agreements through methods such as conservation easements, rotational fallowing, or formalized water swapping; third party investment, and education and outreach to water providers and the general public to shift socio-normative barriers to ATM implementation. These findings offer insight into how emerging agreements are building upon the traditional definition of ATMs, leading to innovative and pioneering water agreements that significantly mitigate the effects of buy and dry.

P75 **Bike Lanes and Bike Lash: Understanding the History, Implementation, Controversy, and Contradiction of Bike Infrastructure in Colorado Springs**

Student Researcher: Lily Weissgold '20

Majors: Economics and Environmental Policy

Faculty Collaborator: Corina McKendry, Environmental Policy and State of the Rockies

This study examines the city of Colorado Springs' decision-making regarding the roll out of bike infrastructure and subsequent citizen opposition. Bike lanes are one of the least expensive actions a city can take to promote multimodal transportation. Bike lanes can spark immense backlash known as 'bikelash.' From 2016-2019 two bike lane projects in Colorado Springs provoked ire from citizens, resulting in a lawsuit against the city and 'Battle of the Bike Lanes,' a community forum. However, the city continues to place new bike lanes and promote the benefits of biking. This study of the history, implementation and controversy of bike infrastructure in Colorado Springs uses qualitative interviews to categorize both the city's reasons and frames for increasing bike infrastructure and the different iterations of bikelash. This study finds that Colorado Springs, after a decades-long period of government shrinkage, has begun to grow government actions (bike infrastructure included) in order to garner increased tax revenue. It also finds that most 'bikelash' is discontent with the perceived growth of government associated with bike infrastructure implementation.

P76 **Community Power via Community Power: Pueblo's Campaign for a Municipal Utility**

Student Researcher: Ethan Greenberg '20

Major: Political Science

Faculty Collaborator: Corina McKendry, Environmental Policy and State of the Rockies

In recent years local political scales have been recognized as appropriate, necessary, and even prime jurisdictions for climate justice policymaking. Simultaneously, however, cities face critique as jurisdictions that lack the necessary capacity to deliver just responses to climate change. This paper investigates a citizen-driven attempt to reshape a city's approach to energy justice and climate mitigation via electric utility municipalization in Pueblo, Colorado. A qualitative method of semi-structured interviews with citizen advocates, city officials, state lawmakers, and the incumbent utility along with usage of gray materials such as government and advocacy documents inform this study. With reference to Pueblo, the paper discusses the movement's synthesis between low-income advocates focused on high rates and shut-off policies, climate advocates focused on renewable energies, and economic development advocates focused on retaining and attracting employment centers. In doing so, this paper argues for a characterization of municipalization as a possible energy justice strategy made feasible by falling wholesale electricity prices, including renewables, and by recasting energy as ripe for democratic contestation.

P77 **Spiraling-Up Through Drought Responses in Colorado's Agricultural Communities**

Student Researcher: Natalie Gubbay '20

Major: Mathematical Economics

Faculty Collaborator: Corina McKendry, Environmental Policy and State of the Rockies

Climate adaptation in agricultural areas occurs against a growing rural-urban divide, amid concerns of outmigration and declining small farm viability, and with considerable financial constraints. Communities' ability to respond to shocks will be paramount in this context, and a growing body of research emphasizes the importance of local assets in empowering rural communities to thrive through change. This study uses a mixed-methods approach to index adaptive capacity in Colorado's fifteen farming-dependent counties and explore the role of social, financial, natural, human, political, cultural, and built assets in community-level responses to recent drought. Findings show strong regional patterns in the distribution of social and cultural resources and suggest that drought responses are largely embedded within broader community development work. In keeping with prior literature, social capital emerges as a critical basis for rural community change. Together, results emphasize an opportunity for synthesis between community resilience and community development in both research and practice. They also offer a tool to communities looking to harness local assets more effectively.

P78 **The Power and Politics of Urban Water Output: Colorado Springs Stormwater**

Student Researcher: Luci Kelemen '20

Major: Integrated Environmental Science

Faculty Collaborator: Corina McKendry, Environmental Policy and State of the Rockies

Stormwater ties together urban environments, their people and their politics. The city of Colorado Springs, CO has a unique and complex stormwater story connected to the rapid growth and development of the area. This study utilizes archival research, interviews with local city officials and stakeholders, and relevant theory to understand the complexities of stormwater management in this city. Focusing on theories of urban political ecology and the concept of the hydro-social cycle, this study links stormwater to local political themes. While these issues once went unnoticed, recent lawsuits and intergovernmental agreements have catalyzed necessary change in the region. The study argues that the way in which Colorado Springs developed, rapidly and with little regulation, has caused robust stormwater management issues that have been poorly managed given a lack of funding in a tax averse place.

P79 **How to Translate a Centuries-Old Text Considering Historical and Cultural Context**

Student Researcher: Grace Spratley '21

Major: French

Minor: Education

Faculty Collaborator: Alistaire Tallent, French

I translated the 1741 text, *L'Histoire de Mademoiselle Cronel dite Fretillon, Actrice de la Comédie de Roüen, Ecrite par elle-même (première partie)*, into English. Using the online resources WordReference, a vocabulary source; le Dictionnaire Vivant de la Langue Francaise, a collection of dictionaries dating back to 1606; and both French and English dictionaries and thesauruses, I found that changes in meaning of vocabulary were prevalent, syntax was frequently unnatural, and the addition of foreign characters proved to be roadblocks in the translation process. A British-English to French dictionary and a French thesaurus were two equally valuable resources as I navigated this antiquated and unfamiliar text. Through this process, my knowledge of the French language and its development over time grew and I learned how to translate efficiently.

P80 **Mental Health at a Predominately White Institution**

Student Researcher: Remi Shore '20

Major: Education

Minor: Journalism

Faculty Collaborator: Chantal Figueroa, Anthropology

This paper, based on participatory action research on the culture of mental health at a PWI, aims to contribute to this literature. We argue that a clear understanding of the culture of mental health of an institution allows for the development and implementation of localized mental health programs and that a “one size fits all” should not be the approach. Through a liberation psychology framework, this study analyzed the in-depth interviews of faculty, staff, and students. Findings evidenced that in a highly competitive, neoliberal, higher education culture, academic achievement is paradoxical to student mental health/well-being. In addition to study limitations, recommendations for developing mentally healthy educational environments for students of color are provided.

P81 **Exploring the Speed of Different Implementations of Peer-Peer Communication**

Student Researcher: Mataan Pe'er '21

Major: Computer Science

Faculty Collaborator: Ben Ylvisaker, Mathematics and Computer Science

Decentralized systems are resilient against privacy and government IP blocking but implementing one can bring up obstacles. The obstacle that was the focus of this project is what technology implementations are fastest for transmitting data from one peer to another. We compared 4 main technologies, WebRTC, Websocket relay server, simple cloud relay server, and dropbox signaling. Websocket and WebRTC times are similarly low-latency while simple cloud server is one order of magnitude higher in latency. Dropbox signaling however is [Insert data here when you have it]. With this data we conclude that while WebRTC is a faster service than dropbox signaling, NAT traversal can be unstable in which cases Dropbox signaling can be used as a reliable backup.

NON-PRESENTATION RESEARCH

Examining the Legacy of Severe Fire on Soil Carbon Cycling in Montane Landscapes in and around the Hayman Burn, Colorado

Student Researcher: Cheristy Jones '20

Major: Environmental Science

Faculty Collaborator: Rebecca Barnes, Environmental Science

Research Collaborators: Michael J. Wilkins, Carly Bonwell '20, Michelle Wolford '20

As the climate continues to warm, the frequency and severity of wildfires are expected to increase, altering global carbon stocks. Microbial communities are important to carbon cycling and sequestration. Here we investigate soil microbial communities present in the 2002 Hayman burn in Colorado to determine microbes' role in building soil carbon stocks. Soil was collected along a geomorphic gradient of three burned watersheds and two unburned, nearby reference watersheds. Soil respiration, measured in 6-week soil laboratory incubations, is not significantly different ($p = 0.79$) between burned and unburned watersheds. However, carbon content in burned watershed soils is ~60% lower than unburned watersheds. Thus, soil organic matter (SOM) in burned watersheds is ~47% more bioavailable than unburned watersheds and is statistically significant ($p = 0.00034$). Higher bioavailability could be due to soil organic matter quality or shifts in the microbial community. Comparison of the SOM and respired CO_2 $\delta^{13}\text{C}$ will help partition preferential sources of carbon. Soil microbial community richness and diversity will be determined using 16S RNA gene sequencing. We hypothesize that burned watersheds will have soil microbial communities that are distinct from unburned locations. Microbial carbon processing could form a positive feedback cycle that inhibits the ability of carbon stocks to increase, which affects post-fire recovery.

Impact of Severe Fire on Stream Carbon Fluxes and Metabolism Across a Mesic Montane Landscape

Student Researcher: Carly Bonwell '20

Major: Environmental Science

Faculty Collaborator: Rebecca Barnes, Environmental Science

Fire transforms carbon stocks within a watershed, subsequently altering watershed carbon dynamics for decades to come. We analyzed the nutrient and DOM chemistry and metabolism of streams draining three watersheds within the 2002 Hayman burn scar and two watersheds unaffected by fire. Results indicate that while soil in burned areas contains ~61% less organic matter, a greater proportion of that soil C is extractable organic matter (i.e. more DOM is exported to the stream). While preliminary results show no statistical difference in stream DOC concentrations, DOC in streams draining fire impacted landscapes is less aromatic ($p < 0.001$) than DOC in nearby reference streams. This less aromatic DOM appears to be more bioavailable, as determined by short-term dark bucket incubations, and is therefore more likely to contribute to stream CO_2 loads. Whole stream metabolism metrics (ER, GPP and NEP) will provide insight as to how these pathways and processes change over time. Such measurements, in addition to isotopic characterization of DOM and DIC, will also provide important estimates of the amount of CO_2 released from burned streams through metabolism versus terrestrially derived DIC.

Electrocrystallisation Project

Student Researcher: Prakhar Gautam '20

Major: Physics

Minor: Biochemistry

Faculty Collaborator: Eli Fahrenkrug, Chemistry and Biochemistry

Research Collaborator: Cecelia Mweka '20

The polymorphic phase of crystals underpins key attributes of drug solubility, bioavailability, stability, and downstream processing. This work aims to model a parallel plate cell on an electrolytic capacitor design to develop large electric fields within the electric double layer interfaces to position paracetamol molecules into Form II orthorhombic polymorphs. Form II has higher solubility and is readily compressible into tablets. The parallel plate electrical double layer cell successfully delivers electric fields on the order of 1 V/nm to a thin layer solution. Electrochemical characterization demonstrates the long-term stability of the cell, dielectric breakdown, and overall electric field intensities that can be applied to solution. Application of this cell to a ring opening epoxide reaction and the resulting modulation of product ratios highlights the effectiveness of the cell. Efforts to affect molecular nucleation are described in the context of supersaturated solutions of paracetamol subject to fields for 4-12 hours with temperatures from room temperature to -6 C. Raman spectroscopy and X-ray diffraction characterization of the crystals are used to confirm polymorph identity.

from **MEGAN NICKLAUS**
Career Center Director

What are internships?



Internships provide high-impact experiences that allow students to demonstrate their ability to apply the knowledge and skills they are learning in the classroom to workplace settings. Through these applied learning experiences students enhance their existing skill set, expand their professional network, and discern future career goals. Colorado College students participate in a wide array of internships in various roles and industries.

This summer over 90 students received Summer Internship Funding Awards, allowing them to participate in internship opportunities many of which remain unpaid or underpaid. All currently enrolled Colorado College students are eligible to receive one award during their undergraduate career. Students who receive funding participate in prep programs, reflection activities, and ongoing support and feedback to enrich their internship experience.

Students also participated in two signature internship programs. The Edge Internship Program, which supports rising juniors and rising seniors in applying their liberal arts education in the corporate sector through paid summer internships. As well as, the Public Interest Fellowship Program, where students participated in paid Colorado fellowships in the non-profit sector.

I hope you enjoy hearing about their unique internship experiences.

Visit:

www.coloradocollege.edu/offices/careercenter/internships/internship-funding-awards.html

EDGE INTERNSHIP PROGRAM POSTER PRESENTATIONS, ABSTRACTS P1-P3

P1 Cisco Systems in Denver, CO

Student Intern: Brianna Fuentes '21

Major: Computer Science

For my internship I was working as an Artificial Intelligence and Machine Learning Software Engineer. I used Artificial Intelligence algorithms and Machine Learning integration for Predictive Analysis. I did this by running traffic on the Cisco system, and I identified what it means to have a healthy system based off of Key Performance Indicators. Using this data, I compared it to artificial data and used AI algorithms to predict when the system is going to fail. This internship was impactful for me to see how the skills I have been developing and learning in the classroom were applicable in a professional environment. As a result of this internship, I plan on applying to graduate programs upon graduation in Artificial Intelligence.

<https://www.cisco.com>

P2 Blue Shield of California, San Francisco, CA

Student Intern: Jio Chang '20

Majors: Molecular Biology; **Minor:** Chinese Language

I was a Digital Customer Experience intern in the Marketing Department of Blue Shield of California. I worked in product management and led a project on information architecture. I learned so much from specific product management platforms to writing stories for products. It was a great way to start a career at the forefront of health and technology. After this experience, I am looking to continue this momentum at startups in Denver. <https://www.blueshieldca.com/>

P3 Cisco Systems in Denver, Colorado

Student Intern: Sam Mayer '20

Major: Economics

This summer I had the pleasure of working for Cisco Systems as a Business Operations Analyst Intern in Denver. I helped to identify problems and opportunities and helped provide analytical solutions for the Business Operations team that works for Cisco's Mobility and Automation division. By collaborating with Cisco's finance and engineering teams, I helped to develop initiatives and strategies to improve internal and external reporting of data. My internship experience was extremely positive; I was able to learn about a sector of business that I had previously known nothing about, I was able to work with amazing people, and I was able to learn a good deal about myself in the process. I feel extremely grateful, both for the entire team at Cisco and for the Edge program. I gained invaluable experience and feel more prepared to enter the business world. <https://www.cisco.com>

INTERNSHIP POSTER PRESENTATIONS, ABSTRACTS P4-P18

P4 **Mirima Dawang Woorlab-gerring Language and Culture Centre, Kununurra, Australia**

Student Intern: Ula Adamska '20

Majors: Anthropology & Spanish-Hispanic Studies; **Minor:** Linguistics

I did my internship at Mirima Dawang Woorlab-gerring Language and Culture Centre in Kununurra, Western Australia, whose mission is to document, preserve, and revitalize the language and culture of the Miriwoong and Gajirrabeng people, the original inhabitants of the lands around Kununurra. Miriwoong is classified as a critically endangered language, with only a handful of fluent speakers left. I was interested in learning about different strategies used in language revitalization, the importance of community involvement in preserving languages and cultures, and generally getting an experience in linguistic fieldwork. Being a linguistics intern and working closely with Aboriginal people allowed me to experience their culture and language in ways I wouldn't be able to otherwise. Learning about different social issues present in the community and how the language revival cannot be separated from these problems was probably the most impactful and valuable experience that changed how I think about preserving languages. <http://mirima.org.au>

P5 **Congresswoman Diana DeGette, Washington, DC**

Student Intern: Elias Asher '21

Major: Political Sciences

This summer I had the opportunity to live and intern in Washington D.C. for two months. As with many fast-paced jobs, my daily schedule fluctuated. I would attend two-three briefings a week on various issues. I would then write memorandums on the briefing and send them to the staff member that corresponds to the issue. I attended briefings on topics like rural health care policy, NGO reports from the U.S./Mexico border, and an update on the NASA mission to send the first woman to the moon. I was fortunate enough to form a great working relationship with our Senior Environmental Policy Staffer and had my research in a letter sent to EPA Director Andrew Wheeler. I enjoyed the experience of working in an office. From dressing appropriately to workplace interactions. I also learned how it truly takes a village for an office, nevertheless a Congressional office to function. There are so many different staff members who play key roles and without them the Congressman/woman could never legislate effectively. The biggest takeaway from this experience is the importance of leadership in an office. There are times when the office environment can feel hectic and unorganized, this is when an effective leader ensures that his/her staff are all on the same page. <https://degette.house.gov/>

P6 **Concrete Couch (Non-Profit), Colorado Springs, CO**

Student Intern: Kate Barnes '20

Major: Cognitive Science

I came to the couch with the belief that a close community is the foundation necessary for many other parts of living. This summer, I helped build community with the summer interns and volunteers on the new Concrete Coyote land through a variety of activities. I encouraged the Coyote people to learn to talk with one another and visitors passing through from the Shooks trail, as well as gain an understanding of the wildlife and the land itself. Planting trees inspired discussions of what trees need to live: nutritious soil, gravel for drainage, sunlight. Billy the crow was spotted in a pair of old pants, so the pants were left in the water so as not to take away Billy's home. I also led discussions with interns about how to respectfully convey the land's history and make the Concrete Coyote project feel welcoming to the houseless people who once occupied the land. I encouraged interns to think about safety, and how littering is unsafe for the earth's health, and loud noises or fast movements can scare animals away. Conversations about respect and being aware of surroundings throughout summer trail-building, construction and art activities helped solidify the community and improve the quality of the work that was done. <http://www.concretecouch.org/>

P7 **Metro Denver Partners, Denver, CO**

Student Intern: Dara Bellinson '21

Major: Sociology

Throughout my experience at the Metro Denver Partners Summer Academy, I realized how much I enjoy working with adolescents. The connections I made with my students were strong and I could feel us growing symbiotically. Working with teenage girls proved to be very important to me and I will look for future careers in this area. I learned a lot about the inner workings of a nonprofit, but I also learned many skills alongside the girls such as meditation, empowerment, and healthy eating. Lessons that I taught the girls are lessons I taught myself and can teach others. My abilities to cater to learning disabilities and support girls with behavioral troubles were strengthened. This role allowed me to exercise empathy, a skill I plan to utilize daily in the future. www.metrodenverpartners.org

P8 **Society for Menstrual Cycle Research, Colorado Springs, CO**

Students Interns: Ciara Bowen '21, Ellen Buford '20, Nan L Elpers '20

Majors: Psychology

The Society for Menstrual Cycle Research (SMCR) is a non-profit organization and interdisciplinary research society that bridges menstruation research from multiple academic and industry fields. SMCR's goal is to inform policy around menstruation, conduct ethical research, promote informed public conversations to de-stigmatize menstruation, and combine interdisciplinary knowledge. The SMCR held its biennial conference at Colorado College this summer which provided the opportunity to be involved in the planning, execution, and follow-up evaluation of the conference. Interns were able to contribute to this important work for women's health, and gain exposure to the research presented. <http://www.menstruationresearch.org/>

P9 National Council on U.S. Arab Relations, Washington, DC

Student: Nick Cleveland-Stout '22

Major: Political Science

My internship with the National Council on U.S. Arab Relations (NCUSAR) gave me invaluable experience and a closer look at the wheels that turn Washington, DC. NCUSAR is a well-established organization in DC, founded and led by Sir John Duke Anthony, who's lectures I attended bi-weekly. Through NCUSAR, I have been able to visit places such as the Saudi Embassy, Aramco, Al Jazeera, the Hoover building, and more. Additionally, I worked 40 hours a week at *Hands Along the Nile*, a nonprofit organization that does developmental work in Egypt. We had workshops including a Model Arab League that allowed us to dive deep into Gulf politics and history. This summer has given me immense opportunity as I navigate job possibilities going forward. I am extremely grateful for the career center for providing me with this opportunity. <https://ncusar.org/>

P10 'Āina Archaeology/DTL Studio, Honolulu, HI

Student Intern: Charles Fox '21

Major: Integrative Design and Architecture

During my internship I helped develop a number of proposals and reports for various clients and created or refined marketing materials for 'Āina Archaeology and DTL Studio. As a graphic design intern this primarily involved logo design, photo editing, document formatting, and creating infographics. I also helped out with some data analysis and content editing. Every day I had the opportunity to hone and advance my skills in Photoshop, Illustrator and InDesign, and apply them to the needs of the company and their clients. The most significant adjustment for me was sitting at a computer for 8 hours a day. Even though I generally enjoyed my tasks, going forward I want to look for opportunities that involve some hands-on work. <http://www.ainaarch.com/> & <https://dtlstudio.com/>

P11 Ingka Centres China, Shanghai

Student Intern: Yuchen (Jack) Gu '20

Major: Mathematical Economics

As an Expansion & Business Development Intern at Ingka Centres China, I am mainly responsible for two rounds of internal sales for employees in Ingka Centres China. Coordination of such a series of events can be challenging to me. It requires strong communication skills, multi-tasking skills, as well as Excel skills. Communications were not limited to colleagues and managers. I gradually explored ways of effectively communicating with them during my internship. Besides, both inventory list and sales summary required me to use Excel as a tool. Lots of repetitive work were involved among those tasks, so I learned more Excel skills during my work in order to efficiently deal with the massive data. www.ingkacentres.com

P12 **Slow Food Denver, Denver, CO**

Student Intern: Eliza Guion '20

Major: Sociology

Working for Slow Food Denver as a mostly remote Communications and Social Media/ Grantwriting intern has been a fruitful and inspiring summer internship. As our world becomes increasingly digitized, I looked forward to testing out remote, computer-based work. It was an interesting challenge and quite extreme change from the Block Plan, and I found it difficult but rewarding to figure out ways to hold myself accountable and stay productive with little oversight throughout the summer. This internship also let me see into the innerworkings of a small non-profit, its highlights and its struggles, which will help me know what to look for as I search for a job after CC. Additionally, offering support to Slow Food USA as they threw their annual food festival, Slow Food Nations (attended by 30,000 people!), was a wonderful networking opportunity with people working in food justice around the country and the world. <http://www.slowfooddenver.org/>

P13 **Worky, Mexico City, Mexico**

Student Intern: Isabel Gutierrez Papacostas '20

Majors: Computer Science and Spanish

Being a software intern for Worky was definitely one of the most insightful work experiences I've had so far. From a technical point of view, my boss had high expectations and important responsibilities for me that pushed me to learn quickly and to work efficiently. I became unafraid of making mistakes and asking questions, which soothed my way through the learning experience. Programming became more enjoyable when I knew how to be resourceful. My biggest take away, however, was the relationship I developed with my boss. In addition to this teaching with regards to programming and problem solving, he was a great friend in the city and introduced me to many people that will be important in my future. He gave me advice on career paths, and made me a job offer to return after graduation. <https://worky.mx/>

P14 **The Center for Biodiversity and Conservation at The American Museum of Natural History, New York, NY**

Student Intern: Katherine Hade '22

Major: Anthropology (and prospective O.B.E. major)

My hope for this internship is to understand what a career in conservation may look like, and become closer to that goal through experiences and skills gained here. My work at The Center for Biodiversity and Conservation (The CBC) ranged from researching and writing articles on women in conservation, to learning how to use the mapping and spatial analysis software QGIS and mapping mine concessions in Argentina. I had the opportunity to visit scientists in the field on two occasions, interview various staff members at The CBC to listen to their career stories, and much more. On some occasions, I may even spend hours doing library research on a specific topic and building literature databases working in endnote or zotero, two popular programs used in science for managing literature and citations. I was given a glimpse into the world of conservation, the methods and technologies used, and the diverse range of career paths. As I continue on the road to a career in conservation, I will forever take this experience with me. <https://www.amnh.org/research/center-for-biodiversity-conservation>

P15 National Review, New York, NY

Student Intern: Nate Hochman '21

Major: Political Science, **Minor:** Journalism

It's difficult to overstate how excited I was for my internship at National Review – the magazine, its writers and its storied history in American politics have all been sources of inspiration for me for as long as I have been interested in political journalism. Knowing this, one might reasonably expect that I would be underwhelmed – after all, it is just an office job at the end of the day. But nothing about the experience was underwhelming – my dream internship turned out to be every bit as dynamic and fascinating as I hoped it would be. Editorial interns were essentially treated as junior writers, pitching our article ideas to the senior editors every morning and then submitting them for edits from those same editors before eventually being published. This meant I was working closely with some of my intellectual heroes – names and faces that had previously been larger-than-life figures for me. I still have to pinch myself when I think about it. www.nationalreview.com

P16 University of Western Ontario, London, Ontario

Student Intern: Julian Moulton '20

Major: Organismal Biology and Ecology

I have always been interested in biological research, but this past year I have become more and more intrigued by entomology. I wanted to work in the Sinclair Lab because it would help me gain experience in that field, and I would be participating in important research that has far reaching implications for the survivability of species during the climate change era. I had never had so much autonomy over my own research projects before, which was a challenge, but it was invaluable experience for graduate school. I now have a better understanding of how physiological research is performed and how to work in a research lab. I still plan on going to graduate school, and this internship has shown me that entomology is an option for my future research. <https://www.uwo.ca/>

P17 U.S Department of Commerce Boulder Labs (NOAA Boulder), Boulder, CO

Student Intern: Kyrie Newby '21

Major: Organismal Biology and Ecology, Music

My internship at NOAA was a unique experience in understanding the combination of governmental work, environmental work, and scientific exploration. Based on the information I knew before coming in, I hoped to learn about the past, present, and future of polar research in the arctic as well as effective mapping techniques. I was mostly independent in the work itself, so I needed to pace myself and plan my daily agendas very carefully. I fell into this routine very naturally, but I sometimes struggled with remembering to take breaks and step back from my work. Polar research was not something I had really considered in my future before this internship, but examining the wide scope of research and characteristics of individual arctic stations has been incredibly interesting and has proved to be instrumental in the future of climate understanding, so I hope to pursue more arctic research opportunities in my career. <https://www.boulder.noaa.gov/>

P18 Lutheran Family Services Rocky Mountains, Colorado Springs, CO

Student Intern: Anabella Owens '21

Major: Anthropology

When I originally applied for this internship, I hoped to learn about the internal processes of legality of someone seeking asylum or refuge in the United States. Though unfortunately LFS is unable to be involved in any client matters of obtaining legal status in America, this internship gave me a lot of insight into what refugees and asylees go through once they are considered legal in America. My biggest challenge and frustration with this internship was witnessing the organization trying to help clients to the best of its ability despite extreme government cutbacks on funding for refugee resettlement at the hands of the current presidential administration. Most importantly, this internship has solidified for me that in the future I see myself working with and helping people who come from different places than me succeed in spaces outside of their comfort zone. www.lfsrm.org

INTERNSHIP POSTER PRESENTATIONS, ABSTRACTS P19-P32

P19 **Docs in Progress, Silver Spring, MD**

Student Intern: Celia Herdic '21

Major: Environmental Science

I interned at Docs in Progress, a unique documentary film organization that brings filmmakers and audiences together to elevate untold stories. Within the organization, I assisted in filmmaking camps for both children and adults. Explaining movie composition but also technical camera and software work, forced me to think deeply and creatively about how to instruct the discipline I love. I discovered that my teaching ability came instinctively, and it allowed me to grow further into my art form. The most challenging aspect was differentiating my teaching style to those of my students, especially the younger children. Despite this demand, my diverse group of learners created great films. While shooting and editing films has always been my passion, this experience validated my love for the movie making process. Whatever my career path, I will use the teaching and presentation skills I honed during this internship and stay passionate about communicating through the visual arts.

<https://www.docsinprogress.org/>

P20 **KKTV 11 News, Colorado Springs, CO**

Student Intern: Emily Ng '20

Major: Mathematical Economics, **Minor:** Journalism

I wanted to explore TV journalism, and I came out with extensive multimedia experience. Writing, reporting, and editing stories for the fast-paced workplace at KKTV 11 News conditioned my broadcast writing voice. I was challenged most with workplace dynamics in a close-knit newsroom, but in many ways, they made me feel like family. It's a delicate balance that can suffer when shaken by loss, which my newsroom unfortunately suffered this summer. This experience has shown me what a broadcast newsroom is like in the best and worst of times. I think I'll keep my options open, but I will apply for some TV Journalism positions this year, my senior year. <https://www.kktv.com/>

P21 **American Transplant Foundation, Denver, CO**

Student Intern: Emma Paradiso '20

Majors: Anthropology & French

During this internship, I hoped to gain valuable professional work experience and to determine if I enjoyed working for a non-profit organization. My time with the American Transplant Foundation was extremely rewarding. One of my biggest takeaways from this experience was just how much of an impact a small organization can have. One of my most memorable experiences was meeting Governor Polis at Capitol Hill after having drafted some of the language that helped pass the Colorado Living Donors Insurance Act. This event was an exciting step toward making Colorado the first state where nobody dies while awaiting an organ transplant, and I was honored to be a part of it. This internship has helped confirm for me how important it is that my career after CC involves meaningful work like this. www.americantransplantfoundation.org

P22 **African Community Center, Denver, CO**

Student Intern: Anna Renkert '21

Major: Political Science

In my internship at the African Community Center, I worked in the case management department with newly arrived refugees, SIVs and Asylum seekers. I hoped to get experience working at a nonprofit with people from different backgrounds and I wanted to learn more about displaced people's experiences both getting to the US and resettling here. This experience definitely challenged my ability to problem solve while working independently with clients who spoke very little English while both of us faced cultural differences. This internship impacted my future plans as I am now more interested in pursuing a career helping people involved in the global migration crisis and am considering law school for immigration law. Additionally, I hope to increase my Spanish language skills, I plan to take more international relations and comparative politics classes; as well as considering a minor in Feminist and Gender Studies or Race, Ethnic, and Migration Studies; and now plan to take the LSAT before graduation. <https://www.acc-den.org/>

P23 **The Norris Cotton Cancer Center at Dartmouth-Hitchcock Medical Center, Lebanon, NH**

Student Intern: Grace Rosner '22

Major: Undeclared

This summer, working as a biomedical research intern in the Steven Leach Lab for Pancreatic Cancer, was one of the most impactful academic experiences I've ever had. This internship was a last-minute decision, so I was not expecting to receive such personalized and dedicated mentorship. Besides the large amount of biological knowledge and technical skill I have gained this summer, the members of the Leach lab have further taught me about aspects of scientific thinking. Such as, taking large ideas and turning them into practical and detailed analyses – as well as the challenge of designing a scientific presentation that is concise, yet both conveys the message clearly and builds throughout the presentation. The real-time problem solving, manipulation of ideas and data, and the collaboration I have witnessed this summer have made a great impact on my mind and motivation. <https://cancer.dartmouth.edu/>

P24 **Berkeley Early Learning Lab at UC Berkeley, Berkeley, CA**

Student Intern: Asha Rudrabhatla '20

Major: Psychology

As a psychology major hoping to learn more about the intersection of social justice advocacy and psychology in the context of developmental psychology, I have really enjoyed the opportunity to take an active role in the meaningful research conducted at the Berkeley Early Learning Lab as a summer intern. Through participating in the data collection process, I have learned so much not only about cognitive development and how research can reveal important relationships between environment and the development of social beliefs, but also how this research can be applied as a tool for social change to foster a more equitable and inclusive society. With this in mind, in the future I am interested in exploring further research involving cognitive and sociocultural factors in other fields such as clinical psychology, as I hope to help close the gap between research and practice and thus help promote accessible and inclusive psychological treatments. <https://www.babylab.berkeley.edu>

P25 **Big Island Physical Therapy by Pākōlea, Hilo, HI**

Student Intern: Ian Sanborn, '20

Major: Computer Science, **Minor:** Human Biology and Kinesiology

By interning at Big Island Physical Therapy, I hoped to gain a greater understanding of what it is like to be a physical therapist. I hope to expand on my knowledge of the human body and its physiology, that I have learned in class, and apply it to real life situations to help patients in achieving their goals. I also hoped to learn more about different therapy techniques and methods that I do not have much experience with. Lastly, I hoped to learn about what it takes to become a good physical therapist and the actions that I need to take in the near future to achieve my goals. Throughout this internship I worked closely with the head physical therapist and clinical assistants to guide and assist patients through exercise and treatment plans. I also focused on building strong and trusting relationships with each patient. <https://pakolea.com>

P26 **Lutheran Family Services, Colorado Springs, CO**

Student Intern: Natalie Sarver '20

Major: Neuroscience, **Minors:** Chemistry and Physics

I have volunteered for Lutheran Family Services Refugee and Asylee Programs for three years. The office is smaller than three years ago because of changes to the number of refugees the US accepts. However, it is still thriving, supporting our newest neighbors who have been through hardships unimaginable to me. This summer, I worked full-time in the office on employment, education, healthcare, and even some interpretation needs for newly arrived refugee families. Some projects included: co-running a summer camp for elementary and middle school refugees in which we had fun singing, doing arts and crafts, and soccer, as well as working on mathematics and English; and helping with a New American Pathways program to help refugee adults who are currently employed advance their careers. I am passionate about helping people connect with opportunities and start a life in a country I have been privileged to always call my home. <https://www.lfsm.org/programs-and-services/refugees/>

P27 Office of Senator Michael Bennett, Washington, DC

Student Intern: Charlotte Schwebel '21

Major: International Political Economy

Working in the United States Senate this summer was an incredible experience that will stay with me for the rest of my life. I was able to work closely with a healthcare fellow on surprise billing legislation and research topics at the forefront of the healthcare debate. I had hoped to learn about how legislative decisions are made, and in weekly conversations with the legislative director, I was able to ask questions that left me far more informed. Talking for an hour and a half with a senator running for president, and grilling his chief of staff for three hours, are experiences I will never forget. This summer has made it clear that, if I can, I'll be spending far more time in the US Congress. <https://www.bennet.senate.gov/public/index.cfm/>

P28 HealthRight International, New York, NY

Student Intern: Willa Serling '20

Major: Anthropology, **Minors:** Global Health, Human Biology and Kinesiology

Through this internship, I hoped to learn what it was like to work for a U.S. based INGO. I was eager to learn more about program implementation, grant management and business development. My biggest takeaways include understanding certain challenges INGOs face as well as how to perform ethical health development practices and maintain effective business development strategies. I was most challenged by learning how to use Raiser's Edge software to manage fundraising and excel. Within the first week of the internship I learned more about excel than I had in any previous class. Towards the end of the internship, however, I helped lead a workshop for the other interns on excel tips and tricks. This internship has affirmed my interest in pursuing a career in the global health field. I would love to return to work for this organization or another INGO with a similar mission, approach and structure to HealthRight International. <https://healthright.org>

P29 Institute of Strategic Studies Islamabad (ISSI), Islamabad, Pakistan

Student Intern: Awais Syed '20

Major: Political Science, **Minor:** Russian

Since freshman year when I spent a week in DC on a Career Center Tiger Trek, I have been keenly interested in working in international relations think tanks such as ISSI. My learning goals were to learn about what work these think tanks exactly do, what my day to day job would look like, do I find pleasure in this line of work and finally if it is actually impactful. It was overall a very positive experience where I got to work on interesting projects such as confidential briefs for the foreign minister of Pakistan; however, at the same time it made me think more about whether I want to do this work long-term. It was mundane at times to churn paper after paper and I'm now looking into becoming a professor as that position allows me to do research on my own terms whilst mentoring students. <http://www.issi.org.pk/>

P30 OrcaLab, Hanson Island, British Columbia, Canada

Student Intern: Emily Vierling '21

Major: Organismal Ecology and Biology

This summer, I spent two months living in a tent on a remote island assisting with Orca vocalization research in British Columbia. In 1970, Dr. Paul Spong and his wife, Helena Symonds, founded OrcaLab, a small land-based whale research station with the objective to observe and study Northern Resident Orcas without interrupting their lives or habitat. OrcaLab has one of the biggest archives of Orca vocalizations in the world, with access to six different hydrophones and cameras spanning over 11 miles through the "Inside Passage" of northern Vancouver Island. My job in the lab identifying and recording vocalizations was rigorous, but extremely rewarding. From the wildlife to the research, I think anything I could say would fall short of accurately portraying the intensity with which the past two months' events have been felt. I will take away so much, but the appreciation for this place, still so wild and free, will stay with me forever. Thank you Paul, Helena and OrcaLab for an incredible summer. Orcalab.org

P31 Shanghai Media Group, Shanghai, China

Student Intern: Bingqing (Zoey) Zhou '20

Major: Film and Media Studies

Before arriving at SMG, I hoped to learn how Chinese TV industry works, especially how entertainment shows operate. Luckily, this summer, I interned for the producer of a medium-sized entertainment show. I assisted the directors and producers throughout all stages, including pre-production, filming, and post-production. This experience is very different from working on projects in college because each production involves over a hundred people. I was challenged by staying in good communication with all team members, but it turned out to be completely manageable as long as I stayed active and attentive. This is the first time for me to be an intern outside of Colorado College and work on such a complex project. This internship is not only a way for me to learn new things, but also a way to inform me about what a type of career can be like, which is immensely meaningful when it comes to making career choices. This internship has allowed me to see how different working for industrialized projects can be from working on independent ones. https://www.smg.cn/review/english_index.html

NON-PRESENTATION INTERNSHIP SITES OF FUNDING RECIPIENTS

Inside Out Youth Services, Colorado Springs, CO

Student Intern: Marve Aguinaga, '21; Major: Philosophy

National Institutes of Health, Bethesda, MD

Student Intern: Hugh Alessi '20; Major: Neuroscience

The Culinary Edge, San Francisco, CA

Student Intern: Sam Aronson '20; Major: Economics

American School of Classical Studies, Athens, Greece

Student Intern: Tianyi Bai '21; Major: Classics and Anthropology

Heritage Radio Network, Brooklyn, NY

Student Intern: Oscar Belkin-Sessler '20; Major: Political Science, Minor: Journalism

IBC International, Longmont, CO

Student Intern: Zach Berzolla '21; Major: Economics

Joan Crescent Manor Holdings, Victoria, British Columbia

Student Intern: Kristian Blumenschein '21; Major: Business and Economics

Lesné Lab, Minneapolis, MN

Student Intern: Hugh Cashman '20; Major: Neuroscience

Green Rose Social Work Service Center, Guangzhou, Guangdong, China

Student Intern: Yajie (Angelina) Chen '20; Major: Anthropology

Health Care Cost Institute, Washington, DC

Student Intern: Elianna Clayton, '20; Major: Economics

Promising Pages, Charlotte, NC

Student Intern: Sylvia Cummings, '22; Major: English Literature

Cybercon, St. Louis, MO

Student Intern: Xinling Dai, '20; Major: Mathematics, Minor: Computer Science

Chester County District Attorney's Office, West Chester, PA

Student Intern: Emily Dodds, '20; Major: International Political Economy

Not Impossible Labs, Venice, CA

Student Intern: Evan Doherty, '20; Major: Cognitive Science Independently Designed Major

Kopp Investment Advisors, Minneapolis, MN

Student Intern: Jonathon Flakne, '21; Major: Economics

Smile America Partners, Farmington Hills, MI

Student Intern: McKay Flanagan, '21; Major: Economics and Business

The Tibet Fund, Dharamshala, India

Student Intern: Fisher Gates '21; Major: undeclared

Boonstra Construction, Oceanside, CA

Student Intern: Jack Gates, '21; Major: Economics

Peak Startup, Colorado Springs, CO

Student Intern: Prakhar Gautam, '20; Major: Biochemistry

Special Tribunal for Lebanon, Leidschendam, Netherlands

Student Intern: Ben Gellman, '22; Major: Undeclared

Midwest Orthopedics, Chicago, IL

Student Intern: Abbott Gifford, '22; Major: Undecided

Meridian International Center, Washington, DC

Student Intern: Julia Gledhill '20; Major: Economics and Business

Evan Guthrie Law Firm, Charleston, SC

Student Intern: Ross Goldberg '20; Major: Political Science

24/7 Teach, New York, NY; and Seri Media, Shanghai, China

Student Intern: Mowei Jiang '21; Major: Film and Media Studies

American Civil Liberties Union, New York, NY

Student Intern: Tali Juliano '21; Majors: Race, Ethnicity, and Migration Studies and Sociology

Food and Drug Administration, Silver Spring, MD

Student Intern: Stokes Kandzari '21; Major: Art Studio and Biochemistry

Cinematic Music Group, Brooklyn, NY

Student Intern: Tarin Karimbux, '21; Major: Race, Ethnic, and Migration Studies, Minor: Studio Art

Nepal Institute of Development Studies (NIDS), Kathmandu, Nepal

Student Intern: Anusha Khanal, '21; Major: International Political Economy

Girls Who Invest Program/Partner Group, Broomfield, CO

Student Intern: Anastasiia Kharitonova '21; Major: Economics and Business

Palmer Land Trust, Colorado Springs, CO

Student Intern: Bekah Latham, '20; Major: Integrative Design and Architecture

Travis County District Attorney, Austin, TX

Student Intern: Daniel Lawrence, '20; Major: Philosophy

Santa Barbara International Film Festival and Orly Adelson Productions, Westwood, CA

Student Intern: Sophie Lebow '20; Major: Film and Media studies

Industry Arts, Los Angeles, CA

Student Intern: Annemarie Lewis '21; Major: Organismal Biology and Ecology

El Centro de la Raza, Seattle, WA

Student Intern: Olivia Liu '21; Major: English

CARE, Washington, DC

Student Intern: Perry Lum, '20; Major: Political Science

Office of Congresswoman Diana DeGette, Denver, CO

Student Intern: Anna Marcus '21; Major: Political Science

Washington Spirit, Germantown, MD

Student Intern: Catie McDonald, '20; Major: Psychology, Minor: Journalism

Inkwell Management, New York, NY

Student Intern: Kendal McGinnis '20; Major: Creative Writing

Office of U.S. Senator Michael Bennet, Denver, CO

Student Intern: Andra Metcalfe '22; Major: Political Science

Wayfinder Education, San Francisco, CA

Student Intern: Keller Mochel '20; Major: Economics and Business

AL Media Strategy, Chicago, IL

Student Intern: Max Moog, '21; Major: Political Science

JAMBOX Entertainment Studios, New York City, NY

Student Intern: Wyatt Morrison '22; Major: Political Science

Peak Startup, Colorado Springs, CO

Student Intern: Thomas Ory '20; Major: Physics

The Legal Rights Center, Minneapolis, MN

Student Intern: Evva Parsons, '20; Majors: Political Science, German

Women's Sports Foundation, New York City, NY

Student Intern: Susanna Penfield, '20; Major: Political Science, Feminist and Gender Studies

University of California-Riverside, Riverside, CA

Student Intern: Charles Schneider '20; Major: Organismal Biology and Ecology

Greenpoint Pictures, Brooklyn, NY

Student Intern: Benjamin Schwaeber '20; Major: Film & New Media

EcoAdapt, Bainbridge Island, WA

Student Intern: Jessie Sheldon '21; Major: Integrated Environmental Science

Massachusetts General Hospital, Vaccine and Immunotherapy Center, Boston, MA

Student Intern: Robert Shepard, '21; Major: Molecular Biology

Aramark Refreshment Services, Denver, Colorado

Student Intern: Cecelia Sommer '20; Major: Sociology

Bureau of Health Promotion for Justice-Impacted Populations at NYC Department of Health and Mental Hygiene, Long Island City, NY

Student Intern: Josephine Stevens '21; Major: Computer Science

University of Colorado Anschutz Medical Campus, Department of Medicine, Division of Endocrinology, Metabolism, and Diabetes; Aurora, CO

Student Intern: Bryan Swanson '21; Major: Biochemistry

WUWM, Milwaukee, WI

Student Intern: Alesandra Tejada '20; Major: Environmental Studies

University of California San Diego, La Jolla, California

Student: Mitch Turner '20; Major: Neuroscience

U.S. Public Interest Research Network, Denver, CO

Student Intern: Maddy Unger '21; Major: Environmental Studies Minor: Anthropology

The Center for Applied Nonviolent Action and Strategies (CANVAS), Belgrade, Serbia

Student Intern: Theodore Weiss '21; Major: Political Science

Capital Group, Norfolk, VA

Student Intern: Remy Wells, '20; Major: Economics

Redbird Physio, Bend, Oregon

Student: Tayla Wheeler '21; Major: Organismal Biology and Ecology

Guotai Junan Securities, Chengdu, China

Student: Wenqian (Shadow) Wu '22; Major: Economics

Civic Party, Hong Kong

Student: Kelly Yue '21; Major: Sociology



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Office of the Provost

Summer Faculty-Student Collaborative Research (SCoRe)



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