Student Research & Internship Symposium

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

FRIDAY, SEPT. 28, 2018
3–5 p.m.

Edith Kinney Gaylord
Cornerstone Arts Center

SCHEDULE

Student Research & Internship Symposium

Friday, Sept. 28, 2018
Edith Kinney Gaylord Cornerstone Arts Center

3-3:40 P.M. RICHARD F. CELESTE THEATRE

Opening Remarks
Jill Tiefenthaler, President of the College

Student Presentations on their Collaborative Research

Ella Axelrod '19
"Historical Archaeology of the San Luis Valley: A Case Study of a Found Box"

Kyrie Newby '21
"Connecting Channels of Creativity: From an Idea to a Performance"

Prakhar Gautam '20 and José Monge Castro '20
"Electric Field Manipulation of Crystal Forms"

Student Presentations on their Internships

Harper Kral '20
"Topeka Zoo and Conservation Center, Topeka, KS"

Abe Lahr '19
"Department of Healthcare Policy and Financing (Medicaid Department), Denver, CO"

3:45-5 P.M. CORNERSTONE MAIN SPACE

Poster Presentations

3:45-4:20 P.M.	Poster Session 1	Research Abstracts P1-P31/ Internship Abstracts P1-P10
4:25-5 P.M.	Poster Session 2	Research Abstracts P32-P62/ Internship Abstracts P11-P19

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 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.

Best regards,

JILL TIEFENTHALER

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

What is SCoRe?

During the summer of 2018, over 120 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/studentfunding**.

"The research process is rarely as pretty as it looks in a final presentation. Sometimes instruments malfunction, experiments don't go as planned, or results don't match our expectations. I frequently tell my students that if it was easy, someone else would have done it already. We ultimately learn the most, and develop a deeper sense of ownership for our collective findings, when we go out on a limb with a new idea and together navigate the unexpected setbacks along with the exciting discoveries."

LYNNE GRATZ, professor, Environmental Science

Historical Archaeology of the San Luis Valley: A Case Study of a Found Box

Student Researcher: Ella Axelrod ’19
Major: Anthropology
Faculty Collaborator: Scott Ingram, Anthropology

The research conducted in this project focuses on the examination and historical and archaeological documentation of a box of artifacts dating from 1890 to the early 1920’s. Found in the Rio Grande National Forest, south of the town of Del Norte and east of Monte Vista in Colorado’s San Luis Valley, there is very little known about who, why, or exactly when the box was buried. However, the artifact assemblage indicates a strong possibility of a woman being the original owner of the box. Through analysis of the artifact assemblage, historical documents, and the site where the box was found, we seek to build a better image of the lifeways of women in the San Luis Valley in the early 20th century.

Connecting Channels of Creativity: From an Idea to a Performance

Student Researcher: Kyrie Newby ’21
Majors: Music, Organismal Biology and Ecology
Faculty Collaborator: Ofer Ben-Amots, Music

The process of conveying and understanding individual creativity has been evolving for hundreds of years, but there are still many barriers between artists and audiences, composers and listeners, poets and readers. The understanding of all mediums of art could be greatly enhanced by answering the question "How does an artist successfully convey the meaning and emotion of their work to others?" This collaborative research project explores the different methods and techniques in which music can be conveyed to an audience and how methods of musical notation can change the perception of the composer, player, and listener of music. To examine this question, professional scores and individual musical parts were edited note by note to more accurately depict the composer's intentions to the player(s), showing how different types of notation can affect the way musicians perform music. In addition, handwritten music was transferred into professional online software (Finale) that allowed for clearer and more accurate notation, printing, and binding of compositions, and was compared to the original in terms of musical expression. Art is an important part of being human, and this research can allow more people to experience the feelings of connection, understanding, and completeness that music can bring to humanity.

Electric Field Manipulation of Crystal Forms

Student Researchers: Prakhar Gautam ’20; José Monge Castro ’20
Majors: Biochemistry; Chemistry
Faculty Collaborator: Eli Fahrenkrug, Chemistry and Biochemistry

The solid-state crystal structure of a compound ultimately determines its usefulness in many pharmaceutical and/or industrial applications. A major challenge of crystallization is to selectively favor one crystal form over another, costing companies billions of dollars and impeding potentially life-saving compounds from being made accessible to the public. Current models predict that it is possible to selectively affect crystallization utilizing high-intensity electric fields in conjunction with the electrostatic nature of molecular arrangement. To test this hypothesis, we designed a reaction cell in which a Lewis-acid-catalyzed epoxide rearrangement is perturbed under different electric potentials (without electron transfer) yielding distinct product distributions. The nature and treatment of electrodes and the conditions at which the reaction is driven are key to the outcome, not only on the external voltage. Careful control of these variables is critical for quantifying electric field effects in the system. Our work will describe current and future challenges in electric-field-controlled crystallization and offer insights into how some of these may be addressed.

Topeka Zoo and Conservation Center, Topeka, KS

Student Intern: Harper Kral ’20
Major: Organismal Biology and Ecology

For the summer of 2018, I was selected from more than 100 applicants to be an animal care intern. Before I arrived, I knew this job would include a lot of cleaning, but I also learned a great deal about what each animal eats and how to prepare these diets. One of the things that made this internship stand out to me from the other potential internships I considered is that I didn’t have to choose one area to work in; at the Topeka Zoo I shifted between keepers, so I could see all the different areas of the zoo. An important part of this internship was creating enrichment for one of the animals. For my project, I created a puzzle feeder for the sun bears (Ho-Ho and Cupcake) which made them use their long tongues to get the food, just like they would in nature. It was extremely successful! Another aspect that made this internship different is that they had required seminars for us to attend that were very helpful ranging from interview skills to training animals. I also got to observe the veterinarian performing checkups and got to witness the birth of a baby giraffe. The biggest takeaway for me was that I went into this internship thinking that I wanted to be a veterinarian for a zoo, but now I feel like I would enjoy being a trainer more. All of this led to a very memorable experience that proved to me that this is the field in which I want to work. http://topekazoo.org/

Colorado Department of Healthcare Policy and Financing (Medicaid Department), Denver, CO

Student Intern: Abe Lahr ’19
Major: History

I came into this summer hoping to learn about and contribute to Medicaid, which I think I did to some extent. The first thing I learned was that Medicaid is complicated. My days consisted of working on small projects (i.e. data in excel and writing a memo on that data, doing policy research, reviewing deliverables) and going to as many meetings as I could. My biggest challenges were asking for help when I was worried it would make me look incompetent and sitting at a desk most of the day. My biggest takeaways from this were: Colorado has a talented and dedicated Medicaid department; huge programs like Medicaid can look like monoliths, but in reality they’re rebuilt every day by normal people with good ideas; almost anything involving the state (like getting a state-issued computer) has to go through multiple levels of approval, which takes time. https://www.colorado.gov/hcpf
*This internship is part of the Public Interest Fellowship Program. http://www.CCPublicInterest.com

P1 Fully Enumerated Bootstrap for Convolutions and Other Random Variable Algebraic Operations

Student Researchers: Sohair Abdullah ’18; Pan Gu ’18; Kelli Sullivan ’19
Majors: Physics; Psychology; Mathematics
Faculty Collaborator: Andrew Glen, Mathematics and Computer Science

Re-sampling based bootstrap methods are well-documented in statistics literature. However relatively little is written on the fully enumerated bootstrap. Fully enumerated bootstraps are in effect a bootstrap operation where the bootstrap is carried on an infinite amount of time. In a fully enumerated bootstrap the result is a completely enumerated distribution of all possible outcomes with associated probabilities. There are many limiting factors that keep one from fully enumerating a bootstrap. However, in the cases where full enumeration is possible, the advantage of the elimination of re-sampling error presents itself. In this paper we will use A Probability Programming Language site 2017 to fully enumerate bootstraps of certain random variable algebraic operations. Furthermore, we will investigate the pure fully enumerated bootstrap (PFEB) in which there are no coincidental repeat values in the algebra. These discrete models for continuous phenomenon have the advantage of not needing a parametric assumption for distribution fitting. Also, these discrete models will eliminate re-sampling error.

P2 Pollination Mechanism in *Pleurothallis*

Student Researcher: Kehan Zhao ’19
Major: Organismal Biology and Ecology
Faculty Collaborator: Mark Wilson, Organismal Biology and Ecology

Pleurothallidinae is a large Neotropical subtribe with around 4,000 species within the *Orchidaceae* family and *Epidendreae* tribe. *Pleurothallis* is the largest genus under it, with both reward and deceit pollination mechanisms discovered. While compared to the large number of species, there is little field data on their pollination mechanism and more information is hypothesized according to the flower morphology. SEM is employed to find characteristics to infer the possible pollination mechanism for five groups in the Pleurothallis genus. Presence of glenion or other secretary tissue is evidence for reward pollination while absence of such secretary tissue, presence of long papillae and copulatory channels would suggest deceit pollination. As morphologically similar flowers could be evolved separately to attract similar pollinators, DNA sequencing on ITS, matK and ycf genes of the samples is done for a phylogeny tree showing the relationship between species. The species hypothesized to use deceit pollination appear in four different clades on the tree. Combining the SEM results with the phylogeny tree, we hypothesize that deceit pollination, which is an apomorphic trait evolved from reward pollination, evolves separately for at least four times in *Pleurothallis* genus.

P3 LibMSR Plugin for the PowerAPI

Student Researcher: Kon Aoki ’20
Major: Physics
Faculty Collaborator: Dan Ellsworth, Mathematics and Computer Science

Measuring and controlling power and energy consumption of high performance computing (HPC) systems is an active research area. Understanding the power characteristics of a program allows us to optimize the performance and the energy use of the system. The software to perform the optimizations is frequently incompatible between different computers. This work adds to the PowerAPI standard by adding compatibility with advanced power management features of Intel processors.

P4 Nutritional Analysis of Croton Nuts to Determine Suitability For Animal Feed

Student Researcher: Israel Ashiagbor ’20
Major: Biochemistry
Faculty Collaborator: Murphy Brasuel, Chemistry and Biochemistry

Nutritional analysis of *Croton megalocarpus* (Kenya) shows that it has significant potential as a new protein source from a nut already being utilized for its biofuel production. The Food and Agriculture Organization of the United Nations reported that, “Global demand for meat products will increase by 58 percent between 1995 and 2020. Consumption of meat will rise from 233 million tons in 2000 to a possible 300 million t by 2020; milk consumption will increase from 568 to 700 million tons by 2020, and there will be an estimated 30 percent increase in egg production.” The croton meal is 47 percent protein with a high fraction of water and salt soluble proteins. The amino acid profile is rich in asparagine, glutamine, and arginine.

P5 Geoarcheology of the Bronze Age Theran Eruption

Student Researcher: Nerissa Barling ’20
Major: Geology
Faculty Collaborator: Floyd McCoy, University of Hawaii

Working with a geoarcheologist from the University of Hawaii, I assisted with various projects on the Greek islands of Santorini and Crete. On Santorini, I mapped and collected samples of the Theran eruption. It is believed that following this eruption, some Minoans fled to Crete, a nearby island. Mapping and characterizing volcanic ash across Santorini provides information on eruption dynamics and how Minoans experienced the eruption. On Crete, I worked at Gournia, a late Bronze Age Minoan archeological site. It appears that the Minoans collected and stored large amounts of volcanic rock from the Theran eruption. My role was to characterize volcanic rocks to study how Minoans utilized it. The rocks were found in what archeologists theorize were storage rooms along the palace, a structure believed to function as a city hall. I also assisted with wall surveys, classifying the rocks used to build walls. The surveys allow researchers to determine where the rocks are from, providing information on possible trade and migration routes in the Mediterranean during the Bronze Age.

P6 Investigating Factors Suspected of Affecting TFIIIC-dependent Boundary Function in *Schizosaccharomyces pombe*

Student Researchers: Alex Barone-Camp ’19; Emma Carlson ’19
Majors: Molecular Biology
Faculty Collaborator: Jennifer Garcia, Molecular Biology

Gene expression, which is essential for cell function, can be controlled 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 TFIIIC. 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 four mutations. We aim to introduce these mutations into wild type cells via CRISPR/Cas9 to observe the 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.

P7 Invisible and Illusory Influence

Student Researcher: Hannah Bollen ’19
Major: Economics
Minor: Art History
Faculty Collaborator: Christina Rader, Economics and Business

“Invisible and Illusory Influence” examines the extent to which people misperceive how advice affects them. Although social influence is a well-studied phenomenon in social psychology, little is known about the correspondence between perceptions of influence and actual influence. This research has implications for improving decision-making by revealing biases. We propose that influence misperception depends on two factors: how attached to the advice the advisee is, and the extent to which the advisee identifies with the advisor. If those two factors do not correspond, then people’s perceptions will not correspond to actual influence. In our study (N = 216), participants estimated the answers to a set of general knowledge questions, then received group estimates from either their “ingroup” or “outgroup” for each question and were asked to re-estimate their answers. Finally, they were asked to estimate the extent to which they were influenced by the advice. Results showed that participants underestimated the extent to which they were influenced, regardless of the identity of the advisor. Furthermore, ingroup advice affected participants more than outgroup advice.

P8 Exchange Rate Volatility and Intermediate Goods Trade

Student Researcher: Anna Brent ’19
Major: Economics
Faculty Collaborator: Bill Craighead, Economics and Business

This macroeconomics research project aims to analyze the impact of international intermediate goods trade on real exchange rate volatility. We use the share of domestic value added in a country’s exports to measure intermediate goods trade. We use this data, from the OECD’s Trade in Value Added (TiVA) dataset, along with a series of control variables that have been shown in the literature to impact exchange rate volatility, in order to analyze the relationship between intermediate goods trade and real exchange rate volatility over the period 2011-16 for a set of 63 OECD and non-OECD countries.

P9 Morphology of Acinetobacter Baylyi in Different Growth Medias

Student Researcher: Anis Buttar-Miller ’21
Major: Molecular Biology
Research Collaborator: Sara Worsham ’18
Faculty Collaborators: Phoebe Lostroh, Molecular Biology; Kristine Lang, Physics

Acinetobacter Baylyi are bacteria that are closely related to *Acinetobacter Baumannii* which are a major cause of nosocomial infections, infections picked up in hospitals. We looked at the morphology of *A. baylyi* grown in nutrient conditions made with different sources of carbon. This research sheds light on the morphology of *A. baumannii*, which can inform the treatment of nosocomial infections. Images were taken using an Atomic Force Microscope (AFM), capable of imaging cells within micrometers, of the *A. baylyi* cells grown in different nutrients. The cells were then measured for length and width. We found that the longer the doubling time of the cells, the shorter and skinnier they were, but the higher the surface area to volume ratio was. *A. baylyi* cells grown in standard media are rod shaped, whereas cells grown in medias with different carbon sources were often spherical or very long and thin. This data is part of a larger project on the overall morphology of *A. baylyi*, which will help determine methods for treating nosocomial infections caused by *A. baumannii*.

P10 United We Stand: Encrypted Server-less Collaborative Document Editing

Student Researcher: Beau Carlborg ’20
Major: Computer Science
Faculty Collaborator: Benjamin Ylvisaker, Mathematics and Computer Science

This project aims to create a more secure collaborative document editing system by utilizing secure encryption primitives and protocols from encrypted chat systems and by sending document edits without using a central server. Collaborative document editing systems can be applied in many different applications which involve multiple users editing a shared file or document. These applications include but are not limited to, shared calendars, collaborative reminders and task lists, and word processing, among others. To make this system more secure, this project utilizes message encryption schemes from common messaging applications like Signal or WhatsApp to securely send edits between users. Additionally, this project eliminates the central server as a necessary middleman to send document edits to users. Removing the central server creates a more distributed system that is more resilient to pressure from large organizations, governments, or internet service providers with malicious intents.

P11 Rotational Row-Complete Latin Squares

Student Researchers: Jerrell Cockerham ’21; Zhaopeng Li ’19
Majors: Mathematics
Faculty Collaborator: Beth Malmskog, Mathematics and Computer Science

Cockerham and Li’s research project explore these questions: for what n is it possible to create *rotational* row complete latin squares—squares where each row follows the same pattern of transitions, though the pattern begins in a different place each time. Many such patterns have been found over the years, but it is not known whether all have been discovered. Cockerham and Li’s research began with compiling all known results. They then did a computational check to determine all patterns for small to moderate size n. Based on their findings, they attempted to prove that new patterns work for some infinite class of sizes, or that no additional new patterns can exist.

P12 Reframing Chinese Secularism: Modern *Qigong* Movements and Religious Terminology in China

Student Researcher: Dylan Compton ’19
Major: Religion
Minor: Chinese Language
Faculty Collaborator: Andrew Schonebaum, University of Maryland, Department of East Asian Languages and Cultures

The rise of Communism may have had a much smaller effect on Chinese religiosity than Western audiences may expect. Chinese secularism is not as anti-religious as it has been made out to be, and the state-religion relationship in China has maintained significant continuity throughout governmental changes. Western scholarly categories and terminology have often failed to grasp the nuances of Chinese religiosity and the state-religion relationship because they lack enough contextualization to deal accurately with the Chinese case. The present study does the following: 1) demonstrates that religious control in the modern People’s Republic of China is a continuation of an age-old politico-religious trend in China, wherein the state determines orthodoxy and heterodoxy 2) reframes “secularism” accordingly, making sense of the term within a Chinese context and exploring aspects of other relevant religious terminology that are distinct to China 3) explores modern *qigong* movements as a case study for these arguments.

P13 Flammulated Owl Research Project

Student Researchers: Adam Mahler ’19; Olivia Noonan ’20
Majors: Organismal Biology and Ecology
Faculty Collaborator: Brian Linkhart, Organismal Biology and Ecology

This summer we had the privilege of collaborating with Brian Linkhart and other CC students on the 38th season of the Flammulated Owl (*Psiloscops flammeolus*) Research Project in the Manitou Experimental Forest. One of our research goals examined the impacts of climate change on long-term changes in phenology and productivity of the owls. We collected data by locating the flammulated owl nests in our study sites and trapping the birds to band, take measurements, and extract blood. We’ve been building on the past data collected in this study, and preliminary results have shown that flammulated owl phenology has been getting earlier as a result of climate change. Furthermore, reproductive success has been lower than previous years. This change in phenology has the potential for trophic decoupling in the future because the owls are long-distance migrants.

P14 Correlations between Gender Identity and Sexual Orientation Identity

Student Researcher: Maria Cuevas ’19
Major: Psychology
Faculty Collaborator: Jason Weaver, Psychology

Use of continuous scales increases the sensitivity of a measure to the complexities of individuals’ identities. We used continuous, multidimensional measures of both gender identity and sexual orientation identity. We predicted that people would respond to measures of sexual orientation identity and gender identity with a similar level of polarity (e.g. a highly polar response would be “I am attracted to only women” or “I identify only as a woman”). The results suggest that there is a correlation between participants responding to the MMSO in a polar manner and responding in a polar manner to the Tate Gender Scale (r = .299, p = .001). The relationship was not mediated by any of the other factors that we measured.

P15 **Reporting on Corticosteroids and Depression**

Student Researcher: Ethan Cutler ’19
Major: Philosophy
Faculty Collaborator: Steve Hayward, English

Corticosteroids are a widely prescribed class of anti-inflammatory and immunosuppressive drugs. Within the medical community, corticosteroids have long been known to have dangerous side-effects, but their effectiveness in a wide range of treatments makes them indispensable nevertheless. We found that doctors are usually aware that adverse drug reactions (ADRs) may occur, but often do not inform their patients. When doctors do inform patients, they usually omit psychological effects. But up to 5 percent of patients who are prescribed corticosteroids experience severe psychological reactions. It’s likely that most of these patients are not warned of the possibility and may never connect their symptoms to corticosteroids. We found that doctors’ tendency not to tell patients about potential side effects is not unique to corticosteroids. In fact, ADRs cause more than 100,000 deaths every year, which makes them a leading cause of death in the U.S. The FDA has stated that half of these deaths likely could have been avoided by more carefully managed medical care.

P16 **Anti-Capitalist Social Movements**

Student Researcher: Anne Daley ’19
Major: Philosophy
Faculty Collaborator: Alberto Hernández-Lemus, Philosophy

Main components of the project: We examined contemporary and historical anti-capitalist land occupations, protests, and networks, looking for trends and for theories in practice; We noticed that individual anti-capitalist social movements occur both independently of and in conjunction with other movements. Problems examined: What events, policies, or conditions are present during the emergence and dissolution of these movements, which might suggest a correlation between them and the emergence and duration of these movements? Where are anti-capitalist social movements happening and where have they happened in the past? What events, policies, or conditions are present during the formation of anti-capitalist social movements? Preliminary findings/trends: Movements that attempt to escape capitalism tend to be more successful than movements that attempt to dismantle or “smash” it; Generally, for a movement to be successful it needs to: Either be supported by the state government or have methods of escaping the conventional economy; Have dedicated, enthusiastic members; Have a driving force/doctrine that inspires continued support for the movement.

P17 **Measuring Dispositions for Culturally Relevant Pedagogy**

Student Researcher: Thuy Dang ’19
Major: Education
Minors: Political Science; Race, Ethnicity, and Migration Studies
Faculty Collaborator: Tina Valtierra, Education

This summer, I assisted Professors Tina Valtierra and Manya Whitaker in the Department of Education with their research aimed at measuring lasting effects of teacher preparation programming and what approaches are most effective in producing effective teachers. Our primary research objective this summer was to examine teacher candidate dispositions — beliefs, values, and attitudes — towards culturally responsive teaching practices. In addition, we looked for specific aspects of teacher preparation programming that increased incoming teachers’ dispositions for culturally relevant pedagogy. Research methods included conducting and analyzing interviews, focus group sessions, and self-reflections from outgoing CC MAT students. Findings from summer research supported the faculty collaborators’ ongoing research project regarding dispositions for culturally responsive teaching.

P18 **Influence of Predation Risk on Nest Habitat Selection**

Student Researcher: Jordan Ellison ’19
Major: Organismal Biology and Ecology
Faculty Collaborator: Brian Linkhart, Organismal Biology and Ecology

Nest predation can influence nest type, life-history traits, and habitat selection in birds. Increased structural protection may afford cavity nesting species greater concealment from predators, resulting in lower rates of predation. The flammulated owl (Psiloscops flammeolus) is a small, secondary cavity nesting raptor that occupies montane forests. To determine how predation risk may influence nest site selection of flammulated owls, characteristics of the nest site were measured at owl nests from 2010-2018 and compared to available but unused sites. Data on predator activity centers were also collected in the area surrounding each nest. The mean cavity height of nests was found to be higher (6.7 ± 0.2m) than available suitable cavities (6.1 ± 0.2m; $t=1.966$, $p<0.01$). Selecting higher cavities for nesting may be suggestive of a response to perceived predation risk, as lower cavities are more likely to be preyed upon. Higher cavities may also allow flammulated owls slightly more time to respond to an approaching predator.

P19 **In Audre’s Footsteps**

Student Researcher: Amelia Eskenazi ’19
Major: Feminist and Gender Studies
Faculty Collaborator: Heidi Lewis, Feminist and Gender Studies

In Audre’s Footsteps was a project that Professor Heidi Lewis and Dana Asbury began in June 2018. During the month of June, Asbury and Professor Lewis completed over half a dozen interviews with artists, scholars, and activists in Berlin Germany. These discussions ranged from discussing solidarity among women of color and the importance of art, dance, and music. In addition, the project explores the complexity of community building both in and outside of the academy. The conversations are part of an ongoing project that Lewis is completing about the legacy of Audre Lorde in Berlin. They will be transcribed and produced in a book that is a part of the Winter Shorts series edited by Sharon Dodua Otoo. In addition, the video and audio footage will be a part of exhibitions throughout Berlin organized by Lewis. Student researcher Amelia Eskenazi assisted Lewis by filming, photographing, and audio recording said conversations. Eskenazi then converted the audio recordings to MP3 and began the process of editing the video and photographic footage. This collaboration between Lewis and Amelia Eskenazi will continue during Eskenazi’s senior year to finalize the editing of said video and photographic footage for Lewis to utilize for an exhibition in 2020 in Berlin.

P20 Floral Color Dimorphism and Anthocyanin in Ipomopsis Aggregata: Fitness and Resistance to UV Radiation Damage

Student Researcher: Elsa Godtfredsen '19
Major: Organismal Biology and Ecology
Faculty Collaborator: Shane Heschel, Organismal Biology and Ecology

Plants require access to photosynthetically active radiation (PAR), which also exposes them to potentially damaging ultraviolet wavelengths. Anthocyanin is a secondary compound which provides red coloration for flowers, which attracts hummingbird pollinators, and has been shown to absorb light in the UV spectrum. Ipomopsis aggregata displays flower color varying from pink to scarlet red, correlated with anthocyanin content. In this study, we investigate the UV protective qualities of I. aggregata individuals with scarlet flowers (dark-colored) compared to plants with pink flowers (light-colored) using a combination of field observations (Manitou Experimental Forest) and in situ experimental manipulations. The field methodology included measurements on photosynthetic ability, conductance, anthocyanin content, and leaf temperature to attempt to understand if there were differences among the light and dark colored morphs. Preliminary results indicate that dark-colored individuals have higher photosystem efficiency and anthocyanin content then the lighter morphs. This could indicate a reproductive and survivorship trade-off, seemingly connected directly to flavonoid content, between pollinator attraction and protection from UV damage in a mid-elevation plant population.

P21 Pharmaceutical Pollution along Ruta de los Cenotes in Yucatan Peninsula

Student Researcher: Karina Grande '20
Major: Chemistry
Research Collaborators: National Science Foundation; Northern Illinois University
Faculty Collaborator: Melissa Lenczewski, Northern Illinois University

The Yucatan Peninsula, home to Cancun, Mexico, is also home to one of the largest karst aquifers in the world. This aquifer is the only freshwater source to the region, supplying drinking water to both tourists and locals. Although much of this aquifer is not exposed to air, cenotes (sinkholes that have formed from collapsed karst) give a glimpse of the aquifer below. Cenotes' high permeability and increasing popularity amongst tourists in Cancun have raised a concern that pharmaceutical pollutants (PP) like acetaminophen and norfloxacin, have entered the cenotes by unfiltered wastewater. The aim of this project is to investigate whether detectable amounts of caffeine, acetaminophen, and norfloxacin have entered these cenotes through recent contamination along the Ruta de los Cenotes using modified US EPA Method 1694. In this presentation, preliminary data will describe identified amounts of caffeine, acetaminophen, and norfloxacin in the respective cenotes sampled. Challenges with the data analysis software led to inconsistent quantities of PPs detected. Future work will focus on more robust quantitation procedures.

P22 Mining Design Rationale by Using Evolutionary Algorithms to Select Features

Student Researcher: Miguel Guerrero ’19
Major: Computer Science
Faculty Collaborator: Janet Burge, Mathematics and Computer Science

Design rationale (DR) is the documentation of reasons behind design decisions. DR can be useful in software development, but it is often not explicitly recorded. Instead, it may appear in other artifacts of the software development process. This research is a continuation of previous work on classifying and extracting DR from software bug reports and design discussion transcripts. Our goal was to use text mining techniques to classify sentences in our documents. These techniques build classification models that use features from the documents. Optimal features are selected from thousands present in the documents using two biologically inspired techniques – ant colony optimization and genetic algorithms. We built on existing work by making three major improvements: modifying how data was split into training and testing sets, running experiments to see if features can generalize to other data sets, and mapping classification results back to the original documents so that we can study the results and import them into other tools for eventual use.

P23 Contempt and Socioeconomic Status

Student Researcher: Brier Youngfleish ’20
Major: Neuroscience
Faculty Collaborator: Jason Weaver, Psychology

Contempt has been proposed to be experienced by high-status individuals towards lower-status individuals. Contempt motivates individuals to create distance from themselves and objects of contempt. Anecdotal and societal observations suggest that contempt may also be directed from lower status individuals towards higher-status individuals. Participants completed a vignette-based survey focused on SES and contempt. The vignette described low SES and high SES characters. Low SES respondents reported very low interest in spending time with the high SES character, whereas high SES participants expressed less strong of an aversion to the low SES character. Both high SES and low SES participants also expressed feeling more similar, and thus, more comfortable with the fictional character who matched their SES. These results suggest that low SES individuals attempt to distance themselves from, and minimize contact with, high SES individuals. However, results from this study indicate that such behaviors are based solely on a desire of low SES people to avoid interactions with high SES, and this tendency is not motivated by feelings of hostile contempt.

P24 Thermochromism of Copper(I) Bromide Clusters with Pyridine and Nitrile Ligands

Student Researcher: Jessica Song ’19
Major: Biochemistry
Faculty Collaborator: Amanda Bowman, Chemistry and Biochemistry

Thermochromism is the phenomenon in which the color of a compound changes in response to temperature. Thermochromic materials have a wide variety of applications including environmental designs in windows and insulation, indicators for temperature dependent goods, as well as novelty goods and road safety signs. Due to the functionality of these compounds, thermochromic luminescence has been studied for over 20 years. Thermochromic copper clusters with a cubane geometry have the most notable luminescent behavior. Cubane compounds have the form $Cu_4X_4L_4$(X=Cl, Br, I; L = pyridine or amine-based derivatives) in which copper and halide atoms alternatively occupy the corners of the cube and the ligand is bound to the copper atoms. In this study, 31 copper bromide clusters were synthesized with 13 different ligands to investigate the thermochromism of copper bromide clusters. Ligand effects were also studied by synthesizing the compounds with pyridine and nitrile ligands due to their availability and diversity. Compounds were characterized by infrared spectroscopy, ^{1}H NMR spectroscopy, UV-Vis spectroscopy, fluorimetry, and qualitative fluorescent analysis.

P25 Synthesis of Dicarbonyl Compounds and Their Reactivity with Benzyne

Student Researchers: Simone Hall ’19; Henos Negash ’20; Katie Thompson ’19
Majors: Biochemistry
Faculty Collaborator: Jessica Kisunzu, Chemistry and Biochemistry

O-benzynes have been used as a synthetic source of carbons due to their highly reactive nature caused by their bond strains. In past research, *o*-benzynes have been used as a starting material along with a variety of substituted dicarbonyl compounds to yield substituted aromatics. Taking advantage of *o*-benzyne’s reactivity, this research sought to determine whether various sulfur and nitrogen-containing dicarbonyl compounds will react with a benzyne precursor to form the expected products via an elimination-addition reaction under mild conditions. We present preliminary data that quantitatively investigates the conditions needed for this reaction to produce the expected products. The analytical analysis supports that we synthesized three new products, but more analytical analysis will need to be conducted for further characterization.

P26 Neighborhood Facilitation and Inhibition Drives Spatial Distribution of Seedlings and Saplings at an Abrupt Treeline

Student Researchers: Alexa Hoffman ’20; Francis Russell ’20
Majors: Environmental Science
Faculty Collaborator: Miroslav Kummel, Environmental Science

Mechanisms responsible for creating the spatial structure of treelines and how they will respond to climate change are poorly understood. Here we present a field study on the relationship between growth and distribution of seedlings and saplings in relation to distance from neighbors within different zones of the ecotone at an abrupt treeline located on Pikes Peak, CO. Results showed that: within the lower-sheltered zone, seedlings and saplings were growing significantly slower compared to other zones. Additionally, seedlings were significantly underrepresented in 1m buffers and 2m buffers around adult trees and saplings. This indicates the prevalence of competitive neighbor-neighbor interactions. Within the upper-sheltered zone seedlings were overrepresented in 1m buffers around saplings, but underrepresented in 2m buffers. Overall they were growing better compared to other zones. This indicates short-range facilitation and long-range inhibition in this zone.

P27 Searching for X-ray Binaries in NGC 6819

Student Researcher: Rory Lowe ’19
Major: Astrophysics
Research Collaborators: Thom Ory ’19; Marta Nowotka ’21
Faculty Collaborator: Natalie Gosnell, Physics

My team began a project to confirm the existence of an X-ray binary in the open cluster NGC 6819. An X-ray binary occurs when a compact body such as a neutron star pulls matter in from a closely-orbiting normal star. This process emits X-ray radiation that can be detected by space-based telescopes. X-ray binaries have not been conclusively detected thus far in open cluster environments, and the detection of one would have broad implications for our understanding of the possible mechanisms of formation of neutron stars. Past results suggested that there may be an X-ray binary in NGC 6819 but greater positional accuracy was needed to confirm the identity of the X-ray source in question. My team analyzed archival *Hubble Space Telescope* data of NGC 6819 to learn the necessary tools to identify these X-ray binaries. We plan to continue our analysis with more accurate data of the cluster that were not available when the preliminary results were published to definitively confirm the identity of the X-ray binary.

P28 The Measurement of Fast Food Exposure and Whites and Blacks in Gentrified and Non Gentrified Neighborhoods in Detroit

Student Researcher: Sam Fesshaie ’19
Major: Race, Ethnicity, and Migration
Minors: History, Environmental Issues
Faculty Collaborator: Joe Darden, Michigan State University

In the United States, the lack of commercial establishments selling fresh fruits and vegetables in certain neighborhoods called “food deserts” is a problem that affects 23.5 million people. The objectives of this paper are to determine whether neighborhoods that are gentrified are different than neighborhoods that are not gentrified in their exposure to fast food restaurants. One way to examine the relationship is to determine whether residents living in poor neighborhoods that are gentrified are less exposed to fast food establishments than poor residents living in non–gentrified neighborhoods. Another way to examine this relationship is to analyze how much black people and white people are exposed to fast food restaurants in both non gentrified and gentrified neighborhoods and access whether there is any inequity in that exposure. The Modified Darden-Kamel Composite Socioeconomic Index was employed to characterize census tracts and the Index of Dissimilarity was applied to measure black and white distribution. The results revealed that the level of unevenness in exposure to fast food restaurants was higher for blacks than whites.

P29 Detection of Aqueous Lead from Electrochemilluminescence in a Bipolar Electrode Chip

Student Researcher: Nick Humphrey ’18
Major: Biochemistry
Faculty Collaborator: Eli Fahrenkrug, Chemistry and Biochemistry

As illustrated by recent drinking water contamination issues, vigilance is paramount when it comes to chemical monitoring of heavy metals in cities around the nation. The goal of this project was to develop an economical platform to rapidly evaluate heavy metal concentration in drinking water samples using bipolar electrochemical (BPE) sensors. The principle of this analysis relies on a closed cell BPE, meaning the analyte and reporter solutions are physically isolated. Using a two-step protocol, aqueous lead (Pb^{2+}) are initially preconcentrated at one pole of the BPE and anodically stripped in a second step. A dye system containing ruthenium bipyridine ($Ru(bpy)_3^{2+}$) and persulfate ($S_2O_8^{2-}$) was investigated, challenges of BPE applications were explored, and image processing techniques to analyze total emission intensity were developed. This technique could eventually be used to test thousands of water sources at once, providing an easy and inexpensive way for the average person to accurately test water sources in the field.

P30 Purifying Lead and Rhodamine B from Water Using Orange Peels and Bamboo

Student Researcher: Alma Jukic ’20
Major: Biochemistry
Faculty Collaborator: Amanda Bowman, Chemistry and Biochemistry

Access to clean water is becoming scarce in developing nations and is starting to become a problem in developed countries. New, effective, cheap, and environmentally sustainable methods for water purification need to be created to combat the water crisis that is occurring. In this research study, activated carbon from bamboo and orange peels are used for water purification. The carbon from orange peels and bamboo shows great effectiveness when removing Rhodamine B from contaminated waters, and only shows to be effective when removing higher concentrations of lead. Future experimentation needs to be performed to figure out more effective ways in using activated carbon in filtering out smaller concentrations of lead from contaminated solutions.

P31 Parameters of Locally Recoverable Codes with Multiple Recovery Sets

Student Researcher: Sam Kottler ’19
Major: Mathematics and Computer Science
Faculty Collaborator: Beth Malmskog, Mathematics and Computer Science

A code is a set of vectors, called codewords. Usually we look at codes that actually form vector spaces. Codes can be used for redundancy and error correction, when storing or transferring data. One way to do this is with locally recoverable codes (LRCs) in which any position of a codeword can be recovered from a fixed subset of other positions, called a recovery set. An interesting problem is called the availability problem, which addresses constructing LRCs with multiple disjoint recovery sets for each position. This project studied minimum distance and other parameters of families of such codes constructed from curves over finite fields.

P32 A Discrete-time Network Model of an Insect Predator-prey System

Student Researcher: Hanqing Li ’20
Major: Mathematics
Faculty Collaborator: Andrea Bruder, Mathematics and Computer Science

We studied a field system of aphids (*Aphis helianthi*) and ladybug (*Coccinella septempunctata* and *Hippodamia convergens*) that live on the raceme of yucca plants (*Yucca glauca*) in the Rocky Mountain Region. Our data set consists of a time series of population of sizes of aphids and ladybugs on 107 yucca plants that are spatially connected via the ladybugs flights. We used a discrete-time network model parameterized with field data to simulate the field system. The numerical simulation in Mathematica shows that the ladybug foraging behavior leads to a small number of aphid populations that escape predation.

P33 X-ray Scattering of Water as a Feasibility Study

Student Researcher: Kenneth Crossley ’19
Major: Physics
Faculty Collaborator: Ian Kehres and Kristoffer Haldrup, Technical University of Denmark, Physics Department

X-ray scattering studies on solutions are of interest because they have the potential to accurately reveal the structure of individual molecules or groups of molecules that are usually indiscernible in complex, disordered systems. Furthermore, the structural alterations often present in the easier to study crystalline forms can be avoided and variable concentrations allow structural changes to be tracked. However, in order to obtain data of sufficient quality to distinguish the scattering from water and the target solute molecules, these types of experiments usually must be performed at large-scale facilities such as synchrotrons (which produce highly intense and monochromatic light), but the beamtime at these large facilities is scarce and often limited to high-impact projects. Here we present a study investigating the feasibility of reproducing synchrotron-quality results using only commercially available, laboratory-scale equipment. We report partial replication of the standard water scattering curve and a potentially unaddressed analysis problem for two-dimensional energy-dispersive X-ray detectors at high scattering angles.

P34 Electric Field Manipulation of Crystal Forms

Student Researchers: Prakhar Gautam ’20; José Monge Castro ’20
Majors: Biochemistry; Chemistry
Faculty Collaborator: Eli Fahrenkrug, Chemistry and Biochemistry

The solid-state crystal structure of a compound ultimately determines its usefulness in many pharmaceutical and/or industrial applications. A major challenge of crystallization is to selectively favor one crystal form over another, costing companies billions of dollars and impeding potentially life-saving compounds from being made accessible to the public. Current models predict that it is possible to selectively affect crystallization utilizing high-intensity electric fields in conjunction with the electrostatic nature of molecular arrangement. To test this hypothesis, we designed a reaction cell in which a Lewis-acid-catalyzed epoxide rearrangement is perturbed under different electric potentials (without electron transfer) yielding distinct product distributions. The nature and treatment of electrodes and the conditions at which the reaction is driven are key to the outcome, not only on the external voltage. Careful control of these variables is critical for quantifying electric field effects in the system. Our work will describe current and future challenges in electric-field-controlled crystallization and offer insights into how some of these may be addressed.

P35 Crosslinguistic Comparison Promotes Flexible Conceptions of Categories

Student Researcher: Emily Gardner ’19
Major: Psychology
Faculty Collaborator: Kevin J. Holmes, Psychology

People tend to believe that membership in many natural (e.g., fruit) and artifactual (e.g., furniture) categories is absolute (i.e., all-or-none) rather than a matter of degree (i.e., graded). However, languages differ dramatically in the category distinctions they encode, implying that category membership is not necessarily absolute. Here we show that learning about such linguistic diversity via analogical comparison facilitates graded conceptions of categories. Participants who compared contrasting categories from different languages were more likely to endorse graded membership for items in natural and artifactual categories than participants who received the same information without comparing. In fact, the latter group performed no differently than a no-exposure control group. These findings suggest that comparing the category systems of different languages can reduce the propensity to categorize the world in absolutes.

P36 Comparison of Indigenous Cultural Representations in Tourism between Santa Fe Region and Pikes Peak Region

Student Researcher: Ziyu Zhao ’19
Major: Anthropology
Faculty Collaborator: Christina Leza, Anthropology

This faculty-student collaborative research mainly focused on cultural representations of indigenous peoples generated by the tourism industry in the Pikes Peak region and the Santa Fe region. After two months of conducting research, we have discovered the two different modes of representing indigenous cultures and cultural identities respectively in Pikes Peak region and in Santa Fe region, and are able to compare these two different modes of cultural representation by analyzing how both indigenous representatives and other activists in tourism industry take different attitudes to cultural tourism itself in these two regions. Generally, the mode of indigenous cultural representation in the Santa Fe region could serve as a model for that in the Pikes Peak region. In addition, the social transformation and consequent inner-tribal conflicts, which are currently happening in Ute tribes in Colorado and Puebloan tribes in New Mexico, are examined in terms of the introduction of colonialism, and therefore capitalism and modernization (partly epitomized in cultural tourism) from mainstream America, which have created a huge strike to the traditional indigenous cultural value and social structure..

P37 Invasive Mussels in Western Waters

Student Researcher: Molly Maier ’21
Major: Undeclared
Faculty Collaborator: Diane Mench, U.S. Bureau of Reclamation

Invasive dreissenid (quagga and zebra) mussels were first detected in U.S. western waters in Lake Mead in 2007 and have since spread to numerous other water bodies. For the U.S. Bureau of Reclamation, invasive mussels pose a significant problem because they are prolific breeders, and they can attach to anything solid, including critical water conveyance structures and numerous components of hydropower facilities. Mussel settlement in these systems can increase maintenance costs and the potential for unplanned outages. Mussels are also disruptive to the natural ecosystem, negatively impacting the food chain and outcompeting native species. The Reclamation Detection Laboratory for Exotic Species (RDLES) was established in 2009 to head prevention, monitoring, and research initiatives for invasive mussels. RDLES receives over 1,500 water samples each year to be examined for the larval stage of mussels, known as veligers, using microscopy and genetic analysis. Early detection of mussel presence allows water managers time to control and prevent spread and allows facility managers 3 to 5 years to implement proactive control strategies before a full-scale infestation will occur.

P38 Women Photography and Cultural Landscape: The Attempt to Capture and Suspend Reality

Student Researcher: Melissa Manuel ’21
Major: Film and Media Studies
Faculty Collaborator: Mario Montaño, Anthropology

Reality has been a dominant concept throughout the different fields of academic study: natural science, social science, and the humanities. All three are interested in capturing and understanding reality, approaching from different perspectives. In this research, we will examine and discuss visual anthropology with a focus on photography. This research will enrich the study of visual anthropology, cultural anthropology, and film and media studies. It addresses issues related to the production of images and their interpretations, content analysis, realism and ethnomethodology. This research is meant to challenge how photography captures reality, and how realism in photography is always subjective to the photographer, the caption, the context, and the viewer. The research done here will allow anthropologists, journalists, or filmmakers to consider more thoughtfully how the image can inform their field of study and change it completely.

P39 The Function of mRNA Decay in the Post-Diauxic Phase

Student Researcher: Rachael Martino ’19
Major: Molecular Biology
Faculty Collaborator: Jennifer Garcia, Molecular Biology

Saccharomyces cerevisiae has different growth phases depending on the amount of nutrients present. When in log phase the yeast cells will divide exponentially, however when the sugar source is depleted the cells will enter the post-diauxic phase. The growth rate of the cells in the post-diauxic phase will slow down and this is the phase that we examine different processes in. Autophagy is an important degrading process for cell survival because it regulates and discards any components that are either unwanted or dysfunctional in the cell, especially during stressful conditions. During this process a double membrane layer, called an autophagosome, will engulf the item to then be degraded in the vacuole. Therefore, we know that the levels of autophagy will increase in the post-diauxic phase. We believe that mRNA that encodes for mitochondrial proteins are especially degraded by an autophagic decay pathway in the post-diauxic phase. To test this, we will use the MS2 labeling technique to fluorescently tag specific mRNAs within the cell, along with autophagosomes. To determine if our specific mRNAs undergo autophagy, we will see that both the autophagosome and the mRNA will localize in the same place. Overall this will tell us if an autophagic mRNA decay pathway exists in the post-diauxic phase.

P40 Impact of an Abrupt Treeline's Spatial Structure on Local Scale Climate Modification on Pikes Peak, CO

Student Researchers: Ali McGarigal '19; Riley Wadehra '20
Majors: Environmental Science Integrated; Environmental Science
Faculty Collaborator: Miro Kummel, Environmental Science

An investigation at an abrupt treeline on Pikes Peak, CO studied the overall structure of microclimates at the stand level, the ability of individual trees to modify local climate conditions, and the impact of local scale climate modification on seedling recruitment. At night, the area immediately above treeline was the coldest due to cold air damming and temperatures increased moving uphill. During the day, this pattern reversed. At night, the overall pattern was modified by heat islands created underneath individual trees and by extremely cold spots that formed downwind of trees above treeline. Temperature varied within tree canopies with the upwind side being significantly warmer than the downwind side. During the day, trees modified the climate through shadows by retaining night time temperatures in these spots, with a temperature difference of up to 17°C. Fewer seedlings were recruited into shadows than expected by random ($\chi 2$ =3.0078, df=1, p=0.0397).

P41 Carbon/Oxygen Isotope Analysis of Proterozoic Carbonates in Inner Mongolia, China

Student Researcher: Peter Mow '20
Major: Geology
Faculty Collaborator: Paul Myrow, Geology

This summer I helped Professor Myrow and the others measure, sample, and describe Paleoproterozoic and Cambrian, carbonates in Inner Mongolia, China. We visited four field sites over three weeks in the month of July and took approximately 600 carbon/oxygen isotope samples. We also collected several bags of trilobite samples. During early August, I worked in Colorado College's geology lab for one week preparing approximately 170 carbon/oxygen samples for analysis. With the help of Stephanie Meyer, I analyzed the samples using a mass spectrometer in David Fike's geology lab at Washington University in St. Louis. Carbon and oxygen isotope data for these samples were amazingly uniform and display no strong correlation to isotope data previously collected by Tianran Zhang and Paul Myrow. Many samples have yet to be analyzed and I will be working with them over the course of this semester.

P42 Neocortical Neuronal Morphology in the African Lion (*Panthera leo*), African Leopard (*Panthera pardus pardus*), and Cheetah (*Acinonyx jubatus*)

Student Researcher: Vivian Nguyen ’20
Major: Neuroscience
Research Collaborators: Lucy Sloan ’18; Lili Uchida ’19; Allysa Warling ’18
Faculty Collaborator: Bob Jacobs, Psychology

Feline neocortical research has recently expanded its scope of quantitative neuromorphology to non-domestic felids (Johnson et al., 2016). To this end, the present study characterizes and quantifies the somatodendritic morphology of the African lion (*Panthera leo*), African leopard (*Panthera pardus pardus*), and cheetah (*Acinonyx jubatus*) neocortices for the first time. After tissue samples from the prefrontal, motor, and visual cortices were stained using a modified rapid Golgi technique, neurons (N = 652) were quantified using computer-assisted morphometry. Qualitatively, the range of spiny and aspiny neurons in the three species were morphologically consistent with that observed in other felids. Quantitatively, somatodendritic measures of typical pyramidal neurons in the cheetah were larger and more complex than those in the African leopard despite similar brain sizes. Furthermore, gigantopyramidal motoneurons were disproportionately large, confirming previous observations of the neuronal type in feliforms (Brodmann, 1909; Jacobs, 2017). African lion neuronal measurements were deemed unfit for statistical analysis due to poor staining. Further comparative research between felids may provide more insight into the functional and evolutionary implications in the present findings.

P43 Multiwavelength Search for a Low Mass X-ray Binary in the Open Cluster NGC 6819

Student Researcher: Marta Nowotka ’21
Majors: Physics, Mathematics
Research Collaborators: Thom Ory ’19; Rory Lowe ’19
Faculty Collaborator: Natalie Gosnell, Physics

The focus of this study is a Low Mass X-ray Binary (LMXB) candidate in the open cluster NGC 6819. Theoretical models prohibit the existence of an LMXB in the sparse stellar environment of open clusters. The presence of LMXB points to alternative supernovae formation scenarios. This study aims to confirm the presence of the LMXB through determining its optical counterpart, achieved by cross-matching neighboring X-ray sources with optical sources and therefore improving the positional uncertainty of the LMXB candidate. We present photometric and H-alpha analysis of the cluster, the first step toward accurate source cross-correlation.

P44 A Potential Role for Non-Coding RNAs in the Mating-Type Switching Mechanism of *Ogataea polymorpha*

Student Researcher: Juliana Olliff '20
Major: Molecular Biology
Faculty Collaborator: Sara Hanson, Molecular Biology

Sexual reproduction is a complex and evolutionarily illogical process, as only half of an organism's genome is inherited. In many yeast species, a unique aspect of its sexual cycle known as mating-type switching (MTS) exists; by studying the mechanisms behind the process of MTS, we can hypothesize about the evolutionary function of sexual reproduction in a variety of eukaryotic species. *Ogataea polymorpha* is methylotrophic yeast species distantly related to the more studied baker's yeast. In this work, we look for the molecular mechanism behind the formation of DNA breaks that initiate MTS in *O. polymorpha*. We hypothesize that the DNA breaks form from a transcription/replication collision, promoted by an overabundance of the transcription factor *STE12*. We used a transgene that promoted overexpression *STE12* in the presence of methanol. We confirmed MTS after overexpression of *STE12* using PCR, and performed RNA-seq to identify targets of *STE12*. We plan to identify non-coding RNAs produced during MTS, including any that are produced at the *MAT* locus that may be involved in double-strand DNA break formation.

P45 Investigating the Presence of Neutron Stars in the Open Cluster NGC 6819

Student Researcher: Thom Ory '20
Major: Physics
Research Collaborators: Marta Nowotka '21; Rory Lowe '19
Faculty Collaborator: Natalie Gosnell, Physics

In 2011, Professor Gosnell and her team undertook a study that examined several open clusters, or low-density groups of gravitationally bound stars, in an attempt to understand the role that "dynamical interactions," or interactions between two or more stars that are close enough to influence the life of one or more of the stars, play in the formation of neutron stars (very dense remains of stars made of fundamental particles). The study searched for quiescent Low-Mass X-ray Binaries (qLMXBs) in the open clusters. A qLMXB is a binary (system of two orbiting stars) that features one main sequence star and one neutron star as well as a detached accretion disk. Discovery of a system such as this would provide evidence for theoretical models that better explain the higher-than-predicted number of neutron stars we see in open clusters. Gosnell's 2011 study identified one possible qLMXB in the open cluster NGC6819, and my research this summer was spent trying to confirm that the source they identified, deemed X1, is in fact a qLMXB.

P46 Infrahumanization of Family Separation in American News Media

Student Researcher: Jessica Ramos '19
Major: Undeclared
Faculty Collaborator: Emily Chan, Psychology

Infrahumanization refers to subtly dehumanizing by overutilizing primary emotions and/or underutilizing secondary emotions to describe the emotional experiences to outgroups. Primary emotions (e.g., sadness) are applied to both animals and humans, whereas secondary emotions (e.g., frustration) are considered "uniquely human." In study 1, an archival analysis was conducted on news stories published in two mainstream news sources that differ in their political leanings (CNN and Fox News) to explore the emotions attributed to immigrant targets and non-immigrant targets in immigration stories, and a set of control non-immigration news stories. Findings showed infrahumanization in the immigration news stories, compared to an absence of it in non-immigration news stories. Interestingly, the more conservative source did not utilize emotions in immigration stories, compared to a higher rate of emotional word usage in non-immigration stories. In study 2, participants (N = 200) read one of three news stories about the separation of families which had no emotional descriptions, used primary emotions (e.g., "frantic and anxious"), or used secondary emotions (e.g., "overwhelmed and a sense of despair" Participants were then asked, "Who are you more likely to agree with in this case-the government officials or the detainee?" The participant was also asked general policy-related questions, and questions regarding attitudes about immigrants.

P47 Monument Creek Project Phase II: Enhancement of the Natural-Urban Interface through Geodesign

Student Researcher: Will Rundquist '19
Major: Geology
Research Collaborator: David Sachs '19
Faculty Collaborator: Christine Siddoway, Geology
Other Collaborators: Matt Cooney, GIS Technical Director; Cyndy Hines, Project Coordinator State of the Rockies

The Monument Creek reach bordering Colorado College is artificially channelized to mitigate risks of flooding from high rainfall. The stream is an element of the city water supply, with potential to be an aesthetic part of a recreational corridor but is neglected and impaired. Using geodesign, the Monument Creek Project Phase II aims to devise remediation concepts based on scientific studies and stakeholder input. Our survey consists of 22 evenly spaced stream transects using a total station and a velocity meter to measure the streambed shape and flow velocities. During low-flow conditions, the average channel depth = 0.15 m, velocity = 0.3 m/s, discharge = 1 m^3/s and channel height = 1 m. Our results, together with data from public sources, are rendered in GIS. This work serves as a basis for long-term study of the stream condition, which will be used to identify interventions that will slow the water, prevent incision, improve water quality, and enhance the natural-urban environment for human enjoyment.

P48 Geodesign Applied to an Urban Campus and its River Reach: Colorado College and Monument Creek

Student Researcher: David Sachs ’19
Major: Independently Designed Major: Geodesign
Research Collaborator: Will Rundquist ’19
Faculty Collaborator: Christine Siddoway, Geology

Monument Creek, a small watershed draining from the SE Front Range, passes through the campus of Colorado College and downtown Colorado Springs. This impaired reach of the stream has been channelized and is thus actively incising. In order to identify interventions and areas of treatment, Monument Creek Project followed an iterative planning method called Geodesign, which uses geospatial data and stakeholder input to inform and create sustainable design. Our interventions aim to improve water quality, aide flood control, and increase community use through visual improvement. In order to characterize the channel and understand water flow we measured 22 profiles at 50-meter intervals. Bed elevations were gridded in ArcGIS to determine the 3D form of the creek bed between the Uintah Street and Mesa Avenue bridges. Using the GIS data and stream parameters, in conjunction with input from city officials and contractors, we have developed designs for restoration that may enhance public enjoyment and stewardship of the stream.

P49 Mosquito Species Composition in the High Mountains of Colorado

Student Researchers: Rebecca Sandvos ’19; Madeleine Sorenson ’19
Majors: Organismal Biology and Ecology
Faculty Collaborator: Emilie Gray, Organismal Biology and Ecology

As climate change causes the warming of higher elevation environments, it is expected that species which traditionally occupy lower, warmer elevations will shift the ranges in which they inhabit upwards. In order to test this hypothesis, we repeated studies from 1966 and 2007 which looked at mosquito species composition in the high mountains of Colorado. We set traps to collect mosquitoes at a range of elevations from 7,500 ft to above 10,000 ft. Mosquitoes caught in each trap were identified to species level in order to determine the elevational ranges of each species and compare to past years. Our results indicate that some species have moved upwards in elevation while others have surprisingly moved down, with some species not shifting their ranges at all. We speculate that the drought of 2018 had an impact on our results and therefore suggest that future research more closely examine the link between climate and mosquito ranges. Further research, with increased sampling capacity, will better allow us to confirm our results of range shifts and thus will help to inform public policy decisions regarding the spread of mosquito-borne diseases in a warming global climate.

P50 Effect of Nutritional Signaling on Mating-Type Switching in *O. polymorpha*

Student Researcher: Natalie Sarver '20
Major: Neuroscience
Minors: Physics, Chemistry
Faculty Collaborator: Sara Hanson, Molecular Biology

The response to nutritional signaling is a homeostatic mechanism in the function of cells in all organisms. Here, we examined the nutrient response of the yeast *Ogataea polymorpha* and its role in sexual processes. Haploid cells of *O. polymorpha* undergo mating-type switching, a process that causes a 19-kilobase DNA region to invert, placing either the *MAT*a or *MAT*α genes under centromeric repression of transcription. Nitrogen starvation induces this reversible change in the structure of a chromosome. Previous work demonstrated that in a nutrient-deprived media, *O. polymorpha* can undergo mating-type switching, while the addition of ammonium sulfate suppressed this response. We wanted to better understand the effect of nutritional signaling on mating-type switching by extracting DNA from *O. polymorpha* that had grown in media with other nitrogen sources, as well as media with rapamycin and cyclic-AMP. Most nitrogen sources were found to suppress switching. The rapamycin and cyclic-AMP were shown to induce and suppress switching, respectively. These data provide insights into the specific signaling pathways that underlie the mating-type switching response in *O. polymorpha*.

P51 Measuring the Concentrations of Mercury in the Feathers of Songbirds in Southeast Michigan

Student Researcher: Saria Sato Bajracharya '20
Majors: Environmental Science
Faculty Collaborator: Lynne Gratz, Environmental Science

Mercury is a toxic metal that can negatively affect the natural environment and the health of living organisms. Once introduced to terrestrial and aquatic ecosystems, primarily through atmospheric deposition, it may be converted to methylmercury that is capable of bioaccumulating within food chains. Sublethal levels of methylmercury in birds, for example, may have consequences for their neurological functioning, reproductive capabilities, and endocrinal system. The objective of this research was to measure the concentrations of mercury present in the feathers of various songbirds in southeast Michigan, where industrial discharge of heavy metals contaminate the local air and water. We performed nitric acid digestions and dry weight measurements on more than 80 feather samples prior to total mercury concentration analysis. We find detectable differences in feather mercury concentrations between different songbird species and between contaminated and non-contaminated sites, with concentrations ranging from 26.0 to 2630 ng/g of dry feather weight. We are further exploring how these patterns coincide with blood lead levels, feather concentrations of other heavy metals, and plumage characteristics of the birds.

P52 Behavioral Effects of Probiotic Supplementation with *Bifidobacterium infantis* in Vagotomized Adolescent Rats

Student Researchers: Uma Scharf ’19; Zac Schulman ’19; Megan Tomhave ’18; Nisha Venkateswaran ’18
Majors: Neuroscience
Faculty Collaborator: Lori Driscoll, Psychology

The gut microbiota influences brain development by affecting hormone levels, immune activity, and neural signaling to the brain via the vagus nerve. One bacterium, the probiotic *Bifidobacterium infantis 35624* (*B.infantis),* is enriched in the human infant gut, where it influences the development of stress pathways and the expression of depression biomarkers. The purpose of our study was to explore the effects of *B.infantis* supplementation on anxiety, depression, and coping ability in male and female adolescent rats (N = 86). Subdiaphragmatic vagotomies were conducted on half of the rats to investigate the necessity of the vagus nerve for these behavioral effects. After a *B. infantis* supplementation period of 22 days, all rats were administered a battery of behavioral tests including a social preference test, a social interaction test before and after a 72h period of social defeat, and a sucrose preference test. Data from behavioral tests are supported by c-Fos expression levels in regions of the brain associated with anxiety and stress such as the hypothalamus, the amygdala, and the hippocampus.

P53 Temporal Variability in Ambient Mercury Concentrations in the Colorado Front Range

Student Researcher: Story Schwantes ’19
Major: Environmental Science
Faculty Collaborator: Lynne Gratz, Environmental Science

Atmospheric mercury (Hg), an airborne heavy metal, can be deposited into aquatic and terrestrial systems, potentially causing serious damage to ecosystems and human health. It is therefore important to understand the sources, chemical cycling, and fate of atmospheric mercury. This study looks at total gaseous mercury (TGM) concentrations collected at an urban, near-road site in Colorado Springs, CO from June - October, 2016 and at the Rocky Flats National Wildlife Refuge in Louisville, CO, from June - August, 2018. The 2016 data set reveals a significant diurnal pattern, with hourly average TGM concentrations reaching a maximum at 3:00 (1.91±0.34 ng/m^3) and minimum at 13:00 (1.56±0.15 ng/m^3). We also observe a seasonal pattern, with significantly higher average TGM concentrations in summer (June – August) than fall (September – October). In contrast, at Rocky Flats in summer 2018 we find that hourly average concentrations peak at 13:00 (1.51±.11 ng/m^3) and are lowest at 6:00 (1.40±0.10 ng/m^3). In addition to TGM data, we use meteorological and chemical measurements to investigate the sources and processes behind atmospheric Hg concentrations in the Colorado Front Range.

P54 “I Want My Great-Great Grandkids to See What I See”

Student Researcher: Aubrey Skeeter ’19
Major: Education
Faculty Collaborator: Victoria Levine, Music

During the 2018 summer after interviewing many members of the Yuchi (Euchee) Tribe, located primarily in Northeastern Oklahoma, the researcher, also a part of this community, was able to come to begin to understand the complexities of the Yuchi community. This community is currently in danger of losing their language, but with dedicated members the language continues to live on. Additionally, members of this community feel as if traditional ceremonial ways are something that are valued and of high priority in their life. For many of these community members, no matter their blood quantum, being Yuchi is one of their biggest identifiers and how they look at the world is influenced by this identity.

P55 Developing a Research Project to Assess Self- Report Versus Accelerometer-Measured Physical Activity in Colorado College Students

Student Researchers: Meghan Tanel ’19; Max Thurston ’19
Majors: Neuroscience; Molecular Biology
Faculty Collaborator: Anthony Bull, Human Biology and Kinesiology

Behaviors such as physical activity (PA) are often established in young adulthood. However, research has reported that many college students do not meet PA guidelines. The purpose of this project was to review literature assessing PA behaviors in college students, in order to help design a research project examining PA in Colorado College (CC) students. Recent research has utilized Accelerometers (ACC) to objectively measure PA in college students. These small, hip worn devices can measure acceleration in all three axes, and calculate PA duration and intensity, as well as steps per day. Alternatively, self-report surveys are the most common method of assessing PA in college students, however, some have been reported to overestimate PA compared to ACC. The International Physical Activity Questionnaire (IPAQ), reported to have adequate reliability and criterion validity, has been utilized in few studies specifically with college students. Therefore, we have designed a research project utilizing both the IPAQ and ACC in order to assess PA in CC students, and the criterion validity of the IPAQ versus ACC. Our initial data collection will focus on first-year CC students.

P56 Purification of the Phosphatase Protein from the TerY-P Triad

Student Researchers: Pedro Tirado Velez ’20; Jake Shapiro ’18
Majors: Molecular Biology; Biochemistry
Faculty Collaborator: Margaret Daugherty, Chemistry and Biochemistry

Acinetobacter Baylyi, a gram-negative bacterium commonly found in soil, has been found to be a nosocomial opportunistic pathogen that has infected people through the improper sterilization of hospital tools and those with weakened immune systems. Although attempts of sterilization have been undertaken, related species of A. baylyi have proven tough to kill; it is resistant to tellurite, an oxidative stressor, and is able to survive in low-nutrient environments. Previous research done by Lostroh et al. have found a specific gene triad named the TerY-P Triad to be upregulated in response to stressful situations such as starvation of the bacteria in the long-term stationary phase. The three proteins coded by this gene triad, however, are hypothesized to be a metal binding protein, kinase, and phosphatase. To further the understanding of this complex, our lab sought to purify each protein to confirm their hypothesized enzymatic activity.

P57 Characterizing the Chemical Composition of Water from the Sanford Underground Research Facility

Student Researcher: Wileen Genz ’19
Major: Environmental Science with Chemistry
Faculty Collaborator: Micheal Zehfus, Black Hills State University

Since the Homestake Mine in Lead, South Dakota closed in 2002, the largest and deepest gold mine in the Western Hemisphere was converted into the Sanford Underground Research Facility (SURF). In the third and final year of this project, the research continues to investigate the inorganic chemical properties of underground water. Initial results concluded that each level possessed a unique water chemistry; however, in the second year, more diverse sampling sites suggested that broad trends could not be generalized for each level. This year’s samples were obtained from the same four levels as done previously with the addition of the 800-foot and 2000-foot levels. Samples were analyzed in situ for temperature, pressure, pH, conductivity, ammonia and dissolved oxygen. The water analysis performed aboveground consists of metal ions, chloride, sulfate, nitrate, bicarbonate, and total alkalinity, employing a variety of analytical techniques; these include titrations, photometric reactions, atomic absorption spectroscopy and ICP-MS (Inductively Coupled Plasma Mass Spectroscopy). The current analysis confirms the previous year’s conclusions that chemical properties could not be characterized for entire levels due to high site-to-site variability. These results provide insight into research on underground microbial environments and the hydrology of the SURF complex.

P58 Long-term Dendritic Changes in Chronic Traumatic Encephalopathy: A Quantitative Golgi Study

Student Researcher: Riri (Lili) Uchida ’20
Major: Neuroscience
Research Collaborator: Allysa Warling ’18
Faculty Collaborator: Bob Jacobs, Psychology

Chronic traumatic encephalopathy (CTE) is a neurodegenerative disease caused primarily by repetitive head injury (RHI). Development of tau aggregates following RHI is suggested to be the leading cause of dendritic degeneration in CTE. To examine the potential long-term effects of CTE on dendritic systems, the present study compared dendritic and spine measures obtained from 3-D tracings of supragranular pyramidal neurons in the frontal and occipital lobes of 12 “neurologically normal” controls and 9 CTE subjects. Dendritic degeneration was observed in both lobes of the CTE cohort. However, it occurred to a greater extent in the frontal lobe than the occipital lobe. The extent to which degeneration occurred in each lobe did not vary greatly between CTE subjects with and without tau aggregates. Interestingly, neurons examined in subjects with tau exhibited larger somas and total dendritic volumes than neurons from other subjects. These findings suggest that the main effects of tau aggregates in CTE may not be dendritic degeneration, but rather neuronal swelling.

P59 "I Never Had a Face to the Name Before": Travel, Humanization, and Shifting Perspectives in Israel-Palestine

Student Researcher: Lam Quynh Vo '19
Major: Sociology
Research Collaborators: Sonya Padden '19; Hailey Corkery '18
Faculty Collaborator: Emily Schneider, Sociology

Previous research on alternative tourism and contact hypothesis has not sufficiently addressed the link between humanizing experiences, changes in thinking, and prejudice reduction. Using in-depth interviews and inductive analysis, we examine the role of humanizing experiences on changes in tourists' thinking about the Israeli-Palestinian conflict. With recent conflicts and violence emerging in the region, research that addresses different avenues to promote peace is particularly needed. We found that even though the tours provide participants with more information and greater knowledge of Palestinian narratives, they often explain the conflict as complex, and have a less clear understanding of potential solutions after the tour. Participants often related new knowledge to having profound humanizing experiences with Palestinians through a recognition of commonalities and shared humanity, a reduction of prejudice, and an appreciation for Palestinian hospitality. Although both of these are clear examples in changes in thinking, these attitudinal shifts rarely disrupt dominant ideological frameworks about the Israeli-Palestinian conflict.

P60 Epstein-Barr Virus Protein LMP1 Does Not Protect B Cells From AICD

Student Researcher: Nora Watkins '19
Major: Molecular and Cellular Biology
Faculty Collaborator: Olivia Hatton, Molecular Biology

Epstein Barr Virus (EBV)-associated B cell cancers including post-transplant lymphoproliferative disorder (PTLD) and Burkitt's lymphoma account for nearly 2 percent of global cancer deaths annually. In the native context, B cells require two signals to undergo activation: one from the B cell receptor (BCR) and a second signal from either CD40 or TLR9. A recent study in murine B cells found that without a second signal, cells experience mitochondrial dysfunction eventually leading to cell death, known as activation-induced cell death (AICD). The EBV protein LMP1 is a functional mimic of CD40 but also functions as an oncogene, driving cell proliferation in EBV-associated cancers. By assessing cell proliferation with Trypan Blue exclusion and viability with flow cytometry in cells expressing an inducible, chimeric LMP1 (NGFR.LMP1), we sought to determine if LMP1 can provide a second signal sufficient to rescue cells from AICD. After confirming functionality of stimulations by measuring ICAM upregulation, we found that in most cases it could not. Further investigation into the functional similarities between CD40 and LMP1 are required to understand the biology of EBV infection and its associated malignancies.

P61 An Investigation of Perfluorinated Alkyl Substances in Surface Waters

Student Researcher: Keenan Wright '19
Major: Chemistry
Faculty Collaborators: Eli Fahrenkrug, Chemistry and Biochemistry; Tyler Cornelius, Environmental Program

In 2015, reports revealed that the several communities just south of Colorado Springs were subject to contamination of their drinking, surface, and ground waters by a class of chemical compounds called perfluorinated alkyl substances (PFASs). PFASs are environmentally persistent contaminants that have been linked to cancers, increases in cholesterol, and birth complications. This study is aimed at identifying both the fate and transport of these compounds in surface waters as well as the full extent of the contaminant plume in the underground aquifer. Samples were collected from several reaches of both Sand and Fountain Creeks. Solid phase extraction (SPE) was used to prepare the samples for subsequent analysis using high pressure liquid chromatography tandem mass spectrometry (HPLC-MS/MS). The study targeted the analysis of 10 different PFAS compounds of varying length and composition. The results were mapped and modelled in ArcGIS software, which displays concentrations along the surface water paths. Three preliminary conclusions were drawn from this preliminary study (1) Traces of contamination can be found at each sampled site (2) Peterson Air Force Base is likely the point source of contamination (3) Sites along the creek measured above the Environmental Protection Agency's (EPA) health advisory of 70 ppt (ppt= ng/L) and as high as 320 ppt.

P62 Graphene-coated Sand and Coconut Shell Charcoal for Water Purification

Student Researcher: Yu Wu '19
Major: Chemistry
Faculty Collaborator: Amanda Bowman, Chemistry and Biochemistry

It is crucial to improve the existing water purification technique, activated carbon adsorption, to a more efficient and sustainable method, because of the increasing heavy metal contaminant threat. GSand (graphene-coated sand) and CSC (coconut shell charcoal) were synthesized through a green and effective way; the materials were tested to remove metal ions, chromium(VI) and lead(II), in this research project. Both GSand and CSC are capable of removing certain amount of metal ions; CSC has a better adsorption capacity in both cases than GSand in 24-hour stirring under standard condition. The SEM (Scanning Electron Microscopy) image shows that activated coconut shell has higher adsorption capacity due to its porous structure and large internal surface area. The adsorption capacity was also affected by pH conditions: both CSC and GSand work the best in the range of pH 3 – pH 4.5 for chromium(VI); CSC shows higher capacity with higher pH for lead(II) from pH 4 to pH 10. The change on adsorption is due to the transformation of the metal ions instead of the carbon sources.

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.

I hope you enjoy hearing about their unique internship experiences.

INTERNSHIP POSTER PRESENTATIONS, ABSTRACTS P1-P10

P1 National Institutes of Health (NIAID), Bethesda, MD

Student Intern: Hugh Alessi ’20
Major: Neuroscience

As an intern for the National Institutes of Health, I was given the opportunity to participate in and conduct research at the world’s largest clinical research hospital, the Mark O. Hatfield Clinical Research Center. This included everything from the outlining of an experiment (i.e. What are we trying to show? How are we going to show it?) to the creation of method protocols so that our techniques can be replicated by others. The largest challenge was my lack of knowledge on various techniques used in molecular biology research – it is important to first have a strong grasp on what has already been discovered and how it was done. Fortunately, I had a wonderful lab group that worked quickly to bring me up to speed. Overall, my experience was incredible. It provided some guidance on where I’d like to go after Colorado College, what potentially I’d like to pursue, and I managed to learn quite a few things along the way. https://www.niaid.nih.gov/

P2 PEAK Parent Center, Colorado Springs, CO

Student Intern: Alison Baird ’19
Major: Economics

I really value the mentoring and leadership development I received through my fellowship with PEAK. My boss included me in her meetings with consultants and walked me through her decision-making processes in regard to personnel, strategic planning, finances, communications, and programming – all the dimensions of leading a successful nonprofit. Moreover, I was able to contribute to meaningful projects that aligned with my interests and goals, including editing a grant proposal through the U.S. Department of Education and devising an editorial calendar to drive outreach efforts. My fellowship allowed me to contribute to PEAK’s meaningful advocacy work in the disability community, while also honing my leadership skills to prepare for a future career in the nonprofit world. I am additionally very appreciative to continue to work at PEAK during the school year. http://www.peakparent.org/
*This internship is part of the Public Interest Fellowship Program. http://www.CCPublicInterest.com

P3 Explorama Lodges, Iquitos, Peru

Student Intern: Kai Cintorino ’19
Major: Film and Media Studies

My internship with Explorama Lodges, a conservation-focused ecotourism company in the Peruvian Amazon, had a huge impact on my future in media production. I was able to put my film training to the test while filming thousands of miles away from home, and learned how to produce content for specific outlets. I learned what it’s like to work with a company to make promotional videos for a variety of different purposes and audiences, which further confirmed that I want to pursue a freelance career as a media creator. While on site, I grew from the mentorship of a number of inspiring people: the directors of Explorama, Amazon Rainforest Workshops, and Conapac, a number of researchers, an entomology media production duo, local guides, and more. This experience was crucial to my film career, but also blended in my passions for the environment, conservation, and the Spanish language. www.explorama.com

P4 **Wold Energy Partners, Denver, CO**

Student Intern: Cash K. Forster ’19
Major: Business Economics

I was extremely happy going to work for Wold Energy Partners this summer. The focus and hope was to get some financial modeling experience and better understanding of their uses. Looking back, I now see all the skills I acquired this summer that came from both work experience and living in Denver. Another important point was figuring out how this internship affected my future plans. I worked heavily in the Finance, Accounting and Marketing Department. After my summer I knew I enjoyed the finance side of things, but accounting seemed a little repetitive. This goes to show how important an internship can be in finding out what you do and do not like. All in all, this was the most incredible summer of learning how the real world works and I am ready to enter senior year with full confidence. www.woldenenergypartners.com

P5 **Harvard Kennedy School, Cambridge, MA**

Student Intern: Grace Gittell ’20
Major: Political Science

My internship provided me with an incredible opportunity to both learn and explore future career options. I worked on a myriad of projects including political research on national governments, briefings for press inquiries, notetaking for conferences, publications on the Program website, and edits on mailing list correspondence. With political research being one of the most common projects , I greatly improved my research skills. Equally as important, I developed the invaluable skill of professionalism. At this internship, I worked for and around people that are former diplomats, former advisors to presidents, and renowned academics. My experience with assisting and communicating with these accomplished people has strengthened my ability to work in any professional environment. This internship has undoubtedly changed my career path and future plans. Working in an academic institution has been very fulfilling largely because of the opportunity to conduct research. https://wappp.hks.harvard.edu/

P6 **National Conference of State Legislatures, Denver, CO**

Student Intern: Riley Hutchings ’19
Major: Economics

The most rewarding part of this fellowship for me was the connections I made to the people at the NCSL. By the end of my fellowship, I had a place within my team and did not need to be told what I should do every second. I was inspired by the work of my supervisors, and content with how much respect they showed me. I am leaving the NCSL with a much better sense of how to write to a broad audience in a nonpartisan way. I was also able to make solid connections and learn more about environmental policy, in part to prepare me for my coursework this year. My biggest takeaway is that I like the environment that nonprofits like the NCSL provide. Working at the NCSL unfortunately made me reconsider going to law school, an option I thought I had ruled out. It also furthered my interest in environmental policy. http://www.ncsl.org
*This internship is part of the Public Interest Fellowship Program. https:/www.CCPublicInterest.com

P7 University of Massachusetts WGS, Boston, MA

Student Intern: Jess Keniston ’20
Major: Psychology

This summer, I worked as a research assistant for two professors in the Women and Gender Studies Department of University of Massachusetts, Boston. I worked on two large projects. The first was research for an article about abortion regret in response to a supreme court case that attempted to recriminalize abortion. My job was to look into literature surrounding parents who regret having children. The second project was analyzing an assortment of journalistic pieces about menstrual taboos through the method of grounded theory coding. I hoped to gain hands-on experience in research and the ability to set my own schedule while still being productive. Ultimately, I think I learned how to conduct a critical literature review, use the method of grounded theory coding to conduct concrete research on qualitative data, and how to manage my time and work on my own schedule. https://www.umb.edu/academics/cla/women

P8 Aark Wildlife Rehabilitation and Education Center, Chalfont, PA

Student Intern: Courtney Knerr ’21
Major: Organismal Biology and Ecology

In order to get some experience in the field of animal care, I did an internship at Aark, a wildlife rehabilitation center in Pennsylvania. It was on-the-job training, so when I got there in May, I started off feeding baby birds, and I worked up from there. Throughout the summer I learned how to care for most Pennsylvania wildlife (rabbits, opossums, mice, squirrels, raptors, deer, beavers, crows, ducks, geese, and small bird species), but I specialized in raptors since I was really interested in them. I learned how to pick up hawks, owls, and vultures, how to tube-feed them, how to do both a body and a wing splint, what to look for when an injured raptor was brought into the clinic, and what diseases affect raptors. This experience solidified my passion for working with animals. https://www.ark.org

P9 Inter-American Development Bank, Washington, D.C.

Student Intern: Eyner Roman ’19
Major: Mathematical Economics

The IDB is the leading source of long-term financing for economic, social, and institutional development in Latin America and the Caribbean. I became interested in their internship program because I wanted to understand the methodology a multilateral international organization follows to provide cutting-edge research about relevant development issues, policy advice, and technical assistance to improve the planning and execution of projects. I found myself comfortable with the analytical and written tasks involved with the distribution of grants and the formulation of impact studies; however, I was challenged when I had to self-teach a new data visualization software, Tableau, to produce an interactive dashboard. Overall, I found a great level of freedom and trust from my supervisors with the way I could approach my deliverables. It was also exciting to apply the concepts I have been learning through my major to tackle problems that seem relevant at the international level. I now feel more confident to pursue a career in international development. I better understand what the work entails and enjoy being surrounded by co-workers who have ample international experience. https://www.iadb.org/en

P10 **JW Player, New York, NY**

Student Intern: Han You ’21
Major: Computer Science

Even though I know I want to work in the tech industry after graduation, as an international student, I knew very little about the US IT industry. Therefore, my primary goal for the internship was to get first-hand experience in the industry. I was not disappointed. JW Player has established a set of matured procedures: agile development, devops, on-called engineers, etc. I was able to experience the culture and atmosphere of a mid-size tech company. JW Player is large enough that it’s not uncommon to run into major websites that use the company’s service; yet, it’s small enough that I can actually work on its core services, instead of having my contribution buried in a trivial functionality as it often happens in big companies. This internship will definitely influence my choice of employer in the future. https://www.jwplayer.com

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INTERNSHIP POSTER PRESENTATIONS, ABSTRACTS P11-P19

P11 **The Riverside Company, New York, NY**

Student Intern: Emma Brossman ’20
Major: Economics

I worked this summer in compliance for a private equity firm. I worked with the SEC laws and conducted internal compliance checks. I was able to learn a lot about private equity and overall finance. I also learned the importance of networking and asking questions. This experience was positive because I got to work independently on projects and independently research any gaps in my knowledge. The biggest challenge was being in a professional environment and learning how to conduct myself in that setting. I think private equity is a great industry which I hope is in my future. https://www.riversidecompany.com/

P12 **Vanguard Communications, Denver, CO, and Ski Magazine, Boulder, CO**

Student Intern: Leah Curtis ’19
Major: English Literature

During my summer internship at Ski Magazine in Boulder, I had hoped to become a published author and get good insight from a professional editor. I was able to contribute editing, fact checking, and writing to the print version of Ski Magazine. I also wrote, edited, and submitted final articles now published on the Ski Magazine website. What I found particularly challenging about this internship was the fast-paced writing that was always assigned alongside a larger ongoing project. My first few weeks were crucial in figuring out how to budget my time. Working at Ski Magazine also taught me the importance of being passionate about the company you work for. Monotonous tasks never felt boring because I was so interested in the content and mission of the company. This experience has shaped my future plans because I now know that I would be happy working for a magazine or other type of publication company, and working on a fast-paced writing schedule. https://www.skimag.com

P13 **Early Childhood Cognition Lab, University of Washington, Seattle, WA**

Student Intern: Pan Gu ’19
Major: Psychology

In the past summer, I worked as a research assistant in Dr. Sommerville’s lab investigating infant’s social-moral development and children’s understanding of the prosocial behaviors. This experience allowed me to develop a strong foundation in formal scientific psychology research and infant-specific testing procedures. I scheduled families through phone and emails, conducted studies about infant’s understanding of punishment as a leading experimenter, and coded babies looking time to the stimuli video. In the experiment, I tested 24-month-old infants with an eye tracker. Moreover, I designed an independent survey investigating factors that correlated with the parent’s response to children’s misbehaviors. We coded the data, ran data analysis, and presented our results at the lab’s summer research festival. Participating in incremental design also improved my ability to design future experiments. This lab built my research skill sets and prepared me to conduct studies in the future. https://depts/washington.edu/eccl/

P14 **Whale Shark and Oceanic Research Center, Utila, Honduras**

Student Intern: Josie Kritter ’19
Major: Political Science

During this internship, I had the opportunity to work as a research assistant at the Whale Shark & Oceanic Research Center, on one of the small Bay Islands of Honduras; Utila. With my time at the research center, I was given the chance to learn the skills and gain the experience needed in order to pursue a career in the field of environmental conservation, specifically in the marine sector. I hope to combine this newly acquired knowledge with my Political Science degree from Colorado College to enter into the field of Marine Affairs, which is the public policy side of oceanic conservation. On the smaller scale, by having the chance to work so closely with other researchers and NGOs on a tiny island towards the same goal of environmental conservation, I was able to reexamine my life style and make the choice to actively better the planet for future generations. http://wsorc.org/

P15 **Denver Art Museum, Denver, CO**

Student Intern: Olivia Martinez ’20
Major: Education

During my internship at the DAM, I was able to take on a variety of projects. The Family and Community Programs Department at DAM focuses on engaging visitors with family spaces that are specific to certain exhibits, along with exhibition games, creative projects and story times, among many other programs. I researched, developed and prototyped my own Create Playdate, inspired by the Jim Howard Fashion Illustration Exhibition (Drawn to Glamour). I also used my Spanish language skills to draft a few stories for Cuentos del Arte. I also helped my department by drafting and brainstorming possible new iterations of the Family Space at the museum; as one exhibit is coming to an end, it is time to think about changes to the space. I was able to mix my love for education, art, children, Spanish and museums into one niche department at DAM. I enjoyed being able use my creativity every day and be challenged by possible development and prototype issues that I came across. I want to be the person who makes museums fun for all people, and allows more people to access art regularly. https://denverartmuseum.org

P16 **Windows – Channels for Communication, Tel Aviv, Israel**

Student Intern: Rachel Powers ’20
Major: Cellular Molecular Biology

I spent my first two years of college beginning to engage academically and politically with the Israeli/Palestinian conflict. I was excited to engage with the conflict on the ground this summer through my internship with Windows, an NGO based in Tel Aviv. Windows engages in anti-occupation work through education, dialogue and the arts with youth from all sides of the occupation. My time in Israel and the West Bank gave me an opportunity to take what I’ve learned academically and engage in a tangible way with different people affected by the occupation, from IDF soldiers my age in extremely powerful positions, to young Palestinian men who spent most of their adolescence in military prison. My experience this summer also granted me a different perspective of which to look at the United States’ complicated role upholding the occupation. I furthered my ability to organize my Jewish community, local and national politicians through education and activism. http://www.win-peace.org

P17 **Organization of American States, Washington, D.C.**

Student Intern: David Salgado ’19
Major: Political Science

My internship was not as I initially expected. It became evident that the main purpose and goal of the internship was not academic, but more focused on understanding the structure of the Inter-American system, the organization itself, the functions of the different departments, and how decisions were made. Therefore, the main focus of the internship was to attend weekly meetings, go to the Sessions of the Permanent Council, meetings of other departments, and think tanks when they were related to the hemisphere. Hence, the internship helped me meet and connect with experts, young professionals, in different fields pertaining to the central issues in the hemisphere. My biggest takeaway from the internship was the network of young professionals that I met during my time in D.C. and experts in the field. http://www.oas.org

P18 **Sakchyam Access to Finance, Kathmandu, Nepal**

Student Intern: Saluja Siwakoti ’21
Major: Environmental Science

Working for the Sakchyam Access to Finance Programme over the summer has been an amazing experience. It has been a mix of both extremely challenging situations like interviewing and documenting about women in the most remote areas of Nepal amid cultural and language barriers to finding comfort in the staff who initially seemed overwhelmingly professional. I went into the internship to learn about how INGOs operating with foreign aid in Nepal are investing in the financial inclusion of women and disadvantaged communities. People are critical about INGOs given that there is so much foreign aid flowing into the country for development, but the gap between the rich and the poor is only widening. With the internship fund, I was able to travel across southern Nepal and see how effective Sakchyam is in breaking the INGO stereotype by actually making a change. I’ve become aware of the political challenges involved with running such projects but most importantly, I have realized I want to go back and work for a better system in my country even if I do something other than finance. http://sakchyam.com.np

P19 **Street Roots, Portland, Oregon**

Student Intern: Abigail Williams ’20
Major: Sociology

Street Roots is a newspaper based out of Portland, OR that creates income opportunities for people experiencing homelessness and poverty by producing a newspaper and other media that are catalysts for individual and social change. The paper was started in 1998 by five people experiencing homelessness, and has now grown to over 700 vendors who are homeless, or formally homeless, people who buy the paper for 25 cents and sell it on the streets of Portland for one dollar. My favorite part of the job was contributing to weekly vendor writing workshops. I got to know a set of approximately 60 regular vendors who I would see every day of my internship. Many vendors are incredible people with really interesting life stories and insights, and I am thankful I was able to become friends with many of them. Working with Street Roots is without a doubt the best job I have ever had and made for the most meaningful and interesting summer to date. In addition to all of the journalism skills, I learned a lot about housing inequality, homelessness politics, and how to work with people in a variety of positions in life. I am extremely grateful to Colorado College for funding this internship. http://www.streetroots.org

ADDITIONAL INTERNSHIP SITES OF SUMMER INTERN FUNDING RECIPIENTS

Amherst H. Wilder Foundation-Youth Leadership Initiative, Saint Paul, MN
Student Intern: Padah Vang ’19; Major: Sociology

Austen Riggs Center, Stockbridge, MA
Student Intern; Alexandra Wong-Appel ’19; Major: Psychology

Auto Value Parts Auto Store, Moose Lake, MN
Westin Michaud ’19; Major: History

Bike Colorado Springs, Colorado Springs, CO
Student Intern: Andrew Austin ’20; Major: English Literature

Caroline Z Hurley, Brooklyn, NY
Student Intern: Cate Johnson ’20; Major: Studio Art

Cells for Cells, Santiago, Chile
Student Intern: Dahao Feng ’18; Major: Molecular Biology

Center for Coastal Studies, Provincetown, MA
Student Intern: Emily Kressley ’20; Major: Environmental Policy Major

City of Colorado Springs Parks, Recreation, and Cultural Services, Colorado Springs, CO
Student Intern: Nikki Mills ’19; Major: Anthropology

Colorado Equine Veterinary Services, Peyton, CO
Student Intern: Savannah Snell ’19; Major: Molecular Biology

Colorado Springs Sports Corp, Colorado Springs, CO
Student Intern: Michael Heinonen ’20; Major: Economics

Concrete Couch, Colorado Springs, CO
Student Intern: Eliza Fitz ’19; Majors: Creative Writing and Mathematics

Damascus Equine Associates, Damascus, MD
Student Intern: Jackson Groner ’21; Major: Undeclared

Dean Phillips for Congress, Excelsior, MN
Student Intern: Theo Merrill ’19; Major: Political Science

Earth Day Network, Washington, D.C.
Student Intern: Jesse Shaich ’20; Major: Education

University of Minnesota Data-Based Instruction Lab, Educational Psychology, Minneapolis, MN
Student Intern: Emily Gardner ’19; Major: Psychology

Entercom Denver, Denver, CO
Student Intern: Jake Golbus ’19; Major: Political Science

Family & Intercultural Resource Center, Summit County, CO
Student Intern: Emily Carlson ’19; Major: Sociology

Final Frame Post, New York, NY
Student Intern: Lindumuzi “Jabu” Ndlovu ’190; Major: Film and Media Studies
Student Intern: Sam Suzuki ’19; Major: Film and Media Major
Student Intern: Willis Zetter ’19; Major: Film and Media Studies

Gabriel Environmental, Chicago, IL
Student Intern: Konrad Lyle ’19; Major: Physics

Generation Teach, Boston, MA
Student Intern: Ariel Filion ’19; Major: Education

GoalerU, Ottawa, Canada
Student Intern: Branden Makara ’19; Major: Economics

Golden Gate Sports Medicine, Greenbrae, CA
Student Intern: Lauren Wilmott ’19; Majors: Neuroscience and Classics

HR Global/Vet Check Inc., Tampa/FL
Student Intern: Trey Bradley ’20; Major: Economics

Hubbard Brook Experimental Forest, North Woodstock, NH
Student Intern: Nikkol Blair ’19; Major: Environmental Science

Ice Bumper Cars International, Longmont, CO
Student Intern: Andrew Farny ’19; Major: Mathematical Economics

Immortal Cinema International, LLC, Los Angeles, CA
Student Intern: Angel Martinez ’19; Major: Film & New Media Studies

International Network of Museums for Peace/European Network of Museums for Peace/Peace Museum Vienna, The Hague (Netherlands) and Vienna (Austria)
Student Intern: Jackie Bonasia ’19; Major: History-Philosophy

Intervale Center Food Hub, Burlington, VT
Student Intern: Emma Gonzalez ’19; Majors: Sociology and Global Health

Jax Media, New York, NY
Student Intern: Madeleine McCann ’19; Major: English

K2 Sports – K2 Snowboarding, Seattle, WA
Student Intern: Noelle Edwards; Major: Film and Media Studies

Lawrence University, Appleton, WI
Student Intern: Emma Stonesmyth ’20; Major: Organismal Biology and Ecology

Los Angeles Area Chamber of Commerce, Los Angeles, CA
Student Intern: Marlee Akerson ’19; Major: Environmental Policy and Global Health

Luxury Matchmaking Services, Los Angeles, CA
Student Intern: Emily Sussman ’19; Major: English Creative Writing

Menlo Systems, Berlin, Germany
Student Intern: Karl Hirt ’20; Majors: German and Economics

Michaels Wilder, Inc., Edina, MN
Student Intern: Mason Bergh ’19; Major: Economics

Mick Management, Brooklyn, NY
Student Intern: Henry Baldwin ’19; Major: English: Creative Writing

Morgan Stanley, Greenwich, CT
Student Intern: Kate DeFrino ’20; Major: History-Political Science

Office of Congresswoman Diana DeGette, Washington, D.C.
Student Intern: Ethan Greenberg ’20; Major: Political Science

Office of the Prosecuting Attorney, Hilo, Hawaii
Student Intern: Kekailani Wong Yuen ’20; Major: English, Comparative Literature

Office of United States Senator Richard Durbin, Washington, D.C.
Student Intern: Chris Maurice ’20; Major: Economics

Omaha Lancers, Omaha, NE
Student Intern: Chris Wilkie ’20; Major: History

Open Arms of Minnesota, Minneapolis, MN
Student Intern: Aidan Franko ’19; Major: Environmental Policy

OverUnder, Boston, MA
Student Intern: Makena Janssen ’19; Major: Studio Art

Picture Berlin, Berlin, Germany
Student Intern: Amelia Eskenazi ’19; Major: Feminist and Gender Studies

Piece & Co, New York, NY
Student Intern: Kate Guynn ’19; Major: Studio Art

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Summer and Yearlong Fellowships for Colorado College students to gain meaningful work experience with nonprofit organizations. Public interest partner organizations gain access to highly qualified and committed newcomers to the sector. Learn more at www.CCPublicInterest.com

Rockford Rivets, Rockford, IL
Student Intern: Scot Gladstone ’20; Major: Theatre

Sender Films, Boulder, CO
Student Intern: Clayton Pierce ’21; Major: Film & Media Studies

Sirius XM, New York, NY
Student Intern: Aaron Alcouloumre ’19; Major: Music

Slate Partners, Denver, CO
Student Intern: David Lamis ’19; Major: Economics

Smithsonian’s National Museum of American History, Washington, D.C.
Student Intern: Charlotte Cribbs ’19; Major: Political Science

Southwest Human Development Phoenix, AZ
Student Intern: Caroline James ’20; Major: Psychology

Sowt, Amman, Jordan
Student Intern: Ramah Aleryan ’20; Major: Sociology

Telluride Foundation, Telluride, CO
Student Intern: Grace Harmon ’20; Major: Environmental Policy

Textile Arts Center, New York, NY
Student Intern: Charlotte Verstraeten ’19; Major: Art Studio

The Borgen Project, Remote
Student Intern: Amelia Merchant ’19; Major: Political Science

The Intervale Center, Burlington, VT
Student Intern: Sophia Skelly ’19; Major: Political Science

The Meyer Law Office, Denver, CO
Student Intern: Manuel Meraz ’19; Major: Sociology

There with Care, Denver, CO
Student Intern: Eva King ’20; Major: Sociology

United States Attorney’s Office, Boston, MA
Student Intern: Liza Huschle ’20; Major: Political Science

University College of London- The Prion Institute, London, UK
Student Intern: Georgie Nahass ’20; Major: Molecular and Cellular Biology

University of International Business and Economics, Beijing, China
Student Intern: David Cui ’19; Major: Mathematics

University of Vermont, Burlington, VT
Student Intern: Dylan Ward ’19; Major: Independently Designed

Western Organization for People Living with HIV/AIDs, Mumias, Kenya
Student Intern: Emma Antall ’19; Major: Molecular Biology
Student Intern: Emma Low ’19; Major: Organismal Biology & Ecology

Westword, Denver, CO
Student Intern: Sara Fleming ’19; Major: History/Philosophy

Wild Salmon Center, Portland, OR
Student Intern: Spencer Daigle ’21; Major: Undeclared

Wyoming Dinosaur Center, Thermopolis, WY
Student Intern: Drew Ceglinski ’19; Major: Geology

Z2 Entertainment, Boulder, CO
Student Intern: Sarah Laico ’19; Major: Psychology

COLORADO COLLEGE

Office of the Provost

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

Part of the **Colorado College Plan: Building on the Block**

ADDITIONAL SUPPORT FOR THE BLOCK PLAN:
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