15th ANNUAL
CSURF 2018
COLORADO SPRINGS UNDERGRADUATE RESEARCH FORUM

Registration is free for everyone
Student presenter deadline: April 15, 2018
www.uccs.edu/csrf

SATURDAY
APRIL 28, 2018
9 A.M. – 4:15 P.M.

HOSTED AT COLORADO COLLEGE
The Colorado Springs Undergraduate Research Forum (CSURF) is a collaborative venture designed to highlight the accomplishments of undergraduates from Colorado College, the United States Air Force Academy, University of Colorado Colorado Springs, and Pikes Peak Community College. In its fifteenth year, the conference has over 400 participants and continues to reflect the commitment and dedication of our faculty and staff to our students from all disciplines—the Arts, Humanities, Engineering, Natural and Social Sciences. The event gives undergraduate students from all four institutions the opportunity to present their research and creative work in a formal academic setting and receive feedback from scholars and peers. The CSURF also helps students to polish the skills involved in formal presentation, job interviews, or continuing education through graduate/professional study.

The 2018 CSURF Committee Members would like to thank you for your interest and participation in the 15th Annual CSURF

**Colorado College - Host Campus**

Dr. Christina Rader, Assistant Professor of Economics and Business, CSURF Chair

Dr. Sara Hanson, Assistant Professor of Molecular Biology

Dr. Ammar Naji, Assistant Professor of Comparative Literature and Arabic and Race, Ethnicity, and Migration Studies

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Lt. Col. Justin Rufa, Director, Technology/Research & Assistant Professor of Mathematical Sciences

Ms. Jennifer Cunningham, Office of Research

**University of Colorado Colorado Springs**

Dr. Michelle Neely, Director, Writing across the Curriculum & Assistant Professor Attendant of English

Ms. Margie Oldham, Director of Community Relations
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Keynote Speaker
12:15-1:00 p.m.
Dr. Manya Whitaker, Assistant Professor
Colorado College

Dr. Manya Whitaker is an Assistant Professor of Education at Colorado College. She is a developmental educational psychologist with expertise in social and political issues in education. Her courses include Urban Education, Diversity & Equity in Education, and Educational Psychology, among others. She researches teacher preparation for pre-service teachers hoping to work in culturally and linguistically diverse schools, and is the author of Learning from the Inside-Out: Child Development and School Choice.

Moving Beyond the Ivory Tower: Doing Research That Matters

The current sociopolitical climate in the United States has made it evident that we have unresolved social, political, and economic issues. Guided by action-research methodologies, Dr. Whitaker invites the next generation of scholars to challenge traditional conceptualizations of research to change the purpose and processes of academic inquiry. Whether you study biology or dance, literature or robotics, Dr. Whitaker will explore the opportunities embedded within problem-based, collaborative, interdisciplinary research.
Many of the approximately 2,000 students at Colorado College are engaged in our active and vibrant research community. Colorado College has a unique academic calendar divided into eight three-and-a-half week “blocks”. During each block, students experience a semester’s worth of material in an intensive and engaging learning environment.

The flexibility of the Block Plan allows faculty to incorporate independent research projects into many of the courses offered at CC. Moreover, the small class sizes ensure that students gain hands-on experience with cutting edge research instrumentation.

Over 120 students at CC also have the opportunity to participate in research during the summer, as part of faculty-student collaborative research activities. These experiences take place both on campus and abroad, and are supported by institutional funding such as the Faculty Student Collaborative Grants and numerous other student research grants through departments, and programs.
Collaborative research activities at CC often result in publication in high-quality journals, with undergraduate research as co-authors, and in presentation at regional and national conferences. Participating in independent research also helps our students to build confidence, develop critical thinking and problem solving skills and gain an understanding of research design and methodology.

Examples of these projects include investigating the cultural history and sustainability of oyster farming on the Chesapeake Bay, developing fluorinated antimalarial compounds and developing computational techniques to predict the ability of drugs to cross the blood-brain barrier.

Integrating undergraduate research into the curriculum is an important part of the liberal arts education at CC, as we strive to develop and nurture creative and innovative thinking in our students. The research community at CC greatly values the opportunity to participate in the CSURF conference and to share and showcase the hard work of our undergraduate researchers.

Colorado College Student Research Opportunities
At UCCS, our primary focus is on student success. We support student research, scholarship and creative works in ways that lead to unique disciplinary experiences. UCCS provides opportunities for students to engage in scholarship in a variety of ways so that students extend their learning through application of knowledge and deep dives into specific content.

Research, scholarship and creative works are crucial activities for our students to expand their learning experiences beyond the classroom. Faculty members engage students and the community in their research and creative work activities providing unique opportunities for both undergraduate and graduate students.

Students have the opportunity to present their scholarly activities at the Colorado Springs Undergraduate Research Forum (CSURF) and UCCS Mountain Lion Research Day as well as at conferences for their discipline-specific professional organizations. Many students are co-authors with faculty on journal publications.

University of Colorado Colorado Springs Office of Research
http://www.uccs.edu/~research/
Some students are international scholars who travel abroad to perform research and creative activities. UCCS supports these students with funds for travel, supplies and tuition because it recognizes the importance of international activities that support our academic endeavors.

Our Undergraduate Research Academy students will have a special opportunity to work with their faculty advisors on real life research projects. During the academic year, each student will spend approximately ten hours a week on their research project, and thirty hours a week during the summer. When funding allows, they will be paid for their work on the project. Not only will the students engage in active research, they will also have opportunities to demonstrate their knowledge by presenting at Mountain Lion Research Day or CSURF, and monthly seminars allow students to make presentations about their research.

During the past decade, UCCS has experienced tremendous growth in enrollment, course offerings and campus facilities. UCCS has had a corresponding surge in research efforts. We're very excited about the work that has been done by faculty, staff and students and look forward to continued achievements in the future.
The mission of the Air Force Academy is to educate, train and inspire men and women to become officers of character, motivated to lead the United States Air Force in service to our nation. Research at the Academy is breaking barriers – breaking barriers to achieve and to better one’s world through science, invention and innovation.

**Research Program Vision**

Enable the efficient research execution, synergize efforts across academic departments and research centers, and promote the transfer of research results and intellectual property for wide benefit in the Air Force and society.

**Research at a Different Altitude**

- Enhancing cadet education
- Developing future problem solvers
- Partnering for innovative solutions

**Research Program Mission**

Facilitating both technical and non-technical research collaborations that support cadet education, faculty development, and support to the warfighter in air, space, and cyberspace.
Research is a high-impact component of the cadet experience. With 23 research centers and institutes, the United States Air Force Academy aims to enhance cadet education by providing rich, independent learning opportunities and fostering the critical thinking skills necessary to succeed as leaders in the Air Force and beyond.

The Office of Research exists to support the researcher as they bolster curriculum, develop faculty, and expose cadets to the importance of planning and executing research.

Research and development at the United States Air Force Academy is developing strategic partnerships to enhance the mission of the Academy in developing leaders of character.
Do Presidential Speeches Impact the Stock Market?

Mark Foreman, Colorado College
Faculty Mentor: Dr. Mark Smith

The focus of this thesis is whether or not presidential speeches have any impact on the economy. To investigate this question, data was gathered for January 2003 to January 2015 on speeches made by the President and assembled into a dataset. To measure economic outlook, I used data from the Dow Jones Industrial Average. I then examined whether or not the market showed a noticeable change on the day after a big speech. It did not.

The Best of Times/The Worst of Times: Contemporary Viewpoints across the Political Spectrum

Danielle Lopez and Timmy Vilgiate, University of Colorado Colorado Springs
Faculty Mentor: Dr. Linda Watts

Thirty-eight people were interviewed representing the political spectrum from conservatives, to centrists, and liberals. Respondents expressed their viewpoints regarding truth values, definitions, and commentary around five key topics: fake news, immigration and diversity issues, energy regulations, healthcare entitlement, and the status of the American Dream. A focus group encouraged respondents to discuss how to "bridge the divide" across current American political reality narratives.

Taking a Knee: The Impact of Protest on NFL Viewership

Jacob Miller, Adam Jolly and Ella Tulchinsky, Colorado College
Faculty Mentor: Dr. Aju Fenn

The ongoing national anthem protests in the National Football League (NFL) have spawned controversy since they began in the 2016-17 season. Using data from 329 NFL games played between the 2014-15 and 2017-18 seasons, demand for televised NFL games was modeled by analyzing factors associated with viewership. Expanding on the current literature, two protest variables were introduced to test the impact of taking a knee on viewership. Results from OLS analyses revealed that both protest terms were significant and negatively associated with viewership per game. Viewership has significantly declined since 2014-15 season, potentially signaling a shift in sports consumers’ preferences. Streaming services did not have a significant impact on viewership. However, the time, day and network of broadcast, as well as the home team county demographics, emerged as significant determinants of NFL viewership. Implications for NFL revenues are discussed.
Within the last several years, the rise of nationalism in countries such as France, Germany, the U.S., and many others, have given rise to rhetoric that significantly challenges international norms. These international norms are the bedrock for peace and stability throughout the world. Much of this criticism is being directed primarily towards many of the world’s international organizations (IO) and spring from the lack of a historical example to base an IO off of. Many utilize the failures of the League of Nations in order to highlight what an IO is not supposed to do, but very few can find a successful historical IO to use as a shining example. This was evident during the most recent elections in Europe. Whether it was the National Front in France or AFD in Germany, the necessity and validity of the European Union (EU) was called into question. This paper seeks to explore those criticisms and offer a model to base solutions off of. That model is the Hanseatic League of Medieval Europe. Intended to be the “Rome” example for building an IO, this paper explains that the Hanseatic League as one of the earliest examples of a successful IO that can be used as a model to rebuild/restructure the EU. Additionally, as a historical European example, this paper explores the idea that the Hanseatic League is a European specific solution to a European specific problem.
Organismal Ecology and Physiology

Armstrong 233

Spatiotemporal Habitat Use by Flammulated Owls (Psiloscops flammeolus) in Colorado

Kate McGinn, Colorado College
Faculty Mentor: Dr. Brian Linkhart

Animals exist in landscape mosaics of good and poor habitat, and evolution selects for behaviors that allow animals to occupy spaces that improve their fitness. Flammulated owl (Psiloscops flammeolus) habitat selection has been studied with radio telemetry, but few studies have investigated Flammulated owl habitat selection as a function of time and the choices associated with energetics. During the 2017 summer breeding season, we deployed trackers on six territorial males in Pike National forest. We compared habitat characteristics between used and unused but available habitat, analyzed territory sizes based on temporal variables, and investigated patterns in their movement paths. Results suggested that Flammulated owls had more concentrated habitat use following daytime fasts and increased energetic demands in their nestling stage. Habitat selection appeared to be limited by suboptimal home range choices, which precluded selection from occurring at a microhabitat level.

Assessment of Macroinvertebrates in USAFA Streams

Anna Nicol, United States Air Force Academy
Faculty Mentor: LCDR Adam C. Strong

The purpose of this study was to assess the water quality of the streams located on the United States Air Force Academy (USAFA) through identification of aquatic insects. Stream health can be analyzed through changes in the relative proportion of genera sensitive to poor water quality (Ephemeroptera, Plecoptera, and Trichoptera [EPT]) compared to the total number of genera. We measured water quality (dissolved oxygen content and pH levels) and collected aquatic macroinvertebrates according to USGS aquatic bioassessment protocol. The insects were counted and identified and the species richness, species diversity (Shannon-Weiner index), EPT ratios, and rarefaction curves calculated. The results showed a significant positive relationship between species richness and dissolved oxygen. We found no relationship between abundance, species diversity, and EPT and water quality. More sampling is required to elucidate the impact of water quality and aquatic macroinvertebrates in USAFA streams.
In vivo quantitative near-infrared spectroscopy in skeletal muscle during incremental whole-body exercise using a commercially available oximeter

Kaylene Ross, University of Colorado Colorado Springs
Faculty Mentor: Dr. Robert A. Jacobs

Exercise performance is dependent on skeletal muscle oxygenation (SmO2), which includes the balance between the amount of oxygen delivered to the working muscle as well as the amount that can then be utilized for bioenergetic processes. Here we study the relationship between established variables important for exercise performance, e.g. maximal aerobic capacity (VO2max), ventilatory threshold (VT), and gross efficiency (GE), with measures of SmO2 during exercise obtained with a commercially available oximeter. Our results suggest that SmO2 does not correlate to any variables of interest. However, parallel measures of total hemoglobin and myoglobin did correlate to VO2max (l/min) and GE

Modulation of Neural Oscillations with Frontal Transcranial Static Magnetic Field Stimulation

Alec Sheffield, Colorado College
Faculty Mentor: Dr. Flavio Frohlich

Transcranial static magnetic field stimulation (tSMS) is a non-invasive brain stimulation technique that has been shown to locally increase alpha oscillations in the parietal and occipital cortex. We investigated if tSMS locally increased alpha oscillations in the left or right prefrontal cortex, as the balance of left/right prefrontal alpha oscillations has been linked to emotional processing and mood disorders. Neither left nor right tSMS locally increased frontal alpha oscillations. However, alpha oscillations were higher in occipital relative to other brain regions only in the left DLPFC tSMS condition. Both left and right tSMS increased post-stimulation global theta oscillations relative to sham, with a greater increase for right stimulation. Beta oscillations in the left hemisphere increased post-stimulation for left and right DLPFC tSMS compared to sham. We concluded that DLPFC tSMS modulated brain network oscillations in regions distant from the location of stimulation.
The security of computer systems is a critical and often overlooked part of software development. To gain a greater understanding and appreciation for the development of secure software we attempted to develop, attack, and defend a network communication application. Throughout this process, we learned the industry challenge of balancing security, functionality, and consumer’s expectations when designing a program. Unfortunately, based on research and the outcomes of multiple company attacks, the pressure of innovation triumphs, leaving security as an afterthought. We learned that as a body of code expands, potential attacks increase almost exponentially in number. In addition, encryption of data makes all kinds of development questions much more complicated, and lastly, we achieved an appreciation for the neverending war that is information security.

Legacy Sea craft Hull-Rivet Construction Corrosion Characterization

Jaspreet Singh and John Despard, United States Air Force Academy
Faculty Mentors: Mr. Kevin Gibbons and Dr. Sandeep Shah

Sunken vessels pose a significant risk to the aquatic environment, the economy and to cultural monuments. The United States Coast Guard Academy (USCGA) and the National Parks Service (NPS), with assistance from the DoD Office of Corrosion Policy and Oversight (CPO), have begun studies on the corrosion potential of legacy seacraft to determine the risk of structural degradation by corrosion leading to contaminant release from these sunken vessels. To support these modeling efforts, a team of USAFA cadets, advised by senior researchers, have conducted materials characterization, including material conductivity, optical emission spectroscopy (OES), X-ray fluorescence (XRF), and Energy Dispersive X-ray Spectroscopy (EDS) to aid in these efforts by determining hull plate and rivet compositions of both the USS Arizona and the USCGC Eagle. Furthermore, the USAFA team has worked to characterize corrosion rates of both ships’ legacy steel hull and rivet metals by creating Tafel plots.

R2D2 Robotics

Brayden Thomas, Mario Bracamonte, Hwi Tae Kim and Anthony Talosaga,
United States Air Force Academy
Faculty Mentor: Maj Kevin Walchko

The purpose of our project is to design, build and test a movie quality R2D2 Robot product. The DFEC department at USAFA has not had an operational R2D2 robot display for the past 12 semesters. R2D2 is a critical asset to the department because the display can be used to recruit cadets to the major and entertain visitors to the department. There has also not been a display produced that is able to showcase the multiple disciplines within DFEC and is instantly recognizable like R2 will be. Our robot will be capable of safe operation, attain the correct appearance of R2D2 from the cinematic film, will have R2D2 like interactions to create its own personality and lastly will have simple operation so that anyone can learn to use the system.
Data control is a widely debated topic. With personal data breaches on the rise, companies are both cautious and excited about the insights big data can bring. Altia, a Colorado Springs-based software company that makes graphical user interfaces (GUIs) has partnered with the Quad Innovation Partnership to research how data interacts with the internet of things. The Quad team has researched and prioritized target industries that would benefit from GUI data capture and created a customer-facing website to host and display important data events in order to incentivize alternate methods for data collection and distribution.
My work is rooted in memory. My memory starts with the physical characteristics, mannerisms, and intimate moments I have shared with deceased loved ones in my family. They have manifested themselves into untouchable, quiet, and reverent representations. Through repetition and tactility, I present an archive of memories, an obsession over absence and loss, and an urgency to preserve. I investigate the construction of memory, its tendency to be faulty and unreliable. I handle my work delicately, viewing my memories through a thin veil of time.

Figures and Shadows

Lauren Larrabee, Colorado College
Faculty Mentor: Emma Powell

In the photographic series entitled "Figures and Shadows," I intend to highlight the nude human form and its interaction with shadow. Inspired by photographer Claire Mallett's composition "Bodies and Shadows," it is my goal to explore the female form through varied exposures of light. To heighten the emotional impact of the series, black and white photography is utilized. It also emphasizes the abstraction of the piece rather than sexualizing the female body.
Memorials are powerful means for perpetuating memory and constructing a national myth: a monument is a node around which notions of who we are coalesce. For millennia societies have altered or destroyed one another’s, and even their own, most potent symbols. I will provide an understanding of the historical context for contemporary and contentious treatment of monuments, as in Charlottesville, VA, and Durham, NC. In the current, dangerously polarized political culture, matters of national identity are brought to the forefront with minimal academic examination. This paper seeks to fill that void by providing a balanced, scholarly view of the issue.

The Face of Claudius: Out with the New and In with the Old

Heather Poll, University of Colorado Colorado Springs
Faculty Mentor: Dr. Lauren Kinnee

The portraiture of the ancient Roman Emperor Claudius is often overlooked just as his life and rule have been. Each of his three portrait types illustrates Claudius’s desire to legitimize his rule through visual connection to Augustus, the first Roman Emperor. At the same time, his portraiture also illustrates his skillful manipulation of the Damnatio Memoriae of his predecessor, Caligula. This presentation will reveal Claudius’s reversal of the standard Augustan style depicting the Emperor as eternally young. It is only with Claudius that we see the emergence of a unique style balancing youth with verisimilitude that would inspire future Emperors.

Discobolus and Diadoumenos: Greek Athleticism

Kaelyn Daughetee, University of Colorado Colorado Springs
Faculty Mentor: Dr. Lauren Kinnee

An important theme within ancient Greek art history is athletic sculpture. This paper aims to discuss Greek athleticism by looking at and discussing athletic sculpture, specifically the sculptures: Discobolus and Diadoumenos. By viewing these two sculptures more in depth, I will demonstrate how the usage of naturalism, the idealized body, and the idea of athleticism accomplish the Greek vision of what it means to be an athlete. The goal of this paper is to inform the audience about ancient Greek athletic sculpture by analyzing the two athletic sculptures, and to examine ways the sculptures influenced art for future cultures.
Developing cities, treaties and archives

Armstrong 257A

Charles Mulford Robinson and The City Beautiful Movement

Ryder Dunbar, University of Colorado Colorado Springs
Faculty Mentor: DeLyn Martineau

The 1893 World Columbian Exposition held in Chicago was a prototype of what Daniel Burnham, the primary architect of The City Beautiful Movement, thought a city should be. The “White City” is largely credited for ushering in the City Beautiful Movement, planting the seeds of modern city planning. Unpleasant living conditions inspired Burnham to make a change. The beauty that attracted a resident must accommodate the resident, anchoring him in his own personal success and prosperity. These conventional ideas suggested further progress for reformers of The City Beautiful Movement, such as Charles Mulford Robinson. Inspired by the Exposition, this newly-constituted demand for beauty, order, and cleanliness left enduring marks on future city plans. The City Beautiful Movement claims to blend civic pride with reform to promote beauty, tourism, trade, and revitalization of cities into places of peace, safety, and beauty that every city and community deserves.

Preserving Icarus - A Digital Humanities Presentation

Jacqueline Parker and Macy Miller, United States Air Force Academy
Faculty Mentor: Bill Newmiller

Panel Presentation: Preserving Icarus is a digital humanities project that incorporates archive works and literary analysis. Icarus is USAFA’s creative works journal, created entirely by cadets that has been around since 1965. Cadet First Cass Jacqueline Parker and Macy Miller have analyzed the works by the historical context and trends prevalent within the work across the cadet wing. The presentation will describe the archive process as well as exploring unique and profound content of the cadets’ writing.

The Pragmatic Gandhi: Prime Minister Indira Gandhi’s Foreign Policy and Domestic Development, 1971-1973

Alexandria Kahalley, University of Colorado Colorado Springs
Faculty Mentor: Mark Honnen

The purpose of my research is to analyze the Indo-Soviet relationship and how it changed as a result of Prime Minister Indira Gandhi’s pragmatism. The paper will provide Cold War context and describe the events that drove India towards a closer relationship with the USSR. Economic development pushed India towards Moscow, resulting in a shift from Nehruvian non-alignment to a more pragmatic approach, connecting foreign and domestic policies. Specifically, I will analyze three treaties, signed between 1970-1973, to demonstrate this transition. My research shows the difficult decisions independent nations face as they attempt to balance security and development.
Luchando contra la injusticia social

Armstrong 256A

Un análisis del concepto del honor en El Cantar de Mío Cid y La Vida de Lazarillo de Tormes y de sus fortunas y adversidades

William Newman, United States Air Force Academy
Faculty Mentor: Dr. Ismenia De Souza

El concepto del honor era muy importante para la sociedad española en la Edad Media. Sin embargo, la desigualdad social y la crítica hacia la iglesia católica influyeron y cambiaron las perspectivas y la mentalidad de muchos españoles. Los problemas como la pobreza, la injusticia social, y la falta de igualdad entre diferentes clases sociales crearon una situación de indignación y desencanto con los ideales tradicionales en relación al honor. El propósito de este estudio es analizar y mostrar los cambios que ocurrieron en la mentalidad española hacia el concepto del honor, y como afecta al individual de la época de El Cantar de Mío Cid hasta la publicación de la obra La Vida de Lazarillo de Tormes y de sus fortunas y adversidades. Palabras clave: La Vida de Lazarillo de Tormes, desigualdad social, El Cantar de Mío Cid, honor.

La verdad desde la perspectiva de Rigoberta Menchú

Jennifer Roca, Colorado College
Faculty Mentor: Clara Lomas

Esta presentación comparte las conclusiones de una investigación sobre el testimonio Me Llamo Rigoberta Menchú. En este testimonio, la utilización de una voz colectiva y la recreación de los eventos reales y ficticios en la vida de Menchú, y los de toda su comunidad, revelan la injusticia política y social hacia la comunidad indígena a la vez que restablece la posición subalterna de Menchú dentro de la sociedad. Esto se puede ver (1) desde las lentes teóricas del descolonialismo y subalternismo y (2) a través de una investigación de la conversación crítica que surgió por la publicación del testimonio. Concluye con una conversación y pensamientos sobre cómo le damos una voz al subalterno en el mundo académico.

La voz poderosa de la mujer indígena: una herramienta esencial para lograr la autonomía

Annie Dargan, Colorado College
Faculty Mentor: Clara Lomas

Esta investigación intenta traer más atención a la lucha de la mujer zapatista en el campo mundial y en su propia comunidad por analizar los comunicados de las Comandantas mujeres del Ejército Zapatista de la Liberación Nacional (EZLN). La última meta del movimiento zapatista es lograr una autonomía del gobierno mexicano que significa que quieren operarse fuera del poder hegemónico que impone el gobierno sobre los indígenas de México. Para proveer la importancia del rol de la mujer indígena en el movimiento zapatista, este trabajo enfocará en los estudios poscolonialistas de José Rabasa y la teoría de la psicología de la liberación de Ignacio Martín-Baró. Al aplicar estas lentes teóricas, se puede entender por qué la mujer indígena tiene que hablar para su misma. Este trabajo demuestra el progreso tangible que ha logrado la mujer zapatista por involucrarse en el movimiento que manifiesta hoy en día en tener una mujer como la líder del EZLN.
1. **Fixed vs Growth**  
Rachel Brottlund, University of Colorado Colorado Springs  
Faculty Mentor: Dr. Michelle Neely

The purpose of this study was to further understand students’ memories of their teachers’ mindsets. A survey asked whether students recall being encouraged in either a fixed or growth mindset and how this affected their performance. The study also explores how it affects them now, and, if a teacher, how it affects the style in which they teach their own students. Two interviews were conducted with college students who were asked the aforementioned questions. The research compiled, both in this study and the sources already published, suggest having a growth mindset to be the most positive mindset to have in terms of learning (Davis, 2017).

2. **Inclusion: What’s keeping Theory out of Practice?**  
Megan Hopkins, University of Colorado Colorado Springs  
Faculty Mentor: Dr. Michelle Neely

Inclusive education is a widely discussed and controversial trend in several school districts today. Though the topic merely suggests that all students are given the opportunity to participate and belong in the school community as a whole, several individuals find distaste in the added expectation that special education classrooms become less prominent in the process. What factors contribute to these polarized opinions? While several studies have been done to answer this question through the eyes of educators (Sutherland 2004), I have attempted to widen the lens. As social regards often shape personal perception, my aim is to look at how the average individual develops ideas about disability and thus inclusive practices as a whole.

3. **Methodologies That Students Utilize in Writing in a Foreign Language**  
Irini Rinn, University of Colorado Colorado Springs  
Faculty Mentor: Dr. Michelle Neely

In our era, being at least bilingual is a preferred skill for many employers; therefore, the desire for learning new languages because there is a need for said foreign languages in the workforce, or, perhaps, due to being born in a bilingual family, has been an area of interest for a plethora of researchers. This study is to better understand how international students feel about writing in a different language. Taking into consideration the current results of my interviews and survey, so far, most people mentioned that writing is the part of the English language that they are the least good at: why is that?
4. Engineering Majors’ Attitudes toward Writing
Gina Herriage, University of Colorado Colorado Springs
Faculty Mentor: Dr. Michelle Neely

Effective communication is vital to success in almost any field. Writing especially is an important skill in most Engineering pursuits in the professional world; if Engineering majors “want to be successful, written communication skills, communication skills in general, are critical” (Zhu, 2004). Yet in spite of this emphasis in communication, many engineering majors view writing as unnecessary in their field. How an engineer engages with academic writing could negatively impact future career success. Conducting both a survey and interviews of current engineering students, I explored the attitudes engineering majors have toward the process of writing and their writing courses to determine strategies for improving this experience.

5. Putting Feelings into Words: The Emotional Experience of Writing
Ashley Leonard, University of Colorado Colorado Springs
Faculty Mentor: Dr. Michelle Neely

Putting words to paper, though most widely recognized by the profession as a cognitive process, is also a process wherein affect plays a role in the development of the written work and the author alike. Significant research (Brand, 1987) has been conducted, demonstrating and arguing for the acknowledgement of affect in writing. This study intends to enter the same conversation, examining college student’s emotional experiences when writing for creative and academic purposes, and what happens as a result of these emotional experiences. Two college students and known writers were interviewed, accompanied by a survey of additional college students. These two methods for data acquisition were implemented in order to more critically evaluate the role of affect in the writing among college students.

6. The Threat of Active Shooters on School Grounds and Its Effect on a Community: Perspectives from Stakeholders
Nicole Marle, University of Colorado Colorado Springs
Faculty Mentor: Dr. Michelle Neely

Exercise performance is dependent on skeletal muscle oxygenation (SmO2), which includes the balance between the amount of oxygen delivered to the working muscle as well as the amount that can then be utilized for bioenergetic processes. Here we study the relationship between established variables important for exercise performance, e.g. maximal aerobic capacity (VO2max), ventilatory threshold (VT), and gross efficiency (GE), with measures of SmO2 during exercise obtained with a commercially available oximeter. Our results suggest that SmO2 does not correlate to any variables of interest. However, parallel measures of total hemoglobin and myoglobin did correlate to VO2max (l/min) and GE.
7. Transformational Leadership as a Moderator of the Person-Organization Value Congruence and Organizational Cynicism Relationship
Noah Conrad, United States Air Force Academy
Faculty Mentor: Lt Col Rylan Charlton

Cadets at United States Air Force Academy were studied in an attempt to determine if person-organization value congruence could be used as a predictor of cynicism towards the organization and if transformational leadership could be used as a moderator of said relationship. Data supported an inverse correlation between person-organization value congruence and organizational cynicism via a Pearson’s correlation. Additionally, moderator analysis, utilizing the PROCESS Procedure of SPSS Version 3.00, indicated the model using transformational leadership as a moderator for the relationship between person-organization value congruence and organizational cynicism demonstrated a statistically significant relationship. The given study supports the idea that the transformational leadership behaviors experienced by an employee may serve as a boundary condition in the person-organization value congruence and organizational cynicism relationship.

8. Validation of a Pilot Performance Assessment Tool
Cassidy Ley-Han and Sonya Kang, United States Air Force Academy
Faculty Mentor: Maj Dan Moore

Tools that assess pilots’ qualifications are important as the Armed Forces’ needs for pilots have increased throughout the years. The demands for the rated career fields are also greater than ever. A Performance Assessment Tool (PAT) was developed in order to test pilot candidates’ cognitive and motor performances through a computer-based program. Measures included pre and post surveys, MicroCog, Original Manikin, Digital Symbol Substitution, and Pursuit Rotor. The preliminary conclusion is that PAT does indeed assess many of the same cognitive and motor skills that are required for successful performance for pilots.

9. Data Analysis for the Air Force Reserve Command Recruiting Services
Luke Amato, Kylie Kester, Claire Hickerson and Conner Mallet, United States Air Force Academy
Faculty Mentor: Lt Col Kristopher Pruitt

How does the Air Force recruit effective recruiters? In order to bring our Nation’s best to the fight, we need to attract the country’s best. This paper analyzes personality traits and sales strategies of current Air Force Reserve Command (AFRC) Recruiters in order to understand what traits define a good recruiter and use these traits to create performance measures. Our model supplies AFRC with predictive performance measures, such as success rates in each region, to determine which region recruiters should be assigned to. The model will supply the AFRC with several assignment options for the recruiter to give the AFRC the most flexibility without significantly sacrificing recruiter effectiveness. AFRC aims to add 40 new recruiters in fiscal year 2019, and our model helps place these new recruiters in the best possible regions.
10. Social Media Influence in an Organizational Setting  
Orchydia Sackey, United States Air Force Academy

In modern day society, social media has become a household phrase. For many people, it is a constant and vital part of their everyday lives. Researchers have spent time trying to analyze how social media became prominent, why users interact on it, how they are interacting, and how users are then influenced by that information those interactions. The theories about user interactions might assist military leaders at the United States Air Force Academy with identifying the institution’s relationship with social media and whether not it is an effective learning and leadership tool. For this project, we observed social media influence at USAFA through Jodel, an anonymous social media platform that allows users to contribute content by creating, responding, or up- or down-voting. We analyzed hundreds of jodels and consolidated them into prominent categories and then considered whether or not these categories could be used to promote as an effective learning and leadership tool.

11. Veteran Students College Experience  
Elaine Garcia, University of Colorado Colorado Springs  
Faculty Mentor: Dr. Judith Long

As more and more veterans begin to use their educational benefits, their transitions back into civilian life and going back to school can be difficult for them. There are two types of veterans, those who completed their obligated service, decided to separate voluntarily and go to school, and those who did not plan to separate from the military but had to, for example, getting medically discharged. A veteran’s self-efficacy (their purpose or goals in areas that they do well in) can also be affected by their transitions. The question here is: are veterans’ self-efficacy lower in those who did not plan to separate from the military than those who did? Additionally, to examine their self-efficacy, the following study will be using three scales to support this question which include the College Stress Inventory, Institutional Integration Scale and the Personal Need for Structure Scale.

12. When Words Fail: A Study of Language, Gender and American Stereotypes  
Rowan Frederiksen, Colorado College  
Faculty Mentor: Christina Leza

This project looks at the gendered stereotypes that are projected on to males and females in the United States and how these stereotypes affect our language and speech. Students at Colorado College participated in a series of activities, free-listing and pile-sorting, to gather data on the association of everyday terms to masculinity and femininity. A common trend that appeared among the participants was the acknowledgement of gendered terms and the discomfort that came with this acknowledgement. This trend supports the gendered language that has been created within American society and the idea of toughness vs. passiveness in males and females respectively.
13. Media Construction of Masculinity: How Media Affects Men's Attitudes toward Masculinity and Fatherhood
Trudy Roberts, University of Colorado Colorado Springs
Faculty Mentor: Dr. Elizabeth Daniel

The present study examined the influence of alternative views of masculinity in media on young men’s attitudes toward traditional masculinity and fatherhood. Using an experimental design, participants viewed two commercials in one of four conditions. First, participants viewed either a Dove commercial, which depicts men in nurturing roles with children, or a Coke commercial, which has no masculinity messages. Then participants viewed either the Max Steel movie trailer which was intended to threaten the participants’ masculinity, or a Galapagos Island movie trailer, which has no masculinity messages. After viewing the videos, participants answered a survey assessing their views on traditional masculinity and fatherhood involvement. We predicted that participants who saw the video with an alternative masculinity message would report less support for traditional masculinity attitudes and more support of fatherhood involvement even after viewing the video that threatened their masculinity.

Raychel Blocher, Kayla Tinucci, John Valentine, Chad Young, United States Air Force Academy
Faculty Mentor: Lt Col Gregory Steeger

In this research, we seek to determine the factors that impact a military officer’s ability to make rank. Gender, ethnicity, marital status, dependents, deployments, information regarding all duty assignments, promotion details, and commissioning years might all play a role in the fate of an officer standing before a promotion board. Though we focus on Aircrew, many of the takeaways are applicable to officers in all lines of work, throughout all of the services. We quantify how each of the aforementioned factors impact an aircrew officer’s chance of reaching their aspired rank. Our research reveals that there is a gap in promotions to both Lieutenant Colonel and Colonel across gender. Ultimately through our research, aircrew personnel data synergizes with linear regression to reveal what really influences promotion boards, thereby pitting perceptions against reality.

15. Bifidobacterium infantis Supplementation Reduces Anxious Behavior Induced by a Stressful Social Situation in Rats
Katharine Teigen, Colorado College
Faculty Mentor: Dr. Lori Driscoll

It is becoming increasingly evident that the commensal gut microbiota are capable of exerting substantial influence on the central nervous system, and that they potentially play a role in the manifestations of mood and affective disorders. The exact route, be it neural, hormonal, or immune through which this communication occurs has yet to be determined. The aim of the current study was to assess whether the probiotic Bifidobacterium infantis (B. infantis), which produces serotonin as a by-product of its metabolic processes, is capable of alleviating anxious and repetitive behavior, and if so, to what extent this effect is dependent upon the vagus nerve (i.e. neural communication). B. infantis treatment reduced anxious behavior as measured by the social interaction test in both male and female rats in a non-vagally dependent manner. In contrast, probiotic supplementation had no effect on the occurrence of repetitive behavior in both sexes as measured by the marble burying test.
16. Socialization on Forums: Developing Social Skills and Relations in an Online Community
   Melody Reither, University of Colorado Colorado Springs
   Faculty Mentor: Dr. Michelle Neely

The purpose of this study was to explore how socialization online can benefit and influence people. Studies show that interaction with online communities can inspire people to engage in social groups, practice their writing and literacy, explore new cultures and ideas, and discover their own interests and identity (Black, 2009). Yet there is a misconception that online socialization is dangerous with the presence of threats and can lead people to become disengaged with reality. Can online interaction teach people to handle conflict in real life (Hangwoo, 2005)? How can people learn communication skills in an online setting? This study analyzed the results of interviews and a survey on people’s experiences with socialization on a forum and how that influenced them or compares to “in-real-life” interactions.

17. Investigating the relationship between Mortality Salience and the perception of the "Uncanny Valley" in robots
   Alekxandria Schneebeck, University of Colorado Colorado Springs
   Faculty Mentors: Dr. Edie Greene and Dr. Damon Tomlin

This study seeks to investigate the relationship between human perception of the "Uncanny Valley" and Mortality Salience as it pertains to robots. The term "Uncanny Valley" refers to the feeling of anxiety and discomfort experienced when viewing robots that are similar to, yet distinguishable from, actual human beings. It has been suggested that this discomfort stems from similarities between such robots, which are human-like but not alive, and deceased human beings (MacDorman & Ishiguro, 2006). According to Terror Management Theory, such stimuli serve as cues that force the viewer to acknowledge the tension between an instinct to avoid death and intellectual awareness that death is inevitable; such cues possess "Mortality Salience" (Solomon, Greenberg, & Pyszczynski, 2000). This relationship will be investigated by confirming the existence of the perception of the "Uncanny Valley" in the mind of the viewer, and then by testing whether reminders of mortality enhance this perception.

18. Postpartum Depression
   Katelin Matson, University of Colorado Colorado Springs
   Faculty Mentor: Sarah Treschl

To inform professionals working with mother about the benefits of early diagnosis of postpartum depression. It affects not only the mother, but the child may have some developmental disabilities, and the father or other close family members who may also begin to have symptoms of depression.
19. Concurrency Defects in Real World Event Loop Based Applications
Clara Richter, Colorado College
Faculty Mentor: Benjamin Ylvisaker

The use of multitasking in software has increased in recent years. A very common model utilized for achieving multitasking is that based on an event-loop and callbacks. The event-based model defines multitasking functionality in a, compared to other existing frameworks, intuitive and effective way. However, we believe that the use of existing event-based frameworks is not without problems. In particular, we believe that the callback abstraction tends to be overused, introducing the possibility for interruption in places where a regular, atomic procedure would be preferred. We speculate that this behavior has made applications susceptible to atomicity violations, a form of concurrency bug. In our project, we searched for patterns constituting the necessary preconditions for atomicity violations in event-based runtime environments. In order to obtain the data, we dug into and modified the core of these environments, including Chromium and Node.js.

20. Social Media Image Labeling and Extraction: Using Convolutional Neural Networks to Identify Threats to National Security
Sheamus Larkin, Nick Forrest, Josh Radjenovich and Andrew Tien, United States Air Force Academy
Faculty Mentor: LtCol Gregory Steeger

As social media becomes more prevalent in society, it creates a new platform to gather data and information, providing aid in intelligence acquisition. This project aims to answer the question, “How can convolutional neural networks and image recognition be used to further identify national security threats revealed through social media?” The main approach used in this project uses Naïve Bayesian statistics to predict whether an image pertains to national security based on the objects detected from a convolutional neural network. The final model is able to scan through a set of images, identify key features within those images, and label images that pose potential threats to national security. The model currently performs at 85.5% test accuracy with a 1.5% false positive rate. These results prove that conditioning the probability of an image being a threat on the objects detected in the convolutional neural networks improves overall model accuracy.

21. Surface Tension of Poly(methyl methacrylate) (PMMA) and Polyvinylidene difluoride (PVDF) Polymers
Jeffrey Baston, University of Colorado Colorado Springs
Faculty Mentor: Dr. Jena McCollum

Tensiometry is ideal in studying surface energy and structure of droplets. Using pendant drop analysis, Laplace fitting equations for angles are used on hanging droplets from medical grade needles to observe changes in surface tension. Using a First Ten Angstroms Tensiometer and a near vacuum state control chamber heated at 300 ºC, PVDF/PMMA polymer crystalline structures are heated and extruded in an automated pump running at 10 uL/s. Concentrations of PVDF/PMMA tested: 100/0, 25/75, 20/80, 15/85 and 0/100 respectively. Surface energies are collected and analyzed to predict the behavior of the polymer when processed as a metalized polymer matrix.
The purpose of this project is to create an indoor bike race simulation using commercial off the shelf (COTS) bike trainers and fitness sensors. The project entails developing 1 custom built sensor as well as a custom mobile device application. The requirements of this project are based on the needs of triathletes and are intended to expose athletes to actual race courses during their training. The system is expected to run a multi-user race simulation, providing a display of course graphics using actual GPS data of a selected course and metrics including inclination, rider’s heart rate & cadence and power. The expected benefits of the system are that it will allow triathletes to optimize their racing performance by familiarizing themselves with actual course topography and steering data on a trainer prior to racing the course in competition. Triathletes will be able to gauge their performance & improvements on the course through the system’s feedback and storage of past race data.

23. Communications Blackout: Review of Current Methods to Overcome the Hypersonic Plasma Sheath
Rachel Golding, Chris Clark and Ryan Olson, United States Air Force Academy
Faculty Mentor: Lt Col Paul Kaster

This paper seeks to review current methods to communicate during hypersonic flight by overcoming the blackout caused by plasma. It looks at seven different methods which are listed in the introduction, and weighs the cost and benefit of each. The magnetic, electrostatic, and Raman scatter methods accounted for more problems with the blackout, but are extremely complicated to the point where they may be impractical. Magnetic and electrostatic methods are very expensive as well. The matched layer and quenching methods are simpler and cheaper, but less developed. Finally, the high/low frequency and reshaping the vehicle methods are simple and relatively inexpensive, but encounter problems in real practical human space flight.

24. Satellite Communications Scheduling: Designing a Resilient Network
Anson Cheng, Anya Wallace, Bennett Hatfield, and Maxwell Thompson, United States Air Force Academy
Faculty Mentor: Lt Col Gregory Steeger

Almost everything that is done on the battlefield relies on data provided by satellites. The United States operates significantly more satellites than any other country, which means it also has the most targets. Reliance on these assets makes building a network that is resilient to physical and/or cyber attacks crucial to its success on the battlefield. When satellites were first launched, the definition of resilience was geared towards surviving the space atmosphere and conditions, but, as technology has evolved, space resilience also evolved. We address methods through which the resilience of satellite networks can be improved. We begin by analyzing the Air Force Satellite Control Network and modeling its scheduling process. Next, we consider possible interdictions or attacks on the network and develop metrics to measure total system impact and consequently, resilience. Finally, we test which design features offer the most resilient network according to the aforementioned metrics.
25. NAO Autism Social Interactions Development  
Jinan Andrews, Briana Chavez, Paige Harrison, Courtland White and Valentine Whitton,  
United States Air Force Academy  
Faculty Mentors: Dr. Steven Hadfield, Dr. Scott Kupferman and Lt Col Clint Sparkman

The NAO robot is a fully interactive humanoid robot that can be programmed to foster therapeutic interventions for children with Autism. Working in collaboration with UCCS, the USAFA’s NAO capstone team has utilized the NAO robot as a computer interface to prompt social interactions for school-age children with Autism in the classroom setting. The cadets created a Java program for a therapist or teacher to foster conversations, social cues, and appropriate behaviors between the NAO robot and a child with Autism. This program will be used to help break down the social barriers that exist for children with Autism so that they will have opportunities to create and maintain social relationships with their peers.

26. IEEE Autonomous Robotics  
Aubrey Lowe, Sharee Acosta, Tylar Hanson, Lucas Mireles and Cait Renee,  
United States Air Force Academy  
Faculty Mentors: Dr. John Ciezki and Capt Phillip Warner

The robot design is based off of competition minimum requirements determined by IEEE, as well as derived requirements due to function. During 3 timed rounds, the robot must autonomously pick up colored, magnetic tokens flush from the game board and drop them off in the corresponding colored squares. Rounds 1 is 5 minutes with 12 tokens, round 2 is 6 minutes with 18, and round 3 is 8 minutes with 24. The subsystems the team has determined were critical to design include mobility, pick up, storage, and drop off. The solution created for this problem involves a predetermined path, line following capability, a magnetic linear actuator as the lift mechanism, a color sensor to determine each token color, a seven container storage unit with 270 degree turning servo, and a slot for easy drop off at locations. Current status of the system is a fully integrated system, working on fine-tuning capabilities and performance specifications.

27. Synthesis and Isolation of Functionalized Quinoxalyltriazoles  
Christopher Clements, University of Colorado Colorado Springs  
Faculty Mentor: Dr. Allen Schoffstall

Reaction of an isomeric mixture of bromonitroquinoxalines with sodium azide was used to synthesize the mixed azido derivatives, used to react with a terminal alkyne to produce nitroquinoxalyl-1H-1,2,3- triazoles. With the core of the molecule synthesized, isomeric separation can be undertaken as well as the addition of various substituents. All products were solids and gave moderate yields. Purifications were carried out at different stages using chromatographic methods. All purified products were characterized using 1 H NMR spectroscopy and FTIR spectroscopy.
28. Exploring a new colormetric approach for testing concentration of diacetyl in beers: using a quinoxaline derivative
Jacob Lewis, Colorado College
Faculty Mentor: Murphy Brasuel

Diacetyl is a common off-flavor found in beer that are caused by poor sterilization allowing for growth of undesired yeast. The current testing technique for diacetyl is expensive headspace analysis paired with a GC-MS or lengthy derivatizations using heavy bases. This new proposed technique uses a derivatization protocol combined with solid phase sample clean up allowing for final analysis utilizing a UV-Vis spectrophotometer. Prior to quantifying the diacetyl, a derivatization is done to form a quinoxaline complex, and isolated using solid phase extraction. Quantification is accomplished using quinoxaline-diacetyl complex absorbance peak at 313 nm. The UV-Vis spectrophotometer is used to analyze different beer samples and the results are compared to the concentrations found by taking the measurements with a uHPLC paired with a mass spectrometer. Using a paired t-test on a limited sample set it was shown that this method gives results that are not statistically different.

29. Synthesis of a Novel Triazole Polymer
Kevin Stewart, University of Colorado Colorado Springs
Faculty Mentor: Dr. Allen Schoffstall

The synthesis of two triazole-based polymers was successfully accomplished by utilizing a non-traditional polymerization process, the Sharpless copper (I) catalyzed azide-alkyne cycloaddition (CuAAC). The polymers were made by reacting a dialkyne with two different diazides in an aqueous alcohol solution, yielding products that were both powders. The two polymeric powders were tested for their solubility in different solvents and thermostability. Both polymers showed promising characteristics, remaining insoluble in all solvents attempted and thermally stable up to 500°F. Further characterization of the polymers will be performed, with real-world application of the novel polymers being the final goal.

30. Lewis-base catalyzed TMSCF3 additions to 2-Fluorinated Ketones
Tara Tyron, United States Air Force Academy
Faculty Mentor: Dr. Todd Davis

In recent years, fluorinated organic molecules are of increased interest to pharmaceutical and agrochemical industries. These carbon fluorine bonds do not occur readily in nature and therefore synthetic methods are necessary. Because of these limitations, our lab has focused on developing nucleophilic addition reactions to fluorinated ketones mediated by organosilanes. To expand on this work, this poster will focus on our recent efforts in developing stereoselective nucleophilic addition reactions to cyclic 2-fluoroketones in high stereoselectivity using the Rupert-Prakash reagent (TMSCF3). In particular, the role of the Lewis base, reaction conditions, and substrate scope will be presented.
31. Assessing Tropical Cyclone Intensity in the Western North Pacific Using ASCAT Imagery
Shelby Fatcheric, United States Air Force Academy
Faculty Mentor: Lt Col Robert Wacker

Forecasters at the Joint Typhoon Warning Center (JTWC) provide tropical cyclone formation alerts (TCFA) and subsequent tracking for tropical cyclones (TCs) within the United States Pacific Command (USPACOM) area of responsibility, which includes the very busy Western North Pacific (NWPAC) basin. This research seeks to provide a tool for forecasters to use during the initial stages of TC development when it is difficult to use other techniques to provide accurate and timely intensity estimates and center fixes. This study examines wind speed and direction data from the Advanced Scatterometer (ASCAT) instrument for storms in NWPAC from 2014-2016. Max winds were consistently the best predictor of storm intensity based on the JTWC Best Track. An algorithm to determine an estimated storm intensity based on quadrant max winds was used on a test data set and resulted in estimates consistent with the wind speeds and directions.

32. Analyzing the Accuracy of Alaskan Icing Forecasts
Cameron Hoover, United States Air Force Academy
Faculty Mentor: Col Jennifer C. Alexander

Aircraft icing is a major danger for planes flying in winter conditions. Without appropriate forecasts pilots might not be prepared to fly in these conditions, which can lead to aircraft damage or the loss of life. Through my research I am studying the accuracy of the icing forecasts over Alaska provided by the National Weather Service. I compared these to the PIREPS provided to the Aviation Weather Service. I collected PIREPS reported to Anchorage, Fairbanks, Juneau, Nome, Dutch Harbor, and Barrow airports.

33. Increasing starch degradation efficiency in engineered yeast
Justin Becker and Sarah Dietrick, University of Colorado Colorado Springs
Faculty Mentor: Dr. Wendy Haggren

The yeasts Saccharomyces cerevisiae and S. diastaticus are being used to ferment ethanol from glucose for biofuel production. Fermentation from glucose can be an expensive process and energetically inefficient. Yeast can be genetically modified to degrade starch into glucose molecules. The starch can be cheaply and efficiently derived from a variety of plant sources, such as the starch-laden root of the Buffalo Gourd. This project focuses on the modification of S. cerevisiae and S. diastaticus with the gene for a yeast glucoamylase. While the enzyme α-amylase degrades internal α-1,4 glycosidic bonds in large branched starch molecules, glucoamylase digests these same bonds from the ends of the starch molecule. S. cerevisiae and S. diastaticus will be genetically modified to contain variable copy numbers of glucoamylase and the efficacy of the secreted glucoamylase will be measured using starch degradation assays on agar plates.
34. Antibody Fragment as Lupus Therapeutic  
Michael Colwell, Colorado College  
Faculty Mentor: Dr. James Kovacs

Lupus is a chronic autoimmune disease able to affect any system in the body. Lupus is thought to first develop when self-antigens are presented to T-cells due to inappropriate disposal of apoptotic cells. The complement system is of interest with respect to Lupus as the final protein of the alternative pathway, C3D, is known to stimulate antibody production by B-cells when bound to its receptor, CR2. An anti-C3D monoclonal anti-body was determined to reverse the production of auto-antibodies in mice, most likely through interrupting the binding interaction between CR2 and C3D. To improve the mAb it was converted into a single chain variable fragment. The scFv’s structure was predicted utilizing modeling programs, and docked to C3D with the program HADDOCK. This in silico method revealed residues on C3D targeted by the scFv, confirming it bound residues important to the interaction with CR2, verifying that the scFv has the potential to prevent the production of autoantibodies.

35. Identifying Male-Transferred sRNA in Same Line and Different Line Crosses of Drosophila melanogaster  
Toan Hoang, University of Colorado Colorado Springs  
Faculty Mentor: Dr. Jeremy Bono

Speciation can arise from reproductive incompatibilities between organismic populations. Reproductive incompatibilities involve improper interactions between the female reproductive tract and the male sperm or other ejaculate component such as sRNA. We attempt to identify the male-transferred sRNA using same line and different line crosses between a white-eyed line, “Iso”, and an African, “G418”, line of Dosophila melanogaster. After mating a female G418 with a male G418 or Iso, the reproductive tract is extracted, and its sRNA content is analyzed using RNA Sequencing. Currently, we are gathering enough reproductive tract samples for RNA sequencing.

36. Aeromonas hydrophila secreted Proteases as a potential Mechanism of avian Influenza A Virus Persistence  
Matthew Lerdahl, United States Air Force Academy  
Faculty Mentor: Lt Col Marcus King

Proteolytic cleavage of hemagglutinin is required for cell entry and plays a role in influenza virus pathogenicity. Previous studies identified 56 caseinolytic-secreting bacterial species capable of cleaving hemagglutinin in a “trypsin-like” manner. The goal of this study was to identify and characterize Aeromonas hydrophila secreted proteases. We separated secreted proteases ion via ion-exchange and size-exclusion chromatography cell-free supernatants and fractions exhibiting proteolytic activity were sequenced for protein identification. Seven caseinolytic proteins were selected for isolation and characterization to determine the role of these respective contributors in virus activation/inactivation. These proteolytic activities may reflect ecological and host environments in which avian influenza viruses persist and replicate. Complete understanding of proteases found in natural sites of infection is necessary to derive insight into mechanisms of pathogenicity.
37. Investigating Plasmid DNA Maintenance in Transformed E. coli
Thomas Oh, United States Air Force Academy
Faculty Mentor: Dr. Barry Hicks

Conjugation, transformation and transduction are the three main mechanisms in which bacteria can alter their genetic information. Chemical transformation occurs when cells that are chemically compromised by ions, detergents or other agents, become competent cells, and take up foreign genetic material in an attempt to survive. “Common knowledge” suggests that once cells are transformed it is necessary to keep them under selection to avoid loss of plasmid DNA. To investigate plasmid DNA stability, we transformed E. coli strain KRX (Promega) with three different plasmids encoding for blue, green and red fluorescent proteins. The plasmids have different antibiotic selection (Kan or Amp), different inducing agents (rhamnose or IPTG), produce different fluorescent protein products, and, with different origins have different copy numbers. We monitored fluorescence over 20 days of growth representing nearly 200 generations in the absence and presence of antibiotic selection.

38. Bifidobacterium infantis 35624 Supplementation in Eubiotic Adolescent Rats Does Not Influence Anxious or Compulsive Behaviors
Paige Anton, Colorado College
Faculty Mentor: Dr. Lori Driscoll

A healthy gut microbiome shapes neuropsychiatric function. Gut microbes communicate with the brain through endocrine, immune, and neural signaling. The extent to which gut microbes depend on each of these modes of communication is unknown. Our goal was to determine if probiotic supplementation with Bifidobacterium infantis 35624 impacts anxious and compulsive behaviors in healthy rats, and if these effects depend on vagus nerve signaling. Rats received a vagotomy or sham surgery, and were supplemented with B. infantis or a vehicle for 22 days. They were tested in the Elevated Plus Maze (EPM) and Marble Burying Task (MBT) to assess the effects of B. infantis on anxious and compulsive behavior. B. infantis did not reduce anxious or compulsive behaviors in rats; however, vagotomy significantly reduced anxious behavior in males in the EPM. These results suggest B. infantis supplementation does not influence anxiety in healthy rats, but that the vagus nerve informs anxious behavior in males.

39. From Gut to Brain: The Influence of the Enteric Microbiome on Human Behavior
Amanda Elliott and Kaitlyn Enright, United States Air Force Academy
Faculty Mentor: Dr. Kellie Kuhn and Dr. Katherine Bates

The human gut microbiome is important in food digestion, and new research suggests it may also play a key role in regulating neurochemicals. The objective of this study was to examine the short chain fatty acid (SCFA) secretions of E. coli, Y. enterocolitica, L. reuteria, C. faecalis, and E. aerogenes to eventually uncover their potential effects on the gut-brain axis. While the mechanisms by which microbes in the intestines affect the brain are not well known, alterations in SCFA production might alter signal conductance through the brain-gut axis and impact the neurochemical response. We identified SCFAs in inoculation solutions by growing different combinations of the bacteria until they reached optimal growth, derivatizing the SCFAs to their respective butyl esters, then analyzing the esters with 1H NMR and GC/MS. Here we present candidate SCFAs and discuss their potential utility in studies of gut-brain interactions.
40. Shade Competition and Heritability of Morphological Traits in Saw Palmetto
Mike Beintner and Luke Dorwart, Colorado College
Faculty Mentor: Shane Heschel

Serenoa repens is a shade-intolerant clonal plant species native to the subtropical Southeastern United States. The encroachment of invasive species in this region have led to new stressors for S. repens, such as light competition, on the S. repens throughout its range potentially causing changes in morphological strategies throughout the range. Densiometer, plant characteristic, and leaf measurements were used to compare variation of shade-response traits across four separate study sites. S. repens were found to have higher heritability in leaf color and size in low-light conditions compared to high-light conditions. Conversely, height and leaf count evolutionary potential are higher in high-light conditions. Low heritabilities in these traits may indicate selection in the past. We recommend future research into the role of prescribed fire on life history strategies and leaf morphology in S. repens.

41. How Does Proximity to Predator Activity Centers Affect Nest Site and Success in Flammulated Owls (Psiloscops flammeolus)?
Joran Ellison, Colorado College
Faculty Mentor: Brian Linkhart

The increased structural protection of cavities may provide concealment from predators, resulting in lower rates of predation compared to other nesting types. Little is known how other factors impact predation on the cavity-nesting flammulated owl (Psiloscops flammeolus) by the North American red squirrel (Tamiasciurus hudsonicus). To address if proximity to middens affects nest success, I mapped all owl nests (n=60) and nearby squirrel middens (n=223) from 2005-2017 on a study site in the Manitou Experimental Forest. Mean distances were calculated between owl nests and nearest squirrel midden. Nests were categorized as successful or unsuccessful if failed due to predation. No significant difference was found between distances from middens to successful owl nests (53±8 m) and unsuccessful owl nests (60±20 m; t=0.564, p=0.58). This exhibits the need for further research on the influence of other habitat characteristics on predation rates of flammulated owls by red squirrels.

42. Plant Community Recovery on a Closed Social Trail Using Active vs. Passive Restoration
Sara Johnson, University of Colorado Colorado Springs
Faculty Mentor: Dr. Emily Mooney

Colorado is well known for the multitude of outdoor activities which is enjoyed by locals as well as tourists. As people explore the amazing surroundings, many inadvertently damage the natural environment. Popular parks are subject to damage through overuse, which can arise in the forms of eroded trail surfaces and the creation of new social trails. These social trails are created by nothing more than the footsteps of many people following the same route. These trails may link official trails together, disrupting wildlife by opening up less populated areas of the park. In 2015 one such social trail was closed, and was subjected to active and passive methods of restoration. The social trail bridged an approximately 300 meter gap between two existing trails. In September of 2017, a survey was conducted to measure the recovery progress of plant life on the former trail.
43. The Short-Term Effects of a Thermogenic Supplement across Age and Gender
Victoria Perez and Travis Brooks, United States Air Force Academy
Faculty Mentor: Lt Col Amy R. Carpenter

The objective of this study was to explore the short-term effects of a commercial thermogenic dietary supplement called Legion Pulse on resting metabolic rate (RMR), heart rate (HR), blood pressure (BP). Published literature on caffeine-containing thermogenic dietary supplements like Legion Pulse suggest that they cause an acute rise in RMR, and in some cases there is a simultaneous increase in blood BP and HR. However, prior published studies on this topic include predominantly resistance-trained, college-age males. This randomized, double-blind, placebo-controlled, crossover study included twenty-four males and females ranging in age from 18-60. Results will be compared between supplement and placebo to determine if differences in BP, HR and RMR are present, and if results are influenced by gender or age.

44. Simultaneous Glint Spectral Signatures of Geosynchronous Satellites from Multiple Telescopes
Augustine DeMeulenaere and Eli Harmon, United States Air Force Academy
Faculty Mentor: Dr. Francis Chun

During glint season over the past three years, multiple cadet team space researchers have collected spectra measurements of geostationary satellites using the technique of slitless spectroscopy using a single telescope on the campus of the USAFA. The spectral data collected over that time showed that the satellite solar panels are the source of the glints observed. This study continues on the previous work, however this time we present measurements of glint spectra taken simultaneously from two separate telescopes. The spectral data from the two different telescopes are compared to one another to determine similar features.

45. Surface Plasmon Resonance in Anisotropic Nanoparticles
Cassandra Eagan, University of Colorado Colorado Springs
Faculty Mentor: Dr. Anatoliy Pinchuk

Plasmonic metal nanoparticles have attracted much attention in recent years because of their potential applications in medicine; they could assist as a therapeutic, diagnostics and imaging platform. In addition, their unique optical and electronic properties make plasmonic nanoparticles an optimal choice when it comes to catalysis in chemistry or boosting the efficiency of next generation solar cells. In this work we present our results on the optical extinction of gold anisotropic nanoparticles of different sizes and shapes. We used Discrete Dipole Approximation to calculate optical extinction of different gold anisotropic nanoparticles, such as gold triangles, hexagons and dodecagons. We estimated a shift of the extinction peak as a function of the dielectric permittivity of the surrounding medium. The results might be used to develop next generation ultrasensitive optical biochemical sensors.
46. Algaudí Tile  
Cory Page, Colorado College  
Faculty Mentor: Kate Leonard

The Algaudí Tile is an urban intervention project designed to reinvent how urban streets function and are utilized in Barcelona, Spain. Barcelona’s status as the most polluted European city makes it critical to also address issues of vehicular air pollution. The city’s response to a lack of public space and vast roadways is the Superilla, a grouping of a three-by-three block area into interior pedestrian-only zones, and exterior vehicular zones. To both mitigate harmful emissions and reinvent public space, the tile acts as an urban bio-reactor producing clean, renewable, algal biofuel. Its soft pillow-like composition encourages direct interaction with the tile, and harvests movement to stimulate algae growth. This public space intervention is designed to bring awareness to the positive impact vegetation can have on air quality and human health. The tile provides a framework for generating algal biofuel not just for Barcelona, but for other dense urban areas worldwide.

47. Metal Binding Characterization of stiP from A. baylyi  
Eden VanDevanter, Colorado College  
Faculty Mentor: Margaret Daugherty

Due to the ability of bacteria to adapt to environmental stressors, antimicrobial resistance is causing an emerging crisis around the world. Acinetobacter baylyi ADP1 has emerged as a model system to study resistance mechanisms because the bacterium presents starvation survival methods similar to those suspected in infectious bacteria. Prior research has shown that during A. baylyi’s long-term stationary phase (LTSP), a period of bacterial growth under sustained starvation, many genes linked with starvation survival are upregulated. Of these genes, the Daugherty lab has purified a corresponding LTSP-induced cysteine protease, stiP, and shown that divalent cations affect the enzyme’s proteolytic activity. We present preliminary data that qualitatively analyze if conformational changes of stiP occur in the presence of metals, as well as identify any metals associated with stiP in vivo. Our data suggest a role for tightly bound cations, and that added metals can also bind to the enzyme.
Oral Session 2 - 1:20-2:40
Social services, parents and schools
Armstrong 231

In Loco Parentis or Parens Patriae? Defining the Reach of Primary Public Schools over Our Student’s Speech
Johnny Murphy, United States Air Force Academy
Faculty Mentor: Maj Aimee Haney

The public school has become a First Amendment battleground, where educators struggle to suppress cyberbullying and harassment beyond school walls, while students and parents are pushing back against schools’ omniscient scrutiny of student expression. The Supreme Court must find a solution to whether and when a school may censor its students’ speech that originates off campus, such as internet speech. This paper recommends that a student’s speech made off-campus cannot be censored unless the speech violates the rights of a student or faculty member to feel physically secure at school, or precludes a student’s access to education. This paper examines the Court’s posture toward unprotected expressions and internet speech, its limitation on First Amendment rights within schools, and its protection over students’ right to education, as well as the circuits’ approaches toward students’ off-campus speech.

Connected: Increasing Access to Social Services through Interactive Technology
Emily Bertrand, United States Air Force Academy, Cole Simon, Colorado College, Sandy Fales, University of Colorado Colorado Springs and Ifeoma Jones, Pikes Peak Community College
Faculty Mentor: Jake Eichengreen

Social Service Access Team: In El Paso County, many low-income families and people experiencing homelessness rely on publicly-provided services to access critical career support, nutrition assistance, child care programs, and numerous other vital programs. In accordance with the smart city initiatives, and in active pursuit of the region’s commitment to economic prosperity and equal opportunity, the Quad Innovation Partnership is working to improve access and transportation to social services. By implementing an innovative interactive technology solution, we are able to take a multi-faceted approach that addresses many critical issues and communities. The service is an integrated software package that combines subsidized transportation, appointment scheduling, service information, and client document submission into a unified user experience.
Regretting Parenthood
Gwen Chambers, University of Colorado Colorado Springs
Faculty Mentor: Dr. Zek Valkyrie

This project explores the concept of “parent regret” among adults who have had at least one child and self-identify as regretting parenthood. This group occupies a heavily stigmatized social position and people who feel this way are unable to seek traditional coping avenues. Yet, they are obligated to perform their role as parents, and thus, they to do their emotion work internally and without social support. Qualitative, unstructured interviews with 20 parents who regret having children were conducted, covering a broad range of experiences and using a life history approach. From this data, the researchers identified a set of language and emotional strategies these parents use to manage their day to day lives performing a role they would prefer not to embody. Implications for the changing meaning of parenthood are addressed.

Legislative Roles in Education Policymaking: A Comparative Analysis
Benjamin Herrick, United States Air Force Academy
Faculty Mentor: Dr. Damon Coletta

In this study, one potential explanation for the difference in performance of education systems was examined, and it was posited that greater consensus in national legislatures about the role and goals of education results in greater success of education policy and reform. To examine this, three case studies were examined to compare the legislative consensus on education legislation to the performance of the nation’s students on standardized tests. The overall results of this study were inconclusive. Analysis of Finland suggested support for the hypothesis, but the inconclusive results from the U.S. and Colombia point towards the idea that attempting to isolate legislative consensus as a variable without considering wider societal factors may not be a feasible approach. Therefore, a deeper look into how the legislatures reached their policy outcomes would improve any further study on the link between legislative consensus and policy effectiveness.
**Performance & innovation: Finance, sports and clothing**

**Armstrong 233**

**Forecast Bitcoin Price Volatility with Hybrid ARMA-GARCH Model**

John Ye, Colorado College  
Faculty Mentor: Daniel K.N. Johnson

This paper uses Bitcoin hacking and Bitcoin miners’ distribution to gain a deeper understanding of the Bitcoin price volatility. This paper uses data directly from the Bitcoin blockchain, as well as data gathered from various Internet sources. A two-step ARMA-GARCH model is chosen to detrend and interpret the Bitcoin price volatility. With three variables, the model can accurately forecast 5 percent of the total volatility. From the result, Bitcoin hack, scam and theft events would make the Bitcoin price more volatile, and more concentrated Bitcoin miners in the network would decrease the Bitcoin price volatility. However, because of the small percent of forecasted values, most of the Bitcoin price volatilities remains a mystery.

**Determinants of NFL Draft Selection**

Rae Conlon, Colorado College  
Faculty Mentor: Dr. Aju Fenn

This paper examines the significant variables that help running backs get drafted in the NFL. The purpose of this project will be to shed light on key variables that scouts should be focused on to get the best/most efficient player. Variables in this paper include college statistics such as total rush yards in college, total rush attempts in college, collegiate conference, and combine results for the forty-yard dash.

**Investigating the Effects of Character Variables on NFL Performance**

Theodore Hooker, Colorado College  
Faculty Mentor: Dr. Aju Fenn

This presentation examines the effect of a collection of character variables on QB draft pick and overall NFL performance. Based on previous literature, we use variables commonly attributed to determining draft pick and NFL performance. In addition, we use team and individual discipline history to gauge players' character.
Janska Team: In an industry tailored primarily to youthful, able bodies, millions of elderly, sick, and handicapped Americans lack access to clothing that suits their needs. Janska’s “Clothing That comforts” line has provided fashionable, comfortable outerwear to suit the needs of those with mobility issues for fifteen years. Research shows that dressing with dignity has social and emotional benefits to those suffering from limited mobility. The Quad Innovation Partnership has worked alongside Janska to further understand the needs of this growing customer segment. The research focused on several categories, including competitors, target market research and interviews, and brand identity. Through the research and interviews, The Quad team recorded valuable data that related comfort, fashion, and the quality of clothing. Equipped with the research, the Quad is assisting in adapting Janska’s marketing strategy to better reach these customers.
Describing the world with math

Armstrong 234

Generalized Devil's Staircase

Jordan Armstrong, United States Air Force Academy
Faculty Mentors: Dr. Beth Schaubroeck and Dr. Kurt Herzinger

We examine random dynamics by looking at the probability that each starting seed value will go to infinity, given a set of starting functions from which to choose at each step. Thus, we create behaviors and graphs similar to that of the Devil's Staircase or Cantor functions. All it is—is taking a number and iterate it through a set of functions an infinite number of times to see what the probability of that number going to infinity is -- how hard could it be?

A Study of Metrics on Visual Boundaries

Malcolm Gabbard, Colorado College
Faculty Mentor: Molly Moran

Certain metrics on the boundary of CAT(0) spaces have been well studied. However, these metrics are not easily extendable to the interior of the CAT(0) space. We propose a new family of metrics on the boundary of CAT(0) spaces which can be extended to metrics on the interior of the space. We explore whether changing the parameters for these metrics is a quasi-symmetric transformation. The advantage of this family of metrics is that it depends on the entire geodesic ray so it captures more of the geometry of the space. This will hopefully help with problems such as generalizing which boundaries of CAT(0) spaces have finite linearly controlled dimension.

Harmonic Mappings from Generalizations of Hypocycloids: Rosette Mappings

Lauren Stierman, Colorado College
Faculty Mentor: Jane McDougall

A family of generalized hypocycloids called rosettes display unique mathematical properties. The rosette is a harmonic mapping with canonical decomposition identical to the simple polynomials that generate the harmonic hypocycloid, but with additional factors that are hypergeometric 2F1 series. While the hypocycloid is well-known in the mathematical realm, the rosette was only discovered in 2016. This project explores the intricacies of rosettes and their relationship with hypocycloids, through an analysis of the relationships between relevant formulae and the use of the computer algebra system Mathematica. Important findings include the following properties of the rosette: its nested behavior, the mirror image property on the boundary of its mappings, the equal and opposite tangent vectors that produce this property, and the distinct shapes that are generated based on the relative angle rotation of the functions of the canonical decomposition.
The Jones polynomial is a powerful (though incomplete) knot invariant invented in 1983. It is still unproven whether the polynomial distinguishes all knots from the unknot. It is typically calculated using a combination of diagram changes and combinatorics; the combinatorics makes it easiest to find via automation, however the dependence on diagrams makes it difficult to handle in a computer. In 1993, Louis Zulli published a matrix which can be derived from a knot which allows us to compute the Jones polynomial using linear algebra and combinatorics, which is much easier to automate. Using this method, we wrote a Python program which can calculate the Jones polynomials of most knots. We also present new proofs of known results about the Jones polynomial, and leave open numerous interesting questions for further research.
As an artist, crafting of artistic endeavors in numerous shapes and forms is the driving force behind my life. Resultant critique and acceptance of my work has led to numerous realizations in my personal life and helped shape a greater world view. Formal presentation of my most recent work provides an intimate glance into how creating art personally impacts my life. This artist discussion will delve into the state in which creation occurs, and the stimulating nature that art has. Art remains an inspirational vehicle of communication; a tangible way to portray and decipher my innermost states of being.

Still Life and Meaning in the Dutch Golden Age

Still life became a popular genre during the Dutch Golden Age, and the meaning of the period’s vanitas still lifes continues to be the subject of scholarly debate. This paper aims to illustrate the historical conditions leading to the proliferation of still life production and place vanitas still lifes within the broader genre. I will discuss the complexities of interpreting vanitas still lifes, including the contradictions that their high detail poses, and present competing scholarly theories on their interpretation. Finally, I will attempt to prove that a single theory is inadequate in addressing this complex and varied genre.

"Invisible" Project

Invisible is a project meant to confront environmental health in relation to human or natural caused elements and chemical compounds that are unseen to the human eye. Sulphur dioxide from burning coal, radioactive elements like radon, or perfluorochemicals (PFCs) in contaminated ground water exist in our surroundings. The use of photography and non-traditional media provides multiple layers of visual communication highlighting specific environments in Colorado Springs, CO. This project is both documentary and altered to provide information and promote an emotion of unease to the viewer. By making the invisible visible, an awareness of our surroundings is given as a catalyst to environmental awareness and the desire to change the current social construct.
This presentation aims to identify similar qualities found within the two triptychs belonging to Mathias Grunewald, his Isenheim Altarpiece, and Otto Dix’s Der Kreig Triptych and how these works were linked to their chosen audience. The proposed audiences in question consist of patients suffering from St. Anthony’s Fire, known as egotism, and veteran soldiers returning from the trenches of World War I. Overall, the two artists both sought to placate those suffering by demonstrating recognizable attributes in their art. Elements I aim to illustrate as I convey this shared essence of agony and empathy between soldiers and patients alike.
Milk and Strawberries
Erynn Mitchell, University of Colorado Colorado Springs
Faculty Mentor: Dr. Lauren Kinnee

Milk and Strawberries is a feature-length mystery film directed by Erynn Mitchell. Five individuals are enticed to come to a house in the mountains under different pretexts. The group of individuals invited all have been involved in deaths of other people, and when they retire to their rooms they each discover letters accusing them of murder and making it clear that they will pay for their crimes. This presentation comes after the full production process and it is a reflection on what it takes to make a film, themes, and techniques the filmmaker wants to explore, and the professional growth student directors experience when making a feature-length film.

Depicting the American Landscape
Jaime Gray, University of Colorado Colorado Springs
Faculty Mentor: Dr. Lauren Kinnee

This paper explores the work of Frederic Church, Albert Bierstadt, and Thomas Moran, as icons of the American landscape. It questions the amount of influence these three artists actually had on expansion, tourism, and conservation. To evaluate their influence, I look at these artists in light of the common ideologies of Americans in the nineteenth century. The topics I cover include influences such as photography, science, religion, and the preferences of the American people. I weigh these influences against the beliefs and experiences of the artists themselves to determine their intentions, if any, in regard to expansion, tourism, and conservation.

Hitchhiker’s Guide to the Pre-Columbian Afterlife: Mayan and Aztec Visual and Literary Interpretations of Life after Death
Brittany Hall, University of Colorado Colorado Springs
Faculty Mentor: Dr. Lauren Kinnee

The civilizations of the Maya and the Aztecs best represent how the afterlife was treated and viewed. This paper aims to examine the literature and imagery present in the codices and how they depict their views on the underworld. Through analysis of the creation myths, as well as other literary sources, there will be an understanding of what these ideas meant. In using the Borgia Codex of the Aztec and the Dresden Codex of the Maya, there will be a full worldview of the trials of each underworld and how death was closely integrated into the world of the living.
Abstract Expressionism, is an American painting movement practiced during the 1940s and ‘50s. It is known for its vigor and performative nature applied by its practitioners, including bold, improvisational brush strokes, and bright, high-key colors. Artists, such as Jackson Pollock and Willem de Kooning, have long exemplified the movement, but the vigor of their painting style is taken for granted as proof of Abstract Expressionism’s fundamentally masculine nature. I am questioning this “fundamental masculinity” by demonstrating the role played by female practitioners working within the movement. These women, who helped pioneer the style, like Lee Krasner, Joan Mitchell, and Janet Soble, sit among the shadows of their male counterparts waiting to be visible and waiting to change the masculine lens through which we view, Abstract Expressionism.
Rebels, rebellion and life as art

Armstrong 257A

Humiliation: The Foreign Invasion of China of Summer 1900

Jonathan Banks, United States Air Force Academy
Faculty Mentor: Lt Col Michael Hamer

The military incident in the summer of 1900 known as the Boxer Rebellion was a major humiliation for the Qing Dynasty. The activities of extremist groups known collectively as Boxers led to direct conflict between the Qing and an alliance of imperial powers. Despite holding numerous natural advantages over the allies such as greater numbers and defensive fortifications, the Qing failed to prevent the allies from marching troops into Beijing. This failure was largely due to the inferior training of Qing troops, incomplete modernization and standardization of equipment, and political disunity within the Qing government.

The Man Who Sold the World: David Bowie and the Society of the Spectacle

Shannon Ritchey, University of Colorado Colorado Springs
Faculty Mentor: Dr. Samantha Christiansen

Shannon Ritchey CSURF Abstract The Man Who Sold the World: David Bowie and the Society of the Spectacle From the gender-bending alien rock messiah, Ziggy Stardust, to the elder statesman of rock, David Bowie redefined what it meant to be a rock star with his ever-changing personae and theatrical stage shows. Yet Bowie was more than a rock star. This paper presents a critical analysis of Bowie’s five-decade career, drawing connections with Situationist revolutionary theory and Bowie’s subversive approach to his art. While some have argued that Situationism died with the dissolution of the Situationist International, I argue that David Bowie claimed the theory and kept it alive by turning his own life into a work of art.

Readings from English 375

Grace Skidmore and William Tatum, United States Air Force Academy
Faculty Mentor: Lt Col Jesse Goolsby

The panel will consist of readings from work produced in English 375: Creative Writing, as well as a discussion on the research techniques used in crafting fiction/nonfiction.
Los temas en la literatura: carpe diem y la oscuridad

Armstrong 256A

Carpe Diem: La fugacidad de la vida y su exploración artística a través de los siglos

Fernanda Gonzalez, United States Air Force Academy
Faculty Mentor: Dr. Ismenia DeSouza

El término carpe diem fue introducido a la literatura miles de años atrás cuando Horacio escribió Oda I.11. Luego, años después, Garcilaso de la Vega exploró también el tema en el Soneto XXIII. Finalmente, hace pocos años en el 2009, Coca-Cola lanzó un comercial que también usaba características de carpe diem para motivar a sus clientes. Todos estos trabajos discuten la fugacidad de la vida. A pesar del tiempo, el ser humano continúa enfrentándose con el dilema de cómo vivir la vida. El propósito de este trabajo es para demostrar que el tema de carpe diem puede ser interpretado de varias maneras, ya que cada persona tiene una perspectiva diferente acerca de la vida. Sin embargo, se verá que a pesar del tiempo, el ser humano ha aprendido que la vida comienza, pasa y termina demasiado rápido. Palabras Clave: Carpe diem, de la Vega, Horacio, Coca-Cola, tiempo

Un análisis de los símbolos en el poema “La Noche Oscura” por San Juan de la Cruz

Brynn Lunaas, United States Air Force Academy
Faculty Mentor: Dr. Ismenia DeSouza

En este análisis, evalué críticamente los recursos literarios que San Juan de la Cruz usa para representar la unión divina en “La noche oscura”. El enfoque principal es la noche como un símbolo, y las referencias bíblicas. Un artículo por autor Edward Sarmiento y Dra. Ismenia Sales de Souza ayuda describir los propósitos de los símbolos varios. Describo porque la decisión del autor de usar amor profano es tan importante, y como puede hacerlo mientras quedar el propósito del poema. Palabras claves: las tinieblas, la unión divina, la oscuridad, la luz, el alma
1. **10 Meter Scenario Virtual Reality for Exposure Therapy**  
Brandy Oliver, Joshua Gallaher, Zachary Vaughn and Yu Cheng Tsao,  
United States Air Force Academy  
Faculty Mentor: Lt Col Clint Sparkman

The 10 Meter Virtual Reality will serve as an outlet for exposure therapy for cadets struggling with a fear of heights. This poster presentation showcases the structure of the virtual reality developed by cadets at USAFA in order to eventually prevent cadets from getting kicked out due to failure to complete the 10 meter scenario. Software used to create the virtual reality is Unity. The cadets are able to use Unity, as well as some outside research and existing knowledge of software in order to create assets and put them together in a VR. So far, the project’s success in completion rate has been substantial and we plan to implement the VR in our Peak Performance Center by the end of the semester.

2. **Assigning Tissue Bank Technicians to Clean Rooms While Considering Dynamic Demand**  
Hunter Morrow, Chris Graham and Jackson Spalding, United States Air Force Academy  
Faculty Mentor: Lt Col Gregory Steeger

Tissue banks’ innovative products change peoples’ lives. One such tissue bank produces over 200 different products that hospitals use to save their patients’ lives. This research analyzes their scheduling processes and poses the question: What is the optimal way to both schedule technicians to shifts and map them to clean rooms while considering the dynamic demand of tissue products? We use two integer programming models: one which assigns technicians to a weekly shift and the other which assigns technicians to both a room and specific processes, daily. We find that by changing variables the tissue bank has control over, we could improve the daily output by as much as 11.8%. These results show that the tissue bank has an excess of under-qualified employees and should focus on increasing its technician qualifications in order to increase utilization and productivity.

3. **The Distribution of Stock Price Fluctuations: An Econophysical Study**  
Hayley Korman, Colorado College  
Faculty Mentor: Dr. Christina Rader

Many widely-used financial models assume a normal distribution of stock price returns, despite increasing evidence that this is not the case. These assumptions ignore the real chances of extreme events and fluctuations occurring, and they underestimate the risk of investing in the market. This thesis examines the distribution of daily stock price fluctuations, using decades of data from exchange-traded funds (ETFs) that encapsulate the market. Findings are that a power law model is a good fit for the distribution, after a certain minimum x value, and a lognormal distribution is a good fit up until and after that x value. Both distributions allow for the possibility of unpredictable, uncertain, significant events.
4. Economic Benefits of Alternative Transit to Colorado Springs  
Matt Bone, University of Colorado Colorado Springs  
Faculty Mentor: Dr. Daphne Greenwood

This project is focused on determining the scope and quantitative values of the economic benefits of providing alternative means of travel for the Pike’s Peak region. The 2014 CDOT Interconnectivity Study has defined three options of how best to approach this goal, thereby creating three scenarios of benefit evaluation for the Pike’s Peak region. This report began with research of comparable transit projects and their analysis throughout the United States such as that connecting Puget Sound to Seattle, WA. Following national standards for transit cost/benefit analysis, econometric and GIS software is used to create demand forecasts under the various scenarios and predict the impact of increased demand from each on various social, economic, and environmental categories, which are translated to economic benefits.

5. Rain Brings Relief: How Fluoride Ingestion Varies Seasonally in the Arusha Maasai  
Audrey Dervarics, Colorado College  
Faculty Mentor: Dr. Krista Fish

Due to the high prevalence of volcanic rock in the East African Rift, high fluoride levels are recorded in the region's drinking water. Excessive fluoride ingestion can cause fluoride toxicity, which manifests as dental and skeletal fluorosis, gastrointestinal problems, and muscle pains. In this study, I investigated variation of these associated issues through a general health survey conducted within a Maasai community with local clinicians. I examined if there are behavioral or environmental factors that account for variation seen in the severity of fluorosis. Overall fluoride’s effect is seasonal, dramatically higher in the dry season because of dependence on fluoridated water and use of magadi, a food additive. Fluoride toxicity may increase with the impending climate change causing more reliance on fluoridated water and food products that are cooked using magadi.

6. Recovery Ability in Semi-Free Range Varecia rubra at the Lemur Conservation Foundation in Myakka City, Florida  
Maddie Bodell, University of Colorado Colorado Springs  
Faculty Mentor: Dr. Krista Fish

This poster presents research on recovery ability in captive red-ruffed lemurs (Varecia rubra). Despite extensive research on how primates recover from various illnesses and health issues, little is known about the recovery behavior of red-ruffed lemurs in captivity. This research provides better knowledge of this topic in order to promote more effective conservation efforts. To explore this topic, two individuals inhabiting a semi-free range forest were examined using group scan and continuous focal animal sampling methods. One individual recently recovered from mysterious weight loss and mobility issues and the other individual acted as a control for comparative data analysis. No significant differences were found between the two, supporting the idea that red-ruffed lemurs are able to successfully recover from health problems in captive environments. This data contributes to conservation efforts by providing more information about how to support the health of captive lemurs.
7. Veteran Students College Experience
Noah Conrad, University of Colorado Colorado Springs
Faculty Mentor: Dr. Judith Long

As more and more veterans begin to use their educational benefits, their transitions back into civilian life and going back to school can be difficult for them. There are two types of veterans, those who completed their obligated service, decided to separate voluntarily and go to school, and those who did not plan to separate from the military but had to, for example, getting medically discharged. A veteran’s self-efficacy (their purpose or goals in areas that they do well in) can also be affected by their transitions. The question here is: are veteran’s self-efficacy lower in those who did not plan to separate from the military than those who did? Additionally, to examine their self-efficacy, the following study will be using three scales to support this question which include the College Stress Inventory, Institutional Integration Scale and the Personal Need for Structure Scale.

8. Stigma in Bipolar Disorder: The Impact of Cause and Treatment Information
Caleigh Cassidy, Colorado College
Faculty Mentor: Kristi Erdal

This study utilized a vignette methodology to examine the impact of cause and treatment information on public stigma in bipolar disorder. The questionnaire was completed by 398 MTurkers. Treatment information reduced stigma in terms of fear/dangerousness, desire for social distance, and responsibility, which has implications for destigmatization campaigns.

9. So You Think You’re a Creep?: Sexualization in Youth Dance
Matthew Cole, Camille Ginsburg and Kelly Culshaw, Colorado College
Faculty Mentor: Tomi-Ann Roberts

Two studies explored sexualization in popular Youtube dance videos featuring youth. Study one established a reliable coding scheme for sexualized appearance and sexualized movements. Videos with the most views had significantly greater sexualization than those with the fewest. Study two used eye tracking to confirm these elements in naive participants.

PerResha Foster, United States Air Force Academy
Faculty Mentor: Lt Col Jimmy Do

The objective of this study is to measure the usability of a social simulator prototype currently under development by the Defense Advanced Research Projects Agency as part of the Agency’s Strategic Social Interaction Modules program. The simulator’s purpose is to create a realistic, effective training tool that prepares service members for interactions in high stakes, cross-cultural contexts. As part of the simulator’s development, the research team will conduct several basic experiments that address subject engagement with the simulator, the effects of framing the experience differently, and ways to structure the subjective, post-experience reactions of subjects involved. Data will be collected using the IPIP personality inventory. Results from this research will inform the ongoing design of the social simulator by the Defense Advanced Research Projects Agency.
11. Examining personality and dementia-related attitudes and knowledge.
Evan Furr, University of Colorado Colorado Springs
Faculty Mentor: Dr. Molly Maxfield

A common concern and negative stereotype related to the aging process is the expectation of inevitable and significant memory loss. This term has been coined as “dementia worry,” whereby cognitively healthy adults interpret everyday forgetfulness as evidence of dementia or become overly concerned with dementia, even in the absence of any sign of cognitive impairment; dementia worry can thus occur in individuals of any age or cognitive status. This study is interested in determining how personality and ageism can affect an individual’s concern about developing ADRD, ultimately leading to dementia worry (DW). More specifically, we are interested in finding out whether certain personality traits (e.g., neuroticism) contribute to DW, or if it is in fact generally ageist attitudes that contribute to DW based on the widespread association of dementia with later life.

12. Identifying Maintenance Discrepancies between F-35 Systems Using Machine Learning and IBM Watson
Trey Pujats and Max Marosko, United States Air Force Academy
Faculty Mentor: Lt Col Gregory Steeger

The current process for transporting F-35 parts from the manufacturer to Air Force bases is causing part tracking issues for maintainers, suppliers, transportation companies partnered with Lockheed Martin. Specifically, action reports filed by maintainers provide trends between key parts, personnel, and resolution time. This information is critical in determining how well the supply chain is working. The main focus of this paper is to discover the root causes of the discrepancies in the action reports and recommend improvements using IBM Watson and statistical analysis.

13. Special Operations Forces: Optimally Assigning Capabilities to Locations and Visualizing Tradeoffs
Connor Reilly and John Francois, United States Air Force Academy
Faculty Mentor: Lt Col Gregory Steeger

Air Force Special Operations Command (AFSOC) comprises the Air Force’s Special Operations members and is currently facing pressure from being tasked with too many missions. When Special Operations Command, the Unified Combatant Command in charge of all US Special Forces, tasks AFSOC with a mission, AFSOC must decide which taskings they can fill and which they can’t. Currently, this decision is made using expert knowledge, based on the readiness of forces and force sustainability. The purpose of this work is to provide a global perspective of AFSOC’s total capability by assigning AFSOC force packages a “capability” value based on their location, which is derived from a weighted additive utility function, encompassing readiness, performance, political restrictions, and cost. The utilization of our tool provides a more efficient and informative way of visualizing and quantifying total military capability.
14. Bounded Relative Trajectories
Michael Grieg, United States Air Force Academy
Faculty Mentor: Lt Col Luke Sauter

Satellites is Earth orbit experience orbit perturbations. This makes it difficult to find bounded relative trajectories between satellites in Earth orbit. It is important to find orbits that give satellites in formation bounded relative trajectories so they don't drift away from each other. This research project is focused on writing a MATLAB program that finds bounded relative trajectories using techniques described in the paper "Design of Bounded Relative Trajectories in the Earth Zonal Problem" by Nicola Baresi and Daniel J. Scheeres from the University of Colorado, Boulder.

15. USAFA Cyber+Power
Benjamin Hockman, Samuel Chadwick, Sebastian Coburn and Dylan Martin-Abood,
United States Air Force Academy
Faculty Mentor: Capt James Miller

The purpose of this capstone project is to augment the power transmission testbed owned by the USAFA Department of Electrical and Computer Engineering. The project runs concurrently with efforts at the USMA and several civilian universities on similar power transmission testbeds. The testbed, provided by the NSA, is outfitted with Schweitzer Engineering Laboratories control and monitoring equipment. The efforts of the 2017-2018 Cyber+Power capstone team are focused on building up the testbed to be a model of a real-world power transmission system.

16. Beta Phase Analysis of PVDF
Matthew Knott, University of Colorado Colorado Springs
Faculty Mentor: Dr. Jena McCollum

PVDF (Polyvinylidene fluoride) is a fluorinated polymer that can easily be combined with thermoplastics as a copolymer. By increasing crystallinity of PVDF to a specific formation, referred to as beta phase, the material takes on piezoelectric properties of varying magnitudes. Beta phase within PVDF may be changed by controlling the temperature gradient and shear stress subjected to the material during processing. Current research focuses on engineering an instrument that utilizes a single screw extruder to produce PVDF filament with desired piezoelectric properties. This work may be adapted to 3D printers with the intent to print structures with specified piezoelectric properties.
17. Best Practices for Optimizing HVAC Programming for Environmental Performance in a Specialized Ground Source Heat Pump System
Randall Pietersen, United States Air Force Academy
Faculty Mentors: Dr. Melissa S. Beauregard

This study explores how changing volumetric water content in well-draining soils can impact the capacity of a ground source heat pump (GSHP) system and how “smart” HVAC programming can maximize user comfort while minimizing energy usage. This investigation will be conducted at an Air Force Academy site, where there is a single story facility constructed with “Energy Piles,” each outfitted with geothermal loops that comprise the GSHP system. In this application, the cost of installation is reduced by integrating the GSHP system into the building foundation, as opposed to traditional systems which are installed separately and located outside of the building footprint. However, this efficiency during construction limits the capacity of the overall system to the geometry of the building foundation. The focus of this study is to determine the extent of this consequential limitation and develop HVAC programming optimized for efficiency by maximizing the effect of changing water contents.

18. Modeling the Flu
Jerrell Cockerham, Colorado College
Faculty Mentor: Andrea Bruder

Influenza is a highly contagious disease which in some cases can be deadly. For this reason, “flu season” has received much attention in the medical community, and many attempts have been made to model the disease as it runs its course. It is important to model this epidemic to describe the spread of the disease. Additionally, it is important to predict how the epidemic will act as time progresses. It might enable the CDC to approach vaccinations differently and predict what might happen if the vaccine is more effective or less effective in upcoming years. In this project, I worked with Kate McGinn and Isaac Du to model the flu in the United States for the 2017-2018 flu season, including the potential effects of a vaccine. Our data consists of documented flu-related deaths, so any of our findings may be underestimations of the actual impact of the flu this season. We employ a number of SIR models and hypothesize that a model that takes into account vaccination will best fit the data.

19. Invariant Subspaces of Rank 2 Heisenberg Vertex Algebra
Hanbo Shao, Colorado College
Faculty Mentor: Molly Moran

In this project, we will discover basic elements and operators of Vertex Operator Algebra, including circle product and so forth, and construct the Heisenberg algebra. Using Classical Invariant Theory, change-of-basis method and quantum corrections, we gradually deduce the minimal strong generating set for the invariant subspaces of rank 2 Heisenberg algebra under the action of S2 and Z/2Z. Further, we obtain the primary generating set for both minimal strong generating set.
20. Boeing Counter Unmanned Aerial System (UAS) Service Academy Challenge
Nathan Creech and Nicholas Martin, United States Air Force Academy
Faculty Mentors: Dr. George York and Dr. Scott Gruber

Unmanned Aerial Systems (UAS) are growing in popularity worldwide, and the defense industry is interested in countering the growing UAS threat. Boeing tasked Capstone design teams at West Point, Annapolis, and USAFA with creating a 2030 concept design for a counter-UAS (C-UAS) that can detect, track, identify, and mitigate UAS threats. The USAFA team conducted trend studies and formulated a concept design before designing a technology demonstration for spring 2018. Tech demo requirements were scaled down from that of the concept design. The tech demo focused on demonstrating acoustic and electro-optical detection and tracking and net capture via another UAV.

21. Autonomous Robotic Exploration
Micah Hayden and Forrest Lang, United States Air Force Academy
Faculty Mentor: Del Christman

Our research project this semester is an introduction to robotic systems and the use of the Robot Operating System. We began by utilizing a Turblebot3 robot: learning how it utilized teleoperation, navigation, and Simultaneous Location and Mapping (SLAM). We gained a greater appreciation of the ROS system, specifically how to create and utilize ROS nodes/messages to transmit pertinent information. Our goal is to develop a method for two Turtlebot3 robots to autonomously explore an unknown space. Once the space is mapped, the system will be able to autonomously navigate within the map it generated.

22. Autonomous Combat Swarm Development
Micah Hayden, Evan Howe, Forrest Lang, Mike Pieschl, Christian Agmata, Daniel Cinnamon, Aaric Rogers, Andy Millan and Josiah Oliver, United States Air Force Academy
Faculty Mentor: Del Christman

The purpose of this capstone project is to design a heterogeneous, combat swarm of small UAVs. These UAVs will be able to receive a strategic goal from the Ground Control Station determining their overall goal, such as offense or defense. From there, the swarm will be able to decide how to allocate its resources on the tactical level. These lower-level “tactics” are individual behaviors which have been developed and programmed by members of the team. The decision of which behavior to utilize is made by utilizing wrapped-behaviors with a decision-making algorithm. The aircraft utilize simulated weapons and sensors to conduct combat missions, drop an air-ground munition, as well as performing autonomous collision avoidance in flight. We are also developing a robust virtual reality command and control interface. This visualization tool will give the ground commander greater situational awareness and control over the aircraft under their control.
23. Construction of a Flavor-Profiling Library by Gas Chromatography-Mass Spectrometry (GC/MS)

Samantha Coyne, University of Colorado Colorado Springs
Faculty Mentor: Dr. Janel Owens

Flavor compounds from samples such as, food, beverages, spices, plants, and hops were obtained through liquid-liquid and solid-liquid extraction techniques. These compounds were then analyzed by gas chromatography-mass spectrometry (GC/MS) to construct a flavor-profiling library. AMDIS, a software program, was used to create the mass spectral library. The compounds found in each individual sample were identified using the NIST library. Each compound was then evaluated for their organoleptic properties through the database of The Good Scents Company. The flavor-profiling library created is targeted to identifying the flavor compounds within whiskeys and other distilled spirits.

24. Sonogashira Coupling of Non-Traditional Halides

Andrew McGrath, University of Colorado Colorado Springs
Faculty Mentor: Dr. Allen Schoffstall

Methylbromoquinoxaline derivatives were prepared from the corresponding methylquinoxalines and subjected to Sonogashira conditions with trimethylsilylacetylene, yielding a coupled product as well as methylquinoxaline and possible an alkyne containing a terminal bromine as side products. The scope of the mechanism was explored further with various reagents and reaction conditions.

25. Synthesis of isoxazoles via copper(I) catalysis with N-chlorosuccinimide

William Morris, Colorado College
Faculty Mentors: Dr. Allen Schoffstall

Isoxazole derivatives were prepared by Cu(I)-catalyzed cycloaddition of organic nitrile oxides and alkynes in one-pot syntheses. The nitrile oxide intermediates were formed from aryl aldoximes with N-chlorosuccinimide at low heat with light. Reactions were carried out as one-pot syntheses where all reagents were left to react to form products in a single step. Reaction conditions for reactants were optimized using phenylacetylene. Crude products were extracted with ethyl acetate and submitted to flash column chromatography or recrystallization for purification, giving the final products, which were characterized using NMR and infrared spectroscopy.

26. The Chemical Modification of Hydrogels for Single Walled Carbon Nanotube Purification

Brennan Watts, University of Colorado Colorado Springs
Faculty Mentors: Dr. Kevin Tvrdy

Innovation of a chirality-selective method of SWNT purification could revolutionize large portions of the technological and industrial sectors. In testing, products such as SWNT solar cells, SWNT composites, and others show increased efficiency when compared to their modern counterparts. There has been progress in SWNT purification - Sephacryl S200, a hydrogel, has been shown to act as a separating medium for SWNT. In response, a major focus of the Tvrdy lab’s research has been dedicated toward gaining improved understanding of Sephacryl on a molecular level - its composition and structure, and the role functional groups play in the separation of SWNT. Three experiments were designed in which a single functionality of Sephacryl is removed or altered. Together, using acid catalyzed dehydration, acid catalyzed cleaving of ethers, and reduction of amines, it is anticipated that greater understanding of the role each of these groups plays in the purification of SWNT will be achieved.
27. Impact of Sapling’s Local-Scale Climate Modification on Spatial Structure of an Abrupt Treeline on Pikes Peak, CO
Alison McGarigal and Riley Wadehra, Colorado College
Faculty Mentor: Dr. Miroslav Kummel

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 ($\chi^2 = 3.0078, df=1, p=0.0397$).

28. Analyzing Lightning Warning Radii for Kennedy Space Center
Kaitlyn Brown, United States Air Force Academy
Faculty Mentor: Lt Col Robert Wacker

Florida is the lightning capital of the world and the Air Force’s 45th Weather Squadron (45 WS) is the first line of defense concerning lightning safety for Kennedy Space Center (KSC) and Cape Canaveral Air Force Station (CCAFS) operations. The 45WS issues lightning advisories and warnings for rings centered on specified points of interest, such as launch pads, in KSC/CCAFS. Each ring currently has a 5 NM radius. This research analyzes detected cloud-to-cloud and cloud-to-ground lightning flashes from 2011 to 2016 to determine how varying the radii for each lightning ring affected the number of warnings issued and the amount of time spent under lightning warnings. It is hoped that this data will enable the 45 WS to assist its various lightning warning customers to determine the optimal lightning warning radii for their facilities of interest.

29. Sprites and mesospheric gravity waves during a summertime mesoscale convective event
Ryan Murphy, United States Air Force Academy
Faculty Mentor: Lt Col David Vollmer

During the night of 22-23 July 2014, a mesoscale convective system containing several severe thunderstorms over western South Dakota and Nebraska produced a large number of sprites, photographed from the Wyoming Infrared Observatory using Phantom high-speed cameras. Several sprites were located in time and space via comparisons with large-amplitude positive cloud-to-ground (CG) flash locations using national Lightning Detection Network (NLDN) data. We analyze radar, NLDN, and satellite data from this event to examine the origin locations of the sprites relative to storm structure and CG lightning distribution. Observations of sprite events were compared to National Lightning Detection Network (NLDN) CG flashes and collocated with large-amplitude CGs with identical date/time groups. NLDN data were then used to examine CG temporal frequency, polarity, and spatial distribution in the vicinity of these concurrent sprite events.
30. Using in silico Methods to Develop a Therapeutic for Systemic Lupus Erythematosus via Targeting the Complement System

Lydia Lac, University of Colorado Colorado Springs
Faculty Mentor: Dr. James Kovacs

Systemic Lupus Erythematosus (SLE) is a chronic inflammatory autoimmune disease that affects 1 in every 1000 people in the US. Auto-antibodies are produced when improper destruction of apoptotic cells results in B-cell activation and differentiation; they are secreted by mature B-cells, making the complement system a target in treating SLE. We have identified antibodies that reverse SLE symptoms in a mouse model of lupus. To use the antibodies as potential therapeutics, we have engineered a single chain variable fragment (scFv). The primary sequence of scFv 3D29 was used to predict its secondary and tertiary structures using open source algorithms. The predicted 3D29 structure and known crystal structure of a potential complement component (C3D) were used with HADDOCK to create a model docking of 3D29 to C3D. This paves the way for further in vitro validation and future in silico small molecule screens to determine potential new therapeutics and imaging agents for complement disorders.

31. The Function of mRNA Decay in the Post-Diauxic Phase

Rachel Martino, Colorado College
Faculty Mentor: Jennifer Garcia

S. 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. Xrn1 is an RNase that will degrade mRNA once the cap and poly-A tail are removed. In log phase Xrn1 is localized in P-bodies in the cytoplasm, however it has been observed that Xrn1 will localize to eisosomes at the cell membrane in the post-diauxic phase. Rny1 is a vacuolar RNase and in the post-diauxic phase Rny1 degrades mRNA that encode for mitochondrial proteins. Both Xrn1 and Rny1 were deleted and the colonies exhibited a petite phenotype when grown on glucose media. Also, when grown on glycerol media this strain could not grow at all. Although we believe that Xrn1 and Rny1 work in parallel pathways to maintain functional mitochondria, the role of mRNA decay in the post-diauxic phase remains fairly unstudied.
Eukaryotic genomes are compacted and organized in the nucleus. Human DNA (6 billion basepairs) is 2 meters long but fits into the 1-10µm diameter nucleus. DNA is compacted by loops, which may control transcription by bringing distal elements together. Presently, DNA loop control and the genetic factors forming loops are unknown. Here, we examined the regulation of intra- and inter-chromosomal contacts in Neurospora crassa, as its silent DNA is similar to humans but its genome is smaller and thus amenable to the high-throughput chromosome conformation capture sequencing (Hi-C) studies for long-range contacts. We tested how genes critical for gene silencing interact in published Hi-C data. Strong interactions (long-range contacts) between genes controlling DNA silencing were found; these direct contacts are lost in mutant strains. Gene interactions will be validated, and deletion experiments will identify regulatory regions and how they impact long-range contacts and gene expression.

Epstein-Barr Virus (EBV) is present latently in 95% of adults worldwide. Latent membrane protein 2a (LMP2a) is an EBV protein present in the membrane of infected human B cells and implicated in establishing and maintaining EBV+ B cell cancers. We aimed to generate EBV- B cell lines that stably express a chimeric LMP2a molecule that permits induction of LMP2a signaling; these lines will be used to examine how LMP2a alters infected-cell biology and drives EBV+ B cell cancers. Initially, optimal DNA transfection and selection media conditions for both EBV- B cell lines were determined. DNA for the Ly49G.LMP2a protein was synthesized in a bacterial expression vector and E. coli were transformed. Ly49G.LMP2a DNA was isolated from bacterial plasmid DNA by restriction enzyme digestion, purified, and subsequently ligated into a mammalian expression vector. We confirmed successful cloning of Ly49G.LMP2 into the expression vector. These vectors were then transfected into two EBV- B cell lines.
34. The fluctuating expression levels of WOR1, a transcription factor in Candida albicans, under various environmental changes
Heather Zimmie and Tami Cardenas, United States Air Force Academy
Faculty Mentors: Capt Michael Barnhart and Dr. Katherine Bates

Candida albicans, a microorganism commensal with humans, can undergo phenotypic switching from a white phenotype to an opaque phenotype in response to environmental changes. The switch to an opaque phenotype is known to increase the pathogenicity of this microbe. While color morph switching has been well characterized as the overexpression of the Wor1 (white-opaque regulator 1) transcription factor, the specific environmental conditions that alter expression have not been described. Here, we induce Candida albicans to switch to the opaque phenotype by altering various environmental conditions. Specifically, we quantified the expression levels of WOR1 with changes in pH, temperature, UV exposure, carbon dioxide levels, oxygen levels, and presence of bacterial serum. The variable expression levels of WOR1 provides insight into which specific environmental changes Candida albicans is most sensitive to, and therefore which change in environment could promote its pathogenicity.

35. Cross Generational Effects of Bifidobacterium Infantis 35624 on the Maternal Restraint Model of Depression
Sarah Barker, Colorado College
Faculty Mentor: Dr. Lori Driscoll

Prepartum depression is correlated with health complications in the mother, and with physical and behavioral abnormalities in the child. The safety of antidepressant use during pregnancy has not been conclusively demonstrated. An alternative approach is to address the health of the gut brain axis. Probiotics can change the composition of the gut microbiota and subsequently improve central nervous system disorders. The present study explores the cross generational effects of Bifidobacterium infantis 35624 supplementation on the maternal restraint model of depression in rats. Maternal restraint significantly increased dams’ depressive behavior and additionally increased offspring weights and depressive behavior. Bifidobacterium infantis 35624 supplementation marginally rescued these deficits. Further research with a larger sample size is warranted to elucidate the efficacy of this intervention in improving the physical and psychological health of mother and infant.
36. Long-term Dendritic Changes Following Repetitive Traumatic Brain Injury: A Quantitative Golgi Study  
Allysa Warling, Colorado College  
Faculty Mentor: Bob Jacobs

Repetitive traumatic brain injury (RTBI) is a risk factor for the neurodegenerative disease chronic traumatic encephalopathy (CTE). We examined potential long-term changes in dendritic systems of frontal and occipital lobe pyramidal neurons following RTBI, in cases with and without CTE diagnoses. Tissue from six males with a history of RTBI, five with CTE diagnoses and one without, was compared to tissue from 12 neurologically normal individuals (Jacobs et al., 1997). Tissue was prepared with a rapid Golgi technique, and dendritic systems were analyzed using computer-assisted morphometry. Most quantitative dendritic and spine measures were decreased in both cortical regions in all post-RTBI tissue in comparison to control tissue, regardless of CTE diagnosis. The prefrontal cortex was more severely affected than the visual cortex. Such lasting dendritic decreases following RTBI may have negative implications for cognitive functions, with or without a neurodegenerative diagnosis.

37. Niche selection in semi-free-ranging ring tailed lemurs (Lemur catta) and red ruffed lemurs (Varecia rubra) within a non-native habitat  
Emma Fetterly, Colorado College  
Faculty Mentor: Dr. Krista Fish

This study examined how red ruffed (Varecia rubra) and ring-tailed lemurs (Lemur catta) select niches within a non-native habitat. I hypothesized that with diet supplementation the two species will occupy generalized niches and demonstrate high degrees of niche overlap due to a reduced competition for resources. Additionally, as plant diversity increases within the habitat lemurs will have higher frequencies of feeding behaviors. I randomly selected 20 by 20 meter plots and evaluated them using a diversity index which I compared to behavioral data of all free ranging lemurs using a grid system. The results demonstrated that both species occupy similar niches within the reserve and that their behaviors are highly affected by anthropogenic influences. Plant diversity did not have a significant correlation with feeding behaviors, an area for further study. This study could assist in the management of primates in captive habitats and broaden the understanding of niche overlap in lemurs.

38. Impacts of ants and pollinators on native and exotic Taraxacum fitness  
Ellie Harrison, Colorado College  
Faculty Mentor: M. Shane Heschel

The purpose of this study was to investigate the impacts of ants and pollinators on fitness of the native sexual Taraxacum ceratophorum and the exotic apomictic Taraxacum officinale. Exclusion experiments permitted or prevented access of ants and pollinators to both Taraxacum species. Seed weighing and germination experiments showed that the exclusion of pollinators significantly reduced seed weight and germination success and increased the ratio of aborted seeds in both species. Ants had no significant effects on the seeds of the combined species. When analyzed separately, T. ceratophorum showed the same patterns as both species combined, whereas T. officinale was not affected by either ants or pollinators. The findings of this study emphasize the importance of pollinators for native plant species.
40. Stress Behaviors in Semi-Free Ranging Lemurs
Nikki Mills, Colorado College
Faculty Mentor: Dr. Krista Fish

This research paper evaluates stress behaviors in semi-free ranging lemurs and how conservation efforts for captive species could be improved. The research took place over 5 days at the Myakka City Lemur Reserve in Myakka, FL. I recorded stress behaviors in two species of lemur, mongoose lemurs (Eulemur mongoz) and red-ruffed lemurs (Varecia rubra) -- a mating pair and a companion pair, respectively -- to evaluate the prevalence of stress in their daily activities and interactions. I collected data using all-occurrence focal animal sampling, studying each species for 8 hours total. The majority of stress behaviors displayed occurred in the companion pair of red-ruffed lemurs in response to the third species group at the Reserve, the ring-tailed lemurs (Lemur catta). Further research on stress behaviors in other semi-free ranging species is necessary for comparison and would contribute to our understanding of how to best care for these species in captivity.

41. Characterization of Photosynthetic Extremophiles
Hannah Rogers, United States Air Force Academy
Faculty Mentors: Melanie L. M. Grogger and Dr. Don V. Veverka

As the world continues to search for answers to today’s big energy problems, some of the solutions could already exist in the smallest forms— microorganisms. The bioactive components of cyanobacteria and microalgae (pigments and lipids) are of great interest in the production of natural products, such as biofuels and nutritional supplements. The discovery, description and quantification of microalgae and cyanobacteria could reveal novel harvestable components. To this end, we sampled desert crusts collected from the Colorado Plateau Physiographic Province to determine if they contain useful products. We used flow cytometry and spectrophotometry to characterize samples. We discovered that the crusts contained a carotenoid-producing algal species identified to be in the family Scenedesmaceae. Members of this algal family are known to produce commercially valuable lipids and pigments that may provide avenues for increasing production capabilities.
42. Circularly-symmetric Apodized Photon Sieves for High-Contrast Imaging
Prayant Hanjra, United States Air Force Academy
Faculty Mentor: Dr. Olha Asmolova

Traditional optical systems are limited in resolving objects in close proximity from each other. If two objects differ significantly in brightness, the higher order diffraction from brighter one can saturate the imaging sensor and makes the dim object undetectable. We present circularly-symmetric apodized photon sieves (APS) that manipulate the far-field pattern, producing a point spread function that drops rapidly from the peak over a region $3\alpha/D$ to $40\alpha/D$ for the higher contrast imaging. APS are designed and tested for 10-10 - 10-5 contrast levels to get a sufficient throughput for use in an exoplanet finding/imaging deployable space telescope or ground-based optical surveillance systems.

43. Characterization and Processing of Non-Uniformities in Backlit CCDs Due to Fabry-Perot Interference
Casey Kowalski, Alia Lemm, Josie Stalker and Jeneke Heerema, United States Air Force Academy
Faculty Mentors: Lt Col Sally Maddocks and Dr. Devin Della-Rose

We are investigating a suspected Fabry-Perot interference pattern in two back-illuminated CCD sensors, both model Apogee Alta U-47, attached to a DFM Engineering 41-cm Ritchey-Chrétien f/8 telescope. Based on the amplitude of this effect, we estimate that instrument magnitude peak-to-valley deviations of 50 mmag or more may result. Our testing suggests that reflected skylight from high pressure sodium (HPS) city lights may be the cause of this interference pattern, as the amplitude of the pattern is highly dependent on the telescope’s azimuth and elevation. Our research goals are threefold: first, to use spectroscopy to confirm HPS as the source of the interference pattern; second, to fully characterize this interference pattern as a function of telescope look direction; and third, to determine the best method to remove this interference pattern from our reduced CCD images.

44. Characterization of Thermal Modal Instability in Fiber Lasers
John Walsworth, United States Air Force Academy
Faculty Mentor: Lt Col Benjamin Ward

Fiber lasers push the limits of size, weight, power, and cooling, proving greatly advantageous to developing directed energy applications. Continued improvement in the area of power, however, must overcome various phenomena which serve as obstacles to improved power output. One of these obstacles is Thermal Modal Instability, which transfers energy from the fundamental mode at high average power outputs. This project characterizes the onset of Thermal Modal Instability by utilizing a single sideband seeder and carrying out a pump-probe measurement over the gain spectrum. The results of this characterization are forthcoming, and will serve future research in attempts to overcome Thermal Modal Instability to further fiber lasers’ ability to produce higher power outputs.
The Catholic Church and the Immigration Debate in France

Helen Griffiths, Colorado College
Faculty Mentor: Robert Lee

Following contentious presidential elections, with questions of immigration and identity at the fore, this thesis explores the relationship between the Catholic Church and the French government, focusing on the immigration debate. Drawing from long-form interviews conducted in France, I consider France’s historical relationship with the Catholic Church, the role of laïcité, the French concept of secularism, the Church’s political role in the immigration debate and its influence in crafting social identities that are a latent political force. I conclude that while the Catholic hierarchy preaches compassion for immigrants, worry about national identity and perceived threats to shared heritage have morphed into a Catholic resurgence that mobilizes voters to oppose immigration from non-Christian countries.

United States’ Withdrawal from the Paris Agreement & China’s Apparent Rise to Global Climate Leadership

Luke Henningsen, Colorado College
Faculty Mentor: John Gould

This presentation argues that the success of the Montreal Protocol (on ozone depletion) relative to the significantly less-successful Paris Agreement (on climate change) is primarily due to the dominant industry interest in the United States aligning with the global public good for the former (Montreal) but not for the latter (Paris). For the Montreal Protocol, the United States CFC industry aligned with the global public good - ozone protection. For the Paris Agreement, the United States fossil fuel industry is not aligned with the global public good (climate change action) and has been nothing but hostile to it. The United States’ federal government is a classic “free-rider” on climate change, however, it appears that China is actually the true beneficiary of the “America First” climate policy. China stands to benefit in various ways from the leadership gap left by the United States, but everyone stands to lose from the United States’ inaction on global climate change.
A Cross-Case Investigation of the Initial Conditions Preceding Demographic Decline in the North American Southwest

Shelby Patrick, Colorado College
Faculty Mentor: Scott Ingram

Between 1100-1450 CE, six populations (Hohokam, Ancestral Puebloans, Paquime, Mimbres, Chaco Canyon and Perry Mesa Settlement), experienced substantial demographic decline. This depopulation happened among the cases at varying rates and time periods, giving a foundation for this research. The research presented examines the prevalence of select social and environmental initial conditions, conditions which may have affected a society’s vulnerability immediately prior to depopulation. The results identify patterns of initial conditions that, when combined, may influence demographic decline. Our cross-case comparative analysis may stimulate further investigation of this topic in the field. The identification of the initial conditions of depopulation is important in studies of the demographic decline and sustainability of past societies.
Grief and Violence
Armstrong 233

Early Palliative Care Intervention Starts within the Emergency Department

Trina Rohrer, University of Colorado Colorado Springs
Faculty Mentor: Dr. Teresa Yambo

There has been a recent push in research regarding early intervention of palliative care to the patient facing a life threatening health condition. Do patients facing a life threatening illness who receive early palliative care intervention, compared to patients that do not, experience better outcomes? Research and current literature indicate patients do experience positive outcomes with early intervention. Better outcomes include physical, emotional, and financial benefits for the patient. This article will review the need to initiate early intervention within the emergency department, at the initial contact point for the patient facing a life threatening illness, surgery or procedure.

The Effects of Priming Feelings of Grief on Various Aspects of Language Production

Tamara Saunders, University of Colorado Colorado Springs
Faculty Mentor: Dr. Lori James

Anxiety is known to increase speech disfluency and research suggests grief increases anxiety. However, there is no evidence grief increases speech disfluency. This study demonstrates that priming feelings of grief does not affect the ability to correctly produce novel non-words, but does affect spontaneous autobiographical speech fluency in specific ways.

Settling the (Un)settled: The Effect of Chicago Police Officers’ Service Lengths on the Settlement Amounts Paid to Victims of Police Misconducts

Louie Shi, Colorado College
Faculty Mentors: Dr. Vibha Kapuria-Foreman and Dr. Michael Sawyer

This project aims to deduce the effects of police officers’ demographic details, with a focus on but not limited to police officers’ service lengths, on the settlement amounts the city of Chicago paid to (alleged) victims of police misconducts. Results indicate that one additional month of service decreases the settlement amount, which implies Chicago PD is willing to keep young and inexperienced officers who commit severe misconducts as active-duty officers at high costs. Also, when the probability of the victim being black increases, the settlement amount increases accordingly. The perspective and interdisciplinary approach from both Economics and Ethnic studies is provocative, as it disrupts a non-interactive relationship between these two disciplines. This research humbly aims to indicate how Ethnic studies would benefit from using an economic methodology to examine a question like police brutality.
Air, light and magnets
Armstrong 234

Halide and ligand effects on the fluorescence of thermochromic metal complexes
Ines Siepmann, Colorado College
Faculty Mentor: Dr. Amanda Bowman

Luminescent materials find numerous applications in everyday life. Thermochromic or temperature-dependent fluorescent complexes often contain d10 tetracopper clusters with Cu4X4L4 (X=Cl, Br, I; L=pyridine and its derivatives) being most prevalent. Within this subfamily, the pyridine ligand complex Cu4I4Py4 has been most thoroughly studied as it is highly luminescent at room temperature with a large thermochromic effect. To investigate the scope of thermochromic fluorescence of cupryl clusters, a library of Cu4X4L4 complexes was synthesized. Preliminary characterization by infrared spectroscopy, density functional theory calculations, powder X-ray diffraction, UV-visible fluorimetry, and qualitative fluorescent analysis of Cu4X4L4 and zinc clusters were carried out in hopes of furthering the understanding of the effect of halide, metal, and ligand on the charge transfer responsible for the thermochromic behavior of the M4X4L4 complexes.

The stray magnetic field above a magnetic domain wall
Alexandra Stuart, University of Colorado Colorado Springs
Faculty Mentor: Dr. Karen Livesey

Magnetic domain walls are tiny regions just a few atoms wide in a magnet that have many important technological applications. In this project, we have found expressions for the stray magnetic field in air that is created above a domain wall in a magnet. The magnet itself is only a few hundred atoms wide and roughly 10 atoms thick. The methods used to obtain these expressions include using Green’s function techniques and integrating over the volume of the tiny magnet. Our results will impact experiments that image domain walls.

StockBot
Dane Hankamer and Todd Millard, United States Air Force Academy
Faculty Mentor: Lt Col Traci A. Sarmiento

StockBot solves the ever-present problem of scrambling for stock information across different platforms such as Yahoo Finance or Google Finance. By messaging @StockBotAI on Facebook Messenger, a user can receive stock prices, volumes, charts, sentiment, and predictions taken from a live AlphaVantage API and big data on Twitter. Currently, there is not a working chatbot that provides a user with more than stock price and general news. Overall, StockBot and its public code on GitHub pave the way for future financial service chatbots. Coders with limited experience can replicate and expand on the numerous features of StockBot. We look forward to introducing the standard for stock market chatbots and educating a wide market on the power of disruptive AI chatbot technology.
Original films

Armstrong 259B

The Farmer: An Animated 2D short film

Samone Roberts, University of Colorado Colorado Springs
Faculty Mentor: David Nelson

This project looks into the process of creating a 2D, frame by frame, hand drawn film. The goal of this research was to take a deeper more personal look into what creating an animated film like this entails, such as skill sets and time management. Another goal of this project was to tell a heartwarming and complete story of parenthood in the short duration of a minute or so.

Alexander Films: Colorado’s Lost Legacy

Stefan Huddleston, University of Colorado Colorado Springs
Faculty Mentor: Dr. Robert von Dassanowsky

Alexander Films: Colorado’s Lost Legacy. A short documentary on the Alexander family of companies, primarily Alexander films. The documentary will include a survey of the history of the Alexander Film Company that existed in Colorado Springs during the mid-20th century. As the world’s largest producer of commercial film clips, the company was one of the cities’ largest employers. The film hopes to engender further scholarship on this piece of local history.
Provocative Storytelling
Armstrong 259A

Alfred Hitchcock’s Metal Gear Solid: The Hitchcockian Influences of Hideo Kojima

Evelyn Smith, University of Colorado Colorado Springs  
Faculty Mentor: Dr. Robert von Dassanowsky

Since his career began in the late 80’s, Hideo Kojima has been known as a game developer with a strong cinematic influence. The particularly strong Hitchcockian influence in his work, however, has never been studied. By examining his seminal work; Metal Gear Solid, alongside the work of Hitchcock, this paper aims not only to examine Kojima as one of the most lucid students of Hitchcock today, but also to establish Alfred Hitchcock as a forefather of modern interactive storytelling.

Hitchcock and the Social Contract

Erynn Mitchell, University of Colorado Colorado Springs  
Faculty Mentor: Dr. Robert von Dassanowsky

Hitchcock and the social contract aims to examine filmmaker, Alfred Hitchcock’s wartime films. In this presentation this includes; Notorious, Lifeboat, The Lady Vanishes, The 39 Steps, and Saboteur. This presentation discusses how he managed to avoid making propaganda films, as well as how he invokes the work of notable social contract philosophers like Thomas Hobbes, Immanuel Kant, and John Locke, in order to show how traditional Western Social Contracts were being reassessed into a new Leviathan during World War II.
Politics and their agitators

Armstrong 257A

The Philosophical and Theological Origins of the American Founding

Patrick Butler, United States Air Force Academy
Faculty Mentor: Lt Col Rouven Steeves

The following are but some of the most important necessities involved in the forming the American political thought which led to the American revolution: Common sense reasoning, enlightenment & self-interest rightly understood, democratic-republican theories, Aristotelian equality of outcome, and freedom of religion without state control. These themes will be explored and explained by examining the works of, but not limited to, the Scottish Enlightenment Philosophers, Montesquieu, Tocqueville, Thomas Hobbes, John Locke, Aristotle, John Calvin, and the early American Puritans.

Maliki Islam and Tribal Politics in Medieval North Africa: the Rise of Berberism

Carl Churchill, University of Colorado Colorado Springs
Faculty Mentor: Dr. Michael Martoccio

North Africa remains today a stronghold of Sunni Islam but also a key case study for how non-Arab peoples adopted Islam as a force for political unity. The development of both Sunni Islam in this region alongside the rise of Berber populism were both driven by the rise of native Berber states in this region during the 10th - 13th centuries AD. These ‘Berber dynasties’ solidified the grip of Sunni Islam on the Maghreb and fused that strain of belief into regional tribal politics, creating a potent ethnopolitical ideology, a type of proto-Berberism, that could withstand constant upheaval, both native and foreign. This presentation will trace the development of this potent political identity through both religious, and political history within the context of medieval North Africa.

The Female Inciters of the Laxdæla saga

Allison McDonald, University of Colorado at Colorado Springs
Faculty Mentor: Dr. Michael Martoccio

There are many female characters that appear within Old Norse Sagas. The Laxdæla saga in particular provides a look into the variety of women: from the gracious lady to the female inciter. I explored the saga and found multiple women who fulfill the female inciter role. The female Inciter acted as a status keeper within her community and often incited violence from her male countrymen. Looking at a particular event in the Laxdæla saga I found two women who fulfill the role and incited violence within their community.
El estigma, la deshumanización, y la interseccionalidad

Armstrong 256A

Las Fronteras de Ser

Bryant Perez, Colorado College
Faculty Mentor: Clara Lomas

Este trabajo creativo inspirado en el libro controversial y provocante de Hunger of Memory escrito por el autor Richard Rodríguez revisita las ideas de la interseccionalidad de identidad social, raza, y educación que constituyen la estructura fundamental de la vida de Richard Rodríguez. Aplicando esas ideas de Rodríguez he escrito mi propia autobiografía sobre mi formación educativa que ha cambiado mis ideas como un mexicano-americano. He creado dos personajes que reflejan mis distintas identidades en diferentes espacios. El personaje de Bryant refleja mi identidad americana que solo existe en espacios públicos donde se habla inglés mientras que el personaje de Bryan refleja mi lado mexicano que solo existe en espacios privados donde español es el idioma aceptado. A lo largo del cuento pueden seguir la intersección de estas identidades y cómo tienen que negociar con sus diferentes valores culturales.

El lenguaje del SIDA: cómo el SIDA se representa a través de la literatura y el arte, y cómo se reduce el miedo a la enfermedad

Trey Watmore, Colorado College
Faculty Mentor: Clara Lomas

El SIDA es una enfermedad tanto medical como social gracias a su duración sin tratamiento y es marcado por estigmas perjudiciales. Al explorar los orígenes de la estigmatización y tratar de rechazar los estigmas, este estudio indica las esfuerzos de autores y artistas que ya existen para refutar el daño causado por las respuestas sociales, y también intercede en el discurso del SIDA en construir un nuevo lenguaje a través de una comparación multicultural que destaca las diferencias (o similitudes) entre España y los Estados Unidos. Entonces, es necesario hacer un análisis literario de Feliz humo de Javier Codesal, además de una crítica artística del arte y de las películas de Pepe Miralles, Pepe Espaliú, Javier Codesal, y Hervé Guibert. También, será útil traducir fragmentos de Feliz humo para incorporar elementos interculturales. La relevancia del SIDA y su lenguaje tienen fundación en el hecho de que, aunque ha sido progreso científico, todavía exista respuestas sociales premodernas.
1. Perceptions of High School Literature: Understanding the Experience of Required Reading  
Joanna Schumacher, University of Colorado Colorado Springs  
Faculty Mentor: Dr. Michelle Neely

High school literature provides the opportunity to inspire, maintain, and create passion, skill, and an appreciation for reading. It also reflects the effort of effective literacy instruction which is affected by students’ perceptions of their competencies as readers and writers, their level of motivation, background knowledge, and their interests (Alvermann). However, so much of this opportunity and instruction depends upon the specific texts that are required to be read in high school. By conducting a survey on personal experiences with high school literature and interviewing teachers regarding required reading and instruction, I hope to contribute to an understanding of how these perceptions affect not only the high school reading experience, but how they may influence life-long reading habits.

2. How do Older vs. Younger Individuals view/use Writing? Generational Differences in Writing as Communication  
Stacy Crotty, University of Colorado Colorado Springs  
Faculty Mentor: Dr. Michelle Neely

How do you view writing as form of communication in your daily life? Some might say writing is the crux of their communication while others say that it is not as important, or they do not like writing at all. How do you communicate on a regular basis? Email? Text message? Written or orally presentation of information/information processing. This project will look at the generational differences in writing as a form of communication. This research project looks at the use of writing as a form of communication across older and younger generations. I hope to see that value writing holds or does not hold in individuals of different generational time periods. This research project will also show the differences in the precedence writing holds or does not hold in the individual’s life as a form of communication. Interview and survey data will be used to determine this research question.

3. To Explore the Role of Nonverbal Languages in Communication Effectiveness  
Yuhan Chen, Colorado College  
Faculty Mentor: Kate Leonard

Nonverbal communication receives less attention than verbal communication as a part of the everyday lives. However, People spend about 75 % of their waking hours communicating of which about 80 % happens nonverbally by understanding and sending nonverbal cues. Nonverbal language like facial expressions and voice largely influences the effectiveness of communication. This project aims to discuss the role of nonverbal language in communication effectiveness. I tried to innovate the way people interact with each other from the perspective of nonverbal language. By breaking the shackles of nonverbal languages, people are given an equal communication right. In this project, there are three design proposals: “the Speaker”, “the Perfect Face” and “the Facial Expression Trainer”.
4. The Commodification of Kimonos: A Reflection on Cultural Appropriation  
Boxin Li, Colorado College  
Faculty Mentor: Joan Ericson

Kimono is widely recognized as the national costume of Japan and a notable part of Japanese traditional culture. Today, the kimono rental business is growing as Japan attracts more visitors worldwide who are interested in Japanese culture. Many foreign tourists enjoy wearing kimonos as a way of exploring Japanese-ness. Consequently, the majority of kimono-wearers is not native to the culture, and kimonos are further commodified as Japanese tourism grows. Questions: Foreigners trying on kimonos to feel Japanese—would this be considered a form of cultural appropriation? Is cultural appropriation always a negative concept? How do we draw the line between the good and bad?

5. Exploring the Connections between Critical Thinking, Close Reading, and the Reader  
Breanna Davidson, University of Colorado Colorado Springs  
Faculty Mentor: Dr. Michelle Neely

Critical thinking and close reading are skills that are needed and looked at as skills that should be used in many aspects of life. There are numerous amounts of research that show that this skill proves to be resourceful and beneficial to the individual. In most research, the idea of where this skill is falling apart is being analyzed and discussed. Each researcher has also given their own ideas for how the skill of critical thinking could be taught and evaluated. There is plenty of research on this topic and more continues to be done. While doing my own research, I found that one of the main gaps in research has nothing to do with the research, but that there isn’t much awareness and individuals do not fully understand the idea of critical thinking. In my research, I analyze how participants are learning critical thinking or have been taught critical thinking. I also look into their experiences with this topic and why students might have such a hard time learning this skill.

6. Investigation of Self-Efficacy in Seeking Mental Health Care  
Nicole Buetell, University of Colorado Colorado Springs  
Faculty Mentor: Dr. Charles Benight

Over 1.6 million troops have been deployed to Iraq and Afghanistan since the start of the Iraq War in 2003. The mental health toll is immense with PTSD levels from 12% up to 38% (Erbes, et al., 2007; Jakupcak, et al., 2008). The purpose of this study was to evaluate specific factors related to self-efficacy for seeking mental health care (SE-SMHC). We tested importance of PTSD, war attitudes, gender and barriers to care (internal, external logistic) in predicting SE-SMHC among veterans and service members. We hypothesized that PTSD and barriers to care would be negatively associated with SE-SMHC. Whereas, being male and having higher positive war attitudes would be positively related to SE-SMHC. Participants (N = 55) ranged from 18-53 years (M = 27.02) with 63.6% female. A hierarchical multiple regression analysis (Enter Method) was used. Results revealed a significant overall model with an adjusted R^2= .25, F = 3.90, p < .003. Significant standardized Beta weights were Control Barriers (β = -.63; p < .001) and War Attitudes (β = .33; p < .05). This information can help increase the knowledge of impediments and possible promoters that influence an individual’s self-efficacy to seek out mental health.
Within J. K. Rowling's Harry Potter series, Lord Voldemort's use of the Horcrux is decidedly evil, leading ultimately to his demise. What makes this form of magical metamorphoses so malevolent, so futile? We may best answer the question when we consider the ways in which Lord Voldemort’s Horcruxes are conceptually akin to the medieval debates on the unicity of the soul. In particular, Dante’s exploration of the conception and the various stages of in utero development of human life and the soul in Purgatorio 25 highlight how the human being has purpose in its physical and conceptual individuality and, when one being tries to increase its purpose at the expense of another, only ill will befall such a perpetrator.

Women are still underrepresented in many STEM careers, especially in regards to engineering. As STEM careers often have a much higher lifetime earning potential than careers in which women are over-represented, understanding ways in which to encourage women's participation in STEM is important. This study attempts to find if STEM-focused role models in the media influence college women's interest in seeking a STEM degree or college major. This research is also investigating if these role models influence college women’s self-efficacy in succeeding in STEM courses, and if the participant’s beliefs about STEM-related gender stereotypes change after being exposed to these role models.

For years there has been conflict over banning literature in the high school classroom. Studies have found that teaching these books benefits the students reading them as they are able to pull educational value from them (Rossuck). Some articles argue that if students in the high school classroom are able to pull lessons from these books, the books must be age appropriate (Whitman). Articles defending the inclusion of these titles in the classrooms are not rare, but articles that discuss how parents feel about the topic are. For my study, I interviewed and surveyed parents to see how they felt about their children being taught controversial literature in school.

Cadets at the Air Force Academy are at a higher risk for concussion. To assist those cadets, we created and are institutionalizing a Return-to-Learn program to help manage their post-concussion academic progress. Return-to-Learn is a five-stage approach to gradually reintroduce cadets into their regular academic routine. When a cadet is diagnosed with a concussion, a support team is created including: a physician, military leadership, academic advisor, and all instructors. Their goal is to manage the cadet’s academic workload. Return-to-Learn was introduced in the fall semester of 2017. Enrollment is voluntary, but thus far, 100% of concussed cadets have enrolled.
Matthew Pryor, United States Air Force Academy
Faculty Mentor: Maj Aimee Haney

Collins v. Virginia presents that Supreme Court with an issue of first impression that will have lasting impact on the automobile exception of the fourth amendment and resolve a current split at the appellate level. In this case, a police officer conducted a warrantless search of Collins’ motorcycle while it was parked on his driveway. The issue is, therefore, whether the location of the vehicle on private property allows the automobile exception introduced in Carroll v. United States to stand as a reasonable warrantless search. Upon review of relevant law and policy, the Supreme Court should develop a special case of the automobile exception test on private driveways, which requires an additional exigent circumstance beyond the inherent exigency of a vehicle. This new rule will provide guidance in cases where the automobile is parked on the driveway, while still allowing lower courts to have discretion when the vehicle in question is on private property that is not a driveway.

12. Politics in Education
Julien DePolo and Duane Dougherty, University of Colorado Colorado Springs
Faculty Mentor: Dr. Michelle Neely

The purpose of this study is to determine what role, if any, educators play in shaping political discourse in the classroom and how students perceive this engagement. In order to make a determination, the researchers, who are from diametrically opposed ends of the political spectrum, developed a series of multiple-choice and open-ended questions. These questions were asked to students with surveys and interviews to roughly determine whether educators are promoting critical thinking or simply promoting their own personal political agenda.

13. Reframing Palestine: Misconceptions and American Jewish-Muslim Solidarity
Rachel Mintz, Colorado College
Faculty Mentor: Dr. Krista Fish

This project studies the impact of discourse surrounding the Israeli occupation of Palestine on American Jewish-Muslim solidarity efforts. The author uses a Muslim-Jewish dialogue that took place between 2001 and 2014, the Muslim-Jewish Bridge Building Group (MJBBG), as a case study, conducting interviews with former participants and facilitators. The data demonstrates that the reframing of Palestine as a religious, rather than political, issue acts as an impediment to addressing the root cause of Jewish-Muslim tension in the United States. The author suggests that this problematic reframing be addressed at the beginning of American Muslim-Jewish solidarity efforts in order to dispel misplaced tension and dismantle the xenophobic project of equating Islam and Palestinians, Jews and Zionists.
14. Russia's Growing Global Dominance in Nuclear Energy
   Drew Fressel, United States Air Force Academy
   Faculty Mentor: Dr. Ryan Cress

Multiple failed plans to create nuclear power plants have caused Westinghouse, America’s main nuclear company, to lose billions of dollars and ultimately leading to their bankruptcy. Russia, taking advantage of the United States nuclear mishaps, has helped other countries gain nuclear power. Many countries are choosing to go to Russia for help because Russia provides cheaper service with fewer strings attached and many times even nuclear expertise to possibly create weapons. As Russia helps countries proliferate, the possibility of the next Iran grows steadily. America can either hope that countries will accept the “golden standard” of purchasing enriched uranium from America, or America can relax their standards to prevent countries from going to other countries that would provide the ability to create nuclear weapons. Saudi Arabia has already stated that they will not accept the United States strict nuclear policies; will we allow them to team with Russia?

15. Time and Death: Relationships between Time Perspectives and Death Attitudes
   Bethany Lundy, University of Colorado Colorado Springs
   Faculty Mentor: Dr. Frederick L. Coolidge

This study explored relationships between the Zimbardo time perspectives (TP) and death attitudes. Researchers developed a Death Attitude Scale (DAS) to measure Death Anxiety, Death Indifference, and Death Acceptance. It was generally hypothesized that positive, negative, and neutral TPs and death attitudes would positively correlate. Participants totaled 207 undergraduate students, 38 male and 168 female. They completed assessments through the online Sona system. Results confirmed significant positive correlations between the following: Past Positive and Death Acceptance, Future and Death Acceptance, Past Negative and Death Anxiety, Present Fatalistic and Death Anxiety, Present Hedonistic and Death Indifference, Present Hedonistic and Death Indifference, and Present Fatalistic and Death Indifference. These findings indicate small to moderate relationships between TPs and death attitudes which generally align together in terms of their positive, negative, or neutral/ambiguous nature.

16. The Difficulty Principle: Language’s Effect on Perceptual Discriminations Depends on Difficulty
   Robert Welch, Colorado College
   Faculty Mentor: Kevin J. Holmes

Although much evidence suggests that language influences perceptual discrimination, relatively little research has explored factors that might modulate such effects. Some have proposed that effects of language may be stronger for more difficult discriminations than for easier ones, yet previous research has either tacitly assumed this idea or tested it in a manner that treats language’s influence as all-or-none rather than graded. Here we provide evidence for graded effects of language across systematically varied levels of discrimination difficulty. Using color as a testbed, we show that categorical perception—enhanced discrimination at category boundaries—increases linearly with difficulty, defined by the perceptual similarity between colors. Evidence for the modulatory role of difficulty was observed across two different category boundaries and perceptual tasks. Taken together, our findings provide insight into the conditions under which language shapes perception most strongly.
17. Stigmatization of Posttraumatic Stress Disorder
Francis Gourley, University of Colorado Colorado Springs
Faculty Mentors: Dr. Kristin Saumelson

People who suffer from mental illness often experience public stigma due to their condition, which may be based on stereotypes rather than facts, and may lead to prejudicial behavior towards those who suffer from mental illness. Public stigma may also be internalized by individuals who suffer from these conditions, leading to greater severity of symptoms, and unwillingness to seek treatment. While stigmatization and negative attributions have been studied for some disorders (e.g. schizophrenia), it has not been thoroughly explored for posttraumatic stress disorder (PTSD). The proposed study will examine how differences in gender, trauma type, and moralization affect public stigmatization of PTSD. Participants will be presented with one of eight different vignettes depicting a person who has experienced a trauma and developed PTSD, each stemming from a different combination of three independent variables: Gender of victim, trauma type, and moralization.

18. The Heritability of Personality Disorders over Time: A Child and Adolescent Twin Study
Rhiannon Nevinczenko, University of Colorado Colorado Springs
Faculty Mentor: Dr. Frederick L. Coolidge

The purpose of the present study is determine the degree to which heritability (“nature”) in proportion to environmental factors (“nurture”) plays a role in child and adolescent personality disorders. To do this, Falconer’s statistical method was used. This method determines heritability as a ratio of monozygotic twin correlations to dizygotic twin correlations. This allowed researchers to determine whether the heritability of personality disorders changes over childhood through adolescence, as it has been previously established that the heritability of personality disorders is evident early in the human lifespan. Keywords: personality disorders, childhood personality disorders, adolescent personality disorders, heritability, behavioral genetics, Falconer’s method.

19. Delay Propagation within an Air Transportation Network: Simulation and Mitigation
Harrison Summerour, Jeremy Blunt, Erik Lecy and Christopher Patti,
United States Air Force Academy
Faculty Mentor: Lt Col Gregory Steeger

This study answers the question: What is the effect of a maintenance delay on a C-17’s total time away from its home station? The C-17 Globemaster III is one of the most heavily utilized platforms for airlift and the efficient use of this resource is a high priority for Air Mobility Command. Delay propagation occurs when a delay incurred on a specific leg of a journey has compounding effects throughout the rest of the mission. In order to examine the delay propagations within the C-17’s specific airlift network, we compiled C-17 flight data to create a simulation of the most common routes into and out of US Central Command bases in the Middle East from North American bases. The simulation is manipulated by altering the number and severity of maintenance delays. We found that there is a relationship between maintenance delays and other delays. A decrease in the average maintenance delay time of one hour across the system decreases the total mission time by roughly two hours.
20. Measuring Medical Provider Strain: Explaining Intensive Care Workload under Highly Variable Demand
Mary Zimmerman, Todd Link, Michael Rieker and Ryan Silva, United States Air Force Academy
Faculty Mentors: Lt Col Johnathan Dulin, Lt Col Gregory Steeger, and Dr. Bradley Warner

The Pediatric Intensive Care Unit at the Children’s Hospital of Colorado is the premier provider of care for young patients with acute illnesses in a five-state region. Given the variable demand and the unpredictability of an intensive care environment, these Units struggle to accurately predict how much strain the unit will be under at any given time. This study develops a composite measure of strain felt by the medical staff of the Unit. We use principal component analysis to explain the variation in the data which directly suggests that outcomes (including medication errors and deaths) did not directly vary with inputs. Directed discussions with the Pediatric Intensive Care Unit Team lead to a strain “stoplight” to discriminate between high, medium, and low strain days. Through ordered logistic regression, the analysis finds that admissions and census data contribute most to the unit’s strain level, with admissions contributing twice as much to strain per unit.

21. FalconSAT Ground Station
Josh Roseler, United States Air Force Academy
Faculty Mentor: Lt Col Todd Nathaniel

The purpose of the FalconSAT capstone is to involve cadets at USAFA in the design, integration, testing, and operation of satellites that act as a supporting platform for various research payloads. Currently, the capstone is working on FalconSAT-6 and FalconSAT-8. Our team is charged with writing and executing procedures for the satellites during test campaigns and operations while on orbit. As part of this team, I worked with the hardware connecting the commanding computers to the antennas mounted on the building’s roof. During the fall semester, we worked to design and implement a system which allowed operators the ability to easily switch between the different antennas. This semester we are working to integrate one of the ground station antennas. With the loss of the primary ground station, a fully operational ground station at USAFA is paramount. Integration of the antenna assembly includes system design, multi-level component testing, installation, and system operational testing.

22. USAFA 2018 Formula SAE Car
Bret Wagner and Damon Payne, United States Air Force Academy
Faculty Mentor: Lt Col Shane Crippen

This presentation will include an overview of some of the different vehicle systems, such as drive train, power train, frame, body, electrical and breaks. We will cover some of the design considerations and processes that went into the design. We will also be detailing our process for production and scheduling as well as overviews of each of the different events and our strategies for them. This should also include visual demonstrations of the vehicle and its current state.
23. Visualizing Range of Attack for Surface to Air Enemy Assets  
Rebecca Wagner, Kyle Daley and Spencer Adolph, United States Air Force Academy  
Faculty Mentor: Dr. Danielle Cummings

USAFA’s Cyberworx and Warfighter Effectiveness Research Centers are conducting a multi-semester research effort to create a collaborative mission review system to highlight critical mission phases, transitions and anomalies. AF pilots use 2D maps to visualize the terrain during mission planning activities prior to and following combat exercises. As part of a larger effort, we are using augmented reality and data gathered from TCTS pods to create a 3D representation of the range of attack for Surface to Air Missiles. This will allow pilots to visualize safe proximity to enemy ground forces which may lead to more effective tactical planning.

24. Collecting Spectral Data in Space using the Amptek DP-5  
Terrance Yi, United States Air Force Academy  
Faculty Mentor: Lt Col Shane Crippen

The purpose of this capstone project is to build and program a device in order to capture spectral data in space to test for levels of radiation. The device must be able to send and receive commands from the ground station at USAFA and be able to change its configuration in order to adapt to factors encountered in space. My primary focus was to establish communications between the microcontroller and the sensor itself in order to send various request packets and be able to read the bit stream that comes back through the sensor. I contributed to this project by verifying that the microcontroller was able to send and receive data correctly, and comparing this new data against the data from a direct connection to the sensor with a computer. I also worked on swapping out an on board power level shifter in order to more efficiently power both the micro controller and the sensor itself, and am currently working on interpreting the results in order to confirm proper functionality.

25. NMR Studies of DNA in the Presence of Chromate Reduction  
Shiyen Sinclair, Colorado College  
Faculty Mentors: Jessica Kisunzu

Chromium(VI) compounds are potent DNA mutagens and carcinogens when inhaled, but the potential of these compounds to generate similar effects when taken orally is an area of active investigation. The exact mechanism(s) of this activity is unknown, but potential mechanisms can be grouped into two categories as discussed below. Virtually no data on the structure of these Cr-DNA complexes exist, in part because of the unique magnetic and chemical properties of Cr(III) complexes, which make characterization non-trivial. The current studies have focused on the binding of Cr(III) generated on-site by the reduction of Cr(VI) by ascorbate and thiols, as well as associated changes to the oligonucleotide. The results of 1-D and 2-D NMR spectroscopic studies of a DNA oligonucleotide containing a GG motif and exposed to Cr(VI) in ascorbic acid of dithiothreitol will be presented.

26. Moved this student to Session 1
27. Purification of a Kinase Associated with the Ter Y-P Triad of A. Baylyi ADP1
Lauren Wilmott and Maxwell Veiga, Colorado College
Faculty Mentor: Margaret Daugherty

Ter (tellurite resistant) gene clusters combat cellular stresses associated with tellurite and other toxic compounds. We are interested in undertaking a functional characterization of the Ter YP gene triad, from A. Baylyi ADP1. This triad may act as a signaling switch for protein phosphorylation, under environmental stresses. The proteins comprise a putative kinase, a phosphatase, and a metal binding protein. The data herein show expression studies and initial purification steps for the putative kinase of the Ter YP triad. To facilitate purification, the kinase is expressed as a fusion protein with the maltose binding protein. Expression studies show that the protein was insoluble when expression was induced at 37°C. Solubility of the protein increased when cells were grown in the presence of glucose, and induced at 30°C. Affinity chromatography, using a maltose binding resin, reveals that we have obtained pure fusion protein. We propose future steps in the purification protocol.

28. The Effects of Vegetation on Snow Accumulation
Jennifer Cowan, University of Colorado Colorado Springs
Faculty Mentor: Dr. Brandon Vogt

The purpose of this study is to identify the differences in snow accumulation on different types of vegetation cover. The characteristics include snow water equivalent and snow depth over three available vegetation cover types in Silverton, Co. The results of this study can be used to predict avalanche activity, future water table levels and availability of water during warmer months.

29. Changes in Weather by Elevation in a Colorado Mountain Environment during a Winter Storm Event
Jana MacInnis, University of Colorado Colorado Springs
Faculty Mentor: Dr. Brandon Vogt

The purpose of this project is to show temperature and humidity changes at different elevations before, during, and after a winter storm passes through a mountain environment in Colorado. Temperature and some relative humidity data was gathered by students using HOBO data loggers in the Silverton, Colorado area between January 8-12 at five locations spread across three elevations. We will compare this data with data from the Colorado Avalanche Information Center at similar elevations to show the changes that occur during a winter storm event and how that can vary with location from the valley floor, mid slope, and summit.
30. Synthesis and Characterization of [Ru(dpop')(2,3-dpp)(Cl)](PF6).H2O and [Ru(dpop')(2,3-dpp)(H2O)](PF6)2.H2O
Kendra Engstrom, University of Colorado Colorado Springs
Faculty Mentor: Dr. Ronald Ruminski

Novel complexes containing Ru(II) and polyamine ligands were prepared, isolated, and characterized. The NMR spectrum of [Ru(dpop')(2,3-dpp)(Cl)]+ in acetonitrile shows an approximate equivalent mix of the proximal and distal isomers. Electronic absorption spectra recorded as a function of time for [Ru(dpop')(2,3-dpp)(H2O)]2+ in room temperature acetonitrile shows the lability of the Ru-H2O bond with first order substitution of the solvent. Absorption spectra and electrochemical results will further be presented and discussed.

31. Triazoles Synthesis and Microwave Assisted Diels-Alders
Jose Montanez, University of Colorado Colorado Springs
Faculty Mentor: Dr. Allen Schoffstall

Presenting possible anti-fungal, anti-bacterial, anti-viral, anti-tumor, anti-convulsant activity and acting as a bioisostere and a peptidomimetic, a 1H-1,2,3 triazole was synthesized through a “one pot” method using “click chemistry” affording yields of 53-57%. The triazole was reacted with dimethylacetylene dicarboxylate under microwave conditions to undergo Diels-Alder cycloaddition. The Diels-Alder adduct was characterized through 1H NMR and 13C NMR spectroscopy and LCMS to confirm the structure of the adduct.

32. Electrochemical Route to Vicinal Ditriazoles from 2-Methylpyrazine
Louis Swanson and Ashleigh Zeller, University of Colorado Colorado Springs
Faculty Mentor: Dr. Allen Schoffstall

Condensation of 2-methylpyrazine and 4-bromobenzaldehyde yielded (E)-2-(4-bromostyryl)pyrazine in moderate yield. Diazidation of the alkene was investigated using electrochemical and traditional approaches. The diazido product was then treated with a terminal alkyne to yield a substituted vicinal di-1H-1,2,3-triazole. Purification was accomplished using flash chromatography or recrystallization. Purified products were characterized using NMR spectroscopy and FTIR spectroscopy.

33. Synthesis of Perfluoropyridyl-1H-1,2,3-Triazole Derivatives
Marissa Trujillo, University of Colorado Colorado Springs
Faculty Mentor: Dr. Allen Schoffstall

Reaction of tetrafluoropyridyl azide with terminal alkyne under Sharpless/Meldal conditions (click chemistry) afforded triazole derivatives containing the 2,3,5,6-tetrafluoropyridine moiety. The triazole derivatives were isolated and purified using flash chromatography. The purified triazoles were gave nucleophilic substitution to produce brominated triazoles, which were also purified using flash chromatography. These compounds were propargylated via Williamson ether synthesis to produce alkynyltriazoles. All products were solids and each reaction gave good yields and recoveries. The purified products were characterized using 1H NMR and infrared spectroscopy.
34. Determining Concentrations of Perfluorinated Compounds (PFCs) in Produce from Historic Venetucci Farm

Rubi Diaz, University of Colorado Colorado Springs
Faculty Mentors: Dr. Janel Owens

Historic Venetucci Farm is an area affected by the contamination of drinking-, surface- and groundwater by toxic perfluorinated chemicals (PFCs) in Colorado Springs. Our laboratory has recently developed methods for determining the concentrations of PFCs in water and soil samples collected from Venetucci Farm via solid phase extraction (SPE) and liquid chromatography tandem mass spectrometry (LC/MS/MS). Total PFCs in water were found to be up to 9.4 times higher than the EPA health advisory limit of 70 ng/L for PFOS and PFOA. Given these high concentrations and the lack of accurate methods for quantitation of these compounds, our goal was to develop methods for extracting and analyzing nine PFCs by SPE-LC/MS/MS to then determine PFC concentrations in produce samples collected from the farm. The accuracy and precision of the method were assessed with reasonable spike. PFC levels in produce from Venetucci Farm were under 80 ng/L for all surveyed PFCs and under 30 ng/L for PFOS and PFOA.

35. Removal of Hexavalent Chromium Ions from Water Using Graphene Materials from Sucrose, Dextrose, and Black Tea Leaves

Huiyuan Guo, Colorado College
Faculty Mentor: Dr. Amanda Bowman

Hexavalent chromium ion is one of the most toxic water contaminants. The removal of Cr(VI) ions from water using different graphene/graphitized materials produced from sucrose, dextrose, and black tea leaves were investigated. Inductively Coupled Plasma was operated to detect chromium concentrations of purified solutions. Stirring the graphenic material and potassium dichromate solution for three hours, and filtering the mixture by gravitational filtration was found to be the most effective way of removing Cr(VI) ions. The wide adaptability and porous characteristics made graphitized black tea leaves a more competent graphene than sugar-based graphene for water purification. Scanning Electron Microscopy was used to capture the surface image of graphitized black tea leaves—a honeycomb-like structure and full of pores with different sizes.

36. Understanding the Molecular Interactions of a Complement Directed Lupus Therapeutic

Nicole Russell, University of Colorado Colorado Springs
Faculty Mentor: Dr. James Kovacs

Systemic Lupus Erythematosus (SLE) is an autoimmune disease that results in more than 200,000 new cases each year. Currently, only symptomatic treatment is available, and the disease cannot be cured. The adaptive immune system, activated through the complement system has been implicated in the development of SLE. Working closely with our collaborators, we have discovered two antibodies that effectively reverse the symptoms of SLE in a mouse model. We began by designing a single chain variable fragment (scFv) of antibody 3D29. The scFv 3D29 was expressed in HEK293T cells and binding to a complement component was monitored and determined to be similar to the intact antibody. Currently we are screening phage display peptide libraries to elucidate peptide-based inhibitors to be used as potential therapeutics and imaging agents for complement related diseases.
37. Investigating the role of a gene in Drosophila arizonae reproduction
Alexis Ryan, University of Colorado Colorado Springs
Faculty Mentor: Dr. Jeremy Bono

Our research examines the genetic basis of infertility in Drosophila arizonae. We hypothesize that male flies transfer proteins during mating that interact with proteins within the female to affect the female post-mating response. Lack of these protein interactions may prevent fertilization. We used a CRISPR-generated knockout of one of our candidate genes to determine whether this gene has an effect on the post-mating response, represented either in number of eggs laid or larvae hatched. Our data did not show any significant effects of the male copy of this gene on these parameters, so we can conclude that the male transferred protein does not play a role in fertility.

38. Belle interacts with Shep to regulate neuron morphology in Drosophila
Michael Titus, University of Colorado Colorado Springs
Faculty Mentor: Dr. Eugenia Olesnicky Killian

Neuron morphology is integral to the appropriate wiring of the nervous system. Defects in neuron morphology are associated with several neurological disorders. RNA-binding proteins (RBPs) have several roles in post-transcriptional regulation and mutations in RBPs have been linked to multiple neurological disorders. Alan Shepard (shep) is an RBP that is integral to the development of proper neuron morphology in Drosophila melanogaster. Co-immunoprecipitation of shep identified other interacting RBPs including Belle (bel). Analyses of neuron morphology showed that bel mutants had increased number of dendritic branches and decreased total branch length. The epistasis analysis revealed that defects in neuron morphology in larvae overexpressing shep is rescued when combined with a bel mutation. Overall, our analyses reveal that bel is integral to neuron development and that it interacts with shep during this process.

39. Complement Components Required for the Establishment of a Latent HIV-1 Reservoir
Bailey Weidner, University of Colorado Colorado Springs
Faculty Mentor: Dr. James Kovacs

It has been suggested that the complement system is necessary to establish a latent HIV-1 reservoir in an infected individual. Results from the early ‘90s show a potential interaction between complement receptor 2 and an intact HIV-1 virion are needed to establish a latent reservoir; however, a subsequent manuscript suggested that an intact immune complex was required to initiate the latent reservoir. Here we report that CR2 and a complement component are required to interact with the HIV-1 surface glycoprotein. Currently, an infected individual treated with a drug cocktail can manage an active infection- however the virus cannot be cleared. Our novel results are the first step in determining the molecular determinants that allow for the latent reservoir to be established.
40. The RNA binding protein Caper regulates larval locomotor behavior
Lauren Young, University of Colorado Colorado Springs
Faculty Mentor: Dr. Eugenia Olesnicky Killian

Mutations within genes that encode RNA-binding proteins (RBPs) involved in alternative splicing have been implicated in many neurodegenerative disorders including spinal muscular atrophy (SMA) and amyotrophic lateral sclerosis (ALS). Preliminary research shows that the RBP splicing factor, caper, plays an important role in the development and maintenance of the Drosophila nervous system, particularly in the development of the neuromuscular junction (NMJ), which regulates behavior in Drosophila. This project focuses specifically on understanding the role of caper in directing larval locomotor behavior in Drosophila. Larval locomotion assays were employed to determine whether caper dysfunction affects larval locomotor behavior in a tissue specific manner. Our preliminary data show aberrant locomotion in caper mutants compared to wild type. Future work will determine if caper functions pre-synaptically within motor neurons to regulate locomotor behavior.

41. Comparing Alert and Flight Initiation Distances among Varying Animal Species in a Human-Built Environment
Shelby Harvey, University of Colorado Colorado Springs
Faculty Mentor: Dr. Emily Mooney

Many animals that reside on campus, show predation defense in the action of escape. A flight initiation distance is the length in meters that an animal actively attempts to escape from a suspected predator. We observed the alert distance (AD) and flight initiation distance (FID) of each of the varying animal species present in a human-built environment. The data indicates that FID are species-specific, with Magpies having the farthest distance for escape methods. Some evidence is shown that animals living closer to human activity have a higher tolerance, with shorter FIDs. We also observed a correlation between whether a bird species was perched or grounded, and their FIDs. The birds that were first located perched, exhibited shorter FIDs than ones that were first located on the ground. The analysis revealed a very strong correlation between the specific animal species and the distance that they initiate their escape strategy (P=0.00189*).

42. Female dominance behavior in semi-free ranging mongoose and ring-tailed lemurs (Eulemur mongoz and Lemur catta) at Myakka City Reserve, Florida
Sophia Pray, Colorado College
Faculty Mentor: Dr. Krista Fish

This paper presents a supplemental line of research on female dominance behavior in semi-free-ranging lemurs at the Myakka City Reserve in Florida. Agonistic and affiliative behaviors, as well as general activity patterns, were recorded through a series of group scan sampling, continuous focal sampling, and interaction matrices. The research resulted in a total of eighteen hours of observation on two species living at the reserve: ring-tailed lemurs and mongoose lemurs. Two 4 year-old female lemurs, one mongoose and one ring-tailed, were the primary study subjects. The results show that female dominance behavior is still present in semi-free-ranging lemurs, however it might vary depending on social structure. Further research should be done on cross-species agonistic behavior in lemurs, both to understand how female dominance might be displayed between members of different species and how social groups might impact it.
43. The relationship between feeding frequency and plant diversity in the ring-tailed lemur (Lemur catta)
Jordan Schrage, Colorado College
Faculty Mentors: Dr. Krista Fish

At the Lemur Conservation Foundation (LCF), my study observed five ring tailed lemurs to understand the feeding patterns within their habitat. I predicted that the lemurs would spend more time feeding in areas of the forest with a higher plant diversity. Splitting the forest into 20x20 meter plots and taking transects of about 25 percent of those allowed random data on species diversity to be collected. Using focal follows, I studied each ring-tailed lemur for 80 minutes. After analysis, each received a full activity budget, with emphasis on feeding. The data shows 16 percent of the day as the average time spent feeding, below the average in the wild. A correlation test, made from the plant diversity data, determined if the frequency of feeding correlates with plant diversity in the plots foraged. Applying an r-test to the data found no correlation between the two. The lemurs may be impacted by human-influenced areas, following pathways and feeding in areas where their enclosures are.

44. Group Cohesion and Social Interaction in Ring-tailed (Lemur catta) and Red Ruffed (Varecia rubra) Populations Influenced by Canopy Cover
Madison Wilkinson, Colorado College
Faculty Mentor: Dr. Krista Fish

This research looked at the influence that canopy cover has on the social interactions and group cohesion of two lemur species, Lemur catta and Varecia rubra, within a 13-acre, semi-free ranging forest environment in Myakka City, Florida. The results of this study were highly interesting, showing stark differences between the ringtail and red ruffed populations. Overall, ringtails were generally found in a lower canopy cover habitat, found to be less cohesive as a group, and found to spend more time interacting socially with each other. Red ruffed lemurs were observed in a higher canopy cover habitat, found to be more cohesive, and spent significantly less time engaging with each other socially.
**Fifteenth Annual Colorado Springs Undergraduate Research Forum**

**Schedule of Events - Colorado College**

<table>
<thead>
<tr>
<th>9:00-9:45</th>
<th>Check-In - Cornerstone Mainspace</th>
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<tbody>
<tr>
<td><strong>Oral Session 1</strong></td>
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<tr>
<td>10:00-10:20</td>
<td>M. Foreman D. Lopez Group J. Miller Group B. Ventura</td>
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<tr>
<td>10:20-10:40</td>
<td>K. McGinn A. Nicol Group K. Ross A. Sheffield</td>
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<td>10:40-11:00</td>
<td>A. Moore Group J. Singh Group B. Thomas Group P. Mokoena Group</td>
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<tr>
<td>11:00-11:20</td>
<td>K. Henrich L. Larrabee K. Latona H. Poll K. Daughtee</td>
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<tr>
<td>10:15-11:30</td>
<td>Poster Session 1 1st floor Armstrong</td>
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<tr>
<td>11:30-1:00</td>
<td>Lunch &amp; Keynote Address - Dr. Manya Whitaker - Cornerstone Mainspace and Celeste Theatre</td>
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<tr>
<td><strong>1:15-2:30</strong></td>
<td>Poster Session 2 1st floor Armstrong</td>
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<tr>
<td><strong>Oral Session 2</strong></td>
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<td>1:20-1:40</td>
<td>J. Murphy E. Bertrand Group G. Chambers B. Herrick</td>
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<tr>
<td>1:40-2:00</td>
<td>J. Ye R. Conlon T. Hooker M. Maloney Group</td>
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<td>2:00-2:20</td>
<td>J. Armstrong M. Gabbard L. Sterman J. Randolph</td>
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<td>2:20-2:40</td>
<td>J. Howard G. Swift B. Tindell A. Toomes</td>
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<td>2:45-4:00</td>
<td>Poster Session 3 1st floor Armstrong</td>
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<td><strong>Oral Session 3</strong></td>
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<td>3:00-3:20</td>
<td>H. Griffiths L. Henningsen S. Patrick</td>
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<td>3:20-3:40</td>
<td>T. Rohrer T. Saunders L. Shi</td>
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<tr>
<td>3:40-4:00</td>
<td>I. Siepmann A. Stuart D. Hankamer Group S. Roberts S. Huddleston</td>
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</tbody>
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**Posters Session 1**

1. Political views, speech, and protest
   - M. Foreman
   - D. Lopez Group
   - J. Miller Group
   - B. Ventura

2. Organismal ecology and physiology
   - K. McGinn
   - A. Nicol Group
   - K. Ross
   - A. Sheffield

3. Security, seacraft, robotics, and tech
   - A. Moore Group
   - J. Singh Group
   - B. Thomas Group
   - P. Mokoena Group

4. Visual arts
   - K. Henrich
   - L. Larrabee

5. Ancient arts and modern iterations
   - K. Latona
   - H. Poll
   - K. Daughtee

6. Developing cities, treaties, and archives
   - R. Dunbar
   - J. Parker Group
   - A. Kahalley

7. Luchando contra la injusticia social
   - W. Newman
   - J. Roca
   - A. Dargan

**Poster Session 2**

1. Social services, parents and schools
   - J. Murphy
   - E. Bertrand Group
   - G. Chambers
   - B. Herrick

2. Performance and innovation: Finance, sports, and clothing
   - J. Ye
   - R. Conlon
   - T. Hooker
   - M. Maloney Group

3. Describing the world with math
   - J. Armstrong
   - M. Gabbard
   - L. Sterman
   - J. Randolph

4. Art hodge podge
   - J. Howard
   - G. Swift
   - B. Tindell
   - A. Toomes

5. Art in the Americas
   - E. Mitchell
   - J. Gray
   - B. Hall
   - K. Henrich

6. Rebels, rebellion, and life as art
   - J. Banks
   - S. Ritchey
   - G. Skidmore Group

7. Los temas en la literatura: carpe diem y la oscuridad
   - F. Gonzalez
   - B. Lunaas

**Poster Session 3**

1. The rise and decline of people and nations
   - H. Griffiths
   - L. Henningsen
   - S. Patrick

2. Grief and violence
   - T. Rohrer
   - T. Saunders
   - L. Shi

3. Air, light, and magnets
   - I. Siepmann
   - A. Stuart
   - D. Hankamer Group

4. Original films
   - S. Roberts
   - S. Huddleston

5. Provocative storytelling
   - J. Gnan
   - E. Smith
   - E. Mitchell

6. Politics and their agitators
   - P. Butler
   - C. Churchill
   - A. McDonald

7. El estigma, la deshumanización, y la interseccionalidad
   - B. Perez
   - T. Watmore
CSURF 2018- Colorado College

04- Cornerstone Arts Center
(Main Space and Celeste Theatre)
Check-in, Breakfast, Keynote

01- Armstrong Hall
(Main Lobby- 1st Floor; Classrooms- 2nd Floor)
Poster and Talk Presentations

Parking for CSURF
C-2 and C-1
Street parking available (some metered)