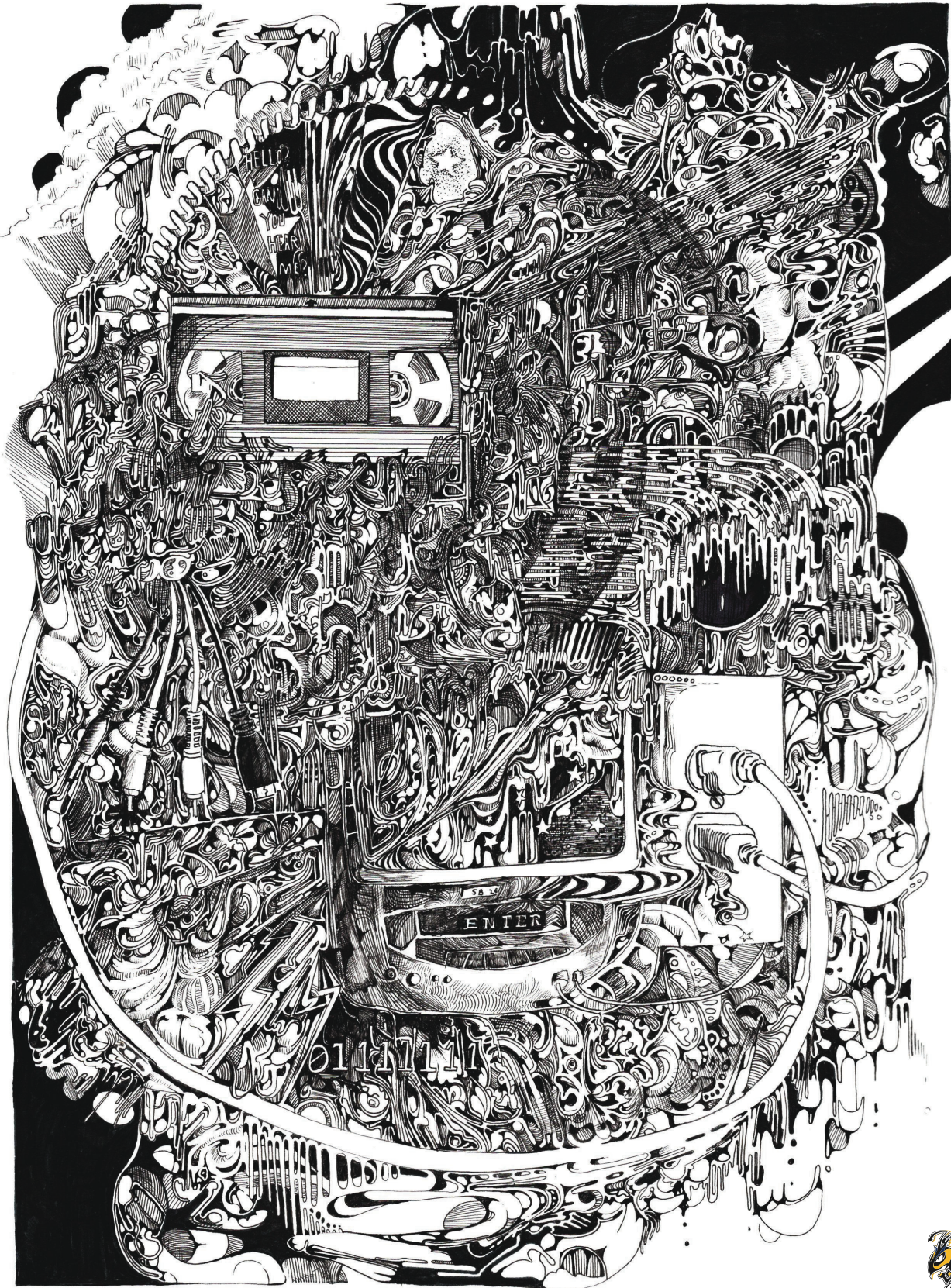


13TH ANNUAL MONTANA STATE UNIVERSITY BILLINGS

RESEARCH AND CREATIVITY SYMPOSIUM

APRIL 17, 2026



Sarah Boucher
Delete, 2026

2026 SYMPOSIUM

Montana State University Billings is proud to host the thirteenth annual Research and Creativity Symposium (RCS) on the University campus April 17, 2026. Sponsored by the Office of Grants and Sponsored Programs, the Office of the Provost, the University Honors Program, and Montana IDeA Networks of Biomedical Research (INBRE), the symposium provides the opportunity for undergraduate and graduate students of all fields to present their research and creative scholarship in a public forum. This program includes abstracts from the research projects as well as artworks from the Juried Student Exhibition.

The calendar below lists names and times for the live presentations. As some students are not participating live, links to online presentations in ScholarWorks will be available on our website here at a later date: msubillings.edu/research

APRIL 16 Liberal Arts Building – Northcutt Steele Gallery	
5:00	Reception for Juried Student Exhibition LA first floor
APRIL 17 Student Union Building – Glacier Room	
12:10	Symposium Welcome from Provost Lee Vartanian Keynote Introduction by Chancellor Stefani Hicswa
12:15	Keynote Speaker Mayor Mike Nelson
12:45	Poster Session
3:15	Presentation of Awards

KEYNOTE SPEAKER

Mayor Mike Nelson

Mayor of Billings and MSUB Alumnus

Mike Nelson is a native of Billings. He graduated from Eastern Montana College (now Montana State University Billings) with a degree in Economics. He followed his wife, Judy, to Las Vegas where she taught Special Education in area high schools and he pursued a career in the hotel/casino industry. Mike and Judy have two girls, Sarah and Hannah, who are professionals in the hospitality industry.

In 2008, he returned to Billings where he and his brother purchased and then refurbished the then-closed Northern Hotel. Since then, he has been active in the community chairing the Big Sky Economic Development Corporation, the Billings Chamber of Commerce, the Billings Preservation Society (the Moss Mansion), and served on the MSUB Foundation Board. He was elected mayor in 2025.

Keynote Title: A Circuitous Route

In his keynote, Mayor Nelson will reflect on his non-linear journey through college and his career, offering an honest perspective on the role of challenge, failure, and persistence in long-term success. Drawing on his experiences as both a student and a professional, he will explore how setbacks can shape growth and prepare individuals for opportunities beyond the classroom.

THANK YOU **TO ALL FACULTY MENTORS**

Dr. Emily Arendt
Daniel Charlton
Dr. Madison Collins
Dr. Jason Comer
Dr. Stephen Eliason
Dr. Brent Finger
Dr. Lynn George
Dr. Hashini Herath

Dr. Joy Honea
Dr. Ambrin Masood
Kylie McKinney
Dr. Cody Patton
Dr. Alex Shafer
Dr. Richard Warner
Dr. Jeffrey Willardson
Dr. Daniel Willems

Posters

The Relationship Between Isometric Mid-Thigh Pull Force-Time Characteristics and Swing Performance in Young Adult Golfers

Student Researcher: Haylee Adams

Faculty Mentor: Dr. Alex Shafer

Muscle strength and power, especially of the lower body, are important physical qualities necessary for golf performance due to their influence on clubhead speed (CHS), a key determining factor of ball distance and overall scoring potential. While previous studies have identified moderate to strong relationships between dynamic measures of lower-body strength and swing performance, limited research has examined force-time characteristics using the isometric midhigh pull (IMTP) assessment in relation to swing performance. The purpose of this study is to investigate the relationship between isometric midhigh pull force-time characteristics and swing performance in young adult golfers. The current study will use a correlational research design to examine the relationship between IMTP force-time characteristics and swing performance in young adult golfers. Participants will complete two familiarization sessions followed by two testing sessions. Maximal isometric strength will be assessed using the IMTP on a force platform, with peak force and force at 50-100 ms being recorded for three maximal-effort trials. Swing performance will be evaluated indoors using a GCQuad launch monitor, with performance measures including CHS and carry distance being recorded across five maximal-effort driver swings. A Pearson's r test will be conducted to determine the relationships between IMTP force-time characteristics and swing performance variables, with statistical significance set at $p < 0.05$.

Antibiotic use and its effects on rabbit gut microbiota

Student Researcher: Stevi Adams

Faculty Mentor: Dr. Jason Comer

Rabbits (*Oryctolagus cuniculus* L.) are common house pets that rely heavily on the consumption of specialized fecal pellets that contain an array of gut microbiota. Antibiotics, among other things, can disrupt the delicate balance of the gut microbiota, leading to decreased movement in the digestive tract. This is known as gastrointestinal stasis, which, if left untreated, can lead to the animal's death. The goal of this study is to examine the effects of antibiotics on the gut microbiota of pet rabbits. Fecal samples were collected from a healthy rabbit with no prior antibiotic use and a rabbit that had previously been on a course of antibiotics and had shown symptoms of GI stasis. Both samples underwent standard protocols for DNA extraction, clean up, barcoding, and next-generation sequencing. The fecal samples from both rabbits appear to have the same five bacterial genera and a single eukaryotic yeast genus dominating the others, though in varying ratios. Almost three times as many antibiotic resistance genes were also noted in the rabbit that had been treated with antibiotics. These findings point to a change in the relative abundance of the gastrointestinal microbiota between healthy rabbits and those that have been on a course of antibiotics.

Paving the Way: How the Going-to-the-Sun Road Used Tourism to Help Preservation in Glacier National Park

Student Researcher: Carey Berendsen

Faculty Mentor: Dr. Cody Patton

This project explores the Conservation history of Glacier National Park through the development of the Going to the Sun Road. It examines the history of the road and engineering, highlighting how it was used to preserve the land of the national park. The project addresses the research question: How did the engineering of Going-to-the-Sun Road balance the development and the environmental preservation in Glacier National Park, and what kind of lessons does it teach for sustainability in protected parks?

Impact of resilience and growth mindset interventions on academic motivation of college students

Student Researcher: Braxton Bybee

Faculty Mentor: Dr. Ambrin Masood

This study examined whether brief resilience and growth mindset interventions would improve college students' Mindset Beliefs, Resilience, and Academic Motivation. A Within-Subjects pretest–intervention–posttest (ABA) Design was used with 35 undergraduate students. Participants first completed baseline measures of growth mindset, resilience, and academic motivation before engaging in four structured intervention activities: a brief Psychoeducation Session on mindset, a 30-minute story-sharing session in which a traumatic brain injury survivor described their resilience journey, a 30-minute Resilience Skills Training session, and a Narrative Therapy activity focused on personal experiences and self-awareness. After completing all four activities, participants filled out the same three questionnaires. Descriptive analyses showed consistent increases across all outcomes: Growth Mindset scores improved by 3–5 points, Resilience increased by 5–10 points, and Academic Motivation rose by 10–20 points. These findings suggest that short, targeted interventions can positively influence students' beliefs about learning, their coping abilities, and their engagement with academic goals. However, the absence of a control group, reliance on self-report measures, and single-institution sampling limit internal and external validity. Overall, results support the potential value of incorporating brief mindset and resilience-building exercises into student development programming.

Driving Under the Influence

Student Researchers: Kylee Calhoun, Lauren Treu, Tyrah Knudsvig

Faculty Mentor: Dr. Stephen Eliason

This project will research data regarding driving under the influence of alcohol, using secondary data to draw its conclusions.

Everyone loves water

Student Researcher: Ethan Carlsen

Faculty Mentor: Dr. Jason Comer

Montana rivers and lakes have several well-known local pathogens, such as *Giardia duodenalis* (Giardia) and *Staphylococcus aureus* (Staph). There are plenty more bacteria, viruses, protozoans, helminths and even cyanobacteria that can cause a wide array of illnesses in the human population, *Escherichia coli* (E. coli), giardia, staph, and salmonella to name a few. This water metagenomics project was an initial study of river water from the Missouri river, collected near the Rainbow Dam. It focused on the identification and cataloguing of DNA from this site, with an emphasis on identifying pathogens that are harmful to humans. The DNA was isolated from the water sample before using sequencing to identify the strands. This data was the baseline from which I identified the pathogens using a list provided by the Centers for Disease Control and Prevention (CDC), as well as a program incorporated into the software, that identified their antimicrobial resistance. Taxonomic analysis of the pathogens was completed to highlight the evolutionary history of the organisms, and data indicating the percentage quantity of each was included. Upon analysis there were 31 unique pathogens, 15 of which were most prominent. This project highlighted which of the CDC's harmful pathogens are in the Missouri river and further explores the unique characteristics of these pathogens from their resistance to antimicrobials to their concentration in the water.

Uncovering the Invisible: Environmental DNA and the Pathogens that Persist

Student Researcher: Rebecca Chambers

Faculty Mentor: Dr. Jason Comer

Within the world of clinical microbiology, innovation in the detection of pathogens can make a significant difference in patient outcomes. Previously conducted research has shown promise in the use of metagenomic sequencing for both surveillance of outbreaks in populations and early determination of infectious organisms in individual human samples. The wide range of clinical applications of metagenomic sequencing influenced this project design, where a river water sample taken downstream of Billings was sequenced using Oxford Nanopore Technology (ONT). The sample was analyzed for antibiotic resistance genes (ARGs), such as those conferring resistance to penicillin, and clinically significant pathogens, such as *e. coli* and MRSA. Given the upstream municipality, including two large hospitals (~300 beds / hospital), it was hypothesized that there would be many clinically significant pathogens and antibiotic resistance genes that persisted in the microbial profile of the waterway. About 5.5% of reads could be directly attributed to clinically significant bacteria species, and over 160 reads were matched to ARGs. While this project does not directly sequence patient samples, it does model the way that a population could be monitored for pathogenic outbreak. Expansions on this project in the future include comparative analysis of water from other cities, as well as the co-analysis of antibiotic usage, antimicrobial standards of practice, and the abundance of persisting pathogens in corresponding waterways.

The Effects of Q-collar Wear on Reaction Time within High School Football Players

Student Researcher: Kaylee Curry

Faculty Mentor: Kylie McKinney

One of the latest technologies for preventing sports-related concussions is a Q-collar. The Q-Collar is designed to compress the jugular vein, thereby increasing blood volume within the skull, which reduces the amount of space available for brain movement. The jugular vein is responsible for allowing deoxygenated blood to leave the brain and return to the heart for oxygenation. Q-Collar compression for a prolonged period can lead to reduced oxygenated blood to the brain, therefore having the potential to affect an athlete's reaction time. Ten high school football players from various positions volunteered to take part in this study. To obtain the necessary data for analysis, participants completed a reaction time assessment before and after their practice times. The participants conducted the Stroop test to obtain a pre-practice baseline test. The two athletes who were in the treatment group during week 1 switched to the control group in week 2, and the control group from week 1 became the treatment group in week 2. Pre-tested athletes' reaction times without the Q-collar averaged 10.34s. Post-tested athletes' reaction times averaged with the Q-collar were 10.93s. An alpha of $p < .05$ was used for the level of significance. Researchers used a one-tailed t-test that showed that Q-collar wear did not change when compared to non-Q-collar wearing athletes, $p = 0.109$. Reaction time did not show a significant difference between Q-collar and non-Q-collar wearers. This data shows no significance due to not meeting the alpha of $p < 0.05$, showing that Q-collar wear has no effect on reaction time within high school football players.

Trauma and delinquency among youth offenders

Student Researchers: Keyona Dalke, Jakob Milling and Victoria Otis

Faculty Mentor: Dr. Stephen Eliason

Childhood trauma and youth delinquency are ongoing social problems that affect families, schools, and the criminal justice system in many communities. Understanding this connection is important for developing prevention and intervention programs. According to GST, individuals who experience strain may turn to delinquency as a way to cope with negative emotions like anger, frustration, or stress. This study examines whether those early stressors are associated with delinquent behaviors during adolescence. The study uses a quantitative survey method to collect data directly from participants. Adults ages eighteen and older voluntarily complete an anonymous survey that includes Likert-scale and multiple-choice questions about childhood trauma and adolescent delinquent behavior. This method allows participants to answer sensitive questions privately and makes it easier to identify patterns and relationships between trauma and delinquency. The survey design also supports statistical analysis, which helps test expectations derived from GST.

The Effects of Rhodiola rosea Supplementation on VO₂max in Collegiate Runners

Student Researcher: Cecily Eagleton

Faculty Mentor: Dr. Alex Shafer

Maximal oxygen consumption (VO₂max) is one of the primary ways to test cardiovascular fitness and aerobic capacity, and one of the main ways endurance athletes measure overall endurance performance and health. VO₂max is influenced by several factors including peripheral oxygen extraction, central cardiovascular function, and the skeletal muscle metabolic capacity (Bassett & Howley, 2000). Supplementation has been studied as a method for increasing aerobic performance; one of these supplements includes the use of adaptogenic herbs like Rhodiola rosea. It has been suggested that Rhodiola rosae can help decrease fatigue and improve aerobic efficiency because of its effects on stress adaptation and energy metabolism (Panossian & Wikman, 2010). However, the research and findings regarding the impact on VO₂max are inconsistent. The purpose of this study is to examine the effects Rhodiola roses has on VO₂max on college athletes using a randomized, placebo-controlled study. Participants will take either a Rhodiola rosea supplement or a placebo 45min before testing. Then participants will undergo the Bruce protocol treadmill test while being hooked to the Cosmed Fitmate and a heart rate monitor to record Vo₂max.

Characterizing the biochemistry of Coleus plants when grown in MGS-1

Student Researcher: Seth Eldridge

Faculty Mentor: Dr. Daniel Willems

Seth B. Eldridge and Dr. Daniel L. Willems investigate how the growth and internal biochemistry of coleus species plants are affected when grown in simulated Martian regolith. By comparing these data to those of the same species grown in regular potting soil, the investigators hope to gain insight on how the plants are affected on the chemical level when grown in a Mars-like environment.

Ethical Issues within Criminal Investigations and Prosecutions

Student Researcher: Natalie Foxley

Faculty Mentor: Dr. Joy Honea

This research examines the ethical challenges that arise within criminal investigations and prosecutions, focusing on issues such as coercion in interrogations, surveillance and privacy concerns, bias prevention, forensic reliability, and prosecutorial discretion. Drawing on insights from Detective Johnson of the Billings Police Department and scholarly perspectives, the discussion highlights how ethical lapses can undermine justice and erode public trust. By contrasting rules and principles within legal ethics, the research emphasizes the importance of fairness, transparency, and integrity in safeguarding constitutional rights. Ultimately, the analysis demonstrates that wrongful convictions and prosecutorial misconduct are not isolated failures but systemic problems with far-reaching consequences for individuals, families, and communities.

How does childhood trauma affect future criminality

Student Researchers: Kayla Frandsen, Kelbie Letasky, Daniel Palmer

Faculty Mentor: Dr. Stephen Eliason

This project gathered data through an online survey study that asked participants questions about childhood trauma and its effects on future criminality. Survey results were cross-examined with Stillwater County law enforcement data.

Effects of In-Game Carbohydrate Intake on Shooting Percentage in Female Collegiate Basketball Players

Student Researcher: Brynn Jolma

Faculty Mentor: Kylie McKinney

This study explored the relationship between fueling the body with carbohydrates during basketball games and shooting performance. Carbohydrates are the fastest, most efficient form of fuel for the body, especially for high intensity intermittent sports like basketball. Fueling through the game allows for the depleted carbohydrate stores in the body to be replenished allowing efforts to be sustained. I studied athletes from the MSUB women's basketball team who played eight minutes or more each game. For three home games carbohydrates were provided in the form of sports drinks and snacks such as crackers, fruit snacks, and dried fruit chews. The following three away games the athletes did not fuel through the game with carbohydrates. The shooting percentages of the players were recorded and analyzed. This study did not find a significant difference in overall shooting percentage; however, free throw percentage was significantly higher in the carbohydrate fueled games.

Mixed Method Study on the Effect of Resilience and Growth Mindset Interventions on Academic Motivation

Student Researcher: Kendyl Kamp

Faculty Mentor: Dr. Ambrin Masood

This project investigates whether there is an effect of Resilience and Growth-mindset interventions on academic motivation in college students. Twenty-two college students currently enrolled at Montana State University Billings participated in brief educational sessions that included storytelling, self-awareness activities, and resilience-based skills training.

Mutating a Soluble B7H3 Gene and Comparison to sB7H3/MDK Protein Interaction

Student Researchers: Elizabeth Larson and Makayla Goffena

Faculty Mentor: Dr. Richard Warner

Immune system re-activation in advanced melanoma patients can be achieved through immunotherapies, and immune checkpoint inhibition therapies are breaking new ground. Previously, we discerned a novel interaction between B7-H3, an immune protein, and the ligand protein, midkine (MDK). To probe the strength of this interaction and disrupt it, we employed mutational analysis to make several mutations to a solubilized B7-H3 to alter its ability to interact with MDK as measured in a Protein Complementation Assay (PCA) system. Based on literature and our own studies, aspartic and glutamic acid residues may be important for B7H3 interaction with positively charged residues on MDK and effect signaling for immune cell regulation. We focused on amino acids around three aspartic acids, namely D84, D116, and D128. Targeted amino acids were mutated to alanines via mutagenesis PCR originally; however, progress cloning these mutants was slower than expected and genes bearing the mutations were then ordered from a DNA synthesis company. Genes have been subcloned to move them into PCA interaction vectors. As their sequences are confirmed to bear the correct mutations, we will test each mutant for interaction with MDK and compare them to the typical B7H3/MDK interaction. PCA measurements are made on whole-cell lysates by luminescence of the reporter. Preliminary results show potential dramatic disruption of interaction with MDK, with loss of between 50-70% of signal from replacement of D116 and E117.

A Mixed Study on Academic Motivation, Growth Mindset, and Resilience in College Students, Both Graduates and Undergraduates

Student Researcher: Simon McCoy

Faculty Mentor: Dr. Ambrin Masood

Multiple studies have shown higher productivity and improvement when people utilize a Growth Mindset. Resilience and Motivation often go together, both with each other and with Growth Mindsets. Other researchers have found that a sound support system is important in building Resilience. This was a mixed-methods study that used storytelling, narrative therapies, and presentations to find if interventions and skill building will have an impact on college students' Motivation and Resilience. First, subjects completed three pretests: the Carol Dweck's Growth vs. Fixed Mindset Assessment, the Connor-Davidson Resilience Scale-25, and the Academic Motivation Scale – College Version, along with a demographic questionnaire. Next, four interventions: a 5-minute talk about research on Mindset and malleability of the brain; a 30-minute storytelling by a traumatic brain injury survivor; a 30-minute presentation on how Resilience skills relate to Growth Mindsets; and a 30-minute Narrative Therapy Activity. The three posttests consisted of the same tests taken in the pretest to track their growth. Out of the 66 total tests taken, 74.2% had an increase between the pretest and posttest, showing that practicing these skills could influence and help develop Growth Mindsets, Resilience, and Motivation.

Drinking and Driving among College Students

Student Researcher: Payton McDonald, Logan Keller, and Troy Spang

Faculty Mentor: Dr. Stephen Eliason

This project examines drinking and driving among college students and explores why students choose to drive after drinking. Data are collected using qualitative interviews and surveys and analyzed through strain theory.

The Effect of Dynamic Stretching vs Neurospike ball on balance

Student Researcher: Tylee McDonald

Faculty Mentor: Kylie McKinney

There is limited research on use of the neurospike ball as an intervention for balance control as compared with more commonly used methods. This study integrated use of this new intervention with commonly used interventions in fifteen healthy college aged individuals. Prior to the intervention, each participant's baseline balance scores were recorded. The biodex settings were set to level 1, the most unstable setting, for all testing. Participants in the neurospike testing group rolled the neurospike ball for 90s on each foot, then moved to the biodex for 30s, and performed three testing trials. The Dynamic group performed 10 common dynamic movements, and then moved to the biodex for 30 seconds and performed three trials for post intervention testing. The average of the three trials was used for post intervention score. There was no statistical significance with balance when following either intervention. When comparing balance before and after dynamic stretching there was no significance ($p=0.60$) when having a p value of (<0.5). When comparing the other variable following pre and post of the neurospike ball on balance there was also no significance ($p=0.86$). The pre baseline was 10.97 and the pre baseline for dynamic stretching was 10.25, which means that their balance did improve a little when comparing baseline and post dynamic stretching. For the neurospike average it was 10.33, meaning their balance got worse after. There was no significance when comparing the neurospike ball and pre-baseline balance scores, with it being ($p=0.34$). Neither the dynamic stretching nor the neurospike ball showed to be statistically significant when comparing pre and post measurements on balance, however both groups' balance improved regardless of the intervention they used.

Effect of vision training in college baseball players

Student Researcher: Kylie McKinney

Faculty Mentor: Daniel Charlton

The purpose of this research is to examine the effect of vision training on letter recognition in collegiate baseball players. Reading is a complex visiocognitive process that depends on precise integration of visual perception. Letter recognition relies on the brain's ability to detect and encode orthographic features. Research suggests that visual factors are a primary cause of beginning reading failure and educators tend to miss when reading problems stem from poorly developed visual skills. For this research, 8 collegiate aged baseball players 20 years \pm 2 years, performed baseline testing to include speed and accuracy on the King-Devick (KD) reading test, card 3, and Near point convergence (NPC). Pupillometry for constriction was measured using the MindMirror handheld smartphone application. The group was educated on how to use the Brock String for convergence training. Training sessions were to take place daily at practice 1-2 times for no more than 30 seconds in duration. During each training session the athlete would set the beads to the place where they see a near "x" and a far "x" and then slowly move their eyes between the near and far bead being sure to gain and hold a clear fixation on each bead for 1-2 seconds. After 6 weeks the same baseline tests were performed, and post-test data was statically analyzed. CONCLUSION: 78% of players decreased speed on the KD test ($p=0.014$), 100% of participants reported zero errors on the KD Test ($p=0.0519$). NPC was less than the 2.5cm cut off for "normal" this was an improvement in 100% of participants ($p=0.005$). Pupil constriction was not statically significant between the control and intervention group.

Characterization of Nucleolar TDP-43 and Implications in ALS

Student Researchers: Gunner Ostrem, Sydney Tuss, Chase Grover

Faculty Mentor: Dr. Lynn George

Amotrophic Lateral Sclerosis (ALS) is a fatal motor neuron disease characterized by cytoplasmic aggregates of a protein called TDP – 43. The George Lab recently showed that TDP – 43 is present in the nucleolus of healthy motor neurons and lost from this organelle in a new mouse model of ALS. Although numerous different isoforms of TDP – 43 have been described, our most recent findings indicate that nucleolar TDP – 43 is full length, although the unique chemical environment of the nucleolus may alter its ability to interact with many common TDP – 43 antibodies.

Regulation of Autophagy Protein Expression in Neutrophils During *S. aureus* Interaction

Student Researcher: Teagan Potter

Faculty Mentor: Dr. Madison Collins

Staphylococcus aureus (*S. aureus*) is a gram-positive bacterium that naturally colonizes the skin and nasal passages. While often harmless, it can become a serious pathogen, causing infections with high morbidity and mortality. To establish infection, *S. aureus* has developed various strategies to evade the human immune system, particularly targeting neutrophils—the body's first line of defense against bacterial infections. Previous work has shown that *S. aureus* without the SaeR/S gene regulatory complex is not as virulent both in vivo and in vitro. Recent research shows that the upstream accessory genes to *saeR/S* (*saeP* and *saeQ*) function to negatively regulate SaeR/S-mediated virulence gene expression. Using western blots, we are working to quantify several hallmark autophagy proteins (i.e., p62, LC3). Additionally, this work has focused on an upstream transcription factor (TFEB) in neutrophils after interacting with wildtype *S. aureus* and mutants deficient in SaeR/S, SaeP, and SaeQ, respectively (Δ *saeR/S*, Δ *saeP*, Δ *saeQ*). Early experiments suggest that neutrophils that phagocytose Δ *saeR/S* and Δ *saeQ* may dephosphorylate TFEB as intended, which may lead to increased degradation of p62. These early data indicate that autophagy may function in neutrophils more efficiently during interaction with these mutants relative to wildtype. With this work and other work ongoing in the lab, the role and impact of SaeR/S, SaeP and SaeQ may begin to be understood during the early stages of infection. Collectively, these studies will fill clinically relevant gaps in our understanding of how *S. aureus* escapes the host immune system to advance disease.

Regulation of Autophagy Protein Expression in Neutrophils During *S. aureus* Interaction

Student Researcher: Steven Levi Reid

Faculty Mentor: Dr. Ambrin Masood

This project investigated if learning about Resilience skills and Growth Mindset theory would have a positive impact on college students' Academic Motivation. Using an ABA test design, we compared participants' self-confidence pre and post in Growth Mindset (Carol Dweck's Growth Versus Fixed Mindset Scale), Resilience (Connor-Davidson Resilience Scale -25), and Academic Motivation (AMS-HS 28). The pre and post tests were mediated by four interventions pertaining to resilience and growth mindset in personal experiences. The interventions had a mostly positive impact on participants' self-confidence in their own Resilience ($p = 1$). Learning about Growth Mindset had a mostly positive impact on participants' self-confidence in having a Growth Mindset ($p = 0.9$). Interventions had a small yet positive impact on participants' own Academic Motivation ($p = 1.94$). Learning about Resilience and Growth Mindset did have a positive impact on a student's Academic Motivation, but no conclusive evidence suggested participants came to adopt more positive learning.

Metagenomic Analysis of Microbial Composition in a soil sampled from a decomposing animal burial site

Student Researcher: Kaley Roundface

Faculty Mentor: Dr. Jason Comer

Vertebrate decomposition introduces organic matter and various nutrients into the soil, which could potentially alter microbial community structure and ecosystem function. This study used a shotgun metagenomics approach to investigate how these microbial communities change when a decomposing vertebrate is buried underneath, compared to a controlled sample. Soil was collected directly above a recently buried vertebrate under winter/spring conditions (-8.9 °C). DNA was extracted using Oxford Nanopore technology. The profiling was done using Taxonomic profiling. Special attention was given to the nitrogen and carbon cycling processes. This study was also used to evaluate whether decomposition created ephemeral nutrient patches.

Phylogenetic Reconstruction of Local Plant Families with cpDNA

Student Researcher: Angelina Sederberg

Faculty Mentor: Dr. Jason Comer

Plant biodiversity is rapidly declining due to agricultural demand from the growing global human population. Biodiversity hotspots are areas with the greatest number of species in the smallest possible area; these hotspots are typically well researched and have conservation efforts in place. Biodiversity coldspots, like Montana, tend to be under-researched in comparison, prompting further evaluation of their ecosystems. Species richness and phylogenetic diversity can be used to assess local community biodiversity, which can lead to better conservation methodologies. An important step in developing these methodologies is analyzing DNA for the construction of phylogenies and comparing sequences, but this can be difficult since species evolve at different rates. Chloroplasts are an ideal candidate for this methodology, since their DNA is highly conserved due to their key role in photosynthetic processes. The purpose of this study was to observe the phylogenetic diversity of four different plant families in Billings' John H. Dover Memorial Park. This was accomplished by extracting, cleaning, and library-prepping chloroplast DNA (cpDNA) for next-generation sequencing. Data from cpDNA were then aligned using a reference chloroplast genome, allowing for the identification of regions where reads belong in the chloroplast genome. Following this read mapping, sequences were aligned without a reference (de novo assembly) to identify differences unique to each sample.

Metagenomic Profiling of Antibiotic Resistance Genes in Montana Soil

Student Researcher: Paige Steffenson

Faculty Mentor: Dr. Jason Comer

Antibiotic resistance is a growing global health problem that threatens the effectiveness of treatments for bacterial infections. While resistance is often studied in hospitals, antibiotic resistance genes (ARGs) are also naturally present in environmental ecosystems such as soil, where bacteria produce antibiotics and develop resistance as part of natural competition. These environmental ARGs are important because they can act as reservoirs that may transfer resistance to disease-causing bacteria. In this study, soil collected from Absarokee, MT, was analyzed using metagenomic sequencing to characterize all environmental DNA (eDNA) present in the sample. DNA was extracted using commercial kits and sequenced using a long-read sequencing platform. The resulting sequences were analyzed using bioinformatics tools and compared against the Comprehensive Antibiotic Resistance Database (CARD) to identify all the organisms present in the sample, antibiotic resistance genes, and their relative abundances. Of the ARG classes identified, glycopeptide (vancomycin) resistance genes were the most abundant, with 246 reads, followed by rifampin resistance (2 reads), aminocoumarin resistance (1 read), and multidrug resistance genes (1 read). The high presence of glycopeptide resistance genes is consistent with natural soil environments, where microorganisms produce antibiotics and develop resistance as part of microbial competition. These findings support previous research demonstrating that soil environments contain diverse ARGs. Understanding environmental resistance genes provides insight into how antibiotic resistance develops and highlights the potential for resistance traits to spread beyond natural ecosystems.

Effect of Guardian Caps on Intra-Helmet Temperatures

Student Researcher: Danielle Stinson

Faculty Mentor: Kylie McKinney

Guardian Caps are a popular device that attaches to the outside of a football helmet to combat concussions. Research revolving around external helmet devices has explored the efficacy in reducing impact forces, and thus, reducing the risk and prevalence of concussions in sport. No previous research has investigated the effects of external devices on intra-helmet temperature. This was a randomized controlled study that included six watermelons to simulate a human head, suited with a new XL Riddell football helmet. Three helmets were randomly selected to be fitted with a Guardian Cap. All helmets were placed on black turf midday. A meat thermometer was placed in each watermelon through the wide gap in the face mask of the helmet. Initial temperatures were recorded and rechecked every 15 minutes for 120 minutes. There was no significant difference found when comparing change in temperature between helmets fitted with a Guardian Cap, and helmets not fitted with a Guardian Cap when the p-value was <0.05 ($p=1.00$). There was a significant difference found when comparing helmet weight and change in temperature ($p=0.0003$).

Washington's Last Chance: The New Jersey Campaign of 1776-1777

Student Researcher: Braden Stone

Faculty Mentor: Dr. Emily Arendt

I will be looking at the truth behind Washington's famous crossing of the Delaware river on Christmas 1776. I will attempt to show that due to various defeats militarily and inability to pay the men, Washington realized that he needed to do something, not to further his position strategically or politically, but to give his men the idea that they could win this war. Due to the incredibly low morale and the need to find pay and a reason to continue for his men, Washington crossed the Delaware and conducted his subsequent campaign through New Jersey in the winter of 1776-77, not to win battles, but to win morale for his troops and the rest of the Patriots throughout the newly formed United States.

Green Synthesis of Silver Nanoparticles by Use of Banana Peels as a reducing agent, and Practical Use of Silver Nanoparticles as a Catalyst

Student Researcher: Jerry Tulimaiau

Faculty Mentor: Dr. Hashini Herath

The green synthesis of silver nanoparticles was tested by use of banana peel extract as a reducing agent. These silver nanoparticles were then tested as a catalyst in a reaction of 5-HMF to 5-HMFCA.

The Impact of Generational Trauma on American Indian College Students at Montana State University Billings: Mental Health, Academic Outcomes, and Cultural Identity

Student Researcher: Destyne Two Moons

Faculty Mentor: Dr. Brent Finger

This mixed-methods study examined the impact of generational trauma on mental health, academic outcomes, and cultural identity among Native American college students at MSUB. Fifteen self-identified Native American and Alaska Native students completed validated measures of historical trauma, depression, anxiety, cultural connectedness, and GPA, and participated in Indigenous talking circles. Quantitative results showed a significant positive relationship between generational trauma and symptoms of depression and anxiety, while trauma and mental health did not significantly predict GPA. Cultural connectedness was positively, though non-significantly, associated with academic performance. Qualitative findings revealed themes of intergenerational trauma alongside resilience, including breaking generational silence, cultural reconnection, healing through community and ceremony, and family-centered motivation. Findings highlight Indigenous resilience and emphasize the need for culturally responsive, decolonial approaches to student support in higher education.

A Mixed Media Study in Improvement of Academic Motivation, Growth Mindset, and Resilience in College Students

Student Researcher: Chloe Lynn Walker

Faculty Mentor: Dr. Ambrin Masood

This study examined whether a mixed-media intervention could boost Growth Mindset, Resilience, and Academic Motivation among college students. The main question was whether combining cognitive, emotional, and narrative-based strategies would create measurable changes in these traits. Participants completed the Growth vs. Fixed Mindset Assessment, the Connor-Davidson Resilience Scale, and the Academic Motivation Scale before and after the intervention sequence. The interventions included a Recovery Narrative, a brief lesson on brain adaptability, a Resilience Presentation, and a Narrative Therapy activity. Results showed increases across all measures. Growth Mindset improved the most, with female participants showing the largest gains. Resilience demonstrated smaller but meaningful improvements, particularly among males. Academic Motivation increased for both genders, suggesting that combining multiple strategies helped shift students' attitudes and coping skills. The findings imply that blended interventions using storytelling, mindset training, and reflective practices can strengthen psychological resources linked to academic and emotional success.

Proteomic and Metabolomic Characterization of *Paruroctonus boreous* Venom

Student Researcher: Madison Walker

Faculty Mentor: Dr. Daniel Willems

Very little is known about *Paruroctonus boreous*, (*P. boreous*), the Northern Scorpion. Venom proteomic and metabolic components will be identified and evaluated for potential anticancer properties. Interest is relevant in this potential anticancer property as other potential anticancer uses from scorpion venom arise. *P. boreous* specimens were collected from field sites outside of Warren, Montana. Venom was collected via manual milking, frozen, reconstituted into high purity samples and clarified before analysis via high-contrast UHPLC Q-TOF mass spectrometry. Identified molecules from raw venom will be searched against relevant databases for

potential function. Bulk venom and specific proteins and/or small molecules of interest found in the venom will be used to assay biological effects on cancerous melanoma cells.

Relationship Between Peak Torque Measured Using an Isokinetic Dynamometer and Throwing Velocities in Overhead Athletes

Student Researcher: Jordyn Walsh

Faculty Mentor: Dr. Jeffrey Willardson

The isokinetic dynamometer is the gold standard in evaluating athlete strength when determining return to sport, demonstrating muscle imbalances between shoulder internal and external rotators. This study tested both limbs' internal and external rotation in the upper extremity and compared the results to throwing velocities. Peak torque for internal and external rotation was measured using the Humac Norm isokinetic dynamometer. This consisted of five practice trials followed by a 30-second rest interval and then three maximal effort trials. A Stalker Sport 2 radar gun measured athletes' throwing velocity with a baseball or softball, depending on their sport, over five trials. A Pearson correlation was used to assess peak torque produced in the internal rotators of the dominant arm and throwing velocities. An independent t-test compared dominant versus nondominant torque produced in the internal and external rotators. Statistical significance was found between throwing velocities and the internal rotational peak torque produced by the dominant arm ($p=0.002$). There was no statistical significance found between peak torque values in the dominant and nondominant arm. Research indicates overhead athletes experience strength differences between limbs. Additional research suggests that as internal rotational torque of the dominant arm increases, throwing velocities will also increase. This study's findings indicate that internal rotational torque of the dominant shoulder is strongly correlated to throwing velocities in overhead athletes. As internal rotational strength increases then throwing velocities will be greater. No significant differences were found between torque values in the dominant and nondominant arm for both internal and external rotators.

Cryotherapy vs Topical Analgesics: Effects on Pain Perception and Range of Motion During ATF Sprain Rehabilitation

Student Researcher: Alyie Williamson

Faculty Mentor: Kylie McKinney

Lateral ankle sprains involving the anterior talofibular ligament (ATFL) are among the most common injuries in athletic populations and often result in pain and restricted functional range of motion that delay the rehabilitation process. Cryotherapy is routinely implemented during early rehabilitation to manage pain; however, concerns exist regarding its potential to impair neuromuscular function and tissue healing during the post-acute phase. Topical analgesics may offer pain relief without the vasoconstrictive or neuromuscular effects associated with cryotherapy. This project compares the effects of cryotherapy and topical analgesics on pain perception and active range of motion during a modified single-leg squat in collegiate athletes recovering from an ATFL sprain. Participants were evaluated 72-84 hours post-injury and randomly assigned to either a cryotherapy group or a topical analgesic group. Pain perception was assessed using a 10-point Likert scale, and active range of motion was measured with a goniometer during a standardized modified single-leg squat. Following baseline measurements, participants will receive either a standardized cryotherapy intervention (ice bag with wrap applied for 20 minutes) or a topical analgesic intervention (5% menthol-based product). Post-intervention pain and range of motion were assessed immediately following treatment. Preliminary data collection from five participants (topical analgesic $n = 3$; cryotherapy $n = 3$) indicate reductions in pain perception following both interventions. Early trends suggest greater preservation or improvement of functional range of motion in participants receiving topical analgesics compared with cryotherapy.



Dreona Beston
The Vase
Lithography Ink. 8"x13"



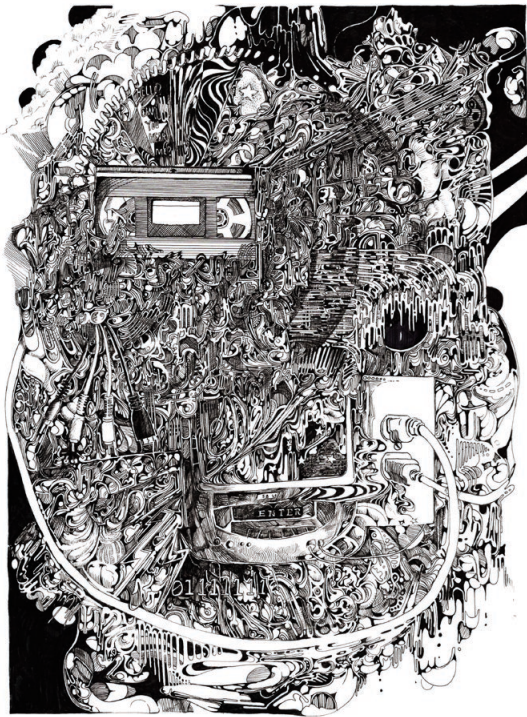
Lisa Blomquist
Medicine Cabinet
Found Objects/Tile/Epoxy Clay. 42"x28"x7"



Sarah Boucher
My 25th Year, 2025
Ink on Paper. 11"x14"



Sarah Boucher
Unaffected (self portrait), 2026
Ink on paper. 9"x12"



Sarah Boucher
Delete, 2026
Ink on paper. 9"x12"



Taya Falcon
Sit Still
Monotype. 11"x13" each



Taya Falcon
Resonance
Assorted Fabrics. 24"x48"



Morgan Finn
Hazed Landscapes
Mixed Media charcoal & pastel. 30"x22.5" each



Arbor Grayson
Old Conventions
Wood, Acrylic Paint. 18"x18"x21"



Gigi Green
Pinus Ponderosa
Hand-doweled and stained alderwood (eight board feet). 17"x13.5"



Samantha Grondin
Passion
Acrylic paint. 30"x15"



Hadassah Harris
Tarnish
Installation Projection .. Video/Photography



Savannah Hill
Floating Freely
Oil Paint. 12"x15"



Rhianna Lee
Pebbles of Time
Ceramic and Mixed Media. 7"x4"x2"



Ashlynn Morser
Untitled
Photography. 16"x17"



Ashlynn Morser
Untitled
Photography. 17"x9"



Holden Musso

Dropping water balloons on myself in front of the Northcutt Steele Gallery (detail)

archival pigment print. 10"x42"



Holden Musso

Rapture in Blue

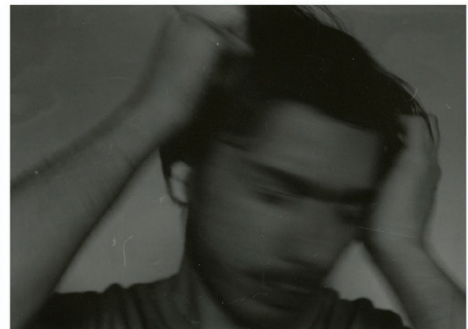
archival pigment print. 12"x16"



Isac Pratt

Hermitess

Digital Print. 14"x18"



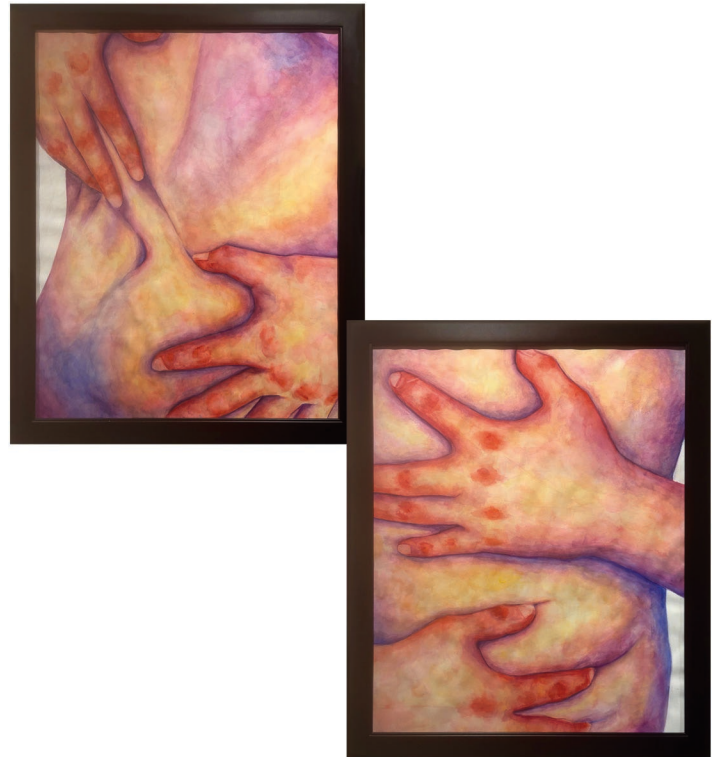
Isac Pratt

Static Frequency

Silver Gelatin Prints. 11"x14"



Madelyn Smith
Ritual
Watercolor on wood. 60"x48"



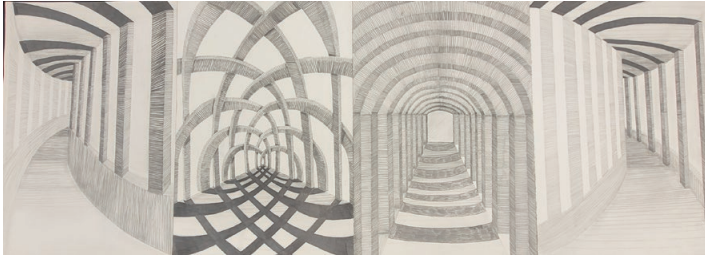
Madelyn Smith
Press and Pull (Diptych)
Watercolor. 24"x32"



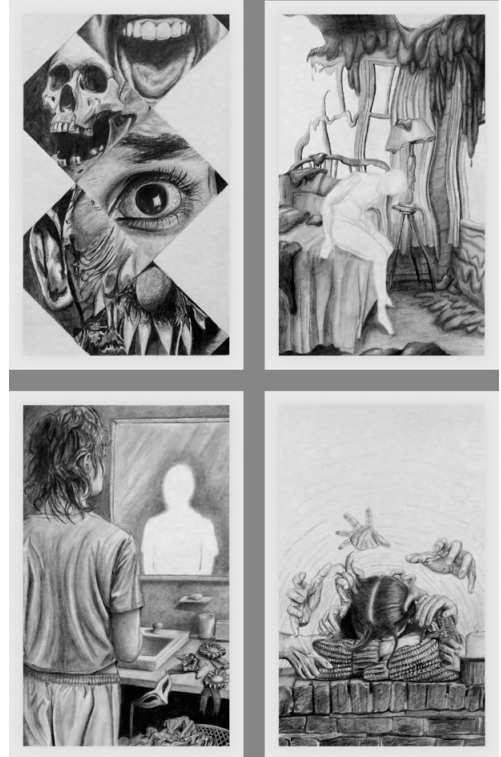
Cyndi Smith
Black Tree
Ceramics. 15"x6"x6"



Emily Tiry
Fancy Dinners (detail)
Ink Print. 50.5"x13"



Emily Tiry
The Shadows Existence
Graphite on Paper. 60"x22"



Kyle Vincent
I'm Not In Here (Rumination, Fatigue, Doubt, Guilt)
Graphite on paper. 18" x 12" (quadriptych)



Kyle Vincent
Canyon
Cut-and-pasted magazine collage on paper. 20" x 14"



Hannah Young
A Quiet Resistance
Digital Collage. 26"x11"

Thank You to Our Research & Creativity Symposium Judges

Austin Bennett, Faculty Director, University Honors Program

Molly Collins, Director, Nursing Expansion Program

Aimee Frank, Outreach Coordinator, TRIO Programs

Daniel Funderhide, Access Services Librarian, Library

Bryan Grove, Assistant Director, Advising

Carsyn Patton, Visiting Assistant Professor Communication Studies, Rocky Mountain College

Natalie Preston, Executive Assistant to the Chancellor

David Russell, Instructor, Biological & Physical Sciences

Erika Sturn, Chemical Safety Officer, Biological & Physical Sciences

Zack Thatcher, Administrative Associate, Library

Daniel Willems, Associate Professor, Biological & Physical Sciences

Jaekyung Willows, Assistant Professor, Educational Theory & Practice

Special Thanks & Appreciation

Chancellor Dr. Stefani Hicswa

Provost Dr. Lee Vartanian

Mayor Mike Nelson – Keynote Speaker

Patrick Williams – Multimedia Designer

Robin Earles – Art Gallery Director

SUB staff – Event Setup and Coordination

IT staff – Poster Printing and Sound/Tech

Jenay Cross – Research Symposium Manager

Cindy Bell – Director, Grants & Sponsored Programs

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